2/8/2022

REPORT ON GREEN AUDIT, ENERGY AUDIT & ENVIRONMENTAL AUDIT

Potti Sriramulu Chalavadi Mallikarjuna Rao College of Engineering & Technology

Kothapeta, Vijayawada-520001

Service Request No.: GDCL/GA/01/022022

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Striving to make the globe greener

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1. Executive Summary:

Eco campus is a concept implemented in many educational institutions, all over the world to make them sustainable because of their mass resource utilization and waste discharge in to the environment.

Waste minimization plans for the educational institute are now mandatory to maintain the cleanliness of the campus. To find out the environmental performance of the educational institutions and to analyze the possible solutions for converting the educational campus as eco-campus the conducting Green Audit of institution is essential.

The green auditing of '**Potti Sriramulu Chalavadi Mallukarjuna Rao College of Engineering & Technology**, **Vijayawada'**, enables to assess the practices, action and its impact on the environment. This audit was mainly focused on **Green Indicators** like consumption of energy in terms of electricity and fossil fuel, quality & utilization of water, vegetation, waste management practices and carbon foot print of the campus etc.

The premises were evaluated against the various criterions laid down by the National Assessment and Accreditation Council (NAAC). The major observations are.

Renewable Energy

- The college is required to plan for installing Roof-top Solar Photovoltaic System for self-use.
- College has a large roof area for installing solar PV. Solar PV will aid in reducing grid power consumption and thereby reducing the electricity bills and carbon emissions.
- At present college requirement is around 200-250 KW solar rooftop system based on the consumption.
- The quantity of plate waste (organic waste with higher starch contents) is not very substantial, consequently, when the plants will grow enough, college may explore the potential for biogas generation.

Green Campus Initiative

- The movement of vehicle inside the campus is not restricted as of now.
- There are pedestrian friendly pathways for in-campus movement.

- There is restriction on the usage of plastic, which may be extended to completely ban plastic usage inside the campus.
- The campus is surrounded with a lot of greenery, trees, and proper landscaping.
- The bicycles are allowed for in campus movement as required.

Environment & Energy Initiative

- Institute has planted more than 100 varieties of trees in its campus.

Air Quality & Ventilation

- The classrooms and other area are well ventilated to ensure proper air quality.
- The fans are appropriately installed to ensure proper air circulation
- The indoor as well as outdoor plants have also been provided to improve the environment.

Lighting System

- The usage of natural light is optimized through well designed structure and windows.
- College has started replacing lighting fixtures with LED. It is being progressively replaced.
- Institute has installed day-light sensor for operating lights in its corridor. Similar sensor based operation may be adopted for other common area and washrooms.

Water Quality & Conservation

- The water is supplied by the Tube well/ bore well.
- The water quality reports are not available. Water analysis is recommended.
- Two R.O. plants are installed for water purification.
- The rainwater harvesting system is available.
- The distribution network and piping are more or less satisfactory and adequate.

Waste Management

- The effluent water is discharged in the common drainage system however there is no Sewage Treatment plant.
- The waste is segregated in two type solid and liquid waste.
- The waste/ discharge from the laboratories, being in-significant in quantity, is being sent to drains without treatment.

Air Conditioning System

- There is a centralized air conditioning system which is operated based on temperature control.
- The room temperature is maintained at 24 to 25 °C, which is well within the recommended values.
- The Air Conditioners are serviced regularly and properly maintained.
- All split air conditioner units are 3-star rated.

Infrastructure usage

- Ramps & lifts are provided for ease of movements for disabled persons.
- The on-campus movement is distributed with multiple entrances as well as staircases.
- There are adequate fire extinguishers & fire hose reels are located at key areas. The college has initiated appropriate measures to meet the safety requirement.
- The draining system for washrooms is efficient and effective.
- No seepages were observed in the building premises.

Green IT culture

- The electronic communication is encouraged to minimize usage of papers
- Most of the papers are reused for doubled sided printing to further minimize usage of paper.

2. Acknowledgment:

We wish to express our gratitude towards Management of **Potti Sriramulu Chalavadi Mallukarjuna Rao College of Engineering & Technology**, **Vijayawada** for having given us the opportunity for conducting the study and the support provided during the study.

We are also thankful to the **Principal Dr. K. Sri Rama Krishna** and NAAC Coordinators **Dr. A.Pathanjali Sastri** and **Dr. J. Lakshmi Narayana, Dr.V.Vijaya Durga Prasad, Dr.A.Bindu Madhavi** and **Mr.A.Ravi** for extending the necessary help and co-operation from their side.

3. Audit Team:

From **Green Done Consultants LLP, Mumbai**

1. Mr. Atul Joshi – Accredited Energy Auditor & Director.
2. Mr. Alkesh Rajdev – Accredited Sustainability Consultant, IGBC AP & Director.

From **PSCMR College of Engineering & Technology, Vijayawada.**

1. Principal - **Dr. K. Sri Rama Krishna**
2. Professor & NAAC Coordinator - **Dr. A.Pathanjali Sastri**
3. Professor & NAAC Coordinator - **Dr. J. Lakshmi Narayana,**
4. Professor & NAAC Coordinator - **Dr. V.Vijaya Durga Prasad,**
5. Professor & NAAC Coordinator - **Dr. A.Bindu Madhavi**
6. Systems Engineer - **Mr. A.Ravi**

4. Introduction:

4.1. About Institute:

Potti Sriramulu Chalavadi Mallikarjuna Rao College of Engineering and Technology, Vijayawada-01, Andhra Pradesh, affiliated to JNTU Kakinada accredited by NBA and NAAC, is an SKPVV Hindu High Schools Committee's (established in 1906) contemporary contribution to serve the poor and needy through education with a new discipline in the sphere of Engineering and Technology. The Committee, a non-profitable academic organization, had been managing schools and arts and science colleges very successfully till 2008. And thereafter, the Committee expanded its educational services to technical education which led to the establishment of PSCMR College of Engineering & Technology during the same year. This is, by and large, the first such institute in the city limits of Vijayawada.

Currently, the college is moving forward very successfully with around 2600 students and 200 faculty members.

PSCMR received outstanding and notable awards Viz., Limca Book of Records, 2015; ICT Academy, 2018; Internshala Award, Education Barron Award, Guinness Book of World Record Participation etc.

The college aims at empowering students with social and career oriented education that can benefit themselves and the society, as well. Scholarships are given by the Management for the meritorious students every year. RO water facility is available round the clock. The campus offers sprawling lawns and neatly tended greenery that add a nuance of natural beauty to the overall ambience. The college campus is conveniently located in the heart of the city with easy accessibility from any part of the city, walking distance from railway station, main bus station and 30km nearby Vijayawada International Airport. Students are encouraged in sports through excellent indoor and outdoor stadia.

