7.1.3 Quality audits on environment and energy regularly

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Sanjeevan Engineering & Technology Institute

AUDIT REPORT

2022-2023

Editorial

In the Era of global warming and climate change every citizen has to reduce their own carbon foot prints to tackle with the adverse impacts of climate change. A green audit of any academic institution revels ways in which we can reduce energy consumption, water use and reduction in emission of carbon dioxide in the environment. It is a process to look into and ask ourselves whether we are also contributing to the degradation of the environment and if so, in what manner and how we can minimize this contribution and bring down to zero and preserve our environment for future generation.

Sanjeevan Engineering & Technology Institute administration has already taken a step towards the green approach and conducted green audit of campus in the year 2023. As an outcome of this institute has taken green steps to reduce its carbon foot prints by several means in campus viz. sustainable fittings, tree plantation and green computing in the administration and examination. The responsibility of carrying out the scientific green audit was given to Environmental and Civil Engineering Solutions. The organization has followed the rules and regulation of Ministry of Environment and Forest, Govt. of India and Central Pollution Control Board, New Delhi.

A questionnaire was prepared based on the guidelines and format of CPCB, New Delhi to conduct green audit. The information related to consumption of resources like water, electricity and handling of solid and hazardous waste was collected in the formats from main building support services and departments. The data collected was grouped and was tabulated in Excel sheets and analysed. The graphs of the analysed data were prepared for getting quick idea of the status. Interpretation of the overall outcomes was made which incorporates primary and secondary data, references and interrelations within. Final report preparation was carried out using this interpretation to prepare environment management plan of institute for next two years.

During the preparation of the Audit Report Hon. Principal, Hon. Vice Principal encouraged us with their full support. Registrar, Director, IQAC, Deans of faculties, and other officers of the institute were also given support to carry out this work. All Heads of the department, Directors, Co-ordinators, In-charge of the support services and engineering section of the university also gave full co-operation.

Environmental & Civil Engineering Solutions ECS Sangli

Nikhil N. Kamble
(C.E.O and Head)

Environmental and Civil Engineering Solutions

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Green, Energy and Environment Audit Report

Sanjeevan Engineering & Technology Institute, Panhala

Acknowledgement

We express our gratitude for calling upon us for this audit, mainly the Principal and all other staff members, who were ever helpful and supported us with all the inputs needed for this audit. We thank all the teaching, non-teaching and students for helping us in conducting this audit.

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1. Introduction:

The modernization and industrialization are the two important outputs of twentieth century which have made human life more luxurious and comfortable. Simultaneously, they are responsible for voracious use of natural resources, exploitation of forests and wildlife, producing massive solid waste, polluting the scarce and sacred water resources and finally making our mother Earth ugly and inhospitable. Today, people are getting more familiar to the global issues like global warming, greenhouse effect, ozone depletion and climate change etc. Now, it is considered as a final call by mother Earth to walk on the path of sustainable development. The time has come to wake up, unite and combat together for sustainable environment.

Considering the present environmental problems of pollution and excess use of natural resources, Hon. Prime Minister, Shri. Narendra Modiji has declared the Mission of Swachch Bharat Abhiyan. Also, University Grants Commission has mentioned “Green Campus, Clean Campus” mission mandatory for all higher educational institutes. As environmental sustainability is becoming an increasingly important issue for the nation, the role of higher educational institutions in relation to environmental sustainability is more prevalent.

Green Audit is the most efficient ecological tool to solve such environmental problems. It is a process of regular identification, quantification, documenting, reporting and monitoring of environmentally important components in a specified area. Through this process the regular environmental activities are monitored within and outside of the concerned sites which have direct and indirect impact on surroundings. Green audit can be one of the initiative for such institutes to account their energy, water resource use as well as wastewater, solid waste, E-waste, hazardous waste generation. Green Audit process can play an important role in promotion of environmental awareness and sensitization about resource use. It can create consciousness towards ecological values and ethics. Through green audit one can get direction about how to improve the condition of environment.

1.1 Need of audit:

Green auditing is the process of identifying and determining whether institutions practices are eco-friendly and sustainable. Traditionally, we are good and efficient users of natural resources. But over the period of time excess use of resources like energy, water, chemicals are become habitual for everyone especially, in common areas. Now, it is necessary to check

whether our processes are consuming more than required resources? Whether we are handling waste carefully? Green audit regulates all such practices and gives an efficient way of natural resource utilization. In the era of climate change and resource depletion it is necessary to verify the processes and convert it in to green and clean one. Green audit provides an approach for it. It also increases overall consciousness among the people working in institution towards an environment.

1.2 **Goals of audit:**

Institute has conducted a audit with specific goals as:

1. Identification and documentation of green practices followed by university.
2. Identify strength and weakness in green practices.
3. Conduct a survey to know the ground reality about green practices.
4. Analyse and suggest solution for problems identified from survey.
5. Assess facility of different types of waste management.
6. Increase environmental awareness throughout campus.
7. Identify and assess environmental risk.
8. Motivates staff for optimized sustainable use of available resources.
9. The long term goal of the environmental audit program is to collect baseline data of environmental parameters and resolve environmental issue before they become problem.

1.3 **Objectives of Audit:**

1. To examine the current practices which can impact on environment such as of resource utilization, waste management etc.
2. To identify and analyse significant environmental issues.
3. Setup goal, vision and mission for Green practices in campus.
4. Establish and implement Environmental Management in various departments.
5. Continuous assessment for betterment in performance in green practices and its evaluation.
6. To prepare an Environmental Statement Report on green practices followed by different departments, support services and administration building.

1.4 **NAAC criteria VII Environmental Consciousness:**

Institutes are playing a key role in development of human resources worldwide. Higher education institutes campus run various activities with aim to percolate the knowledge along with practical dimension among the society. Likewise different technological problems higher education institutes also try to give solution for issues related to environment. Different types of evolutionary methods are used to assess the problem concerning environment. It includes Environmental Impact Assessment (EIA), Social Impact Assessment (SIA), Carbon Footprint Mapping, Green audit etc

National Assessment and Accreditation Council (NAAC) which is a self-governing organization that declares the institutions as Grade according to the scores assigned at the time of accreditation of the institution. Green Audit has become mandatory procedure for educational institutes under Criterion VII of NAAC. The intention of green audit is to upgrade the environmental condition inside and around the institution. It is performed by considering environmental parameters like water and wastewater accounting, energy conservation, waste management, air, noise monitoring etc. for making the institution more eco-friendly.

Students are the major strength of any academic institution. Practicing green actions in any educational institution will inculcate the good habit of caring natural resources in students. Many environmental activities like plantation and nurturing saplings and trees, Cleanliness drives, Bird watching camps, No vehicle day, Rain water harvesting, etc. will make the students good citizen of the country. Through Green Audit, higher educational institutions can ensure that they contribute towards the reduction of Global warming through Carbon Footprint reduction measures.

1.5 **Benefits of Green Audit to an Educational Institute:**

There are many advantages of green audit to an Educational Institute:

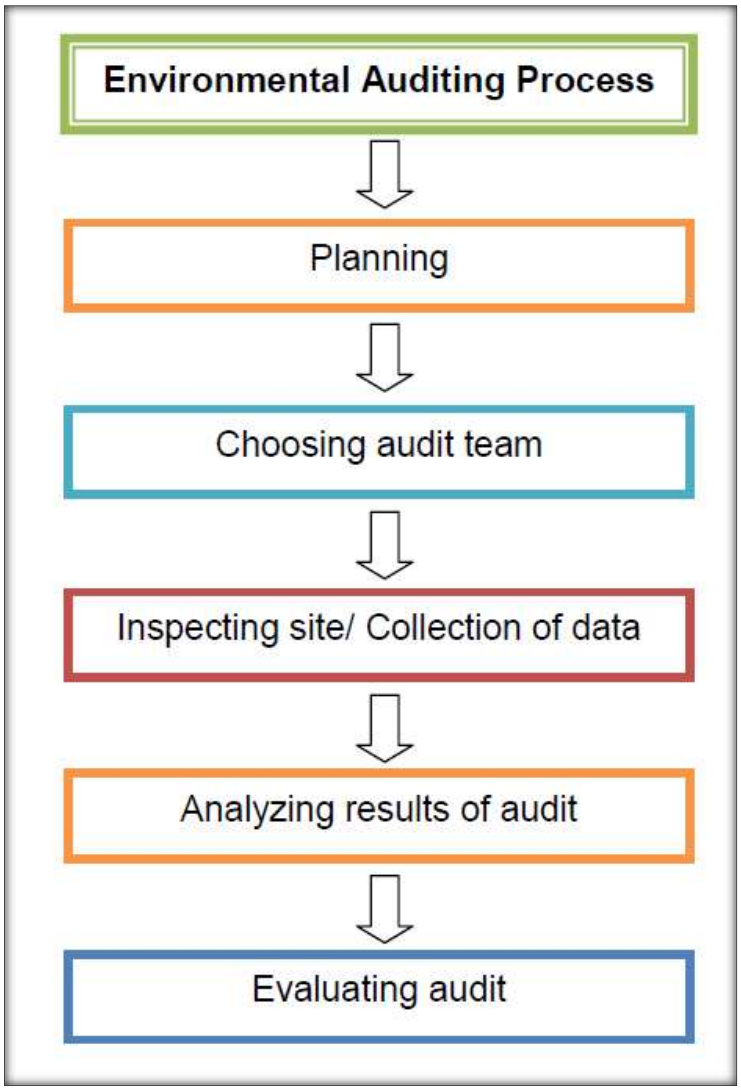
1. It would help to protect the environment in and around the campus.
2. Recognize the cost saving methods through waste minimization and energy conservation.
3. Find out the prevailing and forthcoming complications
4. Empower the organization to frame a better environmental performance.
5. It portrays good image of institution through its clean and green campus.

2. Overview of Institute:

The Sanjeevan Engineering & Technology Institute, Panhala was established in the year of 1994. Institute has huge area of 13 acres and has been serving the mankind in the field science and technology.

The landscaped grounds of college are widely admired for their beauty. The most valuable investment any educational institution can make is “Nurturing Future Leaders”. With the continuous rise in expectation of essential leadership standards, the institute has torch bearers have taken a responsibility for this investment to nurture the NextGen leaders with a vision to bridge the existing skill gap. With a firm step forward to attain an academic excellence, several Centres of Excellence, computer labs, and industry-academia associations have been setup at the College in association with the top leaders. The College believes that its primary stakeholders are the students. All aspects of education focus on the core values of contributing to national development while fostering global competencies among students. The College admits students from all social milieus and empowers them through intensive mentoring and counselling to face the challenges of life and become responsible and sensitized citizens of the country.

3. Methodology:



3.1 **Audits to be carried out:**

- Green and carbon footprint audit
- Energy audit
- Environmental audit
    - Water audit
    - Wastewater audit
    - Solid waste audit
    - Ambient noise audit
    - Ambient air audit

4. Green and Carbon footprint audit:

Green Audit is the most efficient ecological tool to solve such environmental problems. It is a process of regular identification, quantification, documenting, reporting and monitoring of environmentally important components in a specified area. Through this process the regular environmental activities are monitored within and outside of the concerned sites which have direct and indirect impact on surroundings. Green audit can be one of the initiative for such institutes to account their energy, water resource use as well as wastewater, solid waste, E-waste, hazardous waste generation. Green Audit process can play an important role in promotion of environmental awareness and sensitization about resource use. It can create consciousness towards ecological values and ethics. Through green audit one can get direction about how to improve the condition of environment.

Carbon is the basis of life on mother Earth. It is incorporated into the plants through photosynthesis, consumed by animal species through the food, present in the form of carbon dioxide (CO2) the atmosphere, locked into the rocks as limestone and compressed into the different fossil fuels such as coal and oil. As CO2 level in the atmosphere continue to increase, most climate designs or project that the oceans of the world and trees will keep soaking up more than half CO2 . The plants on land and in the sea, taken up carbon by over many years increased the percentage discharged during decay, and this increased carbon became locked away as fossil fuels beneath the surface of the planet. The starting of the 21st century brought growing concern about global warming, climate change, food security, poverty and population growth. In the 21st century more carbon has been released into the atmosphere than that has been absorbed. CO2 is a principle component causing global warming. Atmospheric carbon dioxide levels have increased to 40 % from preindustrial levels to more than 390 parts per million CO2. On this background it is a need of time to cover the research areas interrelated with climate change.

4.1 Green Cover at SETI:

SETI has got a huge green cover and has almost 50 species of vegetation inside the campus. The institute has 22 acres of campus and most of this is covered by green area. They have a huge plantations and structural components are Main building, office section, mess, Block A, Block B, Block C and Block D etc.

Figure 4-1 SETI, Campus

SETI has taken huge efforts to develop its green cover. The institute has about 8.59 acres of green cover. In the vicinity of the institute there are about approximately 805 fully grown trees and more than a 1522 growing plants. The above table shows some of the common tree species found. Institute has agriculture cover approximately about 4.81 acres in plantation.

Sr. No.	Species
1	Caesalpinia pulcherrima
2	Tribulus terrestris
3	Vachellia nilotica
4	Rotheca serrata
5	Lavandula bipinnata
6	Barleria cristata
7	Fox Brush Orchid

Mostly there are trees of Tamarind, mango, neem, ferns etc. Due to this the institute has high carbon sequesterial values. Considering the vicinity some dry plants were observed to approximately about 33. Plants absorb sunlight, 50% is absorbed and 30% reflected so this helps to create a cooler and more pleasant climate through a 3°C temperature reduction in the vicinity. This has also leaded to increase in biodiversity as more than 18 species of birds were observed. Some off the common birds were viz. Sparrow, wild parrots, little stint, black kite etc.

4.2 **Carbon Footprint Audit:**

SETI has estimated its carbon footprint by factor methodology. Various factors were used to estimate the carbon emissions from Consumption of electricity, generation of solid waste, use of vehicles in campus, carbon emissions due to human breathing and emissions from buildings. At last they have also calculated Carbon sequesterial value i.e. carbon that is absorbed by the plants.

Sr. No.	Month	Units	Demand	CO2 emitted (KgCO2 eq.)
1	Mar 22	44358	144	36373.56
2	Apr 22	38749	156	31774.18
2	May 22	30616	156	25105.12
3	Jun 22	38508	156	31576.56
4	Jul 22	61325	156	50286.5
5	Aug 22	55957	156	45884.74
6	Sep 22	42201	156	34604.82
7	Oct 22	43564	156	35722.48
8	Nov 22	43284	156	35492.88
9	Dec 22	53421	156	43805.22
10	Jan 23	50340	156	41278.8
11	Feb 23	49726	156	40775.32

Hence as per the calculation the average unit consumption considering all the months is about 46004.08 units and the carbon emission is 37723.34 kg CO2 eq./year.

Secondly considering emissions from human breathing, the institute has total 956 students. Institute has special boys and girls hostel. Considering all the staff viz. Junior teachers, senior teachers, Non grant, grant CHB they are total of 55. The staff works for about averagely 6 hours a day in the institute and the students are present for 4 hours averagely daily.

Vehicles emit significant amount of gases in environment and SETI has various parking sections in the campus. It was found that averagely 177 vehicles entered the institute daily and travel about 200 m of distance from the gate. Cars also enter the institute and as per observation 12 cars are observed daily. Hence, emission from 2 wheelers is 941.6 g/km CO2 eq. considering petrol and diesel cars the emission are 271.2 g/km CO2 eq. Overall the institute emits 242.56 Kg CO2 eq. per year.

Solid waste is very important as it emits significant amount of carbon through it. SETI has a good solid waste management system. Hence the institute develops about 1355 kg of waste

daily in both the form of wet and dry. Hence for non-residing persons the emissions are 1171.67 kg CO2 eq. per day and for 141 resident students they are 55.23 kg CO2 eq. per day. Overall for an year the generation is about 23.43 ton CO2 eq. per year.

Buildings play an important role in carbon contribution. During the construction operation and use phase they emit significant amount of carbon. Hence considering total built-up area the carbon emissions could be evaluated. After the estimation the total built-up area observed was approximately about 5061 sq. m and the carbon emission were 1012.20 kg CO2 eq. per year.

Carbon sequesterial in important as it is the carbon absorbed by the trees. SETI campus has 805 fully grown trees and 1522 growing trees. Hence the carbon absorbed by both this trees is 27180 kg CO2 eq. per year.

Hence overall carbon data for SETI is mentioned below.

Sr. No.	Section	Emission
1	Emission from electricity	37723.34 kg CO2 eq./year.
2	Emission from solid waste	23.43 ton CO2 eq. per year.
3	Emission from Vehicles	242.56 Kg CO2 eq. per year.
4	Emission from human breathing	63.75 tons of CO2 eq. per year.
5	Emission from buildings	1012.20 kg CO2 eq. per year.
6	Carbon sequesterial	288156 kg CO2 eq. per year.

4.3 **Conclusion:**

- Highest carbon emission was observed from human breathing i.e. 63.75 tons of CO2 eq. per. Year. There is no any significant mean to reduce this number as it is not controllable.
- The next is solid waste. The emission from solid waste comprises of 23.43 ton CO2 eq. per year. This can be significantly reduced by following simple means. Waste segregation is properly observed by the institute and they should follow the cut out plastic plans. There should be complete ban in using the plastic inside the campus. There should be minimization of food waste as it contributes highest in carbon emissions.
- Considering emission from electricity they can be significantly reduced by decrease in electricity use. This can be done by installing LED lights and using energy efficient

equipment's such as machines with high star ratings which save more. Institute can recognize renewable energy sources and have a setup in the institute. This can lead in significant saving of electricity and reduction in carbon emissions.

- Vehicles have the least emissions in SETI and it is due to the easy approached parking so that vehicles do not roam in the vicinity. All the vehicles travel hardly 350 m in the campus and tis has led to lower emissions. Still institute can follows "NO Vehicle Day" on every 2nd Saturday of each month.
- Institute reduces about 2.88 tons of CO2 per year by the means of plants. This could be increased by increasing in plantations. SETI can plant more trees next to chemistry section, surrounding to play ground, front of applied science department etc.
- The plants having highest Carbon sequestration values are suggested. Cinnamomum verum, Eugenia caryophyllid, Bumelia celestina, Acacia Berland Eri, Acacia Francescana, Chinaberry tree, Moringa oleífer, Carya illusoriness, Pinus Arizonian and Buddleia cordata are some of the suggested species for plantation.

5. Environmental Audit:

An environmental audit is a type of evaluation intended to identify environmental compliance and management system implementation gaps, along with related corrective actions. ISO 14001 is a voluntary international standard for environmental management systems ("EMS"). ISO 14001:2004 provides the requirements for an EMS and ISO 14004 gives general EMS guidelines. An EMS meeting the requirements of ISO 14001:2004 is a management tool enabling an organization of any size or type to:

- Identify and control the environmental impact of its activities, products or services;
- Improve its environmental performance continually, and
- Implement a systematic approach to setting environmental objectives and targets, to achieving these and to demonstrating that they have been achieved.

The audit examines the potential hazards or risks posed by the institutes. Areas examined may include environmental policies and procedures, energy use practices, recycling, waste, conservation, and pollution. Then, the institute can use the results to determine what changes need to be made for compliance. In a broad sense, environmental auditing aims to help protect the environment and minimize the risks of business activities to the environment and human safety and health.

5.1 Water Audit and wastewater audit:

Water auditing is a method of quantifying water flows and quality in systems, with a view to reducing water usage and often saving money on otherwise unnecessary water use. Water audit is an effective management tool for minimizing losses, optimizing various uses and thus enabling considerable conservation of water. Water audits trace water use from its point of entry into the facility/system to its discharge into the sewer/river/canal etc. Wastewater audit deals with effective management of wastewater in the system. It deals with proper generation, management, treatment, transfer and disposal of wastewater.

SETI has carried out its water and wastewater audit and has suggested many more ways for water conservation, reuse and recycle. The detail water and waste water report is mentioned below.

5.2 **Water Audit report:**

Water audit for the "SETI" was carried out. The purpose of the water audit is to provide a thorough understanding of the water uses by identifying and measuring all water using fixtures, appliances, and practices in order to recommend potential water saving efficiencies.

PRIMARY DATA

Sr. No.	Title	Information
1	**Name of Institute**	SETI
2	**Address**	Panhala
4	**Name of company under which water audit is carried out**	Environmental and Civil Engineering Solutions, Sangli
6	**Number of floors**	G + 2
7	**Category of building**	Educational Institute
8	**Nearest ESR location**	Campus
9	**Water supply hours**	6 hrs. daily
10	**Water meter present**	Yes

POPULATION DETAILS

Title	Information
Fixed population (Working staff and Students)	Gents: 766
	Ladies: 245
Variable population (Visiting persons)	Gents: 15
	Ladies: 12

SOURCE INFORMATION

Title	Information
Sources of water	River water pumping
Connection details	1" PVC pipe inlet and 1" outlet distribution pipe

STORAGE DETAILS

Title	Information
Overhead tank type	PVC tank
Location	On terrace
Number of tanks	Section A: 1 X 2000 lit PVC Section B: 4 X 2000 lit PVC Section C: 3 X 2000 lit PVC 2 X 1000 lit PVC Section D: 2 X 1000 lit PVC
Motor connection details	2 Hp for pumping
Pumping period	4 hours daily
Underground sump	No
Capacity of underground sump	NA

WATER USAGE

Toilet	Number of users	Water consumption
Gents toilet	766 users	766 X 10 lit = 7660
Washbasin	1011 users	1011 X 0.75 lit = 759
Ladies toilet	245 users	245 X 12 lit = 2940
Toilet cleaning	600 liters	600 liters
Floor cleaning	500 liters	500 liters
Gardening	1500 liters	1500 liters
Laboratories	1000 liters	1000 liters
Total		**14,959 lit**

WATER CONSUMPTION IN HOSTEL

Considering 135 LPCD there are 141 boys and girls in hostel section. Hence, 141 X 87 is 12,267 liters.

WATER USED FOR DRINKING

There are coolers cum water purifiers present in the institute. Sample assessment for 3 months was done and average values are presented below for each section.

Potable water assessment:

Section 1

Sr. No.	Test	Results	Limit
1	pH	**6.6-7.1**	6.5-8.5
2	TDS	**111**	-
3	E.C	**96**	-
4	Hardness	**123**	200
5	Chlorides	**101**	200
6	MPN	**Ab**	1.0
7	Odor and Color	**Ab**	-

Section 2

Sr. No.	Test	Results	Limit
1	pH	**6.6-7.9**	6.5-8.5
2	TDS	**124**	-
3	E.C	**188**	-
4	Hardness	**139**	200
5	Chlorides	**100**	200
6	MPN	**Ab**	1.0
7	Odor and Color	**Ab**	-

Section 3

Sr. No.	Test	Results	Limit
1	pH	**6.6-7.1**	6.5-8.5
2	TDS	**100**	-
3	E.C	**114**	-
4	Hardness	**102**	200

5	Chlorides	**110**	200
6	MPN	**Ab**	1.0
7	Odor and Color	**Ab**	-

Section 4

Sr. No.	Test	Results	Limit
1	pH	**6.8-7.4**	6.5-8.5
2	TDS	**147**	-
3	E.C	**100**	-
4	Hardness	**99**	200
5	Chlorides	**107**	200
6	MPN	**Ab**	1.0
7	Odor and Color	**Ab**	-

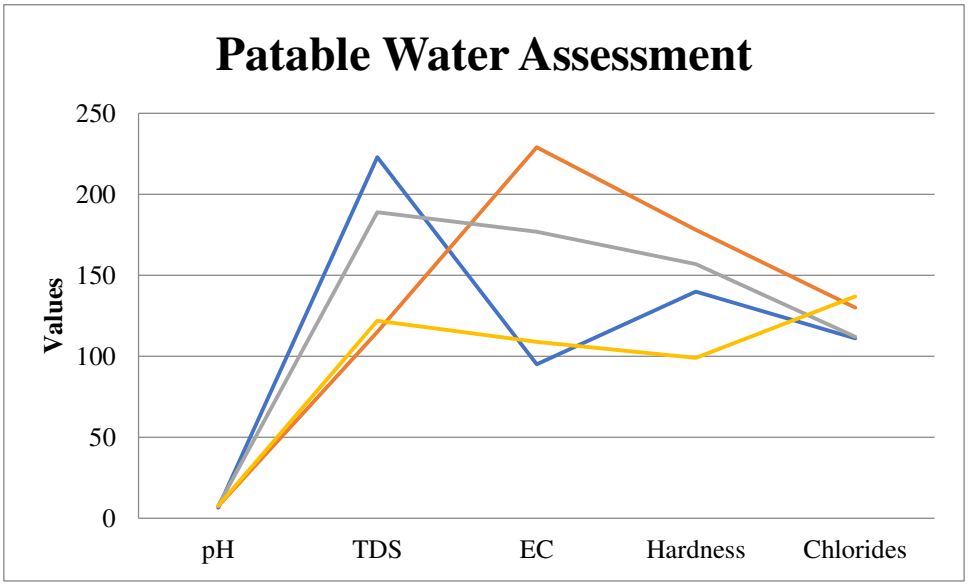
Municipal water and deep well water assessment:

River water ESR water assessment

Sr. No.	Test	Results	Limit
1	pH	**7.8**	6.5-8.5
2	TDS	**1277**	-
3	E.C	**2745**	-
4	Hardness	**188**	200
5	Chlorides	**121**	200
6	MPN	**Ab**	1.0
7	Odor and Color	**Ab**	-

Mail RO plant assessment

Sr. No.	Test	Results	Limit
1	pH	**6.6**	6.5-8.5
2	TDS	**98**	-
3	E.C	**55**	-
4	Hardness	**22**	200
5	Chlorides	**102**	200
6	MPN	**Ab**	1.0
7	Odor and Color	**Clear**	-



5.3 **Waste water audit:**

SETI campus generates huge amount of wastewater. The source for wastewater in the campus is hostels, institute, mess and the washrooms and urinals inside the campus. To estimate the amount of wastewater generated all the water that is used in the washrooms, quarters and hostels is considered as wastewater.

