Quality audits on environment and energy are regularly undertaken by the Institution

-

23. Green Environment Policy

Introduction:

A Green Environment Policy is the commitment to sustainability and environment management that the institute is prepared to make formal practices for stakeholders in managing environmental issues. A Green Policy defines the Institute's approach, to improve the environment and provides a framework for the developing green practices.

A Green Environment ensures health and hygiene to everybody. It is mandatory to create a Green Environment in an Educational Institution, to accommodate varied practices of teaching and learning and ensure its productive outcomes. This would involve eco-friendly practices to promote sustainable environment with greeneries in the campus.

The Government of India started green environment initiatives through Swachh Bharath mission to accelerate the efforts to achieve universal sanitation coverage and to put the focus on sanitation on 2nd October 2014.

The second phase of the mission aims to sustain the open defecation free status and improve the management of solid and liquid waste and also working to improve the lives of sanitation workers. The mission is aimed at progressing towards target 6.2 of the Sustainable Development Goals Number 6 established by the United Nations in 2015.

The institute, in compliance with the vision of Government of India, framed the green environment policy.

Scope of the Policy:

Energy and Environment Policies in Aditya Engineering College develop co-curricular and extracurricular practices that encourage students to take the lead in creating positive change. These initiatives call for a thorough review of all infrastructure and administrative functions from the stand point of energy efficiency, sustainability and the environment.

The focus areas of this policy are:

- Clean Campus Initiatives
- Landscaping Initiatives
- Clean Air Initiatives
- Infrastructure
  - Solar PowerPlant
  - Installation of Energy EfficiencyEquipment
  - Water Conservation through Rainwater HarvestingSystem
- Waste Management processes
  - Solid Waste Management
  - Liquid Waste Management
  - E-Waste Management
- Environment awareness Initiatives
- Green Audit
- Energy Audit
- Plastic-Free Campus

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Objective of the Policy:

- To safeguard and conserve ecological systems and resources within the campus.
- To integrate environmental concerns into policies, plans and programs for social development.
- To work with all stakeholders and local community to create awareness and best practices for the protection of environment.
- To improve our contribution to climate change protection.
- To continuously improve the efficient use of all resources, including energy and water, and to reduce consumption and the amount of waste produced by recovering and recycling waste wherever possible.
- To ban single use plastic inside the campus.
- To conduct environment and energy audits time to time.
- To minimize the use of paper by adopting policy for E-governance.

Implementation:

Clean Campus Initiatives

The institute has pledged to actively implement cleanliness activities in accordance with the guidelines of Swachh Bharat Abhiyan. The institute

- Sensitizes all stakeholders towards up-keeping the cleanliness.
- Encourages students and staff to take part in clean and green program.

Landscaping Initiatives

The campus landscape, its buildings, can be seen as the physical embodiment of institutions values. It is a vital part of the life of a campus, providing space for study, play, outdoor events, relaxation and aesthetic appreciation. Around 500 trees are spread across the campus to provide clean &cool air. The institute encourages

- Gardening of landscapes regularly to provide visual ambience.
- Effective utilization of water by adopting irrigation techniques such as sprinkler systems, drip irrigation and creation of recharge pits for proper runoff of water.

Clean Air Initiatives

The abundant landscape developed in the institute cleans the air naturally. Further, to maintain better air quality index the institute emphasizes:

- Students and staff to use public transportation.
- Restricted entry of automobiles inside the institute.
- Use of Battery powered vehicles to commute inside the institute.
- Prohibition of smoking and use of other tobacco products in the institute in compliance with the framework provided by the National Tobacco Control Programme (NTCP) 2007-2008.

Infrastructural Initiatives

The institute continuously places its effort to conserve energy resources and endeavors for alternative sources of energy. The institute believes in:

- Reducing the consumption of electricity produced by non-renewable resources by switching to clean energysourceslikesolarenergy.
- Installation of eco-friendly electrical appliances that save energy.
- Usage of power efficient equipment.

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- Replenishment of the groundwater level by practicing rainwater harvesting.

Waste Management Processes

Institute strives to have a minimal impact on the environment and is dedicated to reduce and manage the waste generated at various sources. The following specific procedures are to be undertaken to ensure protection of the environment.