4.2. Vision Statement of the College

To make a significant contribution to the evolution of a highly advanced technological society with profound human values by nurturing students with unparalled expertise and a high sense of ethics.

4.3. Mission Statement of the College

To offer a high quality professional education and training blended with a high sense of discipline and ethics to shape the students into people who can play an effective role in the development of a knowledge society and thereby striving to bring the light into the lives around them with human outlook.

Google Earth Image

Fig. 1 Location of the College

The student and faculty strength of the college is listed below:

Physical Structure:

Physical Structure	
Total Campus Area	5.05 Acres
Built-up Area	20436.62 m2
No. of Departments	7
Conference Halls	2
Class Rooms	41
Office Rooms	6
Libraries	2
Auditorium	1
Canteen	1
Labs	7

Total Strength of Students, Teachers & Non-teaching Staff:

Staff Details	Male	Female	Total
No. of Students	885	760	1645
No. of Teaching Staff	91	68	159
No. of Non-Teaching Staff	14	64	82

5. Objectives of Green Audit:

The main aim objectives of this green audit is to assess the environmental quality and the management practice and strategies being implemented in PSCMR College of Engineering & Technology, Vijayawada.

The specific objectives are:

1. To monitor the energy consumption pattern of the college.
2. To assess the quality of the water in the campus.
3. To quantify the liquid and solid waste generation and management plans in the campus.
4. To assess the carbon foot print of the college.
5. To assess whether the measures implemented by the College have helped to reduce the Carbon Footprint.
6. To impart environment management plans of the college.
7. Providing a database for corrective actions and future plans.
8. To assess whether extracurricular activities of the Institution support the collection, recovery, reuse and recycling of waste generated within the campus.
9. To identify the gap areas and suggest recommendations to improve the Green Campus status of the PSCMR College of Engineering & Technology, Vijayawada.

6. Target Areas of Green Audit:

Green audit forms part of a resource management process. Although they are individual events, the real value of green audit is the fact that they are carried out, at defined intervals, and their results can illustrate improvement or change over time. Eco-campus concept mainly focuses on the efficient use of energy and water; Minimize waste generation or pollution and also efficiency in resource utilization. All these indicators are assessed in the process of "Green Auditing of this educational institute".

Eco-campus focuses on the reduction of contribution to emissions, procure a cost effective and secure supply of energy, encourage and enhance energy use conservation, promotes personal action, reduce the institute's energy and water consumption, reduce wastes to landfill, and integrate environmental considerations into all contracts and services considered to have significant environmental impacts. **Target areas included in this green auditing are water, energy, waste, green campus and carbon footprint.**

6.1. Auditing for Water Management

Water is a natural resource; All living organisms depend on water. While freely available in many natural environments, in human settlements potable (drinkable) water is less readily available. Groundwater depletion and water contamination are taking place at an alarming rate. Hence it is essential to examine the quality and usage of water in the college. Water auditing is conducted for the evaluation of facilities of raw water intake and determining the facilities for water treatment and reuse. The concerned auditor investigates the relevant method that can be adopted and implemented to balance the demand and supply of water.

6.2. Auditing for Energy Management

Energy conservation is an important aspect of campus sustainability which is also linked with carbon foot print of the campus. Energy auditing deals with the conservation and methods to reduce its consumption related to environmental degradation. It is therefore essential that any environmentally responsible institution examine its energy use practices.

6.3. Auditing for Waste Management:

Human activities create waste, and it is the way these wastes are handled, stored, collected and disposed of, which can pose risks to the environment and to public health.

Solid waste can be divided into three categories: bio-degradable, non-biodegradable and hazardous waste.

1. Bio-degradable wastes includes food wastes, canteen waste, wastes from toilets etc.
2. Non-biodegradable wastes include what is usually thrown away in homes and schools such as plastic, tins and glass bottles etc.
3. Hazardous waste is waste that is likely to be a threat to health or the environment like cleaning chemicals, acids and petrol.

Unscientific management of these wastes such as dumping in pits or burning them may cause harmful discharge of contaminants into soil and water supplies, and produce greenhouse gases contributing to global climate change respectively. Special attention should be given to the handling and management of hazardous waste generated in the college.

Bio-degradable waste can be effectively utilized for energy generation purposes through anaerobic digestion or can be converted to fertilizer by composting technology. Non-biodegradable waste can be utilized through recycling and reuse. Thus the minimization of solid waste is essential to a sustainable college. The auditor diagnoses the prevailing waste disposal policies and suggests the best way to combat the problems.

6.4. Auditing for Green Campus Management:

Trees play an important ecological role within the urban environment, as well as support improved public health and provide aesthetic benefits to cities. In one year, a single mature tree will absorb up to 48 pounds of carbon dioxide from the atmosphere, and release it as oxygen. The amount of oxygen released by the trees of the campus is good for the people in the campus. So while you are busy studying and working on earning those good grades, all the trees in campus are also working hard to make the air cleaner for you.

6.5. Auditing for Carbon Footprint:

Burning of fossil fuels (such as petrol) has an impact on the environment through the emission of greenhouse gases into the atmosphere. The most common greenhouse gases are carbon dioxide, water vapour, methane, nitrous oxide and ozone. Of all the greenhouse gases, carbon dioxide is the most prominent greenhouse gas, comprising 402 ppm of the Earth's atmosphere. The release of carbon dioxide gas into the Earth's atmosphere through human activities is commonly known as carbon emissions. Vehicular emission is the main source of carbon emission in the campus, hence to assess the method of transportation that is practiced in the college is important.

7. METHODOLOGY ADOPTED:

The methodology adopted to conduct the Green Audit of the Institution had the following components.

Onsite Data Collection:

Due to Covid restrictions, virtual tour of the college campus was organized by the Green Audit Team. The data samples and relevant photographs were collected through geo-tagged photographs. The key focus of the audit was on assessing the status of the green cover of the Institution, their waste management practices and energy conservation strategies etc.

Focus Group Discussion:

The Focus Group discussions were held with the staff members and the management focusing various aspects of Green Audit. The discussion was focused on identifying the attitudes and awareness towards environmental issues at the institutional and local level.

Energy, Waste Management and Carbon Foot Print Analysis Survey:

With the help of teachers and staff, the audit team has assessed the energy consumption pattern and waste generation, disposal and treatment facilities of the college. The monitoring was conducted with a detailed questionnaire survey method.