Sr. No.	Section	Wastewater generated in litres
1	Waste usage generated in campus	**14,959**
2	Hostel water usage	**12,267**
Total		**27,226**
Waste water generated		**20,419.5**

5.4 **Waste water treatment plant at SETI:**

Currently SETI lets all it waste water into sewers and some of the waste water is disposed at the back of chemistry department. Currently there is no any waste treatment facility. Sampling of waste water was done for 3 months for the parameters of COD, BOD, TKN and pH. Following table shows the characterization of wastewater.

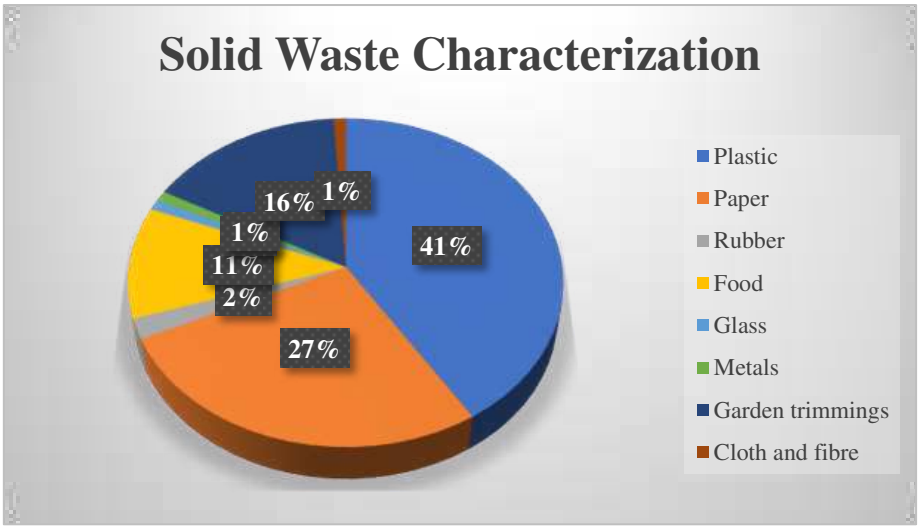
Sr. No.	Parameter	Reading
1	pH	7.11
2	COD	208
3	BOD	101
4	TKN	25

5.5 **Solid waste Audit:**

A waste audit is a physical analysis of waste composition to provide a detailed understanding of problems, identify potential opportunities, and give you a detailed analysis of your waste composition. A waste audit will help you clearly identify your waste generation to establish baseline or benchmark data, Characterize and quantify waste stream, Verify waste pathways, identify waste diversion opportunities and identify source reduction opportunities.

Solid waste is the unwanted or useless solid material generated from the human activities in residential, industrial or commercial area. Solid waste management reduce or eliminates the adverse impact on the environment and human health. Solid waste audit for SETI was carried out. The entire premise was analysed for solid waste generation and waste characterization. Overall waste was observed and characterization was done. The above table shows the components of solid waste at SETI campus. Quartering method was used and 1 Kg of waste was selected.

Sr. No.	Type of waste	Composition %
1	Plastic	41
2	Paper	27
3	Rubber	2
4	Food	11
5	Glass	1
6	Metals	1
7	Garden trimmings	16
8	Cloth and fibre	1



After analysing all the bins it was observed that plastic had highest contribution viz. 41% followed by the paper waste i.e. 27%. Mostly common observed plastic items were plastic wrappers of chips, soft drinks bottles and chocolate wrappers. The paper waste included paper wrappers, notebook pages, pamphlets and some pieces of cardboard. The third highest waste included garden trimmings. It included small grass, minute branches etc. The least contribution was of cloth, fibre, glass and metals.

Institute follows good practices regarding separate bin system, and the bins are even marked. There are 2 separate bins present in campus viz. black bins for wet waste and green bins for dry waste. Considering applied science section they have places yellow bins for wet waste and green bins for dry waste.

5.6 **Observations and Conclusion:**

- There are separate bins for wet waste and dry waste. Hence, source segregation takes place.
- Institute has taken steps towards paper recycling. The paper waste collected from the bins is send to vendors.
- Plastic ban in campus is implemented but due to lack of seriousness in the students plastic is used in campus. Institute should conduct plastic awareness seminars for both the staff and students.

Assessment of soil was done to determine the quality of soil:

Sr. No.	Test	Results
1	pH	**6.1**
2	NPK	**2:3:1**
3	Acidity	**137 mg/lit**
4	Hardness	**170 mg/lit**

5.7 **Ambient Air Audit:**

Ambient air quality refers to the condition or quality of air surrounding us and in the outdoors. National Ambient Air Quality Standards are the standards for ambient air quality set by the Central Pollution Control Board (CPCB) that is applicable nationwide. The CPCB has been conferred this power by the Air (Prevention and Control of Pollution) Act, 1981. Hence, auditing this ambient air quality is stated as ambient air audit.

SETI has carried out its ambient air audit at various locations in the premises. Air quality detector machine PS-21185 was used for air audit. Parameters viz. SOx, NOx, RSPM and Air quality were assessed. Following google earth pro images shows the assessed locations.

Sr. No.	Point number	Location
1	Point No 1	Gate entry
2	Point No 2	Passage
3	Point No 3	Office
4	Point No 4	Drawing hall
5	Point No 5	Classroom 1
6	Point No 6	Classroom 2

7	Point No 7	Classroom 3
8	Point No 8	Block 1
9	Point No 9	Block 2
10	Point No 10	Block 3
11	Point No 11	Block 4
12	Point No 12	Open air
13	Point No 13	Library
14	Point No 14	Study room

Results of air quality monitoring:

Point No	Location	SOx	NOx	RSPM	Quality
	CPCB Limits	**80 µg/m3**	**80 µg/m3**	**80 µg/m3**	**-**
1	Gate entry	33	42	66	Good
2	Passage	10	11	38	Fresh
3	Office	11	8	31	Good
4	Drawing hall	8	12	27	Fresh
5	Classroom 1	11	15	22	Fresh
6	Classroom 2	11	22	10	Fresh
7	Classroom 3	10	18	19	Good
8	Block 1	10	10	11	Good
9	Block 2	9	11	22	Good
10	Block 3	14	5	18	Good
11	Block 4	13	18	19	Good
12	Open air	20	17	49	Good
13	Library	11	10	21	Fresh
14	Study room	10	17	22	Fresh

Conclusion and recommendations:

- After assessing the air quality all the results are within the limits. Considering the RSPM i.e. respirable dust particulate matter highest was observed at the gate entrance.

This is due to the present of small dust particles from the open ground. The second highest was observed in passages.

- Considering the SOx and NOx, it is mainly due to vehicle exhaust. Hence the highest was observed at the main gate entrance since many vehicles from public and college travel.
- There are some measures commonly need to follow such as Ban on open solid waste burning in campus and ban on grass burning in summer season.

5.8 **Ambient Noise audit:**

Ambient sound in relation to audio refers to the background noise present at a given scene or a location. This can include noises such as rain, traffic, crickets, birds, etc. Ambient sound levels are often measured in order to map sound conditions over a specific time to understand their variation with locale and various points. Ambient noise level is measured with a sound level meter. It is usually measured in Decibel (dB).

Three points were selected based on best suitable requirement for noise monitoring. RS-2250 instrument was used. Monitoring was carried out 3 times in a day for 3 months. Readings were collected in morning section, afternoon section and evening section. In addition to this monitoring was also carried out in library section, study room section, classrooms, tutorial rooms and laboratories.

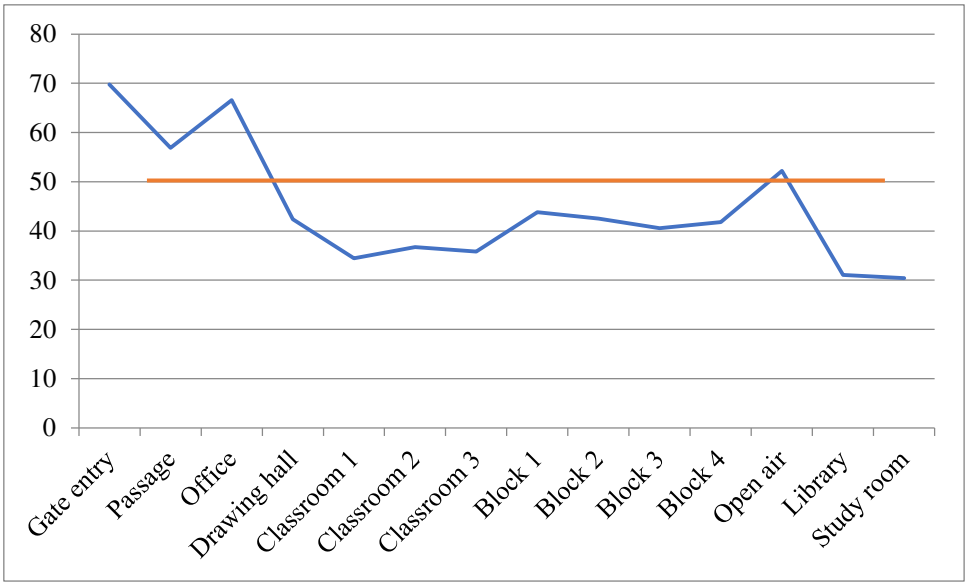
Sr. No.	Point number	Location
1	Point No 1	Gate entry
2	Point No 2	Passage
3	Point No 3	Office
4	Point No 4	Drawing hall
5	Point No 5	Classroom 1
6	Point No 6	Classroom 2
7	Point No 7	Classroom 3
8	Point No 8	Block 1
9	Point No 9	Block 2
10	Point No 10	Block 3
11	Point No 11	Block 4
12	Point No 12	Open air
13	Point No 13	Library
14	Point No 14	Study room

Results of noise assessment:

All the values are in decibels. Assessment values present average of 3 months data and the last column present the final average of morning noon and evening.

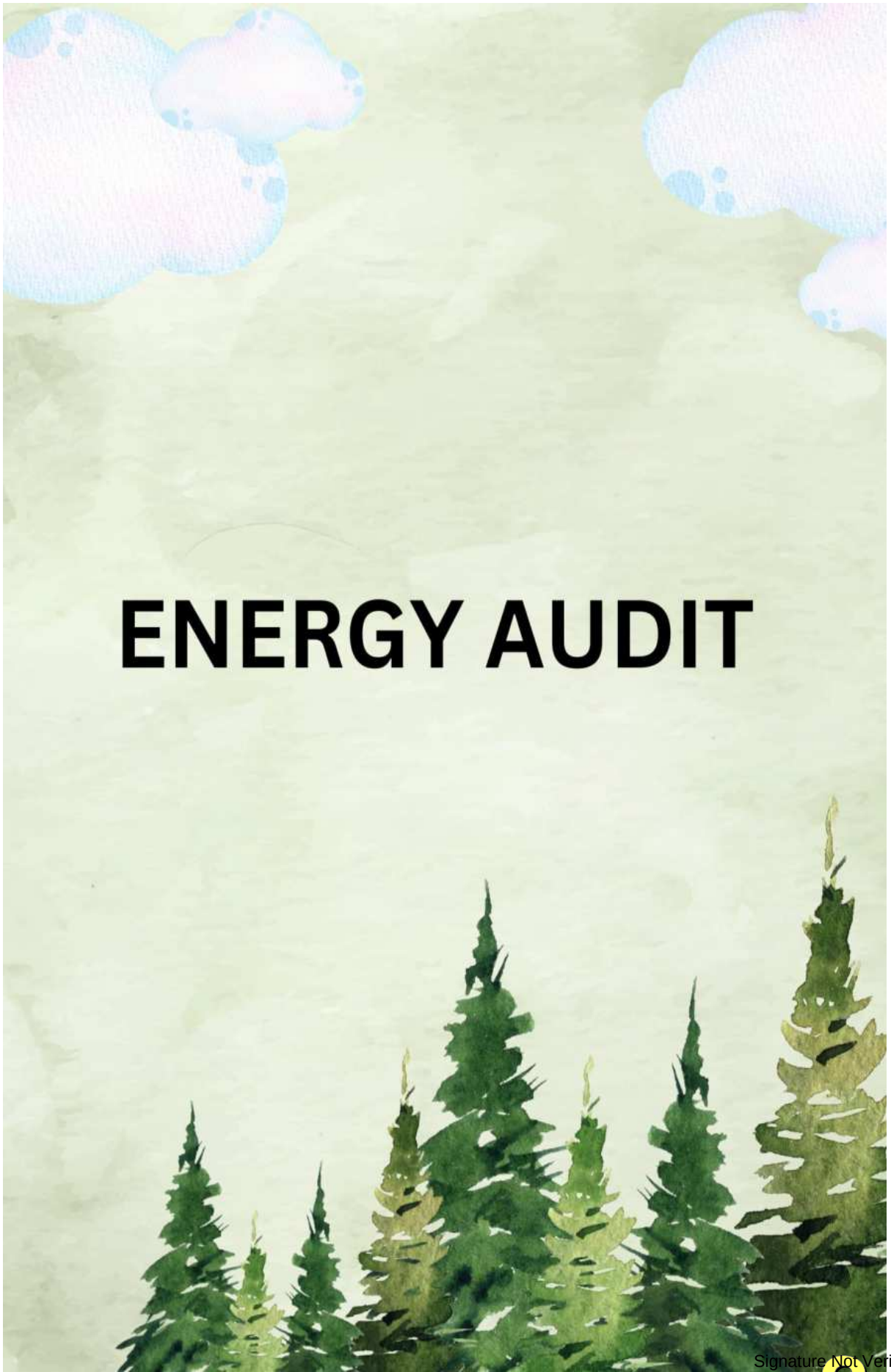
Point No	Location	Morning	Noon	Evening	Average
1	Gate entry	65.23	80.67	60.45	68.78
2	Passage	53.93	63.40	50.50	55.94
3	Office	60.77	65.44	70.70	65.64
4	Drawing hall	40.02	46.23	39.45	41.90
5	Classroom 1	31.34	39.04	31.45	33.94
6	Classroom 2	35.94	41.77	33.73	37.15
7	Classroom 3	35.80	37.00	35.87	36.22
8	Block 1	41.47	49.14	42.04	44.22
9	Block 2	40.46	44.84	42.67	42.66

10	Block 3	41.03	41.26	39.99	40.76
11	Block 4	42.67	44.51	38.73	41.97
12	Open air	55.96	51.52	50.67	52.72
13	Library	33.98	30.14	30.57	31.56
14	Study room	30.82	31.48	30.45	30.92



Conclusion and recommendations:

- As per the rules defined by CPCB the limit standards set for institutes regarding noise emissions are restricted to 50 Decibels.
- Considering the average data highest noise emission were observed at main gate entrance, passage, office and open air. This is due to more wide open spaces and echo of sound.
- The lowest emission was observed at the library and study room section. SETI has followed good practices regarding discipline in library section.
- Some common suggestions such as, installing sign boards in campus regarding provision of mobiles, setting up rules for students regarding premises and canteen utilization.



6. Energy Audit:

An energy audit is an inspection survey and an analysis of energy flows for energy conservation in a building. It may include a process or system to reduce the amount of energy input into the system without negatively affecting the output. In commercial and industrial real estate, an energy audit is the first step in identifying opportunities to reduce energy expense and carbon footprint.

A nation is tiring to advance in quantity and quality to the spread of education among the common India and development of their intelligence. In India the entire field of education and other fields of intelligent activities had been monopolized by a handful of men before independence. But today we are marching towards the desirable status of a developed nation with fast strides. But the development should be a sustained one. For achieving such an interminable development energy management is essential. As far as concerning electricity crisis, we are facing lack of electricity during office work. So, institutional management is taking design regarding production of electricity and saving electricity for Eco social aspect. Energy requirement of India is growing and incomplete domestic fossil fuel treasury. The country has motivated strategy to enlarge its renewable energy resources and policy to establish the nuclear power plants. India increases the involvement of nuclear power to largely electrical energy development facility from 4.2% to 9%. India's industrial demand accounted for 35% of electrical power requirement, domestic household use accounted for 28%, agriculture 21%, commercial 9%, and public lighting and other miscellaneous applications accounted for the rest. Energy conservation means reduction in energy consumption without making any sacrifice of quantity or quality. A successful energy management program begins with energy conservation; it will lead to adequate rating of equipment's, using high efficiency equipment and change of habits which causes enormous wastages of energy. By observing all these study lack of electricity and huge electricity demands. It is necessary to plan to be self-sufficient in electricity requirement.

6.1 Connection details:

Institute receives electricity from MSEB i.e. Maharashtra State Electricity Distribution Co. Ltd. Following are the details about connection.

- **Type of connection:** HT
- **Tariff:** 146 HT-VIII B

- **Sanctioned load:** 300.00 KW
- **Contract demand:** 240.00 KVA
- **Feeder voltage:** 11 KV

Tariff Structure:

As per Maharashtra State Electricity Distribution Company Limited, HT and LT consumers have an option to take Time of Day (TOD) tariff instead of the normal tariff. Under TOD tariff electricity consumption and maximum demand in respect of HT consumers for different periods of the day i.e. normal period, peak load period and off-peak load period could be recorded by installing TOD meter. The maximum demand and consumption recorded in different periods could be billed on the following rates of the tariff applicable.

TOD Tariffs	Rate % (Rs./Unit)
0000 Hrs- 0600 Hrs & 2200 Hrs- 2400 Hrs	-1.500
0600 Hrs- 0900 Hrs & 1200 Hrs- 1800 Hrs	0.000
0900 Hrs- 1200 Hrs	0.800
1800 Hrs- 2200 Hrs	1.100

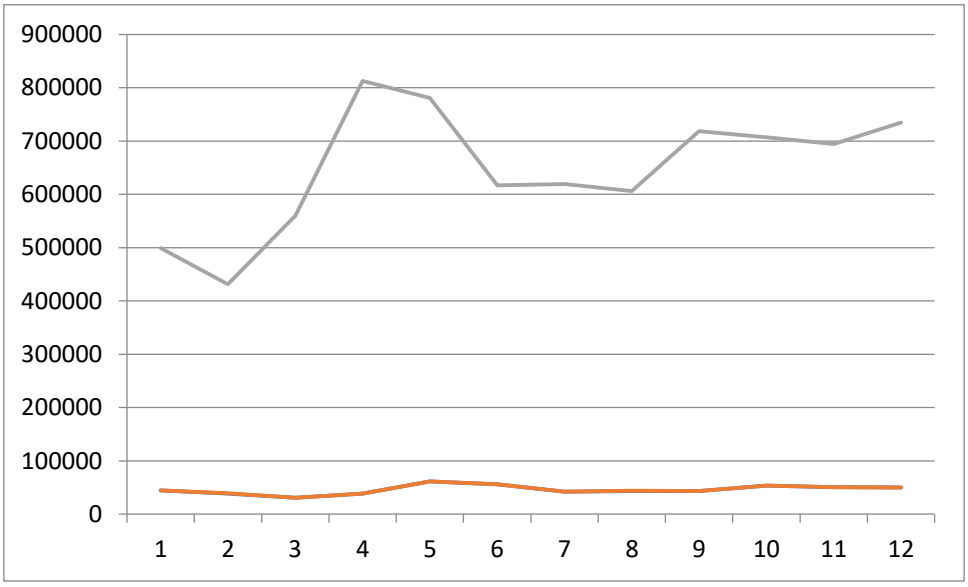
Power Factor:

Power Factor (PF) is an indicator of efficient utilization of power. In an AC (Alternating Current) electrical power system, PF is defined as the ratio of real power flowing to the load, to the apparent power in the circuit and is a dimensionless number.

6.2 **Bill analysis:**

Bill analysis for SETI had been done for academic year 2022-2023.

Sr. No.	Month	Consumption (Kw)	Demand (KVA)	Bill Amount
1	April 22	44358	144	454592
2	May 22	38749	156	392193
3	June 22	30616	156	529082
4	July 22	38508	156	773770
5	August 22	61325	156	719531
6	September 22	55957	156	560932
7	October 22	42201	156	576616
8	November 22	43564	156	562508
9	December 22	43284	156	674664
10	January 23	53421	156	653432
11	February 23	50340	156	643603
12	March 23	49726	156	684781



Average units consumed were about 46004.08 and the average cost was about 602142 Rs.

6.3 **Equipment Details:**

Sr. No.	Name of Laboratory	Name of Equipment	Details
1	**Concrete technology**	Compression testing machine	Area: 92.73 sqm Total Investment: 895704 /-
		Concrete mixer	
		Flexural test apparatus	
		Vibrating table	
		Sieve shaker motorized	
		Rebound hammer	
		Ultrasonic pulse velocity	
2	**Structural mechanics**	UTM	Area: 70.60 sqm Total Investment: 675275 /-
		Hardness testing machine	
		Impact testing machine	
		Torsion testing machine	
3	**Chemistry**	UV Spectrometer	Area: 83.62 sqm Total Investment: 388449 /-
		Electronic digital balance	
		Muffle furnace	
		Electrical oven	
		Digital pH meter	
		Digital potentiometer	
		Conductivity meter	
4	**English and Communication**	PC	Area: 52.46 sqm Total Investment: 835896 /-
		ODLL system	
		Headphones	
		Speakers	
5	**Measurement and Instrumentation**	Falcon 2 MHz function generator	Area: 79.83 sqm Total Investment: 825611 /-
		Thermocouple module	
		Resistance temperature detection module	
		Strain guage and bourdon tube	
		Wheatstone bridge	
		Wein bridge	

		Commutation and MOSFET	
		DC motor and 3 phase AC motor control	
		PLC trainer kit	
		SMPS/UPS trainer kit	
		CD/VCD player trainer	
		Colour TV and pattern generator	
		LCD TV trainer	
6	**Metrology and quality control**	Monochrome light unit	Area: 79.47 sqm Total Investment: 344064 /-
		Standard glass specimen and optic flat	
		Slip gauge box 87 pcs	
		Vernier caliper	
		Sine bar 300mm	
		Micrometre 0-25mm	
		Dial indicator	
		Micrometre 25-50mm	
		Sine centre 200mm	
		V block magnetic	
		Mechanical comparator	
		Surface plate	
		Inside micrometre	
		Vernier depth gauge	
		Inside and outside calliper	
		Optical profile	
7	**Metallurgy lab**	Abrasive belt grinder	Area: 80 sqm Total Investment: 496880 /-
		Double disc polishing machine	
		Desiccator	
		Binocular metallurgical microscope	
		Standard metallurgical	

		microstructure set	
		Trinocular microscope	
		Magnetic particle crack detector	
		Optional accessory of red penetration kit	
		Red dry penetration kit	
		Muffle furnace	
		Jominy quench bath	
8	**Applied thermodynamics**	Flash point	Area: 80 sqm Total Investment: 171408 /-
		Drop point of grease	
		Redwood viscometer	
		Aniline apparatus	
		Model of Lancashire boiler	
		Stop value Hopkinson	
		Feed check valve	
		Pressure gauge	
		Fusible plugs	
		Green economizer	
		Sudden super heater	
		Separating and throttling calorimeter	
		Test on carbon residue apparatus	
		Grease penetrometer	
9	**Mechatronics laboratory**	PLC programming trainer kit	Area: 80 sqm Total Investment: 349509 /-
		PLC based pick and place robotics	
		Characteristics of temperature sensor	
		Pressure transducer	
		Air compressor	

10	**Manufacturing process**	Sand Muller	Area: 78.61 sqm Total Investment: 162750 /-
		Rapid moisture tester	
		Clay washer	
		Sieve shaker	
		Universal sand strength machine	
		Mold hardness tester	
		Compatibility tester	
		Base block	
		Tube filler accessory	
		Permeability meter	
		Sand rammer	
		Rapid dryer	
		Sensitive balance	
11	**Theory of machine**	Band and block brake	Area: 78.61 sqm Total Investment: 215146 /-
		Internally expanding brake	
		Disc brake model	
		Vibrating lab equipment	
		Whirling of shafts	
		Static and dynamic balance	
		Universal governor	
		Motorized governor	
		Double hook joint	
		Trifler suspension	
		Gear tooth profile	
12	**CAD / CAM / CAE**	Dell PC	Area: 68.25 sqm Total Investment: 3472453.40 /-
		10 KVA UPS	
13	**Refrigeration and AC lab**	Refrigeration test ring	Area: 80 sqm Total Investment: 849456 /-
		AC test ring	
		Domestic refrigeration	
		Vapour absorbing ring	

		Vortex tube	
		Window air condition test	
		Ice plant test ring	
		Heat pump test ring	
		Cascade refrigeration test ring	
		Display boards	
14	**CAD Lab**	Dell PC	Area: 82.91 sqm Total Investment: 1184555 /-
		Catia	
		6 KVA UPS	
15	**Measurement switch gear and protection lab**	WEIN bridge model and MAX well bridge	Area: 79.84 sqm Total Investment: 1211047 /-
		Digital storage oscilloscope	
		Generator signal generator	
		Load bank	
		Wheat stone bridge	
		LVDT	
		Capacitive pick up kit	
		Inductive pick up kit	
		Piezo electrical transducer	
		IDMT over current relay test kit	
		Directional over current relay	
		Over current microprocessor	
		Universal relay	
16	**Analog Power electronics and driver lab**	SCR/DIAC/TRIAC Circuit	Area: 78.94 sqm Total Investment: 723832 /-
		1*- fully controlled converter	
		3*- fully controlled converter	
		3*- dual converter	
		1*- cyclo converter	
		1*- inverter using power mosfet	
		3*- IM controlled converter	