- Collection of solid waste from the colored dust bins placed in the institute including departments, administrative-office, canteens, hostels, and guest house by the institute's housekeeping team regularly.
- Segregation of whole waste and the biodegradable waste for vermicomposting.
- Disposal of paper waste from departments, libraries, administrative offices and hostels to external vendors.
- Watering the gardens and lawns in the institute by the recycled liquid waste.
- Channeling runoff water to recharge pits.
- Disposal of e-waste from electronic equipment to external vendor.

Quality Audits:

- The institute aims to regularly undertake audits to assess consumption and conservation of resources for long-term sustainability by conducting energy, green and environment audits every year.

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Energy Audit Study

of

ADITYA ENGINEERINGCOLLEGE

Aditya Nagar, ADB Road, Surampalem- 533437

June 2022

Study Conducted and Prepared by:

KR Energy Consultants

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Contents

Acknowledgement

KR Energy Consultants (called "KR Energy" hereafter) places on record, its sincere gratitude to the Management of ***Aditya Engineering College***, for entrusting the prestigious project of Energy Audit of their College located at Surampalem, ADB Road, East Godavari District, AP State.

We also wish to thank the officers/ Executives & staff of the institute for providing necessary support extended during energy audit study.

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T KRISHNA
BEE Certified Energy Auditor no.3398
KR Energy Consultants
Hyderabad
Date: 30/06/2022

Executive Summary

M/s KR Energy Consultants has conducted a Detailed Energy Audit of Aditya Engineering College, Aditya Nagar, Surampalem, EG District, AP to identify energy savings measures for reducing energy consumption and electricity bill.

Electricity and HSD are main energy sources for the institute. Grid electricity supply by APEPDCL is the main source of electrical energy, which is augmented with power generation from DG Sets during load shedding:

The institute has also solar power plant of 500 kW capacity for captive use for the entire campus requirement

a) Electrical Energy

Table A: Profile of Electrical Energy Consumption

S. No.	Item	Value
1	Contract Maximum Demand (CMD) kVA	260
2	Average recorded demand , kVA	165
3	Average billed demand, kVA	214
4	Demand variation, kVA	69.5 to 267
5	Solar power plant capacity of the campus, kW	500
6	Solar power generated, kWh	489,496
7	Solar power used for captive requirement, kWh	317,221
8	Solar power export to grid, kWh	172,275
9	Annual billed grid electricity consumption, kVAh /year	424,773
10	Total electricity consumption of the campus, kWh	741,994
11	Total annual electricity bill, Rs. lakhs/year Net Payable bill Rs. Rs. lakhs/year	30.05
12	Power factor	0.92
13	Average cost of electricity, Rs/kWh (only grid power)	10.1

b) Summary of Recommendations

The Tables below presents the summary of recommended energy saving projects, anticipated energy savings, and monetary savings, investment required, and simple payback period:

Table 1: Summary of Suggested Energy Saving Measures with Cost-Benefit Analysis

Energy Conservation Measure	Energy savings (kWh/ year)	Monetary savings (Rs. / year)	Investment (Rs.)	Payback period (months)
Improve power factor from 0.92 to 1.00	29,671	2,90,670	25,000	1
Replace old fans with Energy efficient/Super fans(100nos)	6,000	60,000	180,000	36
Install energy savers for ACs	15,552	155,520	240,000	19
Replace conventional CFLs with LED lights	1,695	16,950	22,600	16
Total	**52,918**	**5,23,140**	**4,67,600**	**11**

- As can be observed from the above Table, the total electrical energy savings are estimated at 52,918 kWh/year and the corresponding monetary savings are Rs.5.32lakh/year. The investment required is Rs.4.67 lakhs which will be paid back in **11** months.

- Equivalent CO2 reductions due to energy savings would be 48 tCO2/ yr.

- Initially, the fans, ACs and tube lights operated for more hours in a day/year can be selected for replacement for maximum benefit.