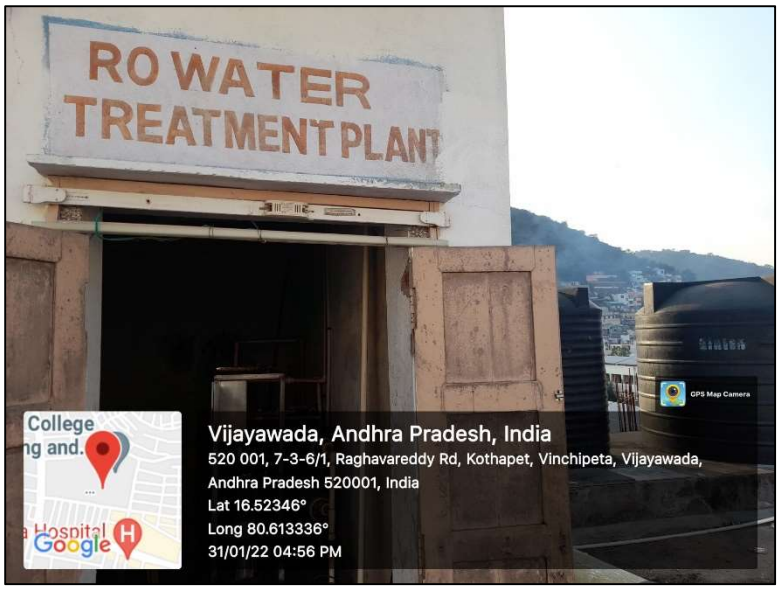
8. AUDIT STAGE:

Green auditing in **PSCMR College of Engineering & Technology, Vijayawada** began with the assessment of the status of the green cover of the Institution followed by waste management practices and energy conservation strategies etc. The team monitored different facilities at the college, determined different types of appliances and utilities (lights, taps, toilets, air conditioners, etc.) as well as measuring the usage per item (Watts indicated on the appliance, etc.) and identifying the relevant consumption patterns (such as how often an appliance is used) and their impacts. The staff and learners were interviewed to get details of usage, frequency or general characteristics of certain appliances. Data collection was done in the sectors such as Energy, Waste, Greening, Carbon footprint and Water use. College records and documents were verified several times to clarify the data received through survey and discussions.

9. GREEN AUDIT REPORT

9.1. Water Quality Assessment:

Water is provided through a tube-well / bore well. Institutes is having 2 R.O. plants to treat the water before sending it for drinking water tank. The bore well water is being used for flushing and gardening.

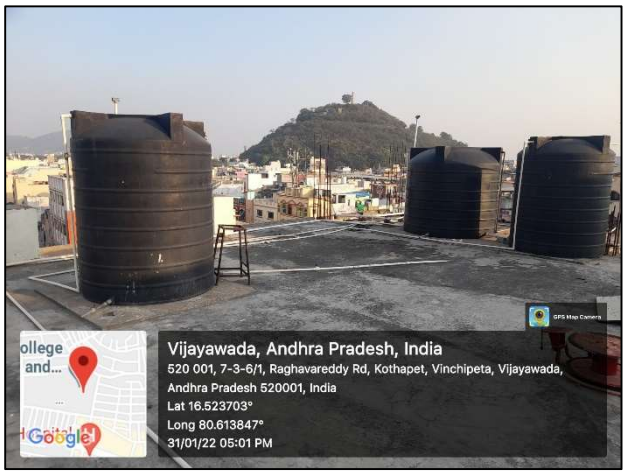


Institute had carried out detailed water analysis in the year 2012 when the R.O. Plant was installed. However, it has not carried out lab testing of bore well water sample after that. Hence current water analysis was not available at the time of audit. Institute has installed water coolers to provide cold water to the staff.

9.2. Water Management:

The source for the water used in the College is a single bore well present in the campus.

Institute has installed 10 number of overhead tanks of 10 KL each for domestic water and it has 15 KL of single tank for drinking water purpose.



Water availability is good throughout the year & institute do not need tanker water to meet its demand.

- **Water consumption meter** is installed on the bore-well water. However, no record it maintained about daily water consumption.
- College has displayed signboards for spreading awareness of its water saving initiatives.

- There was no leaking taps or water wastage reported during the audit phase.
- There is no formal water management plan available with the institute.
- The institute has installed **Rain Water Harvesting** system for recharging the bore well with rainwater from the roof.

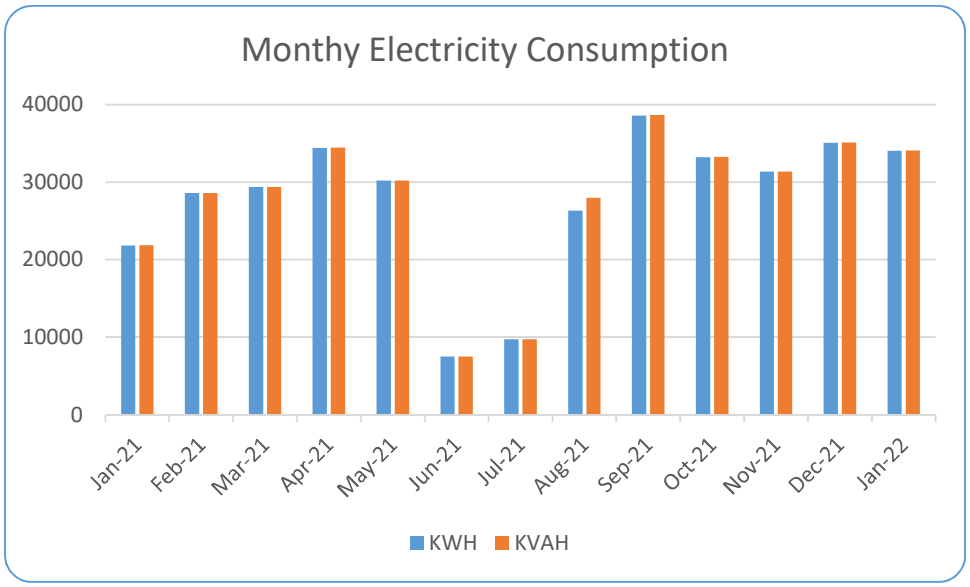
- There is no **Sewage Water Treatment** plant in the campus to recycle the waste water for the use of flushing and gardening. The waste water is being drained to main drainage system of the city.
- The effluent from the laboratory is being discharged in to the common.