		Chopper circuit	
		Chopper circuit	
		Separated excited	
		High frequency	
17	**Electrical workshop and project lab**	4964	Area: 78.94 sqm Total Investment: 723832 /-
		Side cutter plier	
		Wire stripper	
		Centre punch	
		Combination plier	
		Long noise plier	
		Ball pin hammer	
		Screw driver set	
		Soft face hammer	
		Spanner set	
		Crimping tool	
		Iron press	
18	**Digital and microcontroller lab**	Model XPO 8031 kit	Area: 79.56 sqm Total Investment: 375209 /-
		SMPS	
		101 key board	
		RS 232 cable	
		Stepper motor	
		12 V Dc motor	
		Seven segment 8 bridge	
		Mini oven	
		Digital ICs trainer kit	
19	**High voltage engineering lab**	Sphere gap and water resistor	Area: 84.22 sqm Total Investment: 575747 /-
		100KV AV transformer	
		0-60 KV transformer	
		5KV high voltage tester	
		Protection grill	
20	**Basic electrical and circuit**	Dual DC regulator	Area: 111.91 sqm

	lab	Single DC regulator	Total Investment: 1299198 /-
		Dual trace CRO	
		Function generator	
		Digital multimeter	
		1 Φ wattmeter 10 AMP	
		1 Φ wattmeter 2 AMP	
		3 Φ auto transformer	
		3 Φ load bank	
		1 Φ load bank	
		DC shunt motor	
21	**Electrical machine lab**	3 phase alternator	Area: 169.28 sqm Total Investment: 1836005/-
		Rheostat 800 ohm	
		Rheostat 1200 ohm	
		3 phase capacitive load bank	
		3 phase inductive load bank	
		Induction motor 3Hp	
		Induction motor 2Hp	
		Load bank 1 phase	
		Load bank 3 phase	
		1 phase transformer	
		3 phase transformer	
22	**Computer lab 1**	PC	Area: 79.25 sqm Total Investment: 3325234/-
		UPS	
23	**Control system lab**	Pneumatic trainer kit	Area: 78.93 sqm Total Investment: 624600/-
		Hydraulic trainer kit	
		Second order control system	
		On/ off temperature controller	
		Potentiometer as error detector	
		DC voltage regulator	
		Stepper motor	
		DC servo motor	

		AC servo motor	
		PC	
		UPS	
24	**Physics**	Four probe set	Area: 78.63 sqm Total Investment: 485837/-
		B-H loop tracer	
		He –Ne laser source	
		e/m Thomson method	
		Newton ring	
		Half shade polar meter	
		Light source	
25	**APM lab**	Digital beam	Area: 132.74 sqm Total Investment: 294634/-
		Manual beam	
		Universal force table	
		Bell crank lever digital	
		Bell crank lever manual	
		Jib crane digital	
		Jib crane manual	
26	**Transportation lab**	Ductility test	Area: 72.82 sqm Total Investment: 673137/-
		Deval abrasion	
		Penetration apparatus	
		Los Angeles apparatus	
		Flash point and fire point	
		Ring and ball	
		Standard tar viscometer	
		Film stripping device	
27	**Structural mechanics**	UTM	Area: 70.60 sqm Total Investment: 675275/-
		Hardness testing	
		Impact testing	
		Torsion testing	
28	**Concrete testing**	Compression testing	Area: 92.73 sqm Total Investment: 895704/-
		Concrete mixer	
		Flexural test	

		Vibrating table	
		Sieve shaker	
		Rebound hammer	
		Ultrasonic pulse velocity	
29	**Computer lab Civil**	PC	Area: 83.89 sqm Total Investment: 1712598/-
		Projector	
		Printer	
		UPS	
30	**Geotechnical lab**	Oven	Area: 85.35 sqm Total Investment: 504397/-
		Relative density	
		Tri axial shear	
		Consolidation test	
		Permeability test	
		digital weight	
31	**Environmental lab**	COD	Area: 95.92 sqm Total Investment: 231090/-
		BOD	
		Incubator	
		Oven	
		TDS meter	
		pH meter	

6.4 **ILER analysis:**

Lighting is provided in industries, commercial buildings, indoor and outdoor for providing comfortable working environment. The primary objective is to provide the required lighting effect for the lowest installed load i.e. highest lighting at lowest power consumption. The purpose of performance test is to calculate the installed efficacy in terms of lux/watt/m² (existing or design) for general lighting installation. The calculated value can be compared with the norms for specific types of interior installations for assessing improvement options.

Range	Condition
0.5 or less	Urgent activity required (UAR)
0.51 - 0.70	Review Suggested (RS)
0.70- above	Good

ILER analysis for various sections in SETI were carried out. Firstly using LUX meter illumination was measured and then numerical analysis was carried out. ILER gives idea about lighting conditions and measured regarding improving them.

Main Building analysis

Sr. No.	Section	LUX reading	ILER	Condition
1	Library	166	0.71	Good
2	Study room	124	0.71	Good
3	Classroom S1	128	0.46	UAR
4	Classrooms S2	107	0.58	RS
5	Laboratories	147	0.84	Good
6	Office	166	0.74	Good

Other section

Sr. No.	Section	LUX reading	ILER	Condition
1	Staff room	122	0.56	RS
2	Classrooms	154	0.71	Good
3	Laboratories	124	0.78	Good
5	Computer tabs	188	0.52	RS

Reasons for Good ILER:

- Proper placement of windows and doors so that natural light is available well.
- Good ventilation system.

Use of LED bulds:

Institute has toatl light load connection of : 46500 watts

LED load connection is: 32300 watts

Light load other than LED: 14200 watts

Percentage of LED use in institute: 69.46%

Alternatice methods of energy:

Solar power plant at SETI

Capacity of plant: 70kw

Hybrid grid: (Solar + Wind): 50kw

Total capacity: 70+50 = 120 kw

Hybrid Generation during year 2021-2022

Month	PF	Units generated
April 21	0.94	28145
May 21	0.92	15197
June 21	0.89	15811
July 21	0.74	19617
August 21	0.83	40182
September 21	0.83	82736
October 21	0.84	50303
November 21	0.83	34237
December 21	0.83	45054
January 22	0.99	35836
February 22	0.99	38318

Generator, AC and UPS details:

Sr. No.	Particulars	Make	Rating	Qty.
1	Online UPS	Renutron	6 KVA	13
2	Online UPS	Renutron	7.5 KVA	2
3	Online UPS	Renutron	10 KVA	1
4	Online UPS	Renutron	15 KVA	1
5	Air Conditioner	LLoyed	3 Ton	1
6	Air Conditioner	LLoyed	2 Ton	1
7	Air Conditioner	LLoyed	1.5 Ton	5
8	Air Conditioner	LLoyed	1 Ton	1
9	Generator	Kirloskar	125 KVA	1
10	Generator	Kirloskar	82.5 KVA	1

7. Observations and Conclusions:

This section gives the overviews of all the audits.

1. Water Section:

Institute has provision of rain water harvesting; hence huge amount of water is conserved and saved. Another good point is that the rain water collected at various section and is used to ground.

2. Wastewater Section:

SETI doesn't have any wastewater treatment facility till now as all the waste is directly sent to sewers. But the institute has planned for CWs i.e. constructed wetland systems for both the grey and black water treatment. Institute has also planned for hazardous waste management. The waste water generated through chemistry lab will also be treated and then led of onto sewers.

3. Solid waste management:

Proper method such as separate bins for wet waste and dry waste which leads to source segregation is followed by SETI.

4. E-waste:

Electronic waste is generated from many sections viz. physics lab, computer lab and applied science section. Institute collets the E waste centrally and is send to vendors for proper disposal means.

5. Sustainable water practices:

Institute has a fresh source of water i.e. river water. Water is recycled and used.

6. Energy:

Institute has followed good means by installing sustainable source of energy viz. solar energy and wind power generation. They have taken good measures by installing LED lights and solar sensor lights in the campus which are proving to be energy efficient.

8. Image Gallery:

CERTIFICATE

SANJEEVAN ENGINEERING & TECHNOLOGY INSTITUTE

AUDIT REPORT

2021-2022

ENVIRONMENTAL & CIVIL ENGINEERING SOLUTIONS
ISO 9001: 2015, IEC 17025: 2017

Editorial

In the Era of global warming and climate change every citizen has to reduce their own carbon foot prints to tackle with the adverse impacts of climate change. A green audit of any academic institution revels ways in which we can reduce energy consumption, water use and reduction in emission of carbon dioxide in the environment. It is a process to look into and ask ourselves whether we are also contributing to the degradation of the environment and if so, in what manner and how we can minimize this contribution and bring down to zero and preserve our environment for future generation.

Sanjeevan Engineering & Technology Institute administration has already taken a step towards the green approach and conducted green audit of campus in the year 2022. As an outcome of this institute has taken green steps to reduce its carbon foot prints by several means in campus viz. sustainable fittings, tree plantation and green computing in the administration and examination. The responsibility of carrying out the scientific green audit was given to Environmental and Civil Engineering Solutions. The organization has followed the rules and regulation of Ministry of Environment and Forest, Govt. of India and Central Pollution Control Board, New Delhi.

A questionnaire was prepared based on the guidelines and format of CPCB, New Delhi to conduct green audit. The information related to consumption of resources like water, electricity and handling of solid and hazardous waste was collected in the formats from main building support services and departments. The data collected was grouped and was tabulated in Excel sheets and analysed. The graphs of the analysed data were prepared for getting quick idea of the status. Interpretation of the overall outcomes was made which incorporates primary and secondary data, references and interrelations within. Final report preparation was carried out using this interpretation to prepare environment management plan of institute for next two years.

During the preparation of the Audit Report Hon. Principal, Hon. Vice Principal encouraged us with their full support. Registrar, Director, IQAC, Deans of faculties, and other officers of the institute were also given support to carry out this work. All Heads of the department, Directors, Co-ordinators, In-charge of the support services and engineering section of the university also gave full co-operation.

I hope the efforts made will be helpful for university to take one green step ahead.

Nikhil N. Kamble
(C.E.O and Head)

Environmental and Civil Engineering Solutions

Index

1. Introduction:

The modernization and industrialization are the two important outputs of twentieth century which have made human life more luxurious and comfortable. Simultaneously, they are responsible for voracious use of natural resources, exploitation of forests and wildlife, producing massive solid waste, polluting the scarce and sacred water resources and finally making our mother Earth ugly and inhospitable. Today, people are getting more familiar to the global issues like global warming, greenhouse effect, ozone depletion and climate change etc. Now, it is considered as a final call by mother Earth to walk on the path of sustainable development. The time has come to wake up, unite and combat together for sustainable environment.

Considering the present environmental problems of pollution and excess use of natural resources, Hon. Prime Minister, Shri. Narendra Modiji has declared the Mission of Swachch Bharat Abhiyan. Also, University Grants Commission has mentioned “Green Campus, Clean Campus” mission mandatory for all higher educational institutes. As environmental sustainability is becoming an increasingly important issue for the nation, the role of higher educational institutions in relation to environmental sustainability is more prevalent.

Green Audit is the most efficient ecological tool to solve such environmental problems. It is a process of regular identification, quantification, documenting, reporting and monitoring of environmentally important components in a specified area. Through this process the regular environmental activities are monitored within and outside of the concerned sites which have direct and indirect impact on surroundings. Green audit can be one of the initiative for such institutes to account their energy, water resource use as well as wastewater, solid waste, E-waste, hazardous waste generation. Green Audit process can play an important role in promotion of environmental awareness and sensitization about resource use. It can create consciousness towards ecological values and ethics. Through green audit one can get direction about how to improve the condition of environment.

1.1 Need of audit:

Green auditing is the process of identifying and determining whether institutions practices are eco-friendly and sustainable. Traditionally, we are good and efficient users of natural resources. But over the period of time excess use of resources like energy, water, chemicals are become habitual for everyone especially, in common areas. Now, it is necessary to check

whether our processes are consuming more than required resources? Whether we are handling waste carefully? Green audit regulates all such practices and gives an efficient way of natural resource utilization. In the era of climate change and resource depletion it is necessary to verify the processes and convert it in to green and clean one. Green audit provides an approach for it. It also increases overall consciousness among the people working in institution towards an environment.

1.2 **Goals of audit:**

Institute has conducted a audit with specific goals as:

1. Identification and documentation of green practices followed by university.
2. Identify strength and weakness in green practices.
3. Conduct a survey to know the ground reality about green practices.
4. Analyse and suggest solution for problems identified from survey.
5. Assess facility of different types of waste management.
6. Increase environmental awareness throughout campus.
7. Identify and assess environmental risk.
8. Motivates staff for optimized sustainable use of available resources.
9. The long term goal of the environmental audit program is to collect baseline data of environmental parameters and resolve environmental issue before they become problem.

1.3 **Objectives of Audit:**

1. To examine the current practices which can impact on environment such as of resource utilization, waste management etc.
2. To identify and analyse significant environmental issues.
3. Setup goal, vision and mission for Green practices in campus.
4. Establish and implement Environmental Management in various departments.
5. Continuous assessment for betterment in performance in green practices and its evaluation.
6. To prepare an Environmental Statement Report on green practices followed by different departments, support services and administration building.

1.4 **NAAC criteria VII Environmental Consciousness:**

Institutes are playing a key role in development of human resources worldwide. Higher education institutes campus run various activities with aim to percolate the knowledge along with practical dimension among the society. Likewise different technological problems higher education institutes also try to give solution for issues related to environment. Different types of evolutionary methods are used to assess the problem concerning environment. It includes Environmental Impact Assessment (EIA), Social Impact Assessment (SIA), Carbon Footprint Mapping, Green audit etc

National Assessment and Accreditation Council (NAAC) which is a self-governing organization that declares the institutions as Grade according to the scores assigned at the time of accreditation of the institution. Green Audit has become mandatory procedure for educational institutes under Criterion VII of NAAC. The intention of green audit is to upgrade the environmental condition inside and around the institution. It is performed by considering environmental parameters like water and wastewater accounting, energy conservation, waste management, air, noise monitoring etc. for making the institution more eco-friendly.

Students are the major strength of any academic institution. Practicing green actions in any educational institution will inculcate the good habit of caring natural resources in students. Many environmental activities like plantation and nurturing saplings and trees, Cleanliness drives, Bird watching camps, No vehicle day, Rain water harvesting, etc. will make the students good citizen of the country. Through Green Audit, higher educational institutions can ensure that they contribute towards the reduction of Global warming through Carbon Footprint reduction measures.

1.5 **Benefits of Green Audit to an Educational Institute:**

There are many advantages of green audit to an Educational Institute:

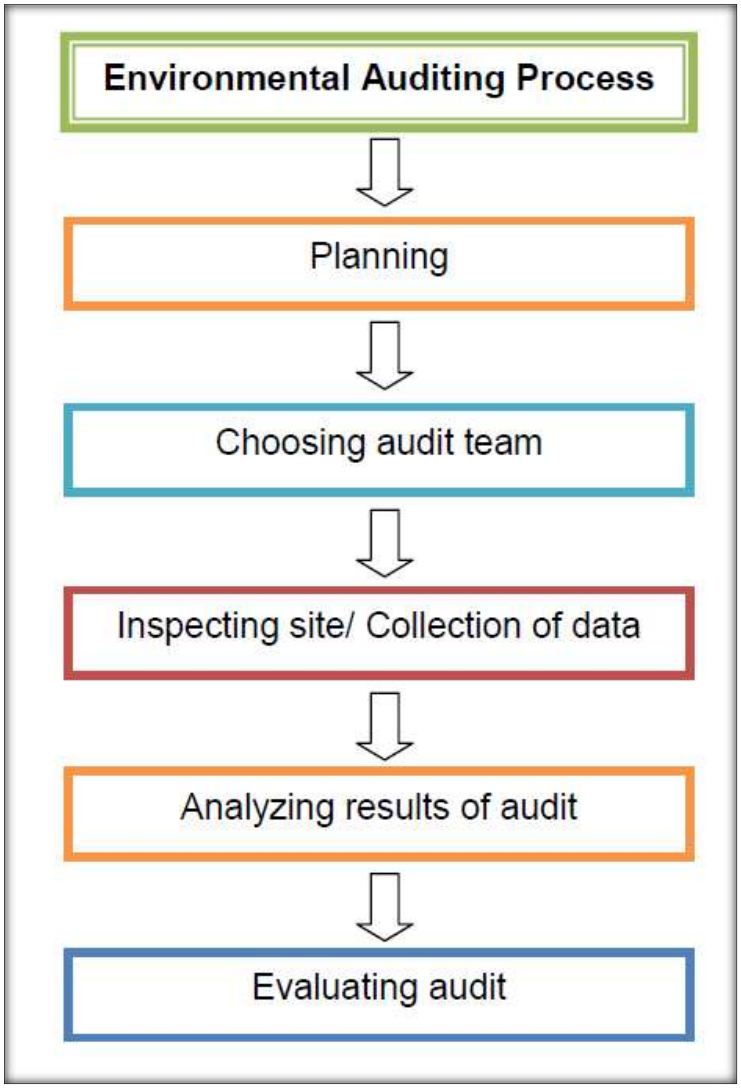
1. It would help to protect the environment in and around the campus.
2. Recognize the cost saving methods through waste minimization and energy conservation.
3. Find out the prevailing and forthcoming complications
4. Empower the organization to frame a better environmental performance.
5. It portrays good image of institution through its clean and green campus.

2. Overview of Institute:

The Sanjeevan Engineering & Technology Institute, Panhala was established in the year of 1994. Institute has huge area of 13 acres and has been serving the mankind in the field science and technology.

The landscaped grounds of college are widely admired for their beauty. The most valuable investment any educational institution can make is “Nurturing Future Leaders”. With the continuous rise in expectation of essential leadership standards, the institute has torch bearers have taken a responsibility for this investment to nurture the NextGen leaders with a vision to bridge the existing skill gap. With a firm step forward to attain an academic excellence, several Centres of Excellence, computer labs, and industry-academia associations have been setup at the College in association with the top leaders. The College believes that its primary stakeholders are the students. All aspects of education focus on the core values of contributing to national development while fostering global competencies among students. The College admits students from all social milieus and empowers them through intensive mentoring and counselling to face the challenges of life and become responsible and sensitized citizens of the country.

3. Methodology:



3.1 **Audits to be carried out:**

- Green and carbon footprint audit
- Energy audit
- Environmental audit
    - Water audit
    - Wastewater audit
    - Solid waste audit
    - Ambient noise audit
    - Ambient air audit

4. Green and Carbon footprint audit:

Green Audit is the most efficient ecological tool to solve such environmental problems. It is a process of regular identification, quantification, documenting, reporting and monitoring of environmentally important components in a specified area. Through this process the regular environmental activities are monitored within and outside of the concerned sites which have direct and indirect impact on surroundings. Green audit can be one of the initiative for such institutes to account their energy, water resource use as well as wastewater, solid waste, E-waste, hazardous waste generation. Green Audit process can play an important role in promotion of environmental awareness and sensitization about resource use. It can create consciousness towards ecological values and ethics. Through green audit one can get direction about how to improve the condition of environment.

Carbon is the basis of life on mother Earth. It is incorporated into the plants through photosynthesis, consumed by animal species through the food, present in the form of carbon dioxide (CO2) the atmosphere, locked into the rocks as limestone and compressed into the different fossil fuels such as coal and oil. As CO2 level in the atmosphere continue to increase, most climate designs or project that the oceans of the world and trees will keep soaking up more than half CO2 . The plants on land and in the sea, taken up carbon by over many years increased the percentage discharged during decay, and this increased carbon became locked away as fossil fuels beneath the surface of the planet. The starting of the 21st century brought growing concern about global warming, climate change, food security, poverty and population growth. In the 21st century more carbon has been released into the atmosphere than that has been absorbed. CO2 is a principle component causing global warming. Atmospheric carbon dioxide levels have increased to 40 % from preindustrial levels to more than 390 parts per million CO2. On this background it is a need of time to cover the research areas interrelated with climate change.

4.1 Green Cover at SETI:

SETI has got a huge green cover and has almost 50 species of vegetation inside the campus. The institute has 22 acres of campus and most of this is covered by green area. They have a huge plantations and structural components are Main building, office section, mess, Block A, Block B, Block C and Block D etc.

Figure 4-1 SETI, Campus

SETI has taken huge efforts to develop its green cover. The institute has about 8.59 acres of green cover. In the vicinity of the institute there are about approximately 800 fully grown trees and more than a 1500 growing plants. The above table shows some of the common tree species found. Institute has agriculture cover approximately about 4.86 acres in plantation.

Sr. No.	Species
1	Caesalpinia pulcherrima
2	Tribulus terrestris
3	Vachellia nilotica
4	Rotheca serrata
5	Lavandula bipinnata
6	Barleria cristata
7	Fox Brush Orchid

Mostly there are trees of Tamarind, mango, neem, ferns etc. Due to this the institute has high carbon sequesterial values. Considering the vicinity some dry plants were observed to approximately about 38. Plants absorb sunlight, 50% is absorbed and 30% reflected so this helps to create a cooler and more pleasant climate through a 3°C temperature reduction in the vicinity. This has also leaded to increase in biodiversity as more than 18 species of birds were observed. Some off the common birds were viz. Sparrow, wild parrots, little stint, black kite etc.

4.2 **Carbon Footprint Audit:**

SETI has estimated its carbon footprint by factor methodology. Various factors were used to estimate the carbon emissions from Consumption of electricity, generation of solid waste, use of vehicles in campus, carbon emissions due to human breathing and emissions from buildings. At last they have also calculated Carbon sequesterial value i.e. carbon that is absorbed by the plants.

Sr. No.	Month	Units	Demand	CO2 emitted (KgCO2 eq.)
1	Mar 21	51,872	132	69684.42
2	Apr- 21	28,145	144	49975.72
2	May 21	15,197	144	44467.78
3	Jun 21	15,811	144	44011.86
4	Jul 21	19,617	144	45250.88
5	Aug 21	40,182	144	44070.08
6	Sep 21	52,736	144	44518.62
7	Oct 21	50,330	144	48775.24
8	Nov 21	34,237	144	45290.24
9	Dec 21	45,054	144	56281.52
10	Jan 22	35,836	144	50455.42
11	Feb 22	38,318	144	45097.54

Hence as per the calculation the average unit consumption considering all the months is about 35,611 units and the carbon emission is 29201 kg CO2 eq./year.

Secondly considering emissions from human breathing, the institute has total 1021 students. Institute has special boys and girls hostel. Considering all the staff viz. Junior teachers, senior teachers, Non grant, grant CHB they are total of 65. The staff works for about averagely 6 hours a day in the institute and the students are present for 4 hours averagely daily.

Vehicles emit significant amount of gases in environment and SETI has various parking sections in the campus. It was found that averagely 180 vehicles entered the institute daily and travel about 200 m of distance from the gate. Cars also enter the institute and as per observation 12 cars are observed daily. Hence, emission from 2 wheelers is 957.6 g/km CO2 eq. considering petrol and diesel cars the emission are 474.6 g/km CO2 eq. Overall the institute emits 286.44 Kg CO2 eq. per year.

Solid waste is very important as it emits significant amount of carbon through it. SETI has a good solid waste management system. Hence the institute develops about 1320 kg of waste

daily in both the form of wet and dry. Hence for non-residing persons the emissions are 1141.40 kg CO2 eq. per day and for resident students they are 49.29 kg CO2 eq. per day. Overall for an year the generation is about 17.69 ton CO2 eq. per year.

Buildings play an important role in carbon contribution. During the construction operation and use phase they emit significant amount of carbon. Hence considering total built-up area the carbon emissions could be evaluated. After the estimation the total built-up area observed was approximately about 5061 sq. m and the carbon emission were 1012.20 kg CO2 eq. per year.

Carbon sequesterial in important as it is the carbon absorbed by the trees. SETI campus has 800 fully grown trees and 1500 growing trees. Hence the carbon absorbed by both this trees is 26140 kg CO2 eq. per year.

Hence overall carbon data for SETI is mentioned below.

Sr. No.	Section	Emission
1	Emission from electricity	29201 kg CO2 eq./year.
2	Emission from solid waste	17.69 ton CO2 eq. per year.
3	Emission from Vehicles	286.44 Kg CO2 eq. per year.
4	Emission from human breathing	65.03 tons of CO2 eq. per year.
5	Emission from buildings	1012.20 kg CO2 eq. per year.
6	Carbon sequesterial	26140 kg CO2 eq. per year.

4.3 **Conclusion:**

- Highest carbon emission was observed from human breathing i.e. 65.03 tons of CO2 eq. per. Year. There is no any significant mean to reduce this number as it is not controllable.
- The next is solid waste. The emission from solid waste comprises of 17.69 ton CO2 eq. per year. This can be significantly reduced by following simple means. Waste segregation is properly observed by the institute and they should follow the cut out plastic plans. There should be complete ban in using the plastic inside the campus. There should be minimization of food waste as it contributes highest in carbon emissions.
- Considering emission from electricity they can be significantly reduced by decrease in electricity use. This can be done by installing LED lights and using energy efficient

equipment's such as machines with high star ratings which save more. Institute can recognize renewable energy sources and have a setup in the institute. This can lead in significant saving of electricity and reduction in carbon emissions.

- Vehicles have the least emissions in SETI and it is due to the easy approached parking so that vehicles do not roam in the vicinity. All the vehicles travel hardly 350 m in the campus and tis has lead to lower emissions. Still institute can follows "NO Vehicle Day" on every 2nd Saturday of each month.
- Institute reduces about 2.6 tons of CO2 per year by the means of plants. This could be increased by increasing in plantations. SETI can plant more trees next to chemistry section, surrounding to play ground, front of applied science department etc.
- The plants having highest Carbon sequestration values are suggested. Cinnamomum verum, Eugenia caryophyllid, Bumelia celestina, Acacia Berland Eri, Acacia Francescana, Chinaberry tree, Moringa oleífer, Carya illusoriness, Pinus Arizonian and Buddleia cordata are some of the suggested species for plantation.

5. Environmental Audit:

An environmental audit is a type of evaluation intended to identify environmental compliance and management system implementation gaps, along with related corrective actions. ISO 14001 is a voluntary international standard for environmental management systems ("EMS"). ISO 14001:2004 provides the requirements for an EMS and ISO 14004 gives general EMS guidelines. An EMS meeting the requirements of ISO 14001:2004 is a management tool enabling an organization of any size or type to:

- Identify and control the environmental impact of its activities, products or services;
- Improve its environmental performance continually, and
- Implement a systematic approach to setting environmental objectives and targets, to achieving these and to demonstrating that they have been achieved.