CHAPTER 1

Introduction

1.1 About Aditya Engineering College

Aditya Academy

Aditya, the premier promoter of quality education in the coastal districts of Andhra Pradesh for the past two decades, comprises from K.G to P.G besides professional colleges like Engineering, Pharmacy and Nursing. Dr. Nallamilli Sesha Reddy as a founder chairman, promoted the educational society in the name and style of Aditya Academy at Kakinada in the year 1984, with a vision and mission to create a platform for holistic growth and success to students at all levels.

Aditya has made its entry into the educational arena with a public school to meet the needs of primary and secondary education. In succession and with rapid strides, the academy established several Junior Colleges, Degree Colleges, PG Colleges, Engineering Colleges, Pharmacy Colleges, Nursing Colleges, and Teacher Training Institutions.

The silver-jubilee educational group with 60,000+ students in 60+ institutions with 6000+ staff across three districts in Andhra Pradesh has become the standard bearer for quality education. In every stream, Aditya has become a spring-board for success through its powered vision, constant innovation, and professional excellence.

Aditya Engineering College

Aditya Engineering College was established in the academic year 2001-02 under the aegis of Aditya Academy, Kakinada with the approval of AICTE and Affiliated to JNTU with an intake of 180 in three UG Courses in Engineering & Technology.

The College is situated in an eco-friendly area of 180 acres with thick greenery at Surampalem, Gandepalli Mandal, East Godavari District, Andhra Pradesh. The College is 15 KM away from Samalkot Railway Station on Howrah-Chennai Railway line in South Central Railway. The College is 35 Km away from Kakinada and Rajahmundry on ADB Road.

The College has five academic Buildings with a total carpet area of 44,524 Sq. Mts. apart from two boy's hostels and one girls hostel buildings. The particulars of academic buildings and the departments / offices accommodated are as follows.

S.No	Building Name	Department/Office
1	Cotton Bhavan	Administrative Office, Accounts, Admission Office, ECE.
2	K. L. Rao Bhavan	Mechanical, Electrical, Petroleum Technology, Mining Engineering and Agricultural Engineering
3	Bill Gates Bhavan	CSE, IT, H&BS, Civil, AI & ML
4	Abdul Kalam Bhavan	MCA, MBA, IMBA, M.Tech & Management Sciences
5	Ratan Tata Bhavan	Examination Cell, Central Library.

The college offers 10 UG and 10 PG programmes in engineering, MCA, MBA, and IMBA (Integrated) with 20 years of rich standing in the educational era. Besides, the college has added many feathers in its cap which include AICTE-ECI-ISTE Chhatra Vishwakarma Award, Utkrist Sansthan Vishwakarma Award, Swachh Campus ranking, AAA+ Grade by Careers 360, South India 4th rank by Digital Mailers, South India 6th rank by Silicon India, 13th rank out of top 25 engineering colleges by 4Ps, a niche in Asia top 100 colleges by WCRC leaders, Best Placement Award by ASSOCHAM, All India 98th rank-DQ CMR top T-School survey by DATA Quest and 13th position in Top 20 colleges of India by the Sunday Indian. These districts recognition speak volumes of the institute's objective to promote engineering excellence. The total student strength is 5052 with faculty strength of 355 thus giving rise to healthy faculty student ratio.

It is approved by AICTE, recognized by Govt. of Andhra Pradesh, permanently affiliated to Jawaharlal Nehru Technological University Kakinada (JNTUK), and is accredited by National Assessment and Accreditation Council (NAAC) with 'A' Grade. The college also received UGC recognition under Sections 2(f) and 12 (B) of the UGC Act.

Campus Specialties

- A WOW! Campus
- PIO (Person of Indian Origin) Status
- Accredited by TCS
- MoU with Infosys and other companies
- State-of-the-art Infrastructure
- Hygienic Canteen & Food Courts
- Project & Activity Clubs
- Record Placements
- Experienced & Trained Faculty
- Campus Placement Training
- Sunrise Start-up Village
- MOU with AMCAT, CoCUBES
- Technology Business Incubator from DST
- Incubation centre by Govt. of AP
- SIRO Recognition by DSIR
- Technical Skill Development Institute - APSSDC
- Certification Courses

The following courses are offered in the college for under graduation and graduation courses:

Under Graduate Courses:

- B.Tech Civil engineering
- B.Tech Electrical and Electronics Engineering
- B.Tech Mechanical Engineering
- B.Tech Electronics and Communication Engineering
- B.Tech Computer Science and Engineering
- B.Tech Information Technology
- B.Tech Mining Engineering
- B.Tech Petroleum Technology
- B.Tech Agricultural Engineering
- B.Tech Artificial Intelligence and Machine Learning

Post Graduate Courses

- M.Tech Software Engineering
- M.Tech VLSI Design
- M.Tech Embedded Systems
- M.Tech Computer Science & Engineering
- M.Tech Structural Engineering
- M.Tech Power Electronics & Drives
- M.Tech Thermal Engineering
- M.Tech Petroleum Engineering
- Master of Business Administration
- Integrated Master of Business Administration
- Master of Computer Applications

1.2 Energy Conservation Efforts made by the Management

The committee of the institute recognizes its responsibility to conserve and manage energy in all its operations.

- ✓ Make every effort to commit organizational resources towards energy management
- ✓ Minimize energy costs and give priority to energy efficiency (EE) by utilizing available resources more efficiently

Towards this objective, the management has inducted LED lighting and Solar Power Plant of 500kW for captive use of power for the entire campus covering all colleges of the group institutions. The solar hot water systems of 12000 LPD capacity were also installed for the hostel blocks.

The management wants to explore further scope for energy conservation and energy cost reduction in the campus and thus entrusted the job of Energy audit to KR Energy Consultants.

1.3 Objectives of the Energy Audit

The key objectives of the Energy audit is to identify, prioritize, and recommend a set of proven, customized, low-cost, and implementable measures for reducing the consumption of electrical energy in the campus.

1.4 Scope of Work

The Energy audit has laid emphasis on performance assessment of electrical utilities comprising the following equipment/ areas for identification of cost-effective energy saving solutions:

1) Energy Consumption and Analysis
2) Pumps(Utility)
3) Air Conditioners
4) Fans
5) Lighting
6) DG sets

1.5 Methodology Adopted for conducting the Energy Audit study

KR Energy Consulting has conducted Energy audit field studies at the institute in April 2022. As a part of the Energy audit, KR Energy Consulting audit team has visited campus for data collection, on-site measurements, and performance monitoring of various equipment using portable Energy audit instruments. KR Energy Consulting has adopted the following methodology for conducting the Energy audit:

- Kick-off meeting with the concerned personnel to finalize field action plan
- Inventory of all the electrical appliances installed by physical verification like air conditioners, luminaries, computers, and others. Physical inspection of the electrical distribution system.
- Monitoring of electrical parameters such as voltage, amps, kW, power factor etc. For individual equipment's and feeders
- Monitoring of harmonics at the identified DB's, feeders UPS with power and harmonic analyzer
- Collection of photocopies of monthly electricity bills for the past one year
- Critical analysis of data collected/ measured and assessment of energy efficiency and energy losses
- Identification of energy saving measures and assessment of energy saving potential
- Submission of the report

The approach/ methodology adopted for Energy audit is furnished pictorially below in Figure 1.