9.3. Energy Audit Report:

9.3.1. Electrical Bill Analysis:

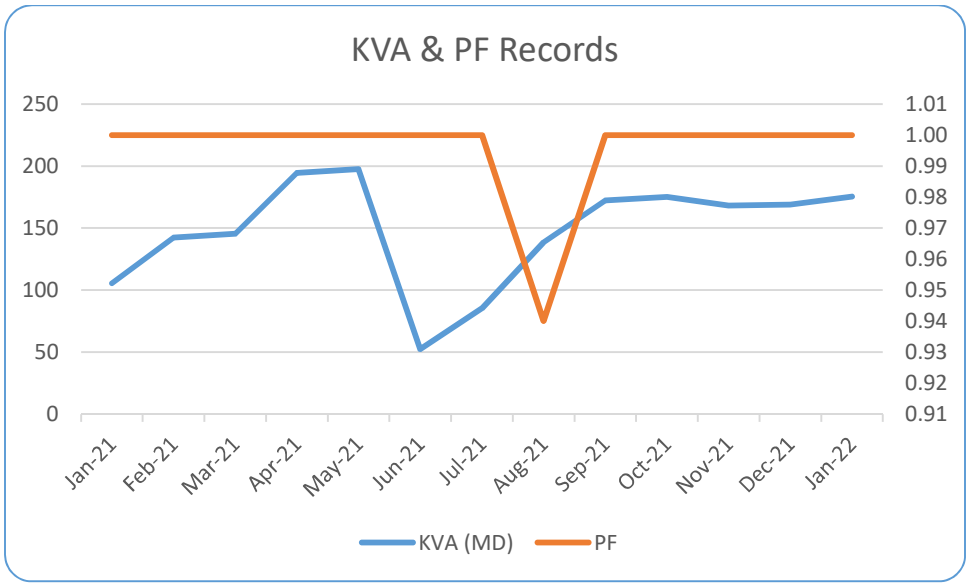
Electricity is supplied by SOUTHERN POWER DISTRIBUTION COMPANY OF ANDHRA PRADESH LIMITED. The institute falls under 2A2 tariff category. The electricity charges under this tariff is Rs. 7.65/kWh for 11 kV commercial feeder consumers. There is a penalty, under TOD tariff, of Rs. 1.00/kWh is electricity is consumed between Peak hours i.e. between 6 PM to 10 PM. Institute has paid an average penalty of Rs. 3337.4/ month because of this TOD tariff.

Following chart shows the energy consumption pattern of the college over last 12 months. The college has consumed an average of 27714 kWh/month electricity in a year. The total electricity bill amount was 41, 86,733/- for last 12 months.



Due to Covid restrictions, the physical college was not operational between Jun'21 & Jul'21 which is reflecting on the energy consumption pattern.

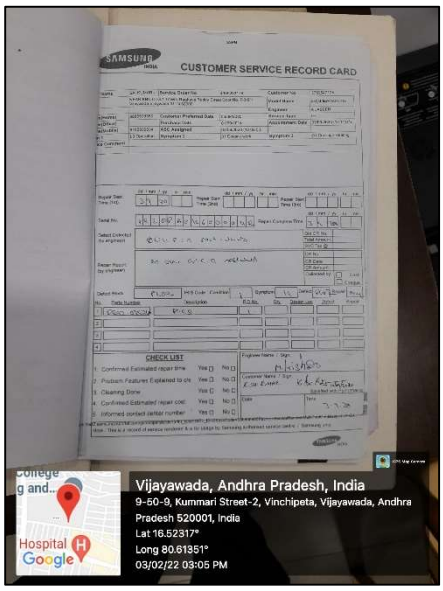
The contract demand is 250 KVA; the maximum demand has never crossed 200 KVA in entire year. The highest MD recorded was for May'21 which was 197.6 KVA. Institute is successfully maintaining power factor at Unity. Only for the month of Aug'21 the power factor was reported 0.94.

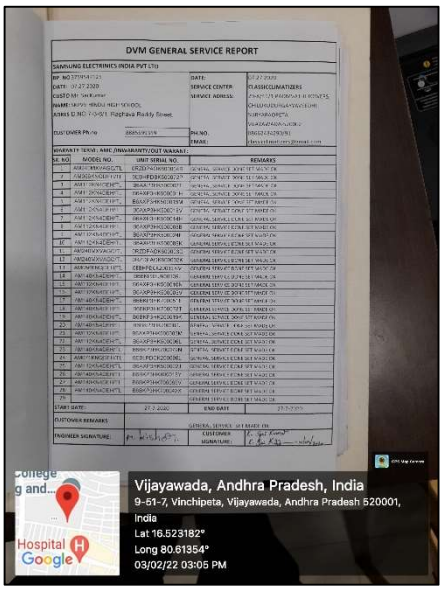


9.3.2. Electrical Consumers:

Institute has installed a centralized air conditioning system for meeting the cooling demand of offices, labs and few classrooms.

The installed air conditioners are having 3-star rating. The temperature setting is generally kept at 24-25 °C. The air conditioner is well maintained and serviced regularly.





The list of common electrical consumers along with its typical electricity consumption is provided in the table below.

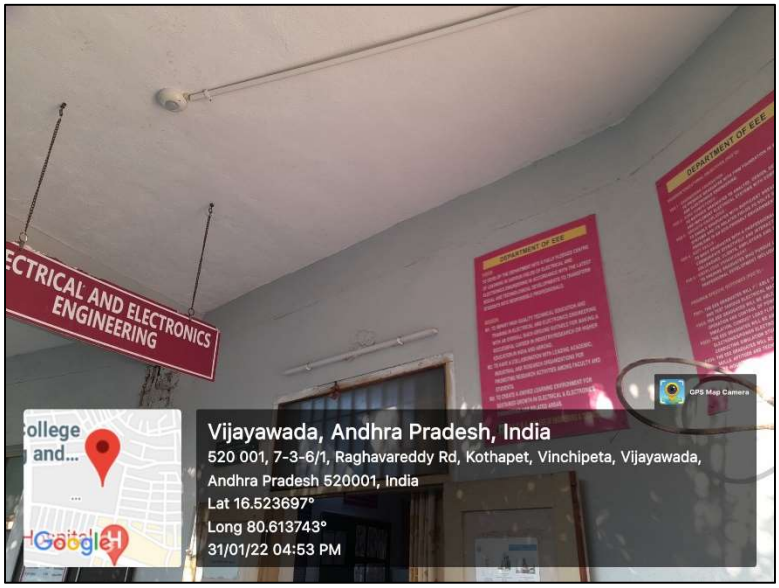
Room Name	Electrical Device	Quantity	Power (W)
EDC LAB/205	CRO	12	45
	F.G	13	13
	RPS	12	N.A.
LICA LAB/201	CRO	12	45
	F.G	13	13
	RPS	12	N.A.
AC LAB/ 226	CRO	12	45
	F.G	13	13
	RPS	12	N.A.
MWE LAB/224	TEST BENCH	9	N.A.
	KLYSTRON POWER SUPPLY	5	N.A.
	VSWR METER	8	N.A.
	DSO	6	50VA
MPMC LAB/220	MONITORS	16	N.A.
	CPU	16	450
PDC/DC LAB/ 214	DSO	12	N.A.
	FG	12	13
	RPS	6	N.A.