The audit examines the potential hazards or risks posed by the institutes. Areas examined may include environmental policies and procedures, energy use practices, recycling, waste, conservation, and pollution. Then, the institute can use the results to determine what changes need to be made for compliance. In a broad sense, environmental auditing aims to help protect the environment and minimize the risks of business activities to the environment and human safety and health.

5.1 Water Audit and wastewater audit:

Water auditing is a method of quantifying water flows and quality in systems, with a view to reducing water usage and often saving money on otherwise unnecessary water use. Water audit is an effective management tool for minimizing losses, optimizing various uses and thus enabling considerable conservation of water. Water audits trace water use from its point of entry into the facility/system to its discharge into the sewer/river/canal etc. Wastewater audit deals with effective management of wastewater in the system. It deals with proper generation, management, treatment, transfer and disposal of wastewater.

SETI has carried out its water and wastewater audit and has suggested many more ways for water conservation, reuse and recycle. The detail water and waste water report is mentioned below.

5.2 **Water Audit report:**

Water audit for the "SETI" was carried out. The purpose of the water audit is to provide a thorough understanding of the water uses by identifying and measuring all water using fixtures, appliances, and practices in order to recommend potential water saving efficiencies.

PRIMARY DATA

Sr. No.	Title	Information
1	**Name of Institute**	SETI
2	**Address**	Panhala
4	**Name of company under which water audit is carried out**	Environmental and Civil Engineering Solutions, Sangli
6	**Number of floors**	G + 2
7	**Category of building**	Educational Institute
8	**Nearest ESR location**	Campus
9	**Water supply hours**	6 hrs. daily
10	**Water meter present**	Yes

POPULATION DETAILS

Title	Information
Fixed population (Working staff and Students)	Gents: 780
	Ladies: 241
Variable population (Visiting persons)	Gents: 26
	Ladies: 22

SOURCE INFORMATION

Title	Information
Sources of water	River water pumping
Connection details	1” PVC pipe inlet and 1” outlet distribution pipe

STORAGE DETAILS

Title	Information
Overhead tank type	PVC tank
Location	On terrace
Number of tanks	Section A: 1 X 2000 lit PVC Section B: 4 X 2000 lit PVC Section C: 3 X 2000 lit PVC 2 X 1000 lit PVC Section D: 2 X 1000 lit PVC
Motor connection details	2 Hp for pumping
Pumping period	4 hours daily
Underground sump	No
Capacity of underground sump	NA

WATER USAGE

Toilet	Number of users	Water consumption
Gents toilet	780 users	780 X 10 lit = 7800
Washbasin	1021 users	1021 X 0.75 lit = 766
Ladies toilet	241 users	241 X 12 lit = 2892
Toilet cleaning	600 liters	600 liters
Floor cleaning	500 liters	500 liters
Gardening	1500 liters	1500 liters
Laboratories	1000 liters	1000 liters
Total		**15,058 lit**

WATER CONSUMPTION IN HOSTEL

Considering 135 LPCD there are 87 boys and girls in hostel section. Hence, 135 X 87 is 11745 liters.

WATER USED FOR DRINKING

There are coolers cum water purifiers present in the institute. Sample assessment for 3 months was done and average values are presented below for each section.

Potable water assessment:

Section 1

Sr. No.	Test	Results	Limit
1	pH	**6.1-7.5**	6.5-8.5
2	TDS	**223**	-
3	E.C	**95**	-
4	Hardness	**140**	200
5	Chlorides	**111**	200
6	MPN	**Ab**	1.0
7	Odor and Color	**Ab**	-

Section 2

Sr. No.	Test	Results	Limit
1	pH	**7.0-8.1**	6.5-8.5
2	TDS	**115**	-
3	E.C	**229**	-
4	Hardness	**178**	200
5	Chlorides	**130**	200
6	MPN	**Ab**	1.0
7	Odor and Color	**Ab**	-

Section 3

Sr. No.	Test	Results	Limit
1	pH	**7.7-7.9**	6.5-8.5
2	TDS	**189**	-
3	E.C	**177**	-
4	Hardness	**157**	200

5	Chlorides	**112**	200
6	MPN	**Ab**	1.0
7	Odor and Color	**Ab**	-

Section 4

Sr. No.	Test	Results	Limit
1	pH	**6.9-8.2**	6.5-8.5
2	TDS	**122**	-
3	E.C	**109**	-
4	Hardness	**99**	200
5	Chlorides	**137**	200
6	MPN	**Ab**	1.0
7	Odor and Color	**Ab**	-

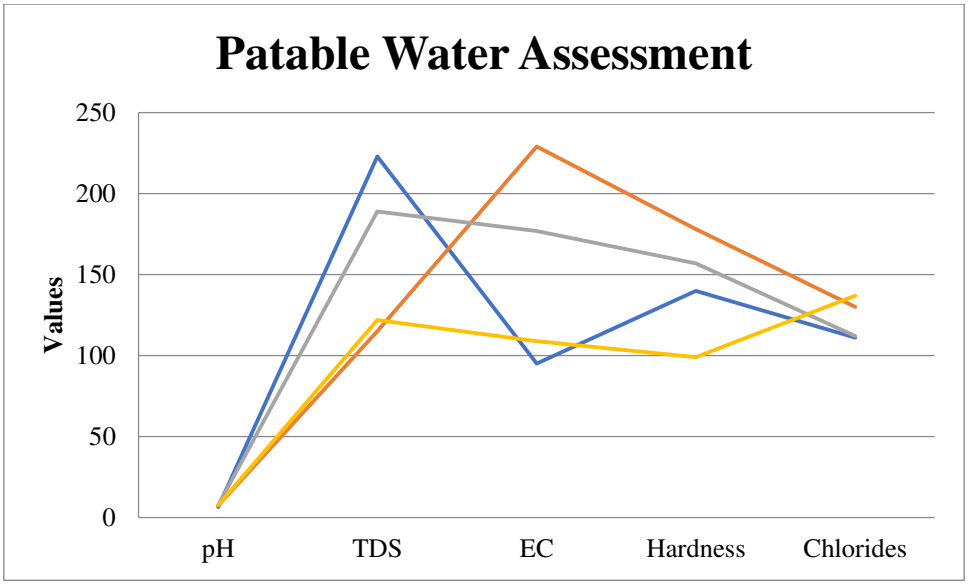
Municipal water and deep well water assessment:

River water ESR water assessment

Sr. No.	Test	Results	Limit
1	pH	**8.1**	6.5-8.5
2	TDS	**1295**	-
3	E.C	**2530**	-
4	Hardness	**213**	200
5	Chlorides	**140**	200
6	MPN	**Ab**	1.0
7	Odor and Color	**Ab**	-

Mail RO plant assessment

Sr. No.	Test	Results	Limit
1	pH	**6.3**	6.5-8.5
2	TDS	**108**	-
3	E.C	**111**	-
4	Hardness	**39**	200
5	Chlorides	**82**	200
6	MPN	**Ab**	1.0
7	Odor and Color	**Clear**	-



5.3 **Waste water audit:**

SETI campus generates huge amount of wastewater. The source for wastewater in the campus is hostels, institute, mess and the washrooms and urinals inside the campus. To estimate the amount of wastewater generated all the water that is used in the washrooms, quarters and hostels is considered as wastewater.

Sr. No.	Section	Wastewater generated in litres
1	Wastewater generated in campus	**10559.5**
2	Hostel boys	**4252**
3	Hostel girls	**3969**
Total		**18781**

5.4 **Waste water treatment plant at SETI:**

Currently SETI lets all it waste water into sewers and some of the waste water is disposed at the back of chemistry department. Currently there is no any waste treatment facility. Sampling of waste water was done for 3 months for the parameters of COD, BOD, TKN and pH. Following table shows the characterization of wastewater.

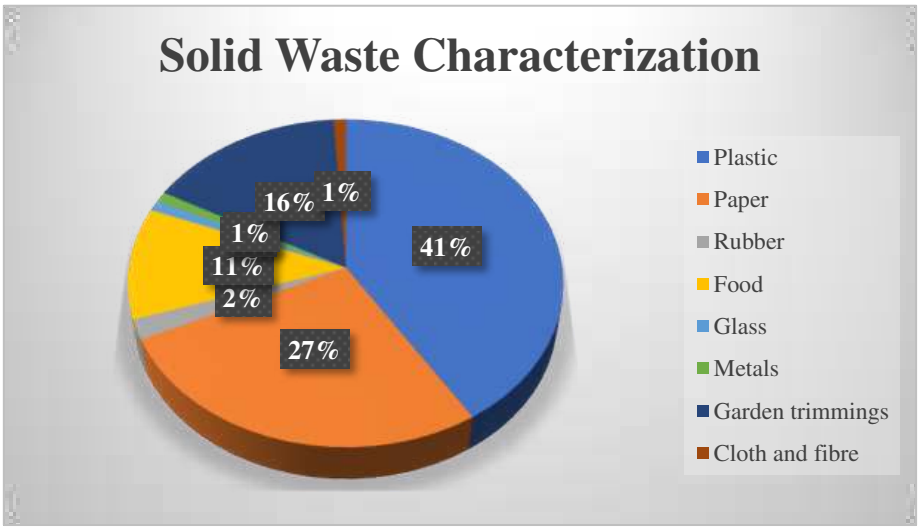
Sr. No.	Parameter	Reading
1	pH	7.45
2	COD	200
3	BOD	90
4	TKN	21

5.5 **Solid waste Audit:**

A waste audit is a physical analysis of waste composition to provide a detailed understanding of problems, identify potential opportunities, and give you a detailed analysis of your waste composition. A waste audit will help you clearly identify your waste generation to establish baseline or benchmark data, Characterize and quantify waste stream, Verify waste pathways, identify waste diversion opportunities and identify source reduction opportunities.

Solid waste is the unwanted or useless solid material generated from the human activities in residential, industrial or commercial area. Solid waste management reduce or eliminates the adverse impact on the environment and human health. Solid waste audit for SETI was carried out. The entire premise was analysed for solid waste generation and waste characterization. Overall waste was observed and characterization was done. The above table shows the components of solid waste at SETI campus. Quartering method was used and 1 Kg of waste was selected.

Sr. No.	Type of waste	Composition %
1	Plastic	41
2	Paper	27
3	Rubber	2
4	Food	11
5	Glass	1
6	Metals	1
7	Garden trimmings	16
8	Cloth and fibre	1



After analysing all the bins it was observed that plastic had highest contribution viz. 41% followed by the paper waste i.e. 27%. Mostly common observed plastic items were plastic wrappers of chips, soft drinks bottles and chocolate wrappers. The paper waste included paper wrappers, notebook pages, pamphlets and some pieces of cardboard. The third highest waste included garden trimmings. This waste was observed in the dustbins near velankar hall. It included small grass, minute branches etc. The least contribution was of cloth, fibre, glass and metals.

Institute follows good practices regarding separate bin system, and the bins are even marked. There are 2 separate bins present in campus viz. black bins for wet waste and green bins for dry waste. Considering applied science section they have places yellow bins for wet waste and green bins for dry waste.

5.6 **Observations and Conclusion:**

- There are separate bins for wet waste and dry waste. Hence, source segregation takes place.
- Institute has taken steps towards paper recycling. The paper waste collected from the bins is send to vendors.
- Plastic ban in campus is implemented but due to lack of seriousness in the students plastic is used in campus. Institute should conduct plastic awareness seminars for both the staff and students.

Assessment of soil was done to determine the quality of soil:

Sr. No.	Test	Results
1	pH	**6.3**
2	NPK	**2:4:1**
3	Acidity	**132 mg/lit**
4	Hardness	**187 mg/lit**

5.7 **Ambient Air Audit:**

Ambient air quality refers to the condition or quality of air surrounding us and in the outdoors. National Ambient Air Quality Standards are the standards for ambient air quality set by the Central Pollution Control Board (CPCB) that is applicable nationwide. The CPCB has been conferred this power by the Air (Prevention and Control of Pollution) Act, 1981. Hence, auditing this ambient air quality is stated as ambient air audit.

SETI has carried out its ambient air audit at various locations in the premises. Air quality detector machine PS-21185 was used for air audit. Parameters viz. SOx, NOx, RSPM and Air quality were assessed. Following google earth pro images shows the assessed locations.

Sr. No.	Point number	Location
1	Point No 1	Gate entry
2	Point No 2	Passage
3	Point No 3	Office
4	Point No 4	Drawing hall
5	Point No 5	Classroom 1
6	Point No 6	Classroom 2
7	Point No 7	Classroom 3
8	Point No 8	Block 1
9	Point No 9	Block 2
10	Point No 10	Block 3
11	Point No 11	Block 4
12	Point No 12	Open air
13	Point No 13	Library
14	Point No 14	Study room

Results of air quality monitoring:

Point No	Location	SOx	NOx	RSPM	Quality
	CPCB Limits	**80 µg/m3**	**80 µg/m3**	**80 µg/m3**	**-**
1	Gate entry	36	41	69	Good
2	Passage	8	10	41	Fresh
3	Office	9	8	33	Good
4	Drawing hall	8	11	22	Fresh
5	Classroom 1	15	14	29	Fresh
6	Classroom 2	5	9	29	Fresh
7	Classroom 3	11	12	22	Good
8	Block 1	8	8	21	Good
9	Block 2	11	12	23	Good
10	Block 3	14	11	18	Good
11	Block 4	14	10	21	Good

12	Open air	22	21	44	Good
13	Library	11	8	21	Fresh
14	Study room	12	18	22	Fresh

Conclusion and recommendations:

- After assessing the air quality all the results are within the limits. Considering the RSPM i.e. respirable dust particulate matter highest was observed at the gate entrance. This is due to the present of small dust particles from the open ground. The second highest was observed in passages.
- Considering the SOx and NOx, it is mainly due to vehicle exhaust. Hence the highest was observed at the main gate entrance since many vehicles from public and college travel.
- There are some measures commonly need to follow such as Ban on open solid waste burning in campus and ban on grass burning in summer season.

5.8 **Ambient Noise audit:**

Ambient sound in relation to audio refers to the background noise present at a given scene or a location. This can include noises such as rain, traffic, crickets, birds, etc. Ambient sound levels are often measured in order to map sound conditions over a specific time to understand their variation with locale and various points. Ambient noise level is measured with a sound level meter. It is usually measured in Decibel (dB).

Three points were selected based on best suitable requirement for noise monitoring. RS-2250 instrument was used. Monitoring was carried out 3 times in a day for 3 months. Readings were collected in morning section, afternoon section and evening section. In addition to this monitoring was also carried out in library section, study room section, classrooms, tutorial rooms and laboratories.

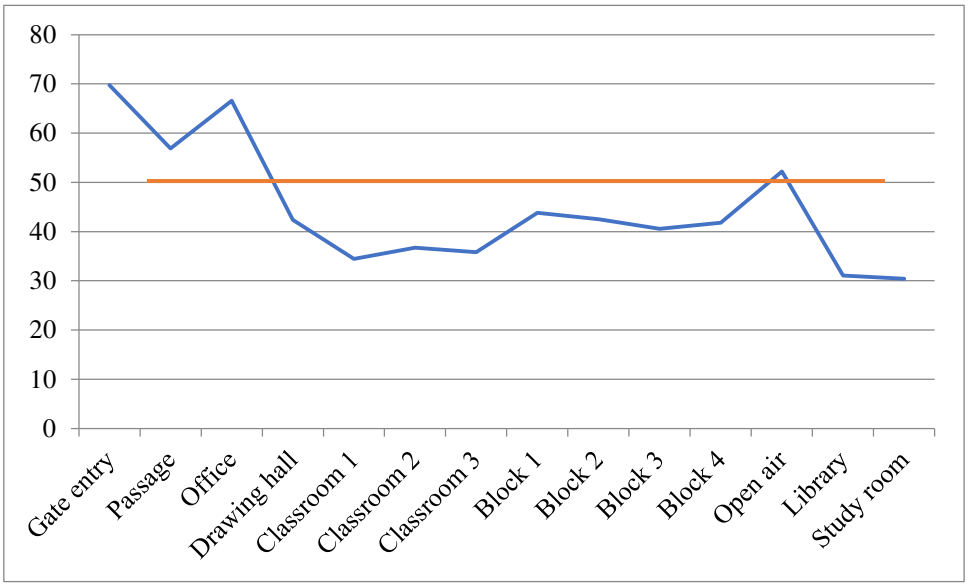
Sr. No.	Point number	Location
1	Point No 1	Gate entry
2	Point No 2	Passage
3	Point No 3	Office
4	Point No 4	Drawing hall
5	Point No 5	Classroom 1
6	Point No 6	Classroom 2
7	Point No 7	Classroom 3
8	Point No 8	Block 1
9	Point No 9	Block 2
10	Point No 10	Block 3
11	Point No 11	Block 4
12	Point No 12	Open air
13	Point No 13	Library
14	Point No 14	Study room

Results of noise assessment:

All the values are in decibels. Assessment values present average of 3 months data and the last column present the final average of morning noon and evening.

Point No	Location	Morning	Noon	Evening	Average
1	Gate entry	66.48	81.55	61.22	69.75
2	Passage	55.18	64.28	51.27	56.91
3	Office	62.02	66.32	71.47	66.60
4	Drawing hall	41.27	45.68	40.22	42.39
5	Classroom 1	32.59	38.49	32.22	34.43

6	Classroom 2	35.69	41.22	33.28	36.73
7	Classroom 3	35.55	36.45	35.42	35.81
8	Block 1	41.22	48.59	41.59	43.80
9	Block 2	40.68	44.58	42.22	42.49
10	Block 3	41.25	41.00	39.54	40.59
11	Block 4	42.89	44.25	38.28	41.80
12	Open air	55.26	51.26	50.22	52.24
13	Library	33.28	29.88	30.12	31.09
14	Study room	30.12	31.22	30.00	30.44



Conclusion and recommendations:

- As per the rules defined by CPCB the limit standards set for institutes regarding noise emissions are restricted to 50 Decibels.
- Considering the average data highest noise emission were observed at main gate entrance, passage, office and open air. This is due to more wide open spaces and echo of sound.
- The lowest emission was observed at the library and study room section. SETI has followed good practices regarding discipline in library section.
- Some common suggestions such as, installing sign boards in campus regarding provision of mobiles, setting up rules for students regarding premises and canteen utilization.

6. Energy Audit:

An energy audit is an inspection survey and an analysis of energy flows for energy conservation in a building. It may include a process or system to reduce the amount of energy input into the system without negatively affecting the output. In commercial and industrial real estate, an energy audit is the first step in identifying opportunities to reduce energy expense and carbon footprint.

A nation is tiring to advance in quantity and quality to the spread of education among the common India and development of their intelligence. In India the entire field of education and other fields of intelligent activities had been monopolized by a handful of men before independence. But today we are marching towards the desirable status of a developed nation with fast strides. But the development should be a sustained one. For achieving such an interminable development energy management is essential. As far as concerning electricity crisis, we are facing lack of electricity during office work. So, institutional management is taking design regarding production of electricity and saving electricity for Eco social aspect. Energy requirement of India is growing and incomplete domestic fossil fuel treasury. The country has motivated strategy to enlarge its renewable energy resources and policy to establish the nuclear power plants. India increases the involvement of nuclear power to largely electrical energy development facility from 4.2% to 9%. India's industrial demand accounted for 35% of electrical power requirement, domestic household use accounted for 28%, agriculture 21%, commercial 9%, and public lighting and other miscellaneous applications accounted for the rest. Energy conservation means reduction in energy consumption without making any sacrifice of quantity or quality. A successful energy management program begins with energy conservation; it will lead to adequate rating of equipment's, using high efficiency equipment and change of habits which causes enormous wastages of energy. By observing all these study lack of electricity and huge electricity demands. It is necessary to plan to be self-sufficient in electricity requirement.

6.1 Connection details:

Institute receives electricity from MSEB i.e. Maharashtra State Electricity Distribution Co. Ltd. Following are the details about connection.

- **Type of connection:** HT
- **Tariff:** 146 HT-VIII B

- **Sanctioned load:** 300.00 KW
- **Contract demand:** 240.00 KVA
- **Feeder voltage:** 11 KV

Tariff Structure:

As per Maharashtra State Electricity Distribution Company Limited, HT and LT consumers have an option to take Time of Day (TOD) tariff instead of the normal tariff. Under TOD tariff electricity consumption and maximum demand in respect of HT consumers for different periods of the day i.e. normal period, peak load period and off-peak load period could be recorded by installing TOD meter. The maximum demand and consumption recorded in different periods could be billed on the following rates of the tariff applicable.

TOD Tariffs	Rate % (Rs./Unit)
0000 Hrs- 0600 Hrs & 2200 Hrs- 2400 Hrs	-1.500
0600 Hrs- 0900 Hrs & 1200 Hrs- 1800 Hrs	0.000
0900 Hrs- 1200 Hrs	0.800
1800 Hrs- 2200 Hrs	1.100

Power Factor:

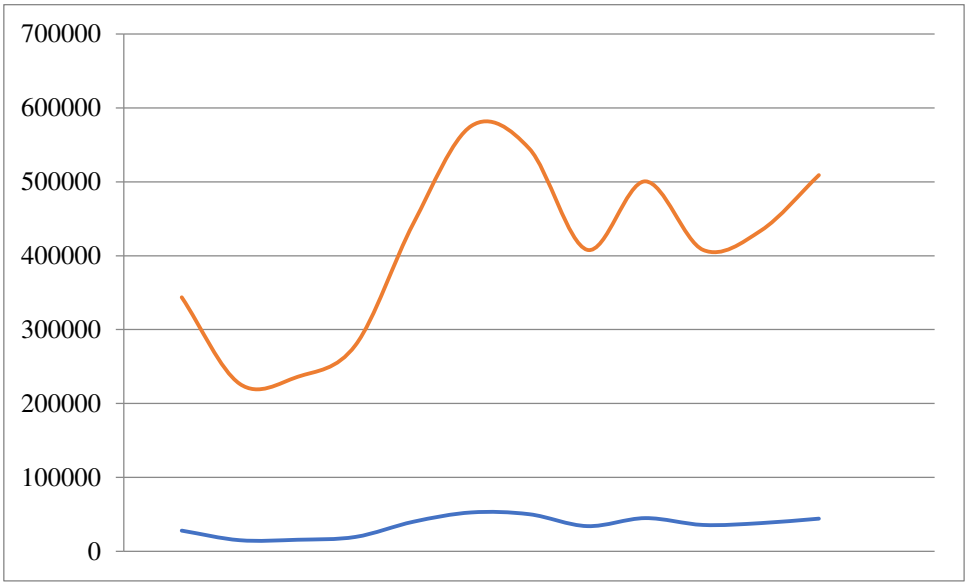
Power Factor (PF) is an indicator of efficient utilization of power. In an AC (Alternating Current) electrical power system, PF is defined as the ratio of real power flowing to the load, to the apparent power in the circuit and is a dimensionless number.

6.2 **Bill analysis:**

Bill analysis for SETI had been done for academic year 2021-2022.

Electricity consumption on the academic year 2021-2022

Sr. No.	Month	Consumption (Kw)	Demand (KVA)	Bill Amount
1	April 21	28145	144	343723
2	May 21	15197	144	226738
3	June 21	15811	144	236172
4	July 21	19617	144	279024
5	August 21	40182	144	443843
6	September 21	52739	144	575502
7	October 21	50330	144	544899
8	November 21	34237	144	407939
9	December 21	45054	144	500568
10	January 22	35836	144	407891
11	February 22	38318	144	433992
12	March 22	44358	144	508969



Highest consumption was observed in Sept 21 i.e. 51,872 units.