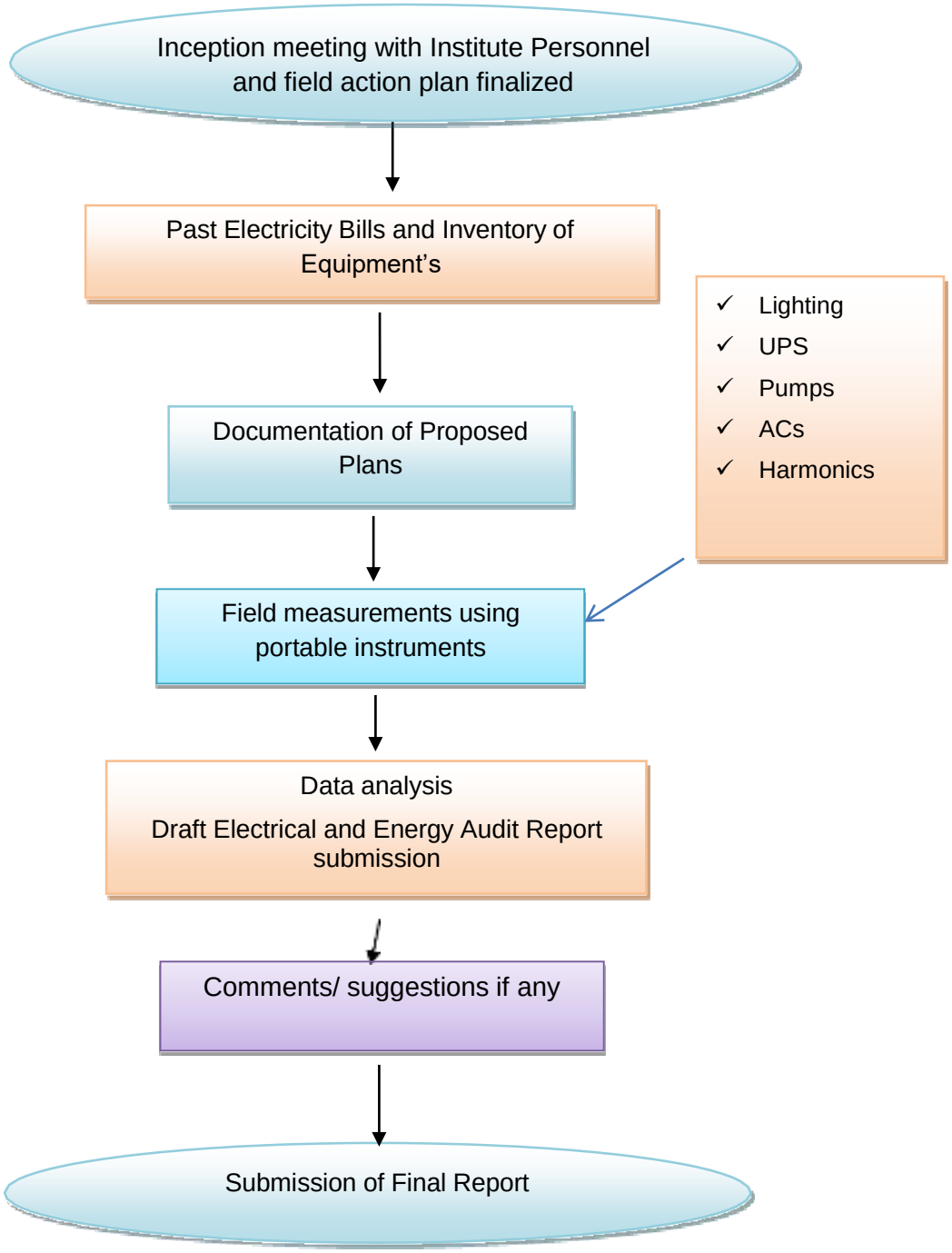


Figure 1: *Approach/ methodology adopted for conducting Energy Audit of Aditya Engineering College, Surampalem, ADB Road, East Godavari District, AP State*

1.6 Measuring Instruments used for the Electrical and Energy Audit

KR Energy Consulting has used portable, micro-processor based, state-of-the-art, calibrated instruments for on-field monitoring of equipment performance during Energy audit. The list of portable instruments used in the study is as follows:

- Nanovip Plus Load Manager
- Harmonic Analyzer
- Lux meter
- Temperature measuring instruments
- Thermal Imager

CHAPTER 2

Energy Consumption & Analysis

The chapter presents the description of various energy inputs used in the Institute, their consumption trends & analysis, annual energy costs, and share of different energy inputs in total energy cost.

2.1 Energy Inputs

Energy sources for the institution are:

- Electricity
- HSD

Electricity is the major energy source in the institute used for lighting, fans, motors etc.
DG Sets are operated as standby to grid power and will run during load shedding. HSD is the fuel for DG Sets.
The campus also has a roof top solar power plant of 500 kW and the electricity generated is used for all the colleges and for captive purpose for the entire campus.