Room Name	Electrical Device	Quantity	Power (W)
CLASSROOMS	FANS	612	80
	WALLFANS	39	80
	LEDS	326	20
	CFL	422	40
	CEILING LIGHTS	126	72
	CEILING LIGHTS	37	48
	CEILING LIGHTS	12	20
	CEILING LIGHTS	96	15
	FLUD LIGHT	9	120
CORRODORS	GF - LEDs	19	20
	FF - LEDs	23	20
	SF - LEDs	24	20
	TF - LEDs	18	20
CORRODORS	GF - CFL	24	40
	FF - CFL	17	40
	SF - CFL	17	40
	TF - CFL	16	40

Room Name	Electrical Device	Quantity	Power (W)
LAB	LVDT Trainer	1	N.A.
	Resistance Strain Wire Gauge	1	N.A.
	1-phase energy meter(5-10)A,230V,50HZ	1	N.A.
	Schering Bridge & Anderson's Bridge	1	N.A.
	Kelvin's Double Bridge	1	N.A.
	Crompton's DC Potentiometer	1	N.A.
	Dielectric oil Testing Kit	1	N.A.

9.4. Alternate Sources of Energy and Energy Conservation Measures

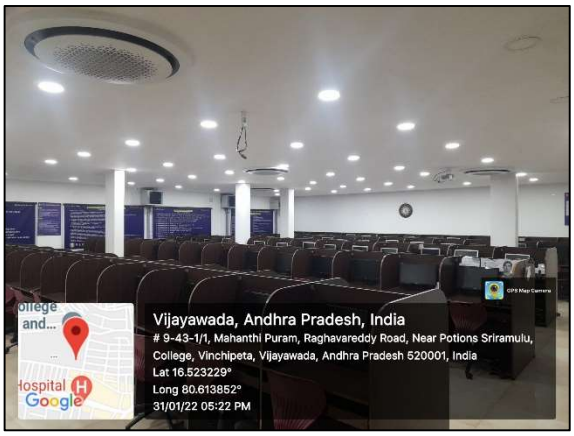
- Institute has not yet installed Solar PV Rooftop system.
- Since there is no hostel/ residential facility or canteen in the institute, hence there is no solar water heating system required.
- Since the biodegradable waste generation is very low, there is no Bio-gas plant.
- Institute is using electricity only from grid and is not wheeling electricity.
- Institute has installed a day-light sensor for controlling the operation of lights in the corridor. It senses the intensity of the light and based on light intensity the lights are turned ON or OFF.

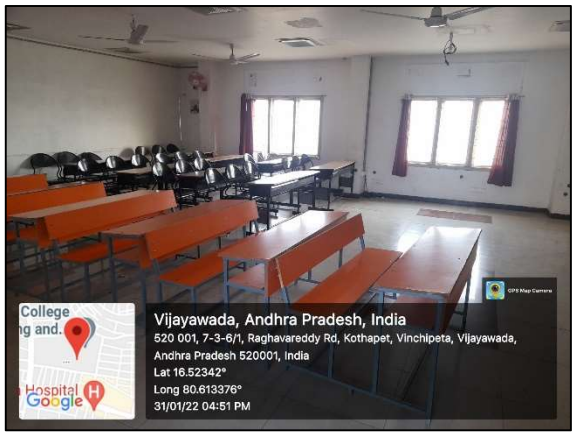


Picture of Day light sensor

- Institute is also planning to install IOT based level controller & pump operation system for water pumping system.
- Institute is has already started replacing existing lighting fixtures with LEDs and energy efficient lighting fixtures.

- Institute has 35 split air conditioners and all of them are having 3 star rating.
- Institute is utilizing the natural light to its maximum. The classroom and offices are designed in such a way that it allows maximum sun light and reduces requirement of artificial lights.





9.5. Waste Management:

Following data provide the details of the waste generated & the disposal method adopted by the college.

Total number of stakeholders in the college: **3768**

Staff Details	Male	Female	Total
No. of Students	885	760	1645
No. of Teaching Staff	91	68	159
No. of Non-Teaching Staff	14	64	82

Total number of rooms (Class rooms, canteen, office, auditorium, library etc.): **60**

Physical Structure	
Total Campus Area	5.05 Acres
Built-up Area	20436.62m2
No. of Departments	7
Conference Halls	2
Class Rooms	41
Office Rooms	6
Libraries	2
Auditorium	1
Canteen	1
Computer Labs	7

9.5.1. Waste Management Practices Adopted by the College:

Following table shows the quantum of waste generation from office, labs & canteen.

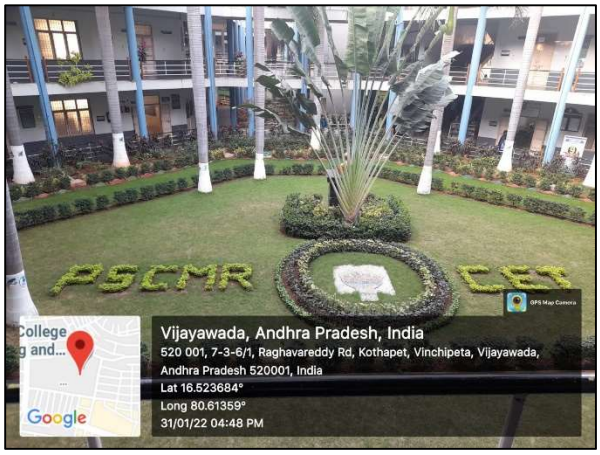
Approximate quantity of waste generated per day (in kg)				
Office	**Type of Waste**			
Quantity	**Biodegradable**	**Non-Biodegradable**	**Hazardous**	**Others**
< 1kg	y			
2 - 10 kg				
> 10 kg				
Labs	**Type of Waste**			
Quantity	**Biodegradable**	**Non-Biodegradable**	**Hazardous**	**Others**
< 1kg	y	y		
2 - 10 kg				
> 10 kg				
Canteen	**Type of Waste**			
Quantity	**Biodegradable**	**Non-Biodegradable**	**Hazardous**	**Others**
< 1kg		y		
2 - 10 kg	y			
> 10 kg				

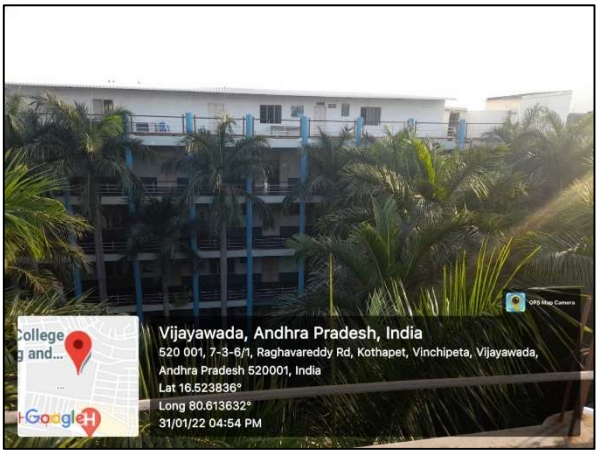
- There is no biomedical waste generation happening in the college.
- There is no hazardous chemicals and radioactive waste getting generated in the college.
- The institute is segregating the waste in to 2 categories viz. solid & liquid waste.