6.3 **Equipment Details:**

Sr. No.	Name of Laboratory	Name of Equipment	Details
1	**Concrete technology**	Compression testing machine	Area: 92.73 sqm Total Investment: 895704 /-
		Concrete mixer	
		Flexural test apparatus	
		Vibrating table	
		Sieve shaker motorized	
		Rebound hammer	
		Ultrasonic pulse velocity	
2	**Structural mechanics**	UTM	Area: 70.60 sqm Total Investment: 675275 /-
		Hardness testing machine	
		Impact testing machine	
		Torsion testing machine	
3	**Chemistry**	UV Spectrometer	Area: 83.62 sqm Total Investment: 388449 /-
		Electronic digital balance	
		Muffle furnace	
		Electrical oven	
		Digital pH meter	
		Digital potentiometer	
		Conductivity meter	
4	**English and Communication**	PC	Area: 52.46 sqm Total Investment: 835896 /-
		ODLL system	
		Headphones	
		Speakers	
5	**Measurement and Instrumentation**	Falcon 2 MHz function generator	Area: 79.83 sqm Total Investment: 825611 /-
		Thermocouple module	
		Resistance temperature detection module	
		Strain guage and bourdon tube	
		Wheatstone bridge	

		Wein bridge	
		Commutation and MOSFET	
		DC motor and 3 phase AC motor control	
		PLC trainer kit	
		SMPS/UPS trainer kit	
		CD/VCD player trainer	
		Colour TV and pattern generator	
		LCD TV trainer	
6	**Metrology and quality control**	Monochrome light unit	Area: 79.47 sqm Total Investment: 344064 /-
		Standard glass specimen and optic flat	
		Slip gauge box 87 pcs	
		Vernier caliper	
		Sine bar 300mm	
		Micrometre 0-25mm	
		Dial indicator	
		Micrometre 25-50mm	
		Sine centre 200mm	
		V block magnetic	
		Mechanical comparator	
		Surface plate	
		Inside micrometre	
		Vernier depth gauge	
		Inside and outside calliper	
		Optical profile	
7	**Metallurgy lab**	Abrasive belt grinder	Area: 80 sqm Total Investment: 496880 /-
		Double disc polishing machine	
		Desiccator	
		Binocular metallurgical	

		microscope	
		Standard metallurgical microstructure set	
		Trinocular microscope	
		Magnetic particle crack detector	
		Optional accessory of red penetration kit	
		Red dry penetration kit	
		Muffle furnace	
		Jominy quench bath	
8	**Applied thermodynamics**	Flash point	Area: 80 sqm Total Investment: 171408 /-
		Drop point of grease	
		Redwood viscometer	
		Aniline apparatus	
		Model of Lancashire boiler	
		Stop value Hopkinson	
		Feed check valve	
		Pressure gauge	
		Fusible plugs	
		Green economizer	
		Sudden super heater	
		Separating and throttling calorimeter	
		Test on carbon residue apparatus	
		Grease penetrometer	
9	**Mechatronics laboratory**	PLC programming trainer kit	Area: 80 sqm Total Investment: 349509 /-
		PLC based pick and place robotics	
		Characteristics of temperature sensor	

		Pressure transducer	
		Air compressor	
10	**Manufacturing process**	Sand Muller	Area: 78.61 sqm Total Investment: 162750 /-
		Rapid moisture tester	
		Clay washer	
		Sieve shaker	
		Universal sand strength machine	
		Mold hardness tester	
		Compatibility tester	
		Base block	
		Tube filler accessory	
		Permeability meter	
		Sand rammer	
		Rapid dryer	
		Sensitive balance	
11	**Theory of machine**	Band and block brake	Area: 78.61 sqm Total Investment: 215146 /-
		Internally expanding brake	
		Disc brake model	
		Vibrating lab equipment	
		Whirling of shafts	
		Static and dynamic balance	
		Universal governor	
		Motorized governor	
		Double hook joint	
		Trifler suspension	
		Gear tooth profile	
12	**CAD / CAM / CAE**	Dell PC	Area: 68.25 sqm Total Investment: 3472453.40 /-
		10 KVA UPS	
13	**Refrigeration and AC lab**	Refrigeration test ring	Area: 80 sqm Total Investment:
		AC test ring	

		Domestic refrigeration	849456 /-
		Vapour absorbing ring	
		Vortex tube	
		Window air condition test	
		Ice plant test ring	
		Heat pump test ring	
		Cascade refrigeration test ring	
		Display boards	
14	**CAD Lab**	Dell PC	Area: 82.91 sqm Total Investment: 1184555 /-
		Catia	
		6 KVA UPS	
15	**Measurement switch gear and protection lab**	WEIN bridge model and MAX well bridge	Area: 79.84 sqm Total Investment: 1211047 /-
		Digital storage oscilloscope	
		Generator signal generator	
		Load bank	
		Wheat stone bridge	
		LVDT	
		Capacitive pick up kit	
		Inductive pick up kit	
		Piezo electrical transducer	
		IDMT over current relay test kit	
		Directional over current relay	
		Over current microprocessor	
		Universal relay	
16	**Analog Power electronics and driver lab**	SCR/DIAC/TRIAC Circuit	Area: 78.94 sqm Total Investment: 723832 /-
		1*- fully controlled converter	
		3*- fully controlled converter	
		3*- dual converter	
		1*- cyclo converter	

		1*- inverter using power mosfet	
		3*- IM controlled converter	
		Chopper circuit	
		Chopper circuit	
		Separated excited	
		High frequency	
17	**Electrical workshop and project lab**	4964	Area: 78.94 sqm Total Investment: 723832 /-
		Side cutter plier	
		Wire stripper	
		Centre punch	
		Combination plier	
		Long noise plier	
		Ball pin hammer	
		Screw driver set	
		Soft face hammer	
		Spanner set	
		Crimping tool	
		Iron press	
18	**Digital and microcontroller lab**	Model XPO 8031 kit	Area: 79.56 sqm Total Investment: 375209 /-
		SMPS	
		101 key board	
		RS 232 cable	
		Stepper motor	
		12 V Dc motor	
		Seven segment 8 bridge	
		Mini oven	
		Digital ICs trainer kit	
19	**High voltage engineering lab**	Sphere gap and water resistor	Area: 84.22 sqm Total Investment:

		100KV AV transformer	575747 /-
		0-60 KV transformer	
		5KV high voltage tester	
		Protection grill	
20	**Basic electrical and circuit lab**	Dual DC regulator	Area: 111.91 sqm Total Investment: 1299198 /-
		Single DC regulator	
		Dual trace CRO	
		Function generator	
		Digital multimeter	
		1 Φ wattmeter 10 AMP	
		1 Φ wattmeter 2 AMP	
		3 Φ auto transformer	
		3 Φ load bank	
		1 Φ load bank	
		DC shunt motor	
21	**Electrical machine lab**	3 phase alternator	Area: 169.28 sqm Total Investment: 1836005/-
		Rheostat 800 ohm	
		Rheostat 1200 ohm	
		3 phase capacitive load bank	
		3 phase inductive load bank	
		Induction motor 3Hp	
		Induction motor 2Hp	
		Load bank 1 phase	
		Load bank 3 phase	
		1 phase transformer	
		3 phase transformer	
22	**Computer lab 1**	PC	Area: 79.25 sqm Total Investment: 3325234/-
		UPS	
23	**Control system lab**	Pneumatic trainer kit	Area: 78.93 sqm Total Investment:
		Hydraulic trainer kit	

		Second order control system	624600/-
		On/ off temperature controller	
		Potentiometer as error detector	
		DC voltage regulator	
		Stepper motor	
		DC servo motor	
		AC servo motor	
		PC	
		UPS	
24	**Physics**	Four probe set	Area: 78.63 sqm Total Investment: 485837/-
		B-H loop tracer	
		He –Ne laser source	
		e/m Thomson method	
		Newton ring	
		Half shade polar meter	
		Light source	
25	**APM lab**	Digital beam	Area: 132.74 sqm Total Investment: 294634/-
		Manual beam	
		Universal force table	
		Bell crank lever digital	
		Bell crank lever manual	
		Jib crane digital	
		Jib crane manual	
26	**Transportation lab**	Ductility test	Area: 72.82 sqm Total Investment: 673137/-
		Deval abrasion	
		Penetration apparatus	
		Los Angeles apparatus	
		Flash point and fire point	
		Ring and ball	
		Standard tar viscometer	
		Film stripping device	
27	**Structural mechanics**	UTM	Area: 70.60 sqm

		Hardness testing	Total Investment: 675275/-
		Impact testing	
		Torsion testing	
28	**Concrete testing**	Compression testing	Area: 92.73 sqm Total Investment: 895704/-
		Concrete mixer	
		Flexural test	
		Vibrating table	
		Sieve shaker	
		Rebound hammer	
		Ultrasonic pulse velocity	
29	**Computer lab Civil**	PC	Area: 83.89 sqm Total Investment: 1712598/-
		Projector	
		Printer	
		UPS	
30	**Geotechnical lab**	Oven	Area: 85.35 sqm Total Investment: 504397/-
		Relative density	
		Tri axial shear	
		Consolidation test	
		Permeability test	
		digital weight	
31	**Environmental lab**	COD	Area: 95.92 sqm Total Investment: 231090/-
		BOD	
		Incubator	
		Oven	
		TDS meter	
		pH meter	

6.4 **ILER analysis:**

Lighting is provided in industries, commercial buildings, indoor and outdoor for providing comfortable working environment. The primary objective is to provide the required lighting effect for the lowest installed load i.e. highest lighting at lowest power consumption. The purpose of performance test is to calculate the installed efficacy in terms of lux/watt/m² (existing or design) for general lighting installation. The calculated value can be compared with the norms for specific types of interior installations for assessing improvement options.

Range	Condition
0.5 or less	Urgent activity required (UAR)
0.51 - 0.70	Review Suggested (RS)
0.70- above	Good

ILER analysis for various sections in SETI were carried out. Firstly using LUX meter illumination was measured and then numerical analysis was carried out. ILER gives idea about lighting conditions and measured regarding improving them.

Main Building analysis

Sr. No.	Section	LUX reading	ILER	Condition
1	Library	128	0.71	Good
2	Study room	151	0.71	Good
3	Classroom S1	101	0.46	UAR
4	Classrooms S2	122	0.58	RS
5	Laboratories	199	0.84	Good
6	Office	174	0.74	Good

Other section

Sr. No.	Section	LUX reading	ILER	Condition
1	Staff room	128	0.56	RS
2	Classrooms	177	0.71	Good
3	Laboratories	166	0.78	Good
5	Computer tabs	123	0.52	RS

Reasons for Good ILER:

- Proper placement of windows and doors so that natural light is available well.
- Good ventilation system.

Use of LED bulds:

Institute has toatl light load connection of : 46500 watts

LED load connection is: 32300 watts

Light load other than LED: 14200 watts

Percentage of LED use in institute: 69.46%

Alternatice methods of energy:

Solar power plant at SETI

Capacity of plant: 70kw

Hybrid grid: (Solar + Wind): 50kw

Total capacity: 70+50 = 120 kw

Hybrid Generation during year 2021-2022

Month	PF	Units generated
April 21	0.94	28145
May 21	0.92	15197
June 21	0.89	15811
July 21	0.74	19617
August 21	0.83	40182
September 21	0.83	82736
October 21	0.84	50303
November 21	0.83	34237
December 21	0.83	45054
January 22	0.99	35836
February 22	0.99	38318

7. Observations and Conclusions:

This section gives the overviews of all the audits.

1. Water Section:

Institute has provision of rain water harvesting; hence huge amount of water is conserved and saved. Another good point is that the rain water collected at various section and is used to ground.

2. Wastewater Section:

SETI doesn't have any wastewater treatment facility till now as all the waste is directly sent to sewers. But the institute has planned for CWs i.e. constructed wetland systems for both the grey and black water treatment. Institute has also planned for hazardous waste management. The waste water generated through chemistry lab will also be treated and then led of onto sewers.

3. Solid waste management:

Proper method such as separate bins for wet waste and dry waste which leads to source segregation is followed by SETI.

4. E-waste:

Electronic waste is generated from many sections viz. physics lab, computer lab and applied science section. Institute collets the E waste centrally and is send to vendors for proper disposal means.

5. Sustainable water practices:

Institute has a fresh source of water i.e. river water. Water is recycled and used.

6. Energy:

Institute has followed good means by installing sustainable source of energy viz. solar energy and wind power generation. They have taken good measures by installing LED lights and solar sensor lights in the campus which are proving to be energy efficient.

8. Image Gallery:

Sanjeevan Engineering & Technology Institute

AUDIT REPORT 2020-21

ENVIRONMENTAL & CIVIL ENGINEERING SOLUTIONS
ISO 9001: 2015, IEC 17025: 2017

Editorial

In the Era of global warming and climate change every citizen has to reduce their own carbon foot prints to tackle with the adverse impacts of climate change. A green audit of any academic institution revels ways in which we can reduce energy consumption, water use and reduction in emission of carbon dioxide in the environment. It is a process to look into and ask ourselves whether we are also contributing to the degradation of the environment and if so, in what manner and how we can minimize this contribution and bring down to zero and preserve our environment for future generation.

Sanjeevan Engineering & Technology Institute administration has already taken a step towards the green approach and conducted green audit of campus in the year 2021. As an outcome of this institute has taken green steps to reduce its carbon foot prints by several means in campus viz. sustainable fittings, tree plantation and green computing in the administration and examination. The responsibility of carrying out the scientific green audit was given to Environmental and Civil Engineering Solutions. The organization has followed the rules and regulation of Ministry of Environment and Forest, Govt. of India and Central Pollution Control Board, New Delhi.

A questionnaire was prepared based on the guidelines and format of CPCB, New Delhi to conduct green audit. The information related to consumption of resources like water, electricity and handling of solid and hazardous waste was collected in the formats from main building support services and departments. The data collected was grouped and was tabulated in Excel sheets and analysed. The graphs of the analysed data were prepared for getting quick idea of the status. Interpretation of the overall outcomes was made which incorporates primary and secondary data, references and interrelations within. Final report preparation was carried out using this interpretation to prepare environment management plan of institute for next two years.

During the preparation of the Audit Report Hon. Principal, Hon. Vice Principal encouraged us with their full support. Registrar, Director, IQAC, Deans of faculties, and other officers of the institute were also given support to carry out this work. All Heads of the department, Directors, Co-ordinators, In-charge of the support services and engineering section of the university also gave full co-operation.

I hope the efforts made will be helpful for university to take one green step ahead.

Nikhil N. Kamble
(C.E.O and Head)
Environmental and Civil
Engineering Solutions

(C.E.O and Head)
Environmental and Civil

Index

1. Introduction

The modernization and industrialization are the two important outputs of twentieth century which have made human life more luxurious and comfortable. Simultaneously, they are responsible for voracious use of natural resources, exploitation of forests and wildlife, producing massive solid waste, polluting the scarce and sacred water resources and finally making our mother Earth ugly and inhospitable. Today, people are getting more familiar to the global issues like global warming, greenhouse effect, ozone depletion and climate change etc. Now, it is considered as a final call by mother Earth to walk on the path of sustainable development. The time has come to wake up, unite and combat together for sustainable environment.

Green Audit is the most efficient ecological tool to solve such environmental problems. It is a process of regular identification, quantification, documenting, reporting and monitoring of environmentally important components in a specified area. Through this process the regular environmental activities are monitored within and outside of the concerned sites which have direct and indirect impact on surroundings. Green audit can be one of the initiative for such institutes to account their energy, water resource use as well as wastewater, solid waste, E-waste, hazardous waste generation. Green Audit process can play an important role in promotion of environmental awareness and sensitization about resource use. It can create consciousness towards ecological values and ethics. Through green audit one can get direction about how to improve the condition of environment.

1.1 Need of audit:

Green auditing is the process of identifying and determining whether institutions practices are eco-friendly and sustainable. Traditionally, we are good and efficient users of natural resources. But over the period of time excess use of resources like energy, water, chemicals are become habitual for everyone especially, in common areas. Now, it is necessary to check whether our processes are consuming more than required resources? Whether we are handling waste carefully? Green audit regulates all such practices and gives an efficient way of natural resource utilization. In the era of climate change and resource depletion it is necessary to verify the processes and convert it in to green and clean one. Green audit provides an approach for it. It also increases overall consciousness among the people working in institution towards an environment.

1.2 **Goals of audit:**

Institute has conducted an audit with specific goals as:

1. Identification and documentation of green practices followed by university.
2. Identify strength and weakness in green practices.
3. Conduct a survey to know the ground reality about green practices.
4. Analyse and suggest solution for problems identified from survey.
5. Assess facility of different types of waste management.
6. Increase environmental awareness throughout campus.
7. The long term goal of the environmental audit program is to collect baseline data of environmental parameters and resolve environmental issue before they become problem.

1.3 **Objectives of Audit:**

1. To examine the current practices which can impact on environment such as of resource utilization, waste management etc.
2. To identify and analyse significant environmental issues.
3. Setup goal, vision and mission for Green practices in campus.
4. Establish and implement Environmental Management in various departments.
5. Continuous assessment for betterment in performance in green practices and its evaluation.

1.4 **NAAC criteria VII Environmental Consciousness:**

Institutes are playing a key role in development of human resources worldwide. Higher education institutes campus run various activities with aim to percolate the knowledge along with practical dimension among the society. Likewise different technological problems higher education institutes also try to give solution for issues related to environment. Different types of evolutionary methods are used to assess the problem concerning environment. It includes Environmental Impact Assessment (EIA), Social Impact Assessment (SIA), Carbon Footprint Mapping, Green audit etc

National Assessment and Accreditation Council (NAAC) which is a self-governing organization that declares the institutions as Grade according to the scores assigned at the time of accreditation of the institution. Green Audit has become mandatory procedure for educational institutes under Criterion VII of NAAC. The intention of green audit is to

upgrade the environmental condition inside and around the institution. It is performed by considering environmental parameters like water and wastewater accounting, energy conservation, waste management, air, noise monitoring etc. for making the institution more eco-friendly.

1.5 **Benefits of Green Audit to an Educational Institute:**

There are many advantages of green audit to an Educational Institute:

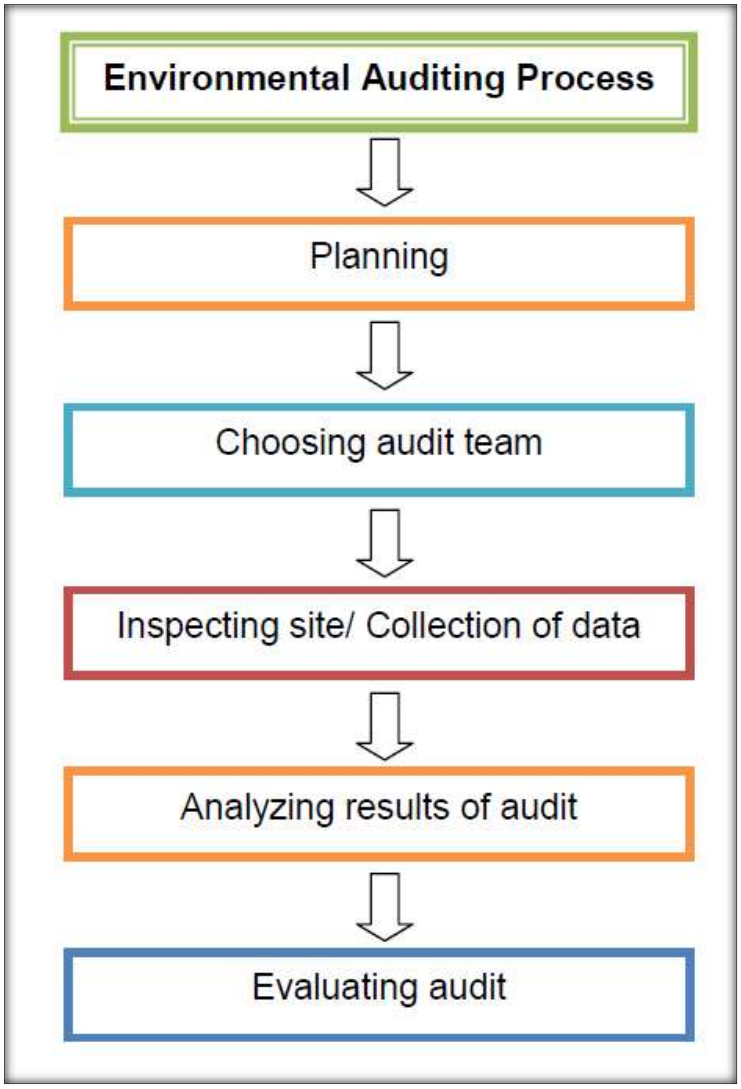
1. It would help to protect the environment in and around the campus.
2. Recognize the cost saving methods through waste minimization and energy conservation.
3. Find out the prevailing and forthcoming complications
4. Empower the organization to frame a better environmental performance.
5. It portrays good image of institution through its clean and green campus.

2. Overview of Institute

The Sanjeevan Engineering & Technology Institute, Panhala was established in the year of 1994. Institute has huge area of 13 acres and has been serving the mankind in the field science and technology.

The landscaped grounds of college are widely admired for their beauty. The most valuable investment any educational institution can make is “Nurturing Future Leaders”. With the continuous rise in expectation of essential leadership standards, the institute has torch bearers have taken a responsibility for this investment to nurture the NextGen leaders with a vision to bridge the existing skill gap. With a firm step forward to attain an academic excellence, several Centres of Excellence, computer labs, and industry-academia associations have been setup at the College in association with the top leaders. The College believes that its primary stakeholders are the students. All aspects of education focus on the core values of contributing to national development while fostering global competencies among students. The College admits students from all social milieus and empowers them through intensive mentoring and counselling to face the challenges of life and become responsible and sensitized citizens of the country.

3. Methodology



3.1 **Audits to be carried out:**

- Green and carbon footprint audit
- Energy audit
- Environmental audit
    - Water audit
    - Wastewater audit
    - Solid waste audit
    - Ambient noise audit
    - Ambient air audit

4. Green and Carbon footprint audit

Green Audit is the most efficient ecological tool to solve such environmental problems. It is a process of regular identification, quantification, documenting, reporting and monitoring of environmentally important components in a specified area. Through this process the regular environmental activities are monitored within and outside of the concerned sites which have direct and indirect impact on surroundings. Green audit can be one of the initiative for such institutes to account their energy, water resource use as well as wastewater, solid waste, E-waste, hazardous waste generation. Green Audit process can play an important role in promotion of environmental awareness and sensitization about resource use. It can create consciousness towards ecological values and ethics. Through green audit one can get direction about how to improve the condition of environment.

Carbon is the basis of life on mother Earth. It is incorporated into the plants through photosynthesis, consumed by animal species through the food, presents in the form of carbon dioxide (CO_2) the atmosphere, locked into the rocks as limestone and compressed into the different fossil fuels such as coal and oil. As CO_2 level in the atmosphere continue to increase, most climate designs or project that the oceans of the world and trees will keep soaking up more than half CO_2 . The plants on land and in the sea, taken up carbon by over many years increased the percentage discharged during decay, and this increased carbon became locked away as fossil fuels beneath the surface of the planet. The starting of the 21st century brought growing concern about global warming, climate change, food security, poverty and population growth.

4.1 Green Cover at SETI:

SETI has got a huge green cover and has almost 50 species of vegetation inside the campus. The institute has 22 acres of campus and most of this is covered by green area. They have a huge plantations and structural components are Main building, office section, mess, Block A, Block B, Block C and Block D etc.

Figure 4-1 SETI, Campus

SETI has taken huge efforts to develop its green cover. The institute has about 8.59 acres of green cover. In the vicinity of the institute there are about approximately 710 fully grown trees and more than a 1300 growing plants. The above table shows some of the common tree species found. Institute has agriculture cover approximately about 4.86 acres in plantation.

Sr. No.	Species
1	Caesalpinia pulcherrima
2	Tribulus terrestris
3	Vachellia nilotica
4	Rotheca serrata
5	Lavandula bipinnata
6	Barleria cristata
7	Fox Brush Orchid

Mostly there are trees of Tamarind, mango, neem, ferns etc. Due to this the institute has high carbon sequesterial values. Considering the vicinity some dry plants were observed to approximately about 38. Plants absorb sunlight, 50% is absorbed and 30% reflected so this helps to create a cooler and more pleasant climate through a 3°C temperature reduction in the vicinity. This has also leaded to increase in biodiversity as more than 18 species of birds were observed. Some off the common birds were viz. Sparrow, wild parrots, little stint, black kite etc.

4.2 **Carbon Footprint Audit:**

SETI has estimated its carbon footprint by factor methodology. Various factors were used to estimate the carbon emissions from Consumption of electricity, generation of solid waste, use of vehicles in campus, carbon emissions due to human breathing and emissions from buildings. At last they have also calculated Carbon sequesterial value i.e. carbon that is absorbed by the plants.

Sr. No.	Month	Units	CO_2 emitted ($KgCO_2$ eq.)
1	Mar 20	14,007	11485.74
2	Apr- 20	35,758	29321.56
2	May 20	14,170	11619.4
3	Jun 20	15,780	12939.6
4	Jul 20	16,706	13698.92
5	Aug 20	14,574	11950.68
6	Sep 20	14,619	11987.58
7	Oct 20	17,250	14145
8	Nov 20	39,102	32063.64
9	Dec 20	47,923	39296.86
10	Jan 21	44,486	36478.52
11	Feb 21	51,872	42535.04
12	Mar 21	14,007	11485.74

Hence as per the calculation the average unit consumption considering all the months is about 27,187 units and the carbon emission is 22293 kg CO_2 eq./year.

Secondly considering emissions from human breathing, the institute has total 1213 students. Institute has special boys and girls hostel. Considering all the staff viz. Junior teachers, senior teachers, Non grant, grant CHB they are total of 77. The staff works for about averagely 6 hours a day in the institute and the students are present for 4 hours averagely daily.

Vehicles emit significant amount of gases in environment and SETI has various parking sections in the campus. It was found that averagely 142 vehicles entered the institute daily and travel about 200 m of distance from the gate. Cars also enter the institute and as per observation 12 cars are observed daily. Hence, emission from 2 wheelers is 755.44 g/km CO_2 eq. considering petrol and diesel cars the emission are 474.6 g/km CO2 eq. Overall the institute emits 286.44 Kg CO_2 eq. per year.

Solid waste is very important as it emits significant amount of carbon through it. SETI has a

good solid waste management system. Hence the institute develops about 1128 kg of waste daily in both the form of wet and dry. Hence for non-residing persons the emissions are 975.38 kg CO_2 eq. per day.

Buildings play an important role in carbon contribution. During the construction operation and use phase they emit significant amount of carbon. Hence considering total built-up area the carbon emissions could be evaluated. After the estimation the total built-up area observed was approximately about 5061 sq. m and the carbon emission were 1012.20 kg CO_2 eq. per year.

Carbon sequesterial in important as it is the carbon absorbed by the trees. SETI campus has 710 fully grown trees and 1300 growing trees. Hence the carbon absorbed by both this trees is 23108 kg CO_2 eq. per year.

Hence overall carbon data for SETI is mentioned below.

Sr. No.	Section	Emission
1	Emission from electricity	22293 kg CO_2 eq./year.
2	Emission from solid waste	9.75 ton CO_2 eq. per year.
3	Emission from Vehicles	1230 Kg CO_2 eq. per year.
4	Emission from human breathing	72.03 tons of CO_2 eq. per year.
5	Emission from buildings	1012.20 kg CO_2 eq. per year.
6	Carbon sequesterial	23108 kg CO_2 eq. per year.

4.3 **Conclusion:**

- Highest carbon emission was observed from human breathing i.e. 72.03 tons of CO_2 eq. per. Year. There is no any significant mean to reduce this number as it is not controllable.
- The next is solid waste. The emission from solid waste comprises of 9.75 ton CO_2 eq. per year. This can be significantly reduced by following simple means. Waste segregation is properly observed by the institute and they should follow the cut out plastic plans. There should be complete ban in using the plastic inside the campus. There should be minimization of food waste as it contributes highest in carbon emissions.
- Considering emission from electricity they can be significantly reduced by decrease in electricity use. This can be done by installing LED lights and using energy efficient

equipment's such as machines with high star ratings which save more. Institute can recognize renewable energy sources and have a setup in the institute. This can lead in significant saving of electricity and reduction in carbon emissions.