2.2 Electrical Energy Analysis

Grid electricity is supplied by the AP Eastern Power Distribution Company Limited (APEPDCL) voltage of 11kV. The connection meets the entire campus electricity requirement including all colleges of the group in the campus. During grid power shortage/ failure, DG Sets supply the required electricity. The institution has a Contract Maximum Demand (CMD) is 260 kVA for the entire campus in the name of “Aditya Educational Academy“

Data on monthly CMD, recorded MD, billed units, and bill amount for period year from January 2021 to December 2021 is collected, analyzed, and presented in Table 2.1 below:

Table 2.1: *Month-wise CMD, Recorded MD, Billed MD, Billed Units, and Bill Amount (June 2021 to May 2022)*

S.NO	MONTH	CMD	RMD KVA	BILL KVA	PF	kWh	kVAh	Nett Payable Rs.	Solar Units consumption (kWh)
1	Jun-21	260	69.48	208	0.94	11749	12459	0	15547
2	Jul-21	260	113.1	208	0.94	21018	22422	149812	19067
3	Aug-21	260	191	208	0.95	33994	35779	291598	27807
4	Sep-21	260	211	211	0.96	38910	40740	343753	23095
5	Oct-21	260	163.7	208	0.95	37527	39444	296420	19751
6	Nov-21	260	163.8	208	0.95	43534	45857	367576	22743
7	Dec-21	260	162.2	208	0.90	30522	34068	268534	24698
8	Jan-22	260	127.26	208	0.87	20146	23210	143331	21596
9	Feb-22	260	186.7	208	0.89	27453	30877	220006	27941
10	Mar-22	260	267.12	267.12	0.85	31078	36411	307187	34692
11	Apr-22	260	---	---	---	---	47184	558076	35130
12	May-22	260	--	--	--	--	56322	58758	45154
		2080	**1655.36**	**1667**	**6.582243**	**295931**	**424773**	**3005051**	**317221**
		260	**165**	**214**	**0.92**	**29593**	**35398**	**250421**	**26435**

The variation of electricity consumption, recorded demand, billed demand, solar power, and power factor demand is graphically furnished in fig 2.1. 2.2, 2.3, 2.4 and 2.5

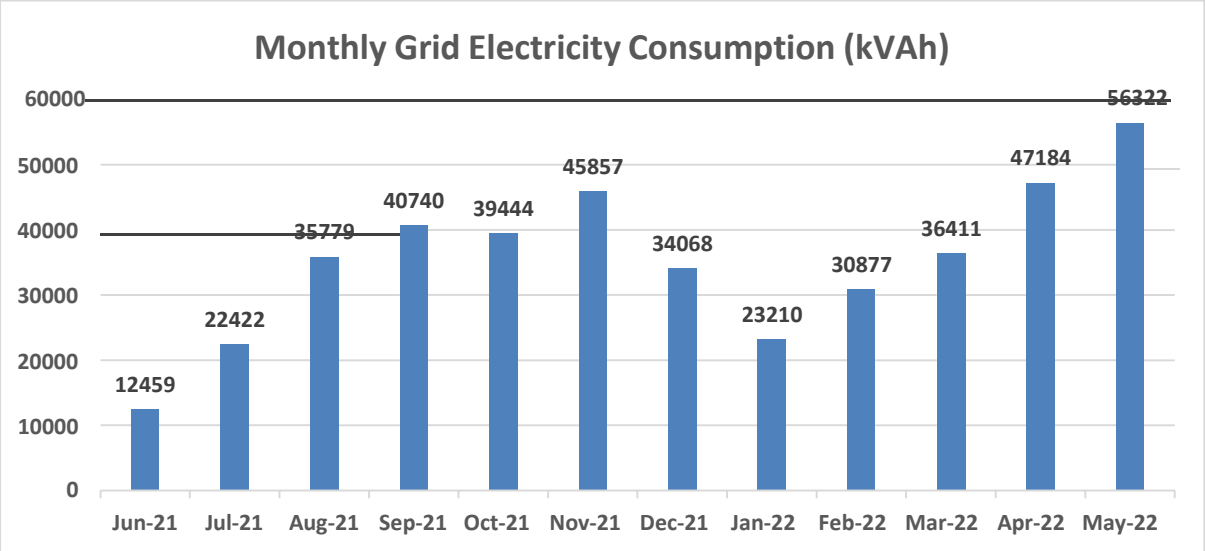


Fig 2.1: Monthly Grid Power Energy Consumption