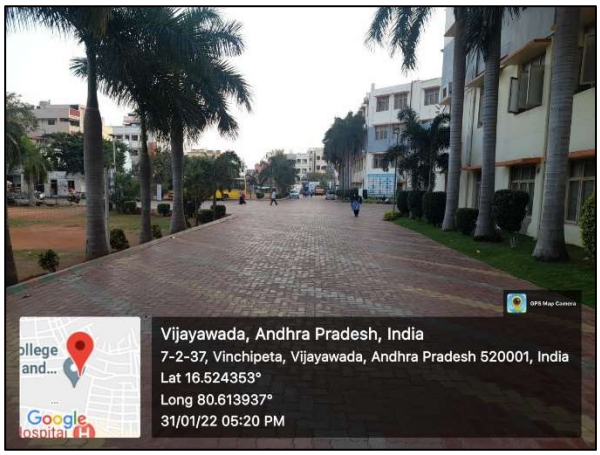
9.6. Green Campus:

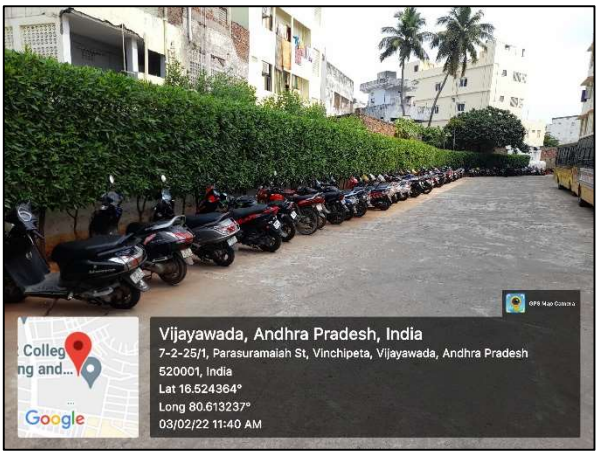
The college campus is relatively new and the plantation has been done recently.

- Total number of plant species identified - More than 100.
- Total number of plants in the campus – More than 100









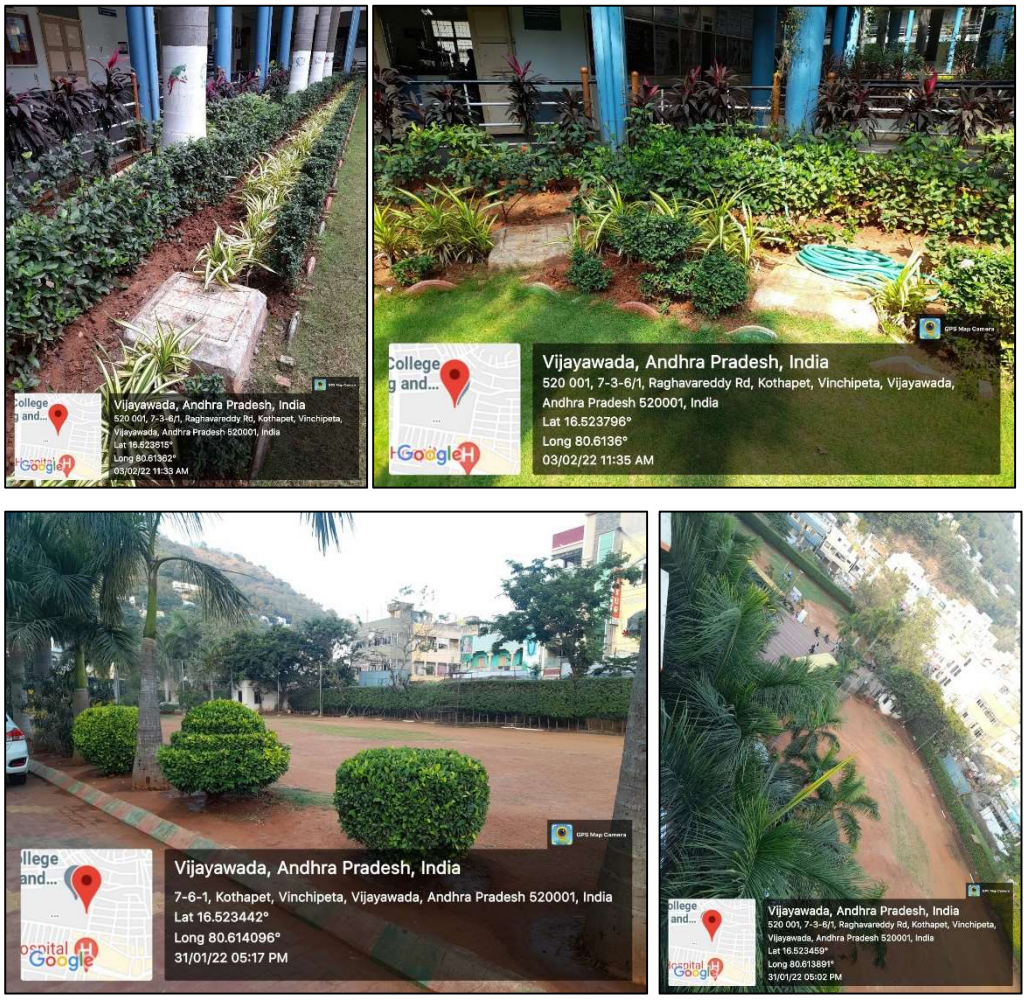


Table 6. List of plants in the campus

AYURVEDIC PLANTS	Qty.	A-BLOCK	Qty.
TULASI	1	MAHATHMA DRESSENIA	1
GULABI	1	SINGAPORE IJORA (YELLOW, ORANGE, RED, PINK)	4
LEMON GRASS	1	KERALA IJORA(WHITE, PINK)	2
MINT TULASI	1	THAI IJORA(YELLOW, RED)	2
CURRY LEAVES	1	GOLDEN PANDANUS	1
AMLA	1	MINI IJORA(PINK, WHITE)	2
CROWN FLOWER(JILEDU)	1	THAILAR PALMS	1
PRICKLY PEAR(NAGA JAMUDU)	1	AURELIA GOLD	1
BLUE BERRY(NEREDU)	1	**B-BLOCK**	
INDIAN SANDAL WOOD (SRI GANDHAM)	1	MAHATHMA DRESSENIA	1
ALISON	1	SYNGONIUM	1