- Vehicles have the least emissions in SETI and it is due to the easy approached parking so that vehicles do not roam in the vicinity. All the vehicles travel hardly 350 m in the campus and tis has lead to lower emissions. Still institute can follows "NO Vehicle Day" on every 2nd Saturday of each month.
- Institute reduces about 2.1 tons of CO_2 per year by the means of plants. This could be increased by increasing in plantations. SETI can plant more trees next to chemistry section, surrounding to play ground, front of applied science department etc.
- The plants having highest Carbon sequestration values are suggested. Cinnamomum verum, Eugenia caryophyllid, Bumelia celestina, Acacia Berland Eri, Acacia Francescana, Chinaberry tree, Moringa oleífer, Carya illusoriness, Pinus Arizonian and Buddleia cordata are some of the suggested species for plantation.

5. Environmental Audit

An environmental audit is a type of evaluation intended to identify environmental compliance and management system implementation gaps, along with related corrective actions. ISO 14001 is a voluntary international standard for environmental management systems ("EMS"). ISO 14001:2004 provides the requirements for an EMS and ISO 14004 gives general EMS guidelines. An EMS meeting the requirements of ISO 14001:2004 is a management tool enabling an organization of any size or type to:

- Identify and control the environmental impact of its activities, products or services;
- Improve its environmental performance continually, and
- Implement a systematic approach to setting environmental objectives and targets, to achieving these and to demonstrating that they have been achieved.

The audit examines the potential hazards or risks posed by the institutes. Areas examined may include environmental policies and procedures, energy use practices, recycling, waste, conservation, and pollution. Then, the institute can use the results to determine what changes need to be made for compliance. In a broad sense, environmental auditing aims to help protect the environment and minimize the risks of business activities to the environment and human safety and health.

5.1 **Water Audit and wastewater audit:**

Water auditing is a method of quantifying water flows and quality in systems, with a view to reducing water usage and often saving money on otherwise unnecessary water use. Water audit is an effective management tool for minimizing losses, optimizing various uses and thus enabling considerable conservation of water. Water audits trace water use from its point of entry into the facility/system to its discharge into the sewer/river/canal etc. Wastewater audit deals with effective management of wastewater in the system. It deals with proper generation, management, treatment, transfer and disposal of wastewater.

SETI has carried out its water and wastewater audit and has suggested many more ways for water conservation, reuse and recycle. The detail water and waste water report is mentioned below.

5.2 **Water Audit report:**

Water audit for the "SETI" was carried out. The purpose of the water audit is to provide a thorough understanding of the water uses by identifying and measuring all water using fixtures, appliances, and practices in order to recommend potential water saving efficiencies.

PRIMARY DATA

Sr. No.	Title	Information
1	**Name of Institute**	SETI
2	**Address**	Panhala
4	**Name of company under which water audit is carried out**	Environmental and Civil Engineering Solutions, Sangli
6	**Number of floors**	G + 2
7	**Category of building**	Educational Institute
8	**Nearest ESR location**	Campus
9	**Water supply hours**	6 hrs. daily
10	**Water meter present**	Yes

POPULATION DETAILS

Title	Information
Fixed population (Working staff and Students)	Gents: 935
	Ladies: 278
Variable population (Visiting persons)	Gents: 21
	Ladies: 11

SOURCE INFORMATION

Title	Information
Sources of water	River water pumping
Connection details	1" PVC pipe inlet and 1" outlet distribution pipe

STORAGE DETAILS

Title	Information
Overhead tank type	PVC tank
Location	On terrace
Number of tanks	Section A: 1 X 2000 lit PVC Section B: 4 X 2000 lit PVC Section C: 3 X 2000 lit PVC 2 X 1000 lit PVC Section D: 2 X 1000 lit PVC
Motor connection details	2 Hp for pumping
Pumping period	4 hours daily
Underground sump	No
Capacity of underground sump	NA

WATER USAGE

Toilet	Number of users	Water consumption
Gents toilet	935 users	935 X 10 lit = 9350
Washbasin	1213 users	1213 X 0.75 lit = 909.75
Ladies toilet	278 users	278 X 12 lit = 3348
Toilet cleaning	500 liters	500 liters
Floor cleaning	500 liters	500 liters
Gardening	1300 liters	1300 liters
Laboratories	1200 liters	1200 liters
Total		**17,107 lit**

WATER CONSUMPTION IN HOSTEL

Considering 135 LPCD there are 71 boys and girls in hostel section. Hence, 135 X 71 is 9585 liters.

WATER USED FOR DRINKING

There are coolers cum water purifiers present in the institute. Sample assessment for 3 months was done and average values are presented below for each section.

Potable water assessment:

Section 1

Sr. No.	Test	Results	Limit
1	pH	**6.0-7.2**	6.5-8.5
2	TDS	**145**	-
3	E.C	**77**	-
4	Hardness	**121**	200
5	Chlorides	**102**	200
6	MPN	**Ab**	1.0
7	Odor and Color	**Ab**	-

Section 2

Sr. No.	Test	Results	Limit
1	pH	**7.0-7.7**	6.5-8.5
2	TDS	**112**	-
3	E.C	**198**	-
4	Hardness	**124**	200
5	Chlorides	**109**	200
6	MPN	**Ab**	1.0
7	Odor and Color	**Ab**	-

Section 3

Sr. No.	Test	Results	Limit
1	pH	**7.5-7.6**	6.5-8.5
2	TDS	**144**	-
3	E.C	**104**	-
4	Hardness	**105**	200

5	Chlorides	**111**	200
6	MPN	**Ab**	1.0
7	Odor and Color	**Ab**	-

Section 4

Sr. No.	Test	Results	Limit
1	pH	**6.8-7.7**	6.5-8.5
2	TDS	**144**	-
3	E.C	**125**	-
4	Hardness	**112**	200
5	Chlorides	**133**	200
6	MPN	**Ab**	1.0
7	Odor and Color	**Ab**	-

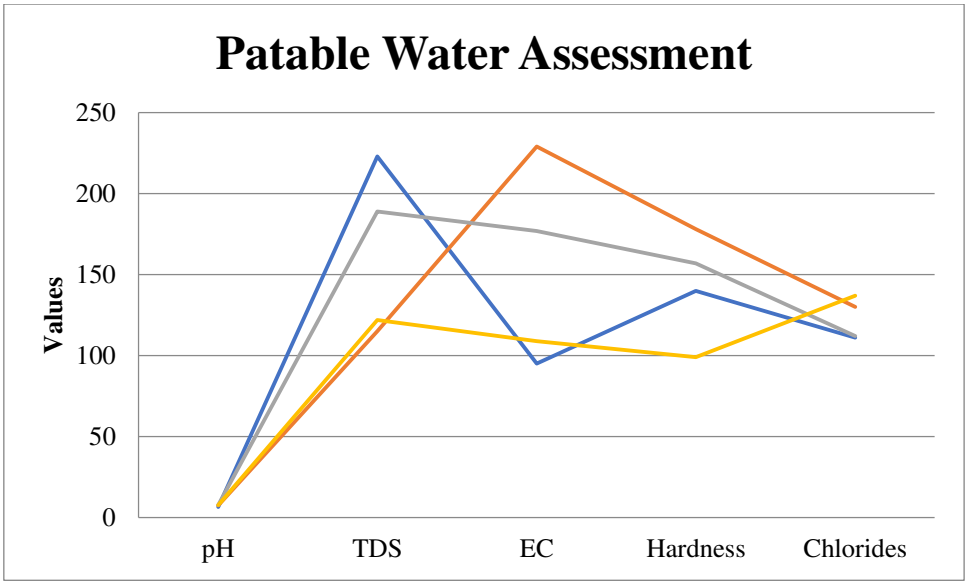
Municipal water and deep well water assessment:

River water ESR water assessment

Sr. No.	Test	Results	Limit
1	pH	**8.1**	6.5-8.5
2	TDS	**1222**	-
3	E.C	**2312**	-
4	Hardness	**144**	200
5	Chlorides	**122**	200
6	MPN	**Ab**	1.0
7	Odor and Color	**Ab**	-

Main RO plant assessment

Sr. No.	Test	Results	Limit
1	pH	**6.6**	6.5-8.5
2	TDS	**98**	-
3	E.C	**102**	-
4	Hardness	**33**	200
5	Chlorides	**77**	200
6	MPN	**Ab**	1.0
7	Odor and Color	**Clear**	-



5.3 **Waste water audit:**

SETI campus generates huge amount of wastewater. The source for wastewater in the campus is hostels, institute, mess and the washrooms and urinals inside the campus. To estimate the amount of wastewater generated all the water that is used in the washrooms, quarters and hostels is considered as wastewater.

Sr. No.	Section	Wastewater generated in litres
1	Wastewater generated in campus	**17107**
2	Hostel boys	**3213**
3	Hostel girls	**3497**
Total		**23816**

5.4 **Waste water treatment plant at SETI:**

Currently SETI lets all it waste water into sewers and some of the waste water is disposed at the back of chemistry department. Currently there is no any waste treatment facility. Sampling of waste water was done for 3 months for the parameters of COD, BOD, TKN and pH. Following table shows the characterization of wastewater.

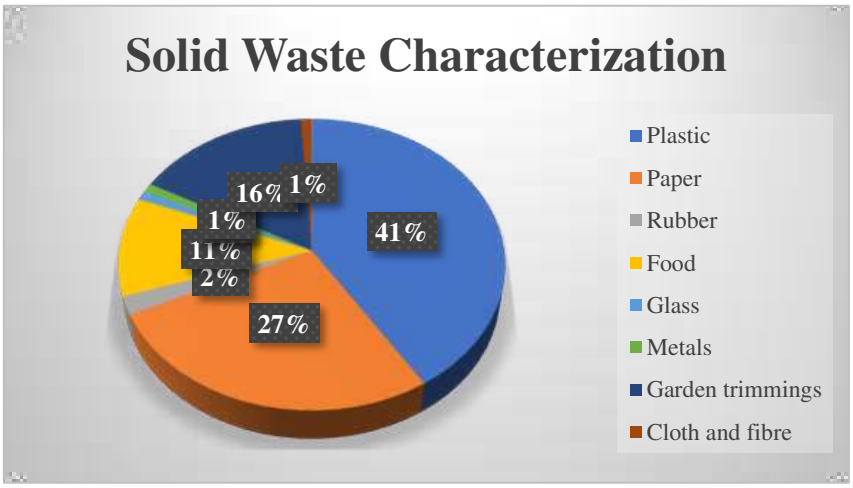
Sr. No.	Parameter	Reading
1	pH	7.41
2	COD	198
3	BOD	99
4	TKN	17

5.5 **Solid waste Audit:**

A waste audit is a physical analysis of waste composition to provide a detailed understanding of problems, identify potential opportunities, and give you a detailed analysis of your waste composition. A waste audit will help you clearly identify your waste generation to establish baseline or benchmark data, Characterize and quantify waste stream, Verify waste pathways, identify waste diversion opportunities and identify source reduction opportunities.

Solid waste is the unwanted or useless solid material generated from the human activities in residential, industrial or commercial area. Solid waste management reduce or eliminates the adverse impact on the environment and human health. Solid waste audit for SETI was carried out. The entire premise was analysed for solid waste generation and waste characterization. Overall waste was observed and characterization was done. The above table shows the components of solid waste at SETI campus. Quartering method was used and 1 Kg of waste was selected.

Sr. No.	Type of waste	Composition %
1	Plastic	41
2	Paper	27
3	Rubber	2
4	Food	11
5	Glass	0.5
6	Metals	2
7	Garden trimmings	16
8	Cloth and fibre	0.5



After analysing all the bins it was observed that plastic had highest contribution viz. 41% followed by the paper waste i.e. 27%. Mostly common observed plastic items were plastic wrappers of chips, soft drinks bottles and chocolate wrappers. The paper waste included paper wrappers, notebook pages, pamphlets and some pieces of cardboard. The third highest waste included garden trimmings. This waste was observed in the dustbins near velankar hall. It included small grass, minute branches etc. The least contribution was of cloth, fibre, glass and metals.

Institute follows good practices regarding separate bin system, and the bins are even marked. There are 2 separate bins present in campus viz. black bins for wet waste and green bins for dry waste. Considering applied science section they have places yellow bins for wet waste and green bins for dry waste.

5.6 **Observations and Conclusion:**

- There are separate bins for wet waste and dry waste. Hence, source segregation takes place.
- Institute has taken steps towards paper recycling. The paper waste collected from the bins is send to vendors.
- Plastic ban in campus is implemented but due to lack of seriousness in the students plastic is used in campus. Institute should conduct plastic awareness seminars for both the staff and students.

Assessment of soil was done to determine the quality of soil:

Sr. No.	Test	Results
1	pH	**6.3**
2	NPK	**2:4:1**
3	Acidity	**128 mg/lit**
4	Hardness	**177 mg/lit**

5.7 **Ambient Air Audit:**

Ambient air quality refers to the condition or quality of air surrounding us and in the outdoors. National Ambient Air Quality Standards are the standards for ambient air quality set by the Central Pollution Control Board (CPCB) that is applicable nationwide. The CPCB has been conferred this power by the Air (Prevention and Control of Pollution) Act, 1981. Hence, auditing this ambient air quality is stated as ambient air audit.

SETI has carried out its ambient air audit at various locations in the premises. Air quality detector machine PS-21185 was used for air audit. Parameters viz. SOx, NOx, RSPM and Air quality were assessed. Following google earth pro images shows the assessed locations.

Sr. No.	Point number	Location
1	Point No 1	Gate entry
2	Point No 2	Passage
3	Point No 3	Office
4	Point No 4	Drawing hall
5	Point No 5	Classroom 1
6	Point No 6	Classroom 2
7	Point No 7	Classroom 3
8	Point No 8	Block 1
9	Point No 9	Block 2
10	Point No 10	Block 3
11	Point No 11	Block 4
12	Point No 12	Open air
13	Point No 13	Library
14	Point No 14	Study room

Results of air quality monitoring:

Point No	Location	SOx	NOx	RSPM	Quality
	CPCB Limits	**80 µg/m3**	**80 µg/m3**	**80 µg/m3**	**-**
1	Gate entry	31	37	77	Good
2	Passage	12	11	55	Fresh
3	Office	11	12	42	Good
4	Drawing hall	12	10	21	Fresh
5	Classroom 1	11	11	44	Fresh
6	Classroom 2	12	7	33	Fresh
7	Classroom 3	15	18	34	Good
8	Block 1	14	15	33	Good
9	Block 2	14	15	23	Good
10	Block 3	19	12	35	Good
11	Block 4	14	10	21	Fresh
12	Open air	18	16	37	Good

13	Library	10	8	21	Fresh
14	Study room	11	9	22	Fresh

Conclusion and recommendations:

- After assessing the air quality all the results are within the limits. Considering the RSPM i.e. respirable dust particulate matter highest was observed at the gate entrance. This is due to the present of small dust particles from the open ground. The second highest was observed in passages.
- Considering the SOx and NOx, it is mainly due to vehicle exhaust. Hence the highest was observed at the main gate entrance since many vehicles from public and college travel.
- There are some measures commonly need to follow such as Ban on open solid waste burning in campus and ban on grass burning in summer season.

5.8 **Ambient Noise audit:**

Ambient sound in relation to audio refers to the background noise present at a given scene or a location. This can include noises such as rain, traffic, crickets, birds, etc. Ambient sound levels are often measured in order to map sound conditions over a specific time to understand their variation with locale and various points. Ambient noise level is measured with a sound level meter. It is usually measured in Decibel (dB).

Three points were selected based on best suitable requirement for noise monitoring. RS-2250

instrument was used. Monitoring was carried out 3 times in a day for 3 months. Readings were collected in morning section, afternoon section and evening section. In addition to this monitoring was also carried out in library section, study room section, classrooms, tutorial rooms and laboratories.

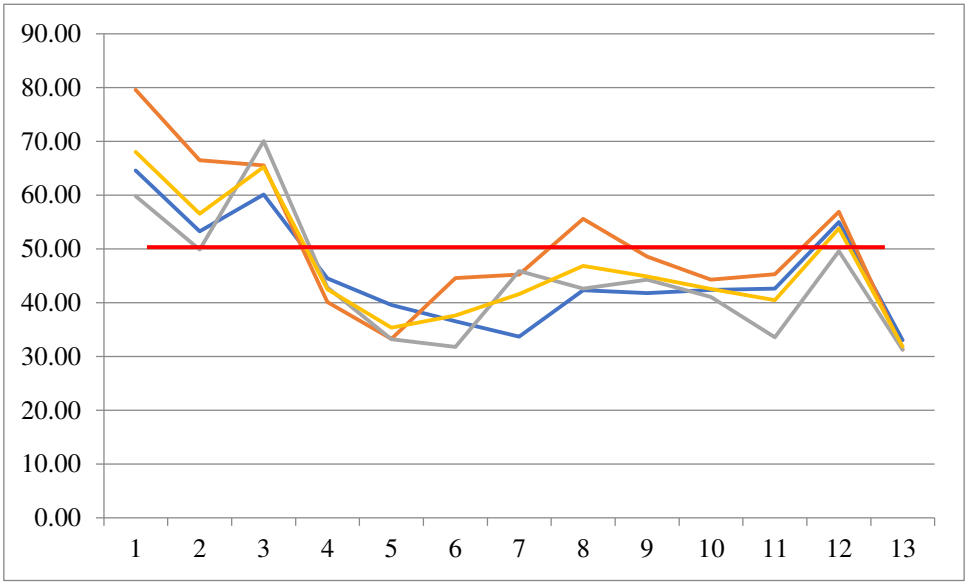
Sr. No.	Point number	Location
1	Point No 1	Gate entry
2	Point No 2	Passage
3	Point No 3	Office
4	Point No 4	Drawing hall
5	Point No 5	Classroom 1
6	Point No 6	Classroom 2
7	Point No 7	Classroom 3
8	Point No 8	Block 1
9	Point No 9	Block 2
10	Point No 10	Block 3
11	Point No 11	Block 4
12	Point No 12	Open air
13	Point No 13	Library
14	Point No 14	Study room

Results of noise assessment:

All the values are in decibels. Assessment values present average of 3 months data and the last column present the final average of morning noon and evening.

Point No	Location	Morning	Noon	Evening	Average
1	Gate entry	64.59	79.58	59.82	68.00
2	Passage	53.29	66.45	49.87	56.54
3	Office	60.13	65.55	70.07	65.25
4	Drawing hall	44.53	40.11	42.86	42.50
5	Classroom 1	39.58	33.28	33.23	35.36
6	Classroom 2	36.55	44.56	31.79	37.63
7	Classroom 3	33.66	45.22	45.89	41.59

8	Block 1	42.32	55.58	42.59	46.83
9	Block 2	41.78	48.59	44.29	44.89
10	Block 3	42.35	44.25	41.08	42.56
11	Block 4	42.63	45.28	33.56	40.49
12	Open air	55.00	56.89	49.58	53.82
13	Library	33.02	31.28	31.25	31.85
14	Study room	64.59	79.58	59.82	68.00



Conclusion and recommendations:

- As per the rules defined by CPCB the limit standards set for institutes regarding noise emissions are restricted to 50 Decibels.
- Considering the average data highest noise emission were observed at main gate entrance, passage, office and open air. This is due to more wide open spaces and echo of sound.
- The lowest emission was observed at the library and study room section. SETI has followed good practices regarding discipline in library section.
- Some common suggestions such as, installing sign boards in campus regarding provision of mobiles, setting up rules for students regarding premises and canteen utilization.

6. Energy Audit

An energy audit is an inspection survey and an analysis of energy flows for energy conservation in a building. It may include a process or system to reduce the amount of energy input into the system without negatively affecting the output. In commercial and industrial real estate, an energy audit is the first step in identifying opportunities to reduce energy expense and carbon footprint.

A nation is tiring to advance in quantity and quality to the spread of education among the common India and development of their intelligence. In India the entire field of education and other fields of intelligent activities had been monopolized by a handful of men before independence. But today we are marching towards the desirable status of a developed nation with fast strides. But the development should be a sustained one. For achieving such an interminable development energy management is essential. As far as concerning electricity crisis, we are facing lack of electricity during office work. So, institutional management is taking design regarding production of electricity and saving electricity for Eco social aspect. Energy requirement of India is growing and incomplete domestic fossil fuel treasury. The country has motivated strategy to enlarge its renewable energy resources and policy to establish the nuclear power plants. India increases the involvement of nuclear power to largely electrical energy development facility from 4.2% to 9%. India's industrial demand accounted for 35% of electrical power requirement, domestic household use accounted for 28%, agriculture 21%, commercial 9%, and public lighting and other miscellaneous applications accounted for the rest. Energy conservation means reduction in energy consumption without making any sacrifice of quantity or quality. A successful energy management program begins with energy conservation; it will lead to adequate rating of equipment's, using high efficiency equipment and change of habits which causes enormous wastages of energy. By observing all these study lack of electricity and huge electricity demands. It is necessary to plan to be self-sufficient in electricity requirement.

6.1 **Connection details:**

Institute receives electricity from MSEB i.e. Maharashtra State Electricity Distribution Co. Ltd. Following are the details about connection.

- **Type of connection:** HT
- **Tariff:** 146 HT-VIII B

- **Sanctioned load:** 300.00 KW
- **Contract demand:** 240.00 KVA
- **Feeder voltage:** 11 KV

Tariff Structure:

As per Maharashtra State Electricity Distribution Company Limited, HT and LT consumers have an option to take Time of Day (TOD) tariff instead of the normal tariff. Under TOD tariff electricity consumption and maximum demand in respect of HT consumers for different periods of the day i.e. normal period, peak load period and off-peak load period could be recorded by installing TOD meter. The maximum demand and consumption recorded in different periods could be billed on the following rates of the tariff applicable.

TOD Tariffs	Rate % (Rs./Unit)
0000 Hrs- 0600 Hrs & 2200 Hrs- 2400 Hrs	-1.500
0600 Hrs- 0900 Hrs & 1200 Hrs- 1800 Hrs	0.000
0900 Hrs- 1200 Hrs	0.800
1800 Hrs- 2200 Hrs	1.100

Power Factor:

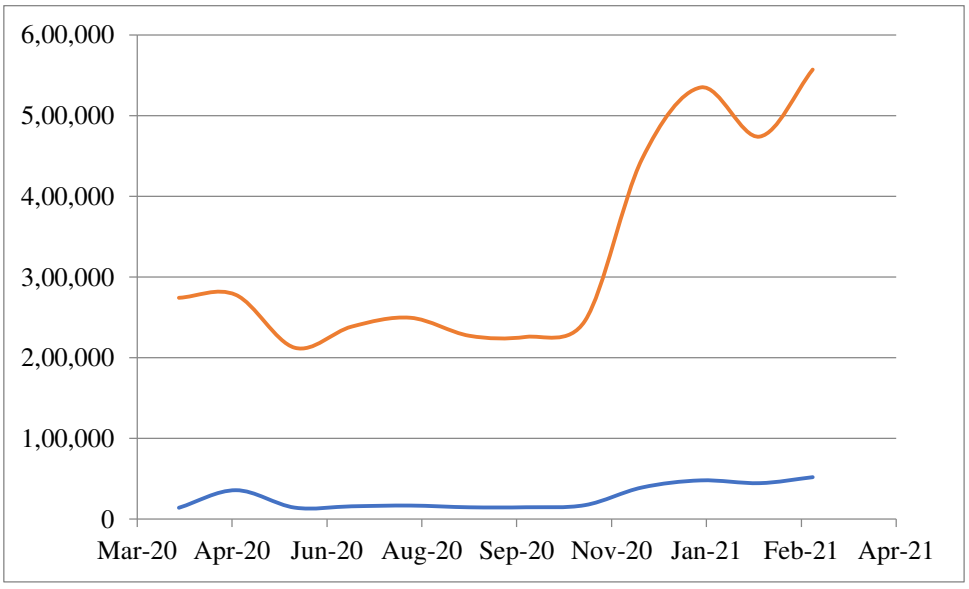
Power Factor (PF) is an indicator of efficient utilization of power. In an AC (Alternating Current) electrical power system, PF is defined as the ratio of real power flowing to the load, to the apparent power in the circuit and is a dimensionless number.

6.2 **Bill analysis:**

Bill analysis for SETI had been done for academic year 2020-2021.

Electricity consumption on the academic year 2020-2021

Sr. No.	Month	Consumption (Kw)	Bill Amount
1	April 20	14,007	2,74,190
2	May 20	35,758	2,77,819
3	June 20	14,170	2,12,344
4	July 20	15,780	2,38,461
5	August 20	16,706	2,49,469
6	September 20	14,574	2,27,152
7	October 20	14,619	2,25,770
8	November 20	17,250	2,45,645
9	December 20	39,102	4,45,944
10	January 21	47,923	5,34,916
11	February 21	44,486	4,73,952
12	March 21	51,872	5,57,026



Highest consumption was observed in March 21 i.e. 51,872 units.

6.3 **Equipment Details:**

Sr. No.	Name of Laboratory	Name of Equipment	Details
1	**Concrete technology**	Compression testing machine	Area: 92.73 sqm Total Investment: 895704 /-
		Concrete mixer	
		Flexural test apparatus	
		Vibrating table	
		Sieve shaker motorized	
		Rebound hammer	
		Ultrasonic pulse velocity	
2	**Structural mechanics**	UTM	Area: 70.60 sqm Total Investment: 675275 /-
		Hardness testing machine	
		Impact testing machine	
		Torsion testing machine	
3	**Chemistry**	UV Spectrometer	Area: 83.62 sqm Total Investment: 388449 /-
		Electronic digital balance	
		Muffle furnace	
		Electrical oven	
		Digital pH meter	
		Digital potentiometer	
		Conductivity meter	
4	**English and Communication**	PC	Area: 52.46 sqm Total Investment: 835896 /-
		ODLL system	
		Headphones	
		Speakers	
5	**Measurement and Instrumentation**	Falcon 2 MHz function generator	Area: 79.83 sqm Total Investment: 825611 /-
		Thermocouple module	
		Resistance temperature detection module	
		Strain guage and bourdon tube	
		Wheatstone bridge	
		Wein bridge	

		Commutation and MOSFET	
		DC motor and 3 phase AC motor control	
		PLC trainer kit	
		SMPS/UPS trainer kit	
		CD/VCD player trainer	
		Colour TV and pattern generator	
		LCD TV trainer	
6	**Metrology and quality control**	Monochrome light unit	Area: 79.47 sqm Total Investment: 344064 /-
		Standard glass specimen and optic flat	
		Slip gauge box 87 pcs	
		Vernier caliper	
		Sine bar 300mm	
		Micrometre 0-25mm	
		Dial indicator	
		Micrometre 25-50mm	
		Sine centre 200mm	
		V block magnetic	
		Mechanical comparator	
		Surface plate	
		Inside micrometre	
		Vernier depth gauge	
		Inside and outside calliper	
		Optical profile	
7	**Metallurgy lab**	Abrasive belt grinder	Area: 80 sqm Total Investment: 496880 /-
		Double disc polishing machine	
		Desiccator	
		Binocular metallurgical microscope	

		Standard metallurgical microstructure set	
		Trinocular microscope	
		Magnetic particle crack detector	
		Optional accessory of red penetration kit	
		Red dry penetration kit	
		Muffle furnace	
		Jominy quench bath	
8	**Applied thermodynamics**	Flash point	Area: 80 sqm Total Investment: 171408 /-
		Drop point of grease	
		Redwood viscometer	
		Aniline apparatus	
		Model of Lancashire boiler	
		Stop value Hopkinson	
		Feed check valve	
		Pressure gauge	
		Fusible plugs	
		Green economizer	
		Sudden super heater	
		Separating and throttling calorimeter	
		Test on carbon residue apparatus	
		Grease penetrometer	
9	**Mechatronics laboratory**	PLC programming trainer kit	Area: 80 sqm Total Investment: 349509 /-
		PLC based pick and place robotics	
		Characteristics of temperature sensor	
		Pressure transducer	

		Air compressor	
10	**Manufacturing process**	Sand Muller	Area: 78.61 sqm Total Investment: 162750 /-
		Rapid moisture tester	
		Clay washer	
		Sieve shaker	
		Universal sand strength machine	
		Mold hardness tester	
		Compatibility tester	
		Base block	
		Tube filler accessory	
		Permeability meter	
		Sand rammer	
		Rapid dryer	
		Sensitive balance	
11	**Theory of machine**	Band and block brake	Area: 78.61 sqm Total Investment: 215146 /-
		Internally expanding brake	
		Disc brake model	
		Vibrating lab equipment	
		Whirling of shafts	
		Static and dynamic balance	
		Universal governor	
		Motorized governor	
		Double hook joint	
		Trifler suspension	
		Gear tooth profile	
12	**CAD / CAM / CAE**	Dell PC	Area: 68.25 sqm Total Investment: 3472453.40 /-
		10 KVA UPS	
13	**Refrigeration and AC lab**	Refrigeration test ring	Area: 80 sqm Total Investment: 849456 /-
		AC test ring	
		Domestic refrigeration	

		Vapour absorbing ring	
		Vortex tube	
		Window air condition test	
		Ice plant test ring	
		Heat pump test ring	
		Cascade refrigeration test ring	
		Display boards	
14	**CAD Lab**	Dell PC	Area: 82.91 sqm Total Investment: 1184555 /-
		Catia	
		6 KVA UPS	
15	**Measurement switch gear and protection lab**	WEIN bridge model and MAX well bridge	Area: 79.84 sqm Total Investment: 1211047 /-
		Digital storage oscilloscope	
		Generator signal generator	
		Load bank	
		Wheat stone bridge	
		LVDT	
		Capacitive pick up kit	
		Inductive pick up kit	
		Piezo electrical transducer	
		IDMT over current relay test kit	
		Directional over current relay	
		Over current microprocessor	
		Universal relay	
16	**Analog Power electronics and driver lab**	SCR/DIAC/TRIAC Circuit	Area: 78.94 sqm Total Investment: 723832 /-
		1*- fully controlled converter	
		3*- fully controlled converter	
		3*- dual converter	
		1*- cyclo converter	

		1*- inverter using power mosfet	
		3*- IM controlled converter	
		Chopper circuit	
		Chopper circuit	
		Separated excited	
		High frequency	
17	**Electrical workshop and project lab**	4964	Area: 78.94 sqm Total Investment: 723832 /-
		Side cutter plier	
		Wire stripper	
		Centre punch	
		Combination plier	
		Long noise plier	
		Ball pin hammer	
		Screw driver set	
		Soft face hammer	
		Spanner set	
		Crimping tool	
		Iron press	
18	**Digital and microcontroller lab**	Model XPO 8031 kit	Area: 79.56 sqm Total Investment: 375209 /-
		SMPS	
		101 key board	
		RS 232 cable	
		Stepper motor	
		12 V Dc motor	
		Seven segment 8 bridge	
		Mini oven	
		Digital ICs trainer kit	
19	**High voltage engineering lab**	Sphere gap and water resistor	Area: 84.22 sqm Total Investment:

		100KV AV transformer	575747 /-
		0-60 KV transformer	
		5KV high voltage tester	
		Protection grill	
20	**Basic electrical and circuit lab**	Dual DC regulator	Area: 111.91 sqm Total Investment: 1299198 /-
		Single DC regulator	
		Dual trace CRO	
		Function generator	
		Digital multimeter	
		1 Φ wattmeter 10 AMP	
		1 Φ wattmeter 2 AMP	
		3 Φ auto transformer	
		3 Φ load bank	
		1 Φ load bank	
		DC shunt motor	
21	**Electrical machine lab**	3 phase alternator	Area: 169.28 sqm Total Investment: 1836005/-
		Rheostat 800 ohm	
		Rheostat 1200 ohm	
		3 phase capacitive load bank	
		3 phase inductive load bank	
		Induction motor 3Hp	
		Induction motor 2Hp	
		Load bank 1 phase	
		Load bank 3 phase	
		1 phase transformer	
		3 phase transformer	
22	**Computer lab 1**	PC	Area: 79.25 sqm Total Investment: 3325234/-
		UPS	
23	**Control system lab**	Pneumatic trainer kit	Area: 78.93 sqm Total Investment:
		Hydraulic trainer kit	

		Second order control system	624600/-
		On/ off temperature controller	
		Potentiometer as error detector	
		DC voltage regulator	
		Stepper motor	
		DC servo motor	
		AC servo motor	
		PC	
		UPS	
24	**Physics**	Four probe set	Area: 78.63 sqm Total Investment: 485837/-
		B-H loop tracer	
		He –Ne laser source	
		e/m Thomson method	
		Newton ring	
		Half shade polar meter	
		Light source	
25	**APM lab**	Digital beam	Area: 132.74 sqm Total Investment: 294634/-
		Manual beam	
		Universal force table	
		Bell crank lever digital	
		Bell crank lever manual	
		Jib crane digital	
		Jib crane manual	
26	**Transportation lab**	Ductility test	Area: 72.82 sqm Total Investment: 673137/-
		Deval abrasion	
		Penetration apparatus	
		Los Angeles apparatus	
		Flash point and fire point	
		Ring and ball	
		Standard tar viscometer	
		Film stripping device	
27	**Structural mechanics**	UTM	Area: 70.60 sqm

		Hardness testing	Total Investment: 675275/-
		Impact testing	
		Torsion testing	
28	**Concrete testing**	Compression testing	Area: 92.73 sqm Total Investment: 895704/-
		Concrete mixer	
		Flexural test	
		Vibrating table	
		Sieve shaker	
		Rebound hammer	
		Ultrasonic pulse velocity	
29	**Computer lab Civil**	PC	Area: 83.89 sqm Total Investment: 1712598/-
		Projector	
		Printer	
		UPS	
30	**Geotechnical lab**	Oven	Area: 85.35 sqm Total Investment: 504397/-
		Relative density	
		Tri axial shear	
		Consolidation test	
		Permeability test	
		digital weight	
31	**Environmental lab**	COD	Area: 95.92 sqm Total Investment: 231090/-
		BOD	
		Incubator	
		Oven	
		TDS meter	
		pH meter	

6.4 **ILER analysis:**

Lighting is provided in industries, commercial buildings, indoor and outdoor for providing comfortable working environment. The primary objective is to provide the required lighting effect for the lowest installed load i.e. highest lighting at lowest power consumption. The purpose of performance test is to calculate the installed efficacy in terms of lux/watt/m² (existing or design) for general lighting installation. The calculated value can be compared with the norms for specific types of interior installations for assessing improvement options.

Range	Condition
0.5 or less	Urgent activity required (UAR)
0.51 - 0.70	Review Suggested (RS)
0.70- above	Good

ILER analysis for various sections in SETI were carried out. Firstly using LUX meter illumination was measured and then numerical analysis was carried out. ILER gives idea about lighting conditions and measured regarding improving them.

Main Building analysis

Sr. No.	Section	LUX reading	ILER	Condition
1	Library	162	0.77	Good
2	Study room	155	0.71	Good
3	Classroom S1	91	0.46	UAR
4	Classrooms S2	134	0.60	RS
5	Laboratories	201	0.84	Good
6	Office	163	0.74	Good

Other section

Sr. No.	Section	LUX reading	ILER	Condition
1	Staff room	149	0.50	RS
2	Classrooms	160	0.72	Good
3	Laboratories	159	0.71	Good
5	Computer tabs	149	0.55	RS

Reasons for Good ILER:

- Proper placement of windows and doors so that natural light is available well.
- Good ventilation system.

Use of LED bulds:

Institute has toatl light load connection of : 46500 watts

LED load connection is: 32300 watts

Light load other than LED: 14200 watts

Percentage of LED use in institute: 69.46%

Alternatice methods of energy:

Solar power plant at SETI

Capacity of plant: 70kw

Hybrid grid: (Solar + Wind): 50kw

Total capacity: 70+50 = 120 kw

Hybrid Generation during year 2021-2022

Month	PF	Units generated
April 20	0.93	12104
May 20	0.95	35758
June 20	0.94	14170
July 20	0.93	15780
August 20	0.93	16706
September 20	0.93	14574
October 20	0.95	14619
November 20	0.87	17250
December 20	0.98	39102
January 21	0.98	47923
February 21	0.98	44486
March 21	0.99	51872

7. Observations and Conclusions

This section gives the overviews of all the audits.

1. Water Section:

Institute has provision of rain water harvesting; hence huge amount of water is conserved and saved. Another good point is that the rain water collected at various section and is used to ground.

2. Wastewater Section:

SETI doesn't have any wastewater treatment facility till now as all the waste is directly sent to sewers. But the institute has planned for CWs i.e. constructed wetland systems for both the grey and black water treatment. Institute has also planned for hazardous waste management. The waste water generated through chemistry lab will also be treated and then led of onto sewers.

3. Solid waste management:

Proper method such as separate bins for wet waste and dry waste which leads to source segregation is followed by SETI.

4. E-waste:

Electronic waste is generated from many sections viz. physics lab, computer lab and applied science section. Institute collets the E waste centrally and is send to vendors for proper disposal means.

5. Sustainable water practices:

Institute has a fresh source of water i.e. river water. Water is recycled and used.

6. Energy:

More number of solar panels can be installed for generation of green energy. Energy efficient equipment's can be used at various places too. Continues energy monitoring systems can be installed at places where high energy consumption takes place.

8. Image Gallery

ENVIRONMENTAL & CIVIL
ENGINEERING SOLUTIONS
ISO 9001: 2015, IEC 17025: 2017

SANJEEVAN ENGINEERING & TECHNOLOGY INSTITUTE

AUDIT REPORT

2019-2020

seti
SANJEEVAN ENGINEERING & TECHNOLOGY INSTITUTE
॥ विद्यां विद्या संजीवनी ॥

Signature Not Verified
SANJEEV NATVAR JAIN
Digitally Signed By SANJEEV NATVAR JAIN, O=SANJEEVAN ENGINEERING &

Editorial

In the Era of global warming and climate change every citizen has to reduce their own carbon foot prints to tackle with the adverse impacts of climate change. A green audit of any academic institution revels ways in which we can reduce energy consumption, water use and reduction in emission of carbon dioxide in the environment. It is a process to look into and ask ourselves whether we are also contributing to the degradation of the environment and if so, in what manner and how we can minimize this contribution and bring down to zero and preserve our environment for future generation.

Sanjeevan Engineering & Technology Institute administration has already taken a step towards the green approach and conducted green audit of campus in the year 2019. As an outcome of this institute has taken green steps to reduce its carbon foot prints by several means in campus viz. sustainable fittings, tree plantation and green computing in the administration and examination. The responsibility of carrying out the scientific green audit was given to Environmental and Civil Engineering Solutions. The organization has followed the rules and regulation of Ministry of Environment and Forest, Govt. of India and Central Pollution Control Board, New Delhi.

A questionnaire was prepared based on the guidelines and format of CPCB, New Delhi to conduct green audit. The information related to consumption of resources like water, electricity and handling of solid and hazardous waste was collected in the formats from main building support services and departments. The data collected was grouped and was tabulated in Excel sheets and analysed. The graphs of the analysed data were prepared for getting quick idea of the status. Interpretation of the overall outcomes was made which incorporates primary and secondary data, references and interrelations within. Final report preparation was carried out using this interpretation to prepare environment management plan of institute for next two years.

During the preparation of the Audit Report Hon. Principal, Hon. Vice Principal encouraged us with their full support. Registrar, Director, IQAC, Deans of faculties, and other officers of the institute were also given support to carry out this work. All Heads of the department, Directors, Co-ordinators, In-charge of the support services and engineering section of the university also gave full co-operation.

I hope the efforts made will be helpful for university to take one green step ahead.

Nikhil N. Kamble
(C.E.O and Head)

Environmental and Civil Engineering Solutions

Index

1. Introduction:

The modernization and industrialization are the two important outputs of twentieth century which have made human life more luxurious and comfortable. Simultaneously, they are responsible for voracious use of natural resources, exploitation of forests and wildlife, producing massive solid waste, polluting the scarce and sacred water resources and finally making our mother Earth ugly and inhospitable. Today, people are getting more familiar to the global issues like global warming, greenhouse effect, ozone depletion and climate change etc. Now, it is considered as a final call by mother Earth to walk on the path of sustainable development. The time has come to wake up, unite and combat together for sustainable environment.

Green Audit is the most efficient ecological tool to solve such environmental problems. It is a process of regular identification, quantification, documenting, reporting and monitoring of environmentally important components in a specified area. Through this process the regular environmental activities are monitored within and outside of the concerned sites which have direct and indirect impact on surroundings. Green audit can be one of the initiative for such institutes to account their energy, water resource use as well as wastewater, solid waste, E-waste, hazardous waste generation. Green Audit process can play an important role in promotion of environmental awareness and sensitization about resource use. It can create consciousness towards ecological values and ethics. Through green audit one can get direction about how to improve the condition of environment.

1.1 Need of audit:

Green auditing is the process of identifying and determining whether institutions practices are eco-friendly and sustainable. Traditionally, we are good and efficient users of natural resources. But over the period of time excess use of resources like energy, water, chemicals are become habitual for everyone especially, in common areas. Now, it is necessary to check whether our processes are consuming more than required resources? Whether we are handling waste carefully? Green audit regulates all such practices and gives an efficient way of natural resource utilization. In the era of climate change and resource depletion it is necessary to verify the processes and convert it in to green and clean one. Green audit provides an approach for it. It also increases overall consciousness among the people working in institution towards an environment.

1.2 **Goals of audit:**

Institute has conducted a audit with specific goals as:

1. Identification and documentation of green practices followed by university.
2. Identify strength and weakness in green practices.
3. Conduct a survey to know the ground reality about green practices.
4. Analyse and suggest solution for problems identified from survey.
5. Assess facility of different types of waste management.
6. Increase environmental awareness throughout campus.
7. Identify and assess environmental risk.
8. Motivates staff for optimized sustainable use of available resources.
9. The long term goal of the environmental audit program is to collect baseline data of environmental parameters and resolve environmental issue before they become problem.

1.3 **Objectives of Audit:**

1. To examine the current practices which can impact on environment such as of resource utilization, waste management etc.
2. To identify and analyse significant environmental issues.
3. Setup goal, vision and mission for Green practices in campus.
4. Establish and implement Environmental Management in various departments.
5. Continuous assessment for betterment in performance in green practices and its evaluation.
6. To prepare an Environmental Statement Report on green practices followed by different departments, support services and administration building.

1.4 **NAAC criteria VII Environmental Consciousness:**

Institutes are playing a key role in development of human resources worldwide. Higher education institutes campus run various activities with aim to percolate the knowledge along with practical dimension among the society. Likewise different technological problems higher education institutes also try to give solution for issues related to environment. Different types of evolutionary methods are used to assess the problem concerning environment. It includes Environmental Impact Assessment (EIA), Social Impact Assessment (SIA), Carbon Footprint Mapping, Green audit etc

National Assessment and Accreditation Council (NAAC) which is a self-governing organization that declares the institutions as Grade according to the scores assigned at the time of accreditation of the institution. Green Audit has become mandatory procedure for educational institutes under Criterion VII of NAAC. The intention of green audit is to upgrade the environmental condition inside and around the institution. It is performed by considering environmental parameters like water and wastewater accounting, energy conservation, waste management, air, noise monitoring etc. for making the institution more eco-friendly.

Students are the major strength of any academic institution. Practicing green actions in any educational institution will inculcate the good habit of caring natural resources in students. Many environmental activities like plantation and nurturing saplings and trees, Cleanliness drives, Bird watching camps, No vehicle day, Rain water harvesting, etc. will make the students good citizen of the country. Through Green Audit, higher educational institutions can ensure that they contribute towards the reduction of Global warming through Carbon Footprint reduction measures.

1.5 **Benefits of Green Audit to an Educational Institute:**

There are many advantages of green audit to an Educational Institute:

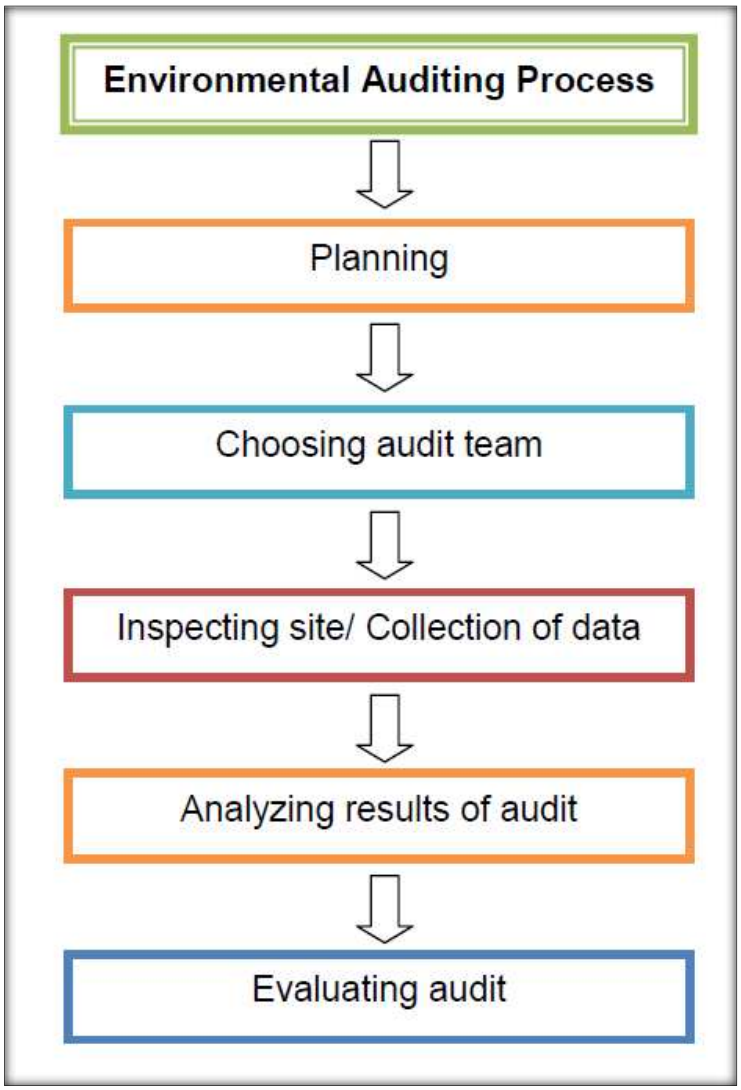
1. It would help to protect the environment in and around the campus.
2. Recognize the cost saving methods through waste minimization and energy conservation.
3. Find out the prevailing and forthcoming complications
4. Empower the organization to frame a better environmental performance.
5. It portrays good image of institution through its clean and green campus.

2. Overview of Institute:

The Sanjeevan Engineering & Technology Institute, Panhala was established in the year of 1994. Institute has huge area of 13 acres and has been serving the mankind in the field science and technology.

The landscaped grounds of college are widely admired for their beauty. The most valuable investment any educational institution can make is “Nurturing Future Leaders”. With the continuous rise in expectation of essential leadership standards, the institute has torch bearers have taken a responsibility for this investment to nurture the NextGen leaders with a vision to bridge the existing skill gap. With a firm step forward to attain an academic excellence, several Centres of Excellence, computer labs, and industry-academia associations have been setup at the College in association with the top leaders. The College believes that its primary stakeholders are the students. All aspects of education focus on the core values of contributing to national development while fostering global competencies among students. The College admits students from all social milieus and empowers them through intensive mentoring and counselling to face the challenges of life and become responsible and sensitized citizens of the country.

3. Methodology:



3.1 Audits to be carried out:

- Green and carbon footprint audit
- Energy audit
- Environmental audit
    - Water audit
    - Wastewater audit
    - Solid waste audit
    - Ambient noise audit
    - Ambient air audit

4. Green and Carbon footprint audit:

Green Audit is the most efficient ecological tool to solve such environmental problems. It is a process of regular identification, quantification, documenting, reporting and monitoring of environmentally important components in a specified area. Through this process the regular environmental activities are monitored within and outside of the concerned sites which have direct and indirect impact on surroundings. Green audit can be one of the initiative for such institutes to account their energy, water resource use as well as wastewater, solid waste, E-waste, hazardous waste generation. Green Audit process can play an important role in promotion of environmental awareness and sensitization about resource use. It can create consciousness towards ecological values and ethics. Through green audit one can get direction about how to improve the condition of environment.

Carbon is the basis of life on mother Earth. It is incorporated into the plants through photosynthesis, consumed by animal species through the food, present in the form of carbon dioxide (CO2) the atmosphere, locked into the rocks as limestone and compressed into the different fossil fuels such as coal and oil. As CO2 level in the atmosphere continue to increase, most climate designs or project that the oceans of the world and trees will keep soaking up more than half CO2 . The plants on land and in the sea, taken up carbon by over many years increased the percentage discharged during decay, and this increased carbon became locked away as fossil fuels beneath the surface of the planet. The starting of the 21st century brought growing concern about global warming, climate change, food security, poverty and population growth. In the 21st century more carbon has been released into the atmosphere than that has been absorbed. CO2 is a principle component causing global warming. Atmospheric carbon dioxide levels have increased to 40 % from preindustrial levels to more than 390 parts per million CO2. On this background it is a need of time to cover the research areas interrelated with climate change.

4.1 Green Cover at SETI:

SETI has got a huge green cover and has almost 55 species of vegetation inside the campus. The institute has 22 acres of campus and most of this is covered by green area. They have a huge plantations and structural components are Main building, office section, mess, Block A, Block B, Block C and Block D etc.

Figure 4-1 SETI, Campus

SETI has taken huge efforts to develop its green cover. The institute has about 7.96 acres of green cover. In the vicinity of the institute there are about approximately 822 fully grown trees and more than a 1120 growing plants. The above table shows some of the common tree species found. Institute has agriculture cover approximately about 4.55 acres in plantation.

Sr. No.	Species
1	Caesalpinia pulcherrima
2	Tribulus terrestris
3	Vachellia nilotica
4	Rotheca serrata
5	Lavandula bipinnata

Mostly there are trees of Tamarind, mango, neem, ferns etc. Due to this the institute has high carbon sequesterial values. Considering the vicinity some dry plants were observed to approximately about 18. Plants absorb sunlight, 50% is absorbed and 30% reflected so this helps to create a cooler and more pleasant climate through a 3°C temperature reduction in the vicinity. This has also leaded to increase in biodiversity as more than 22 species of birds were observed. Some off the common birds were viz. Sparrow, wild parrots, little stint, black kite etc.

4.2 **Carbon Footprint Audit:**

SETI has estimated its carbon footprint by factor methodology. Various factors were used to estimate the carbon emissions from Consumption of electricity, generation of solid waste, use of vehicles in campus, carbon emissions due to human breathing and emissions from buildings. At last they have also calculated Carbon sequesterial value i.e. carbon that is absorbed by the plants.

Sr. No.	Month	Units	Demand	CO2 emitted (KgCO2 eq.)
1	Mar 19	50190	131	41155.80
2	Apr- 19	40350	120	33087.00
2	May 19	23238	120	19055.16
3	Jun 19	33768	120	27689.76
4	Jul 19	63534	164	52097.88
5	Aug 19	25175	138	20643.50
6	Sep 19	42722	138	35032.04
7	Oct 19	54804	143	44939.28
8	Nov 19	46067	135	37774.94
9	Dec 19	59469	131	48764.58
10	Jan 20	59087	133	48451.34
11	Feb 20	56772	131	46553.04

Hence as per the calculation the average unit consumption considering all the months is about 46,264 units and the carbon emission is 37937.03 kg CO2 eq./year.