ALOEVERA	1	SPATHIPHYLLUM	1
SNAKE PLANT	1	SANGAPINDIA	1
SAUSSUREA OBVALLATA (BRAHMA KAMALAM)	1	HYDERLILLY RED	1
HIBISCUS(MANDHARA)	1	HYDERLILLY WHITE	1
NYCTANTHES ARBOR-TRISTIS(PARIJATHAM)	1	VEDHANTA SENCH NOBLES	1
BAEL (MAREDU)	1	THAI IJORA(YELLOW, RED)	2
VELDT GRAPE(NALLERU)	1	KERALA IJORA(WHITE, PINK)	2
TABLE LEMON	1	MINI IJORA(PINK, WHITE)	2
LAWSONIA INERMIS (GORINTAKU)	1		
POTS		**BESIDE LABS**	
KENTIA PALMS(RK PALMS(3))	3	FAIKAS PANDA	2
KING PALMS(1)	1	FAIKAS BLAKANIA	2
IGNOLIMA(2)	2	ARELIA BALLS	1
DIEFFENBACHIA(2)	2	CUSTARD APPLE	1
JAMIA KULKAS(3)	3	CUSTARD APPLE(RAMA PHAL)	1
RAPIX PALMS(2)	2	SAPOTA	1
PETRA CROTONS(3)	3	AMLA	1
BILLA CROTONS(3)	3	SEETHA PHALAM	1
GARUDA VARDHAN MINI(2)	2	MANGO	1
MONEY PLANT WHITE	1	BAEL (MAREDU)	1
MONEY PLANT YELLOW	1	LAKSHMANA PHAL	1
DIPHEN BAKHIA(2)	2	BLUE BERRY(NEREDU)	1
VICTORIA DRESSENIA	1	LEMON	1
		BANANA	1
SURROUNDING CAMPUS		**SURROUNDING CAMPUS**	
CONO CARPUS(4)	4	KARIVERU(2)	2
EPOBRIA	1	GADI JODIA	1
POLELA	1	FICUS FIRST AGE(2)	2
FICUS PANDA(3)	3	BLACK PLUM(NEREDU)	1
ROYAL PALMS(6)	6	PEDILANTHUS(2)	2

9.6.1. Green Campus Initiatives:

Following are few activities under green campus initiatives.

- College campus is not very large and automobile entry is not yet restricted in the campus.
- Institute is yet to adopt the battery-powered vehicle for transportation. However cycles are being used for internal transport.
- The pathways inside the campus are pedestrian friendly.

- Institute has initiated banning plastic in the campus.

- The college campus is landscaped with various trees & plants.

9.6.2. Quality audits on Environment and Energy:

Institutes has initiated carrying out following audit on regular basis.

1. Green Audit
2. Environmental Audit
3. Energy Audit

This is the first audit and institute plans to have such audits every year.

Institute is carrying out many environmental promotion activities in the campus throughout the year. These activities include

- ✓ Cleanliness Drive
- ✓ Plantation Drive

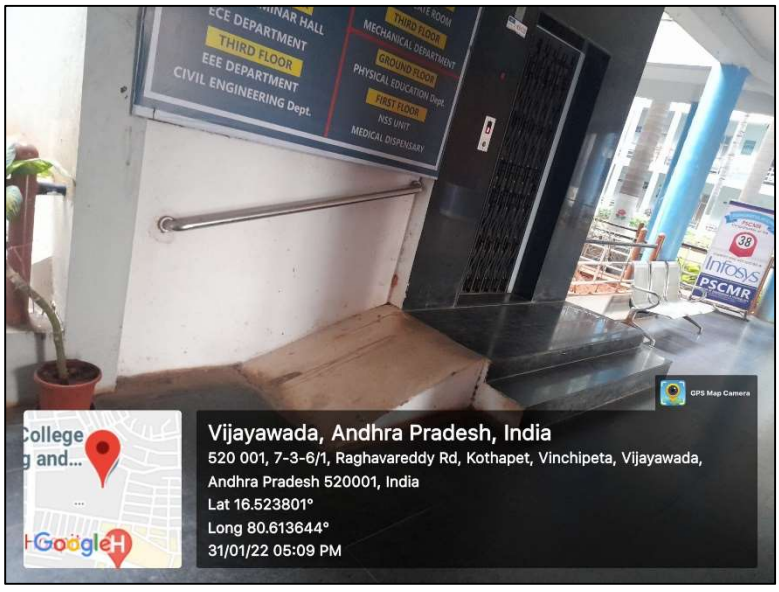
The institute not only organizes such program inside the campus but is also actively doing it outside the campus as well.

9.6.3. Routine Green Practices:

Every year college celebrates World Environment Day and World Water Day in the campus. The main focus of these programs was to provide awareness to the students about the importance of the environment, its conservation and sustainable use of environmental resources. The programs are conducted through seminars, poster presentation, quiz competition debates etc.

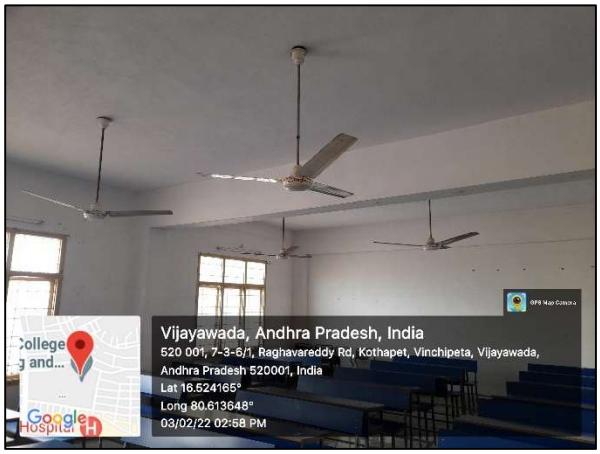
9.6.4. Disabled-Friendly Environment:

Institute has provided a ramp and a lift for easy access to classrooms for disabled students and staff. College also provides required assistance to Disabled students during examination as provided in the rules & regulations.



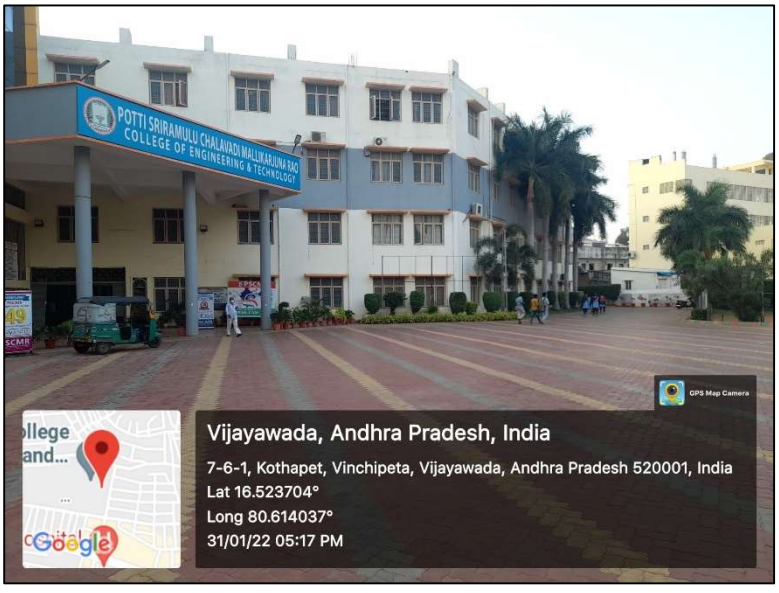
9.6.5. Air Quality & Ventilation:

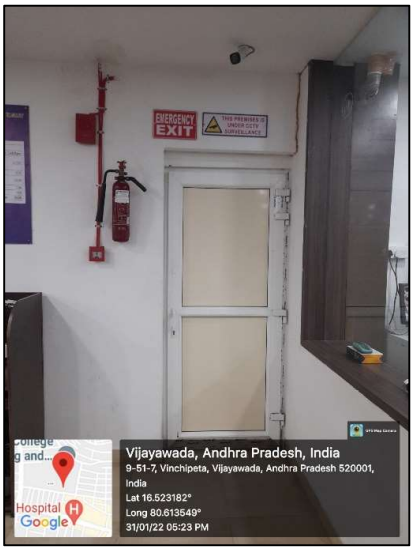
The classrooms and offices in the premises are well ventilated. The fans are operational and adequately placed to effect the sufficient air changes. Fans installed are not star-rated. College has done indoor plantation to provide fresh air inside the premises.

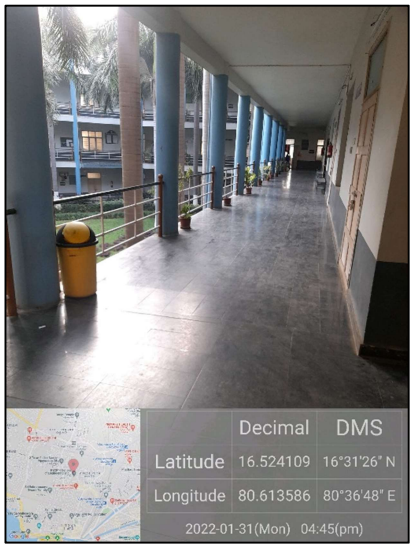


9.6.6. Infrastructure Usage:

- College premises has multiple entrances and has broad passage ways. And also has provided emergency exits.







- The campus has proper drainage system and there were no leakages/ seepages from the roof was observed.
- The premises has fire extinguishers installed at required locations which are regularly checked and maintained.
- Institute also has installed hose reels for firefighting purpose in the corridors.

9.6.7. Green IT Culture:

The institute is following a green IT culture.

- Email/ electronic communication mode is preferred to save papers.
- Both side printing is being adopted to save paper and trees.

10. Carbon Foot Print Analysis:

10.1. CO2e Calculation:

Carbon Foot Print Calculation		
A- Scope 1 (Direct Emission)		
Source	Fuel Consumption	CO2
DG	NA	NA
Vehicles	NA	NA
Others	NA	NA
B- Scope 2 (Indirect Emission)		
Source	Unit Consumption	CO2 (KG)
Electicity Consumption	360278	324250.2
Total A+B	**360278**	**324250.2**
Carbon Offset		
Source	Quantity	CO2 (KG)
Solar	Nil	0
Trees	112	2240
Others	Nil	0
Total	**Nil**	**2240**

Sr. No	Description	Remark
1	Direct Emissions	No Data available
2	Indirect Emissions	Calculated as per international standards
3	Reductions	To increase the carbon offset, it is recommended to install Solar PV.

11. SUGGESTIONS AND RECOMMENDATIONS:

11.1. Water Management:

- There should be a proper monitoring of water consumption pattern in the campus. The bore well should be installed with water meter to monitor the consumption. The water meter readings to be recorded every day or every week at a fixed time.
- It is recommended to check water quality from bore well and R.O. water quality for dissolved oxygen, acidity, alkalinity, chloride, hardness, pH, and conductivity, total dissolved solids and E-coli/ coliform.
- The wash basin taps may be equipped with water saving fixtures.
- The flush tanks of the toilets may be fitted with dual volume system.
- Institute may install drip irrigation system to water the garden and plants in the campus.

11.2. Energy Management:

- The potential of renewable energy sources have to be explored. As the college has a large roof area for installing additional solar panels to increase the capacity of existing solar PV will aid in reducing grid power consumption and thereby reducing the electricity bills and carbon emissions.
- At present college requirement is around 200-250 KW solar rooftop system based on the consumption. However, based on the sanction load college may go ahead with 250 kW capacity solar roof top system. The saving and payback calculations are provided in the table below.

Sr. No.	Parameters	Unit	Value
1	Average Monthly Electricity Consumption	Units	27714
2	Connected Load	kW	250
3	Area Available	ft2	> 25000
3	Solar PV Capacity Based on Area Available	kW	250.0
4	Solar PV Capacity Based on Connected Load	kW	250.0
5	Solar PV Capacity Based on Consumption	kW	221.7
6	Solar PV Capacity (Least of three)	kW	221.7
7	Cost of Solar PV (On-grid)	Lacs Rs.	110.9
8	Electricity Tariff – For Net Metering	Rs./kWh	6.00
9	Unit Generation per annum	kWh	269380.1
10	Cost Saving per Annum	Lacs Rs.	16.16
11	Payback period	Years	6.9
12	ROI	%	14.6%

- The energy audit recommend to avoid the use of more energy consuming electrical appliances and to replace with more environment friendly and energy efficient appliances (for example five stars rated Air conditioner, star rated fans) in the college.
- College may adopt sensor-based (occupancy sensors) energy conservation approach for offices, classrooms and washrooms as well.
- Based on the TOD tariff there is a penalty of Rs. 1/unit electricity consumption if the electricity is consumed between 6 PM to 10 PM (Peak Hours). It is recommended to shift non-critical loads to non-peak hours like.
  - ✓ Running water pumps after 10 PM.
  - ✓ Starting 50% of flud lights after 10 PM (consider safety aspect before implementation).
  - ✓ Stopping centralized air conditioning system at 5:45 PM.
  - ✓ Switching of non-critical lights at 5:45 PM.
- Going forward college may also replace existing tube lights with LEDs.

11.3. Green Campus:

- Institute may avoid or partially restrict the entry of automobiles inside its campus.
- Battery powered vehicles may be adopted in future to reduce emissions inside campus.
- Use of cycles may be promoted among the students.

11.4. Waste Management:

College may undertake feasibility study to install sewage water treatment in the campus to recycle waste water and use it in flush or for gardening purpose.

Leaf litter from the campus can be effectively used for aerobic/ vermi composting, so that the composted material can also be used as good manure.

Try to completely ban the use of plastic in the campus, and to encourage the use of biodegradable materials as alternatives. Try to achieve the goal of plastic free campus.