Secondly considering emissions from human breathing, due to COVID all the students and staff was operating from their home. Hence emissions from human breathing will not be in account.

Vehicles emit significant amount of gases in environment and SETI has various parking sections in the campus. Again due to COVID were rarely any vehicle was present in the campus.

Solid waste is very important as it emits significant amount of carbon. The institute was closed due to COVID pandemic and hence no any waste was generated.

Buildings play an important role in carbon contribution. During the construction operation and use phase they emit significant amount of carbon. Hence considering total built-up area the carbon emissions could be evaluated. After the estimation the total built-up area observed

was approximately about 5061 sq. m and the carbon emission were 1012.20 kg CO2 eq. per year.

Carbon sequesterial in important as it is the carbon absorbed by the trees. SETI campus during COVID period had 830 fully grown trees and 1450 growing trees. Hence the carbon absorbed by both this trees is 26504 kg CO2 eq. per year.

Hence overall carbon data for SETI is mentioned below.

Sr. No.	Section	Emission
1	Emission from buildings	1012.20 kg CO2 eq. per year.
2	Carbon sequesterial	26504 kg CO2 eq. per year.

4.3 **Conclusion:**

- The plants having highest Carbon sequestration values are suggested. Cinnamomum verum, Eugenia caryophyllid, Bumelia celestina, Acacia Berland Eri, Acacia Francescana, Chinaberry tree, Moringa oleífer, Carya illusoriness, Pinus Arizonian and Buddleia cordata are some of the suggested species for plantation.

5. Environmental Audit:

An environmental audit is a type of evaluation intended to identify environmental compliance and management system implementation gaps, along with related corrective actions. ISO 14001 is a voluntary international standard for environmental management systems ("EMS"). ISO 14001:2004 provides the requirements for an EMS and ISO 14004 gives general EMS guidelines. An EMS meeting the requirements of ISO 14001:2004 is a management tool enabling an organization of any size or type to:

- Identify and control the environmental impact of its activities, products or services;
- Improve its environmental performance continually, and
- Implement a systematic approach to setting environmental objectives and targets, to achieving these and to demonstrating that they have been achieved.

The audit examines the potential hazards or risks posed by the institutes. Areas examined may include environmental policies and procedures, energy use practices, recycling, waste, conservation, and pollution. Then, the institute can use the results to determine what changes need to be made for compliance. In a broad sense, environmental auditing aims to help protect the environment and minimize the risks of business activities to the environment and human safety and health.

5.1 Water Audit and wastewater audit:

Water auditing is a method of quantifying water flows and quality in systems, with a view to reducing water usage and often saving money on otherwise unnecessary water use. Water audit is an effective management tool for minimizing losses, optimizing various uses and thus enabling considerable conservation of water. Water audits trace water use from its point of entry into the facility/system to its discharge into the sewer/river/canal etc. Wastewater audit deals with effective management of wastewater in the system. It deals with proper generation, management, treatment, transfer and disposal of wastewater.

SETI has carried out its water and wastewater audit and has suggested many more ways for water conservation, reuse and recycle. The detail water and waste water report is mentioned below.

5.2 **Water Audit report:**

Water audit for the "SETI" was carried out. The purpose of the water audit is to provide a thorough understanding of the water uses by identifying and measuring all water using fixtures, appliances, and practices in order to recommend potential water saving efficiencies.

PRIMARY DATA

Sr. No.	Title	Information
1	**Name of Institute**	SETI
2	**Address**	Panhala
4	**Name of company under which water audit is carried out**	Environmental and Civil Engineering Solutions, Sangli
6	**Number of floors**	G + 2
7	**Category of building**	Educational Institute
8	**Nearest ESR location**	Campus
9	**Water supply hours**	6 hrs. daily

SOURCE INFORMATION

Title	Information
Sources of water	River water pumping
Connection details	1" PVC pipe inlet and 1" outlet distribution pipe

STORAGE DETAILS

Title	Information
Overhead tank type	PVC tank
Location	On terrace
Number of tanks	Section A: 1 X 2000 lit PVC Section B: 4 X 2000 lit PVC Section C: 3 X 2000 lit PVC 2 X 1000 lit PVC Section D: 2 X 1000 lit PVC

Motor connection details	2 Hp for pumping
Pumping period	4 hours daily
Underground sump	No
Capacity of underground sump	NA

Municipal water and deep well water assessment:

River water ESR water assessment

Sr. No.	Test	Results	Limit
1	pH	**8.1**	6.5-8.5
2	TDS	**1295**	-
3	E.C	**2530**	-
4	Hardness	**213**	200
5	Chlorides	**140**	200
6	MPN	**Ab**	1.0
7	Odor and Color	**Ab**	-

Main RO plant assessment

Sr. No.	Test	Results	Limit
1	pH	**6.3**	6.5-8.5
2	TDS	**108**	-
3	E.C	**111**	-
4	Hardness	**39**	200
5	Chlorides	**82**	200
6	MPN	**Ab**	1.0
7	Odor and Color	**Clear**	-

5.3 **Waste water audit:**

SETI campus generates huge amount of wastewater. Due to COVID pandemic very few amount of waste water was generated. Characterization was doen based on available waste water.

Sr. No.	Parameter	Reading
1	pH	8.99
2	COD	299
3	BOD	145
4	TKN	31

5.4 **Solid waste Audit:**

A waste audit is a physical analysis of waste composition to provide a detailed understanding of problems, identify potential opportunities, and give you a detailed analysis of your waste composition. A waste audit will help you clearly identify your waste generation to establish baseline or benchmark data, Characterize and quantify waste stream, Verify waste pathways, identify waste diversion opportunities and identify source reduction opportunities.

Solid waste is the unwanted or useless solid material generated from the human activities in residential, industrial or commercial area. Solid waste management reduce or eliminates the adverse impact on the environment and human health. Due to pandemics and closed premises only garden waste, dry tree leaves and tree branches were observed in the campus.

Assessment of soil was done to determine the quality of soil:

Sr. No.	Test	Results
1	pH	**6.0**
2	NPK	**2:4:1**
3	Acidity	**122 mg/lit**
4	Hardness	**107 mg/lit**

5.5 **Ambient Air Audit:**

Ambient air quality refers to the condition or quality of air surrounding us and in the outdoors. National Ambient Air Quality Standards are the standards for ambient air quality set by the Central Pollution Control Board (CPCB) that is applicable nationwide. The CPCB has been conferred this power by the Air (Prevention and Control of Pollution) Act, 1981. Hence, auditing this ambient air quality is stated as ambient air audit.

SETI has carried out its ambient air audit at various locations in the premises. Air quality detector machine PS-21185 was used for air audit. Parameters such as Air quality were assessed. Following google earth pro images shows the assessed locations.

Sr. No.	Point number	Location
1	Point No 1	Gate entry
2	Point No 2	Passage
3	Point No 3	Office
4	Point No 4	Drawing hall
5	Point No 5	Classroom 1
6	Point No 6	Classroom 2
7	Point No 7	Classroom 3

8	Point No 8	Block 1
9	Point No 9	Block 2
10	Point No 10	Block 3
11	Point No 11	Block 4
12	Point No 12	Open air
13	Point No 13	Library
14	Point No 14	Study room

Results of air quality monitoring:

Point No	Location	Quality
1	Gate entry	Good
2	Passage	Fresh
3	Office	Good
4	Drawing hall	Fresh
5	Classroom 1	Fresh
6	Classroom 2	Fresh
7	Classroom 3	Good
8	Block 1	Good
9	Block 2	Good
10	Block 3	Good
11	Block 4	Good
12	Open air	Good
13	Library	Fresh
14	Study room	Fresh

5.6 **Ambient Noise audit:**

Ambient sound in relation to audio refers to the background noise present at a given scene or a location. This can include noises such as rain, traffic, crickets, birds, etc. Ambient sound levels are often measured in order to map sound conditions over a specific time to understand their variation with locale and various points. Ambient noise level is measured with a sound level meter. It is usually measured in Decibel (dB).

Three points were selected based on best suitable requirement for noise monitoring. RS-2250 instrument was used. Monitoring was carried out 3 times in a day for 3 months. Readings were collected in morning section, afternoon section and evening section. In addition to this monitoring was also carried out in library section, study room section, classrooms, tutorial rooms and laboratories. Average of all the readings are mentioned in the table below

Sr. No.	Point number	Location
1	Point No 1	Gate entry
2	Point No 2	Passage
3	Point No 3	Office
4	Point No 4	Drawing hall
5	Point No 5	Classroom 1
6	Point No 6	Classroom 2
7	Point No 7	Classroom 3

8	Point No 8	Block 1
9	Point No 9	Block 2
10	Point No 10	Block 3
11	Point No 11	Block 4
12	Point No 12	Open air
13	Point No 13	Library
14	Point No 14	Study room

Results of noise assessment:

All the values are in decibels. Assessment values present average of 3 months data and the last column present the final average of morning noon and evening.

Point No	Location	Average
1	Gate entry	55.21
2	Passage	51.23
3	Office	51.22
4	Drawing hall	48.98
5	Classroom 1	37.56
6	Classroom 2	34.58
7	Classroom 3	37.88
8	Block 1	44.25
9	Block 2	41.25
10	Block 3	41.89
11	Block 4	45.28
12	Open air	58.98
13	Library	33.02
14	Study room	31.89

6. Energy Audit:

An energy audit is an inspection survey and an analysis of energy flows for energy conservation in a building. It may include a process or system to reduce the amount of energy input into the system without negatively affecting the output. In commercial and industrial real estate, an energy audit is the first step in identifying opportunities to reduce energy expense and carbon footprint.

A nation is tiring to advance in quantity and quality to the spread of education among the common India and development of their intelligence. In India the entire field of education and other fields of intelligent activities had been monopolized by a handful of men before independence. But today we are marching towards the desirable status of a developed nation with fast strides. But the development should be a sustained one. For achieving such an interminable development energy management is essential. As far as concerning electricity crisis, we are facing lack of electricity during office work. So, institutional management is taking design regarding production of electricity and saving electricity for Eco social aspect. Energy requirement of India is growing and incomplete domestic fossil fuel treasury. The country has motivated strategy to enlarge its renewable energy resources and policy to establish the nuclear power plants. India increases the involvement of nuclear power to largely electrical energy development facility from 4.2% to 9%. India's industrial demand accounted for 35% of electrical power requirement, domestic household use accounted for 28%, agriculture 21%, commercial 9%, and public lighting and other miscellaneous applications accounted for the rest. Energy conservation means reduction in energy consumption without making any sacrifice of quantity or quality. A successful energy management program begins with energy conservation; it will lead to adequate rating of equipment's, using high efficiency equipment and change of habits which causes enormous wastages of energy. By observing all these study lack of electricity and huge electricity demands. It is necessary to plan to be self-sufficient in electricity requirement.

6.1 Connection details:

Institute receives electricity from MSEB i.e. Maharashtra State Electricity Distribution Co. Ltd. Following are the details about connection.

- **Type of connection:** HT
- **Tariff:** 146 HT-VIII B

- **Sanctioned load:** 300.00 KW
- **Contract demand:** 240.00 KVA
- **Feeder voltage:** 11 KV

Tariff Structure:

As per Maharashtra State Electricity Distribution Company Limited, HT and LT consumers have an option to take Time of Day (TOD) tariff instead of the normal tariff. Under TOD tariff electricity consumption and maximum demand in respect of HT consumers for different periods of the day i.e. normal period, peak load period and off-peak load period could be recorded by installing TOD meter. The maximum demand and consumption recorded in different periods could be billed on the following rates of the tariff applicable.

TOD Tariffs	Rate % (Rs./Unit)
0000 Hrs- 0600 Hrs & 2200 Hrs- 2400 Hrs	-1.500
0600 Hrs- 0900 Hrs & 1200 Hrs- 1800 Hrs	0.000
0900 Hrs- 1200 Hrs	0.800
1800 Hrs- 2200 Hrs	1.100

Power Factor:

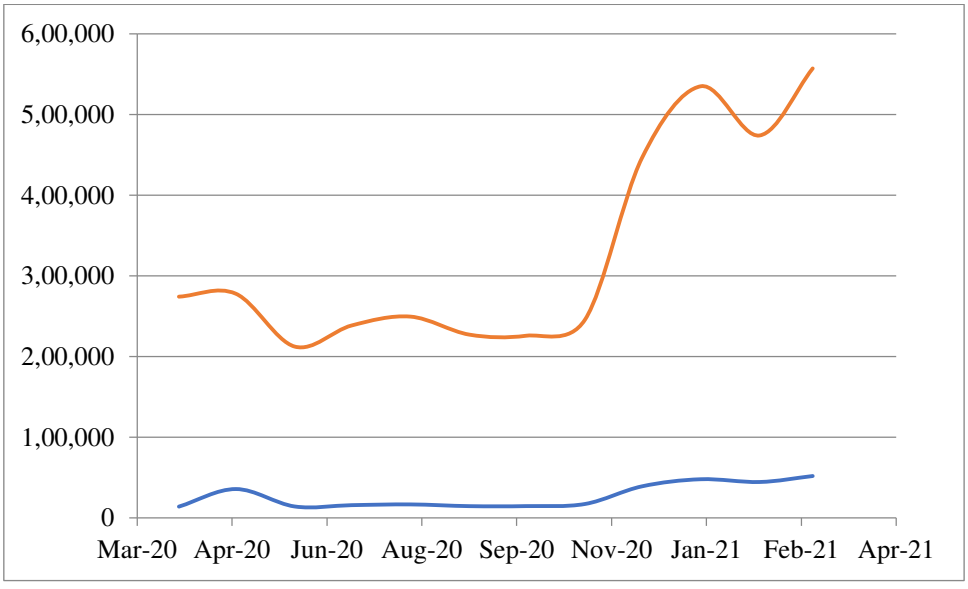
Power Factor (PF) is an indicator of efficient utilization of power. In an AC (Alternating Current) electrical power system, PF is defined as the ratio of real power flowing to the load, to the apparent power in the circuit and is a dimensionless number.

6.2 **Bill analysis:**

Bill analysis for SETI had been done for academic year 2020-2021.

Electricity consumption on the academic year 2020-2021

Sr. No.	Month	Consumption (Kw)	Bill Amount
1	Mar 19	50190	598234
2	Apr- 19	40350	504149
3	May 19	23238	323614
4	Jun 19	33768	414579
5	Jul 19	63534	679423
6	Aug 19	25175	674994
7	Sep 19	42722	594159
8	Oct 19	54804	674864
9	Nov 19	46067	581754
10	Dec 19	59469	729420
11	Jan 20	59087	750579
12	Feb 20	56772	721877



6.3 **Equipment Details:**

Sr. No.	Name of Laboratory	Name of Equipment	Details
1	**Concrete technology**	Compression testing machine	Area: 92.73 sqm Total Investment: 895704 /-
		Concrete mixer	
		Flexural test apparatus	
		Vibrating table	
		Sieve shaker motorized	
		Rebound hammer	
		Ultrasonic pulse velocity	
2	**Structural mechanics**	UTM	Area: 70.60 sqm Total Investment: 675275 /-
		Hardness testing machine	
		Impact testing machine	
		Torsion testing machine	
3	**Chemistry**	UV Spectrometer	Area: 83.62 sqm Total Investment: 388449 /-
		Electronic digital balance	
		Muffle furnace	
		Electrical oven	
		Digital pH meter	
		Digital potentiometer	
		Conductivity meter	
4	**English and Communication**	PC	Area: 52.46 sqm Total Investment: 835896 /-
		ODLL system	
		Headphones	
		Speakers	
5	**Measurement and Instrumentation**	Falcon 2 MHz function generator	Area: 79.83 sqm Total Investment: 825611 /-
		Thermocouple module	
		Resistance temperature detection module	
		Strain guage and bourdon tube	
		Wheatstone bridge	
		Wein bridge	

		Commutation and MOSFET	
		DC motor and 3 phase AC motor control	
		PLC trainer kit	
		SMPS/UPS trainer kit	
		CD/VCD player trainer	
		Colour TV and pattern generator	
		LCD TV trainer	
6	**Metrology and quality control**	Monochrome light unit	Area: 79.47 sqm Total Investment: 344064 /-
		Standard glass specimen and optic flat	
		Slip gauge box 87 pcs	
		Vernier caliper	
		Sine bar 300mm	
		Micrometre 0-25mm	
		Dial indicator	
		Micrometre 25-50mm	
		Sine centre 200mm	
		V block magnetic	
		Mechanical comparator	
		Surface plate	
		Inside micrometre	
		Vernier depth gauge	
		Inside and outside calliper	
		Optical profile	
7	**Metallurgy lab**	Abrasive belt grinder	Area: 80 sqm Total Investment: 496880 /-
		Double disc polishing machine	
		Desiccator	
		Binocular metallurgical microscope	

		Standard metallurgical microstructure set	
		Trinocular microscope	
		Magnetic particle crack detector	
		Optional accessory of red penetration kit	
		Red dry penetration kit	
		Muffle furnace	
		Jominy quench bath	
8	**Applied thermodynamics**	Flash point	Area: 80 sqm Total Investment: 171408 /-
		Drop point of grease	
		Redwood viscometer	
		Aniline apparatus	
		Model of Lancashire boiler	
		Stop value Hopkinson	
		Feed check valve	
		Pressure gauge	
		Fusible plugs	
		Green economizer	
		Sudden super heater	
		Separating and throttling calorimeter	
		Test on carbon residue apparatus	
		Grease penetrometer	
9	**Mechatronics laboratory**	PLC programming trainer kit	Area: 80 sqm Total Investment: 349509 /-
		PLC based pick and place robotics	
		Characteristics of temperature sensor	
		Pressure transducer	

		Air compressor	
10	**Manufacturing process**	Sand Muller	Area: 78.61 sqm Total Investment: 162750 /-
		Rapid moisture tester	
		Clay washer	
		Sieve shaker	
		Universal sand strength machine	
		Mold hardness tester	
		Compatibility tester	
		Base block	
		Tube filler accessory	
		Permeability meter	
		Sand rammer	
		Rapid dryer	
		Sensitive balance	
11	**Theory of machine**	Band and block brake	Area: 78.61 sqm Total Investment: 215146 /-
		Internally expanding brake	
		Disc brake model	
		Vibrating lab equipment	
		Whirling of shafts	
		Static and dynamic balance	
		Universal governor	
		Motorized governor	
		Double hook joint	
		Trifler suspension	
		Gear tooth profile	
12	**CAD / CAM / CAE**	Dell PC	Area: 68.25 sqm Total Investment: 3472453.40 /-
		10 KVA UPS	
13	**Refrigeration and AC lab**	Refrigeration test ring	Area: 80 sqm Total Investment: 849456 /-
		AC test ring	
		Domestic refrigeration	

		Vapour absorbing ring	
		Vortex tube	
		Window air condition test	
		Ice plant test ring	
		Heat pump test ring	
		Cascade refrigeration test ring	
		Display boards	
14	**CAD Lab**	Dell PC	Area: 82.91 sqm Total Investment: 1184555 /-
		Catia	
		6 KVA UPS	
15	**Measurement switch gear and protection lab**	WEIN bridge model and MAX well bridge	Area: 79.84 sqm Total Investment: 1211047 /-
		Digital storage oscilloscope	
		Generator signal generator	
		Load bank	
		Wheat stone bridge	
		LVDT	
		Capacitive pick up kit	
		Inductive pick up kit	
		Piezo electrical transducer	
		IDMT over current relay test kit	
		Directional over current relay	
		Over current microprocessor	
		Universal relay	
16	**Analog Power electronics and driver lab**	SCR/DIAC/TRIAC Circuit	Area: 78.94 sqm Total Investment: 723832 /-
		1*- fully controlled converter	
		3*- fully controlled converter	
		3*- dual converter	
		1*- cyclo converter	
		1*- inverter using power	

		mosfet	
		3*- IM controlled converter	
		Chopper circuit	
		Chopper circuit	
		Separated excited	
		High frequency	
17	**Electrical workshop and project lab**	4964	Area: 78.94 sqm Total Investment: 723832 /-
		Side cutter plier	
		Wire stripper	
		Centre punch	
		Combination plier	
		Long noise plier	
		Ball pin hammer	
		Screw driver set	
		Soft face hammer	
		Spanner set	
		Crimping tool	
		Iron press	
18	**Digital and microcontroller lab**	Model XPO 8031 kit	Area: 79.56 sqm Total Investment: 375209 /-
		SMPS	
		101 key board	
		RS 232 cable	
		Stepper motor	
		12 V Dc motor	
		Seven segment 8 bridge	
		Mini oven	
		Digital ICs trainer kit	
19	**High voltage engineering lab**	Sphere gap and water resistor	Area: 84.22 sqm Total Investment: 575747 /-
		100KV AV transformer	

		0-60 KV transformer	
		5KV high voltage tester	
		Protection grill	
20	**Basic electrical and circuit lab**	Dual DC regulator	Area: 111.91 sqm Total Investment: 1299198 /-
		Single DC regulator	
		Dual trace CRO	
		Function generator	
		Digital multimeter	
		1 Φ wattmeter 10 AMP	
		1 Φ wattmeter 2 AMP	
		3 Φ auto transformer	
		3 Φ load bank	
		1 Φ load bank	
		DC shunt motor	
21	**Electrical machine lab**	3 phase alternator	Area: 169.28 sqm Total Investment: 1836005/-
		Rheostat 800 ohm	
		Rheostat 1200 ohm	
		3 phase capacitive load bank	
		3 phase inductive load bank	
		Induction motor 3Hp	
		Induction motor 2Hp	
		Load bank 1 phase	
		Load bank 3 phase	
		1 phase transformer	
		3 phase transformer	
22	**Computer lab 1**	PC	Area: 79.25 sqm Total Investment: 3325234/-
		UPS	
23	**Control system lab**	Pneumatic trainer kit	Area: 78.93 sqm Total Investment: 624600/-
		Hydraulic trainer kit	
		Second order control system	

		On/ off temperature controller	
		Potentiometer as error detector	
		DC voltage regulator	
		Stepper motor	
		DC servo motor	
		AC servo motor	
		PC	
		UPS	
24	**Physics**	Four probe set	Area: 78.63 sqm Total Investment: 485837/-
		B-H loop tracer	
		He –Ne laser source	
		e/m Thomson method	
		Newton ring	
		Half shade polar meter	
		Light source	
25	**APM lab**	Digital beam	Area: 132.74 sqm Total Investment: 294634/-
		Manual beam	
		Universal force table	
		Bell crank lever digital	
		Bell crank lever manual	
		Jib crane digital	
		Jib crane manual	
26	**Transportation lab**	Ductility test	Area: 72.82 sqm Total Investment: 673137/-
		Deval abrasion	
		Penetration apparatus	
		Los Angeles apparatus	
		Flash point and fire point	
		Ring and ball	
		Standard tar viscometer	
		Film stripping device	
27	**Structural mechanics**	UTM	Area: 70.60 sqm Total Investment:
		Hardness testing	

		Impact testing	675275/-
		Torsion testing	
28	**Concrete testing**	Compression testing	Area: 92.73 sqm Total Investment: 895704/-
		Concrete mixer	
		Flexural test	
		Vibrating table	
		Sieve shaker	
		Rebound hammer	
		Ultrasonic pulse velocity	
29	**Computer lab Civil**	PC	Area: 83.89 sqm Total Investment: 1712598/-
		Projector	
		Printer	
		UPS	
30	**Geotechnical lab**	Oven	Area: 85.35 sqm Total Investment: 504397/-
		Relative density	
		Tri axial shear	
		Consolidation test	
		Permeability test	
		digital weight	
31	**Environmental lab**	COD	Area: 95.92 sqm Total Investment: 231090/-
		BOD	
		Incubator	
		Oven	
		TDS meter	
		pH meter	

6.4 **ILER analysis:**

Lighting is provided in industries, commercial buildings, indoor and outdoor for providing comfortable working environment. The primary objective is to provide the required lighting effect for the lowest installed load i.e. highest lighting at lowest power consumption. The purpose of performance test is to calculate the installed efficacy in terms of lux/watt/m² (existing or design) for general lighting installation. The calculated value can be compared with the norms for specific types of interior installations for assessing improvement options.

Range	Condition
0.5 or less	Urgent activity required (UAR)
0.51 - 0.70	Review Suggested (RS)
0.70- above	Good

ILER analysis for various sections in SETI were carried out. Firstly using LUX meter illumination was measured and then numerical analysis was carried out. ILER gives idea about lighting conditions and measured regarding improving them.

Main Building analysis

Sr. No.	Section	LUX reading	ILER	Condition
1	Library	148	0.77	Good
2	Study room	159	0.71	Good
3	Classroom S1	133	0.46	RS
4	Classrooms S2	138	0.60	RS
5	Laboratories	211	0.84	Good
6	Office	178	0.74	Good

Reasons for Good ILER:

- Proper placement of windows and doors so that natural light is available well.
- Good ventilation system.

Use of LED bulds:

Institute has toatl light load connection of : 46500 watts

LED load connection is: 32300 watts

Light load other than LED: 14200 watts

Percentage of LED use in institute: 69.46%

Alternatice methods of energy:

Solar power plant at SETI

Capacity of plant: 70kw

Hybrid grid: (Solar + Wind): 50kw

Total capacity: 70+50 = 120 kw

7. Image Gallery:

Laboratory equipments:

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CERTIFICATE

This Certificate is Presented to:

SANJEEVAN ENGINEERING & TECHNOLOGY INSTITUTE

FOR CARRYING OUT GREEN AUDIT FOR ACADEMIC YEAR
2021-2022

SEEMA N. KAMBLE
DIRECTOR

NIKHIL N. KAMBLE
HEAD

Signature Not Verified
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Digitally signed by SANJEEV NATVAR JAIN
SANJEEVAN ENGINEERING &

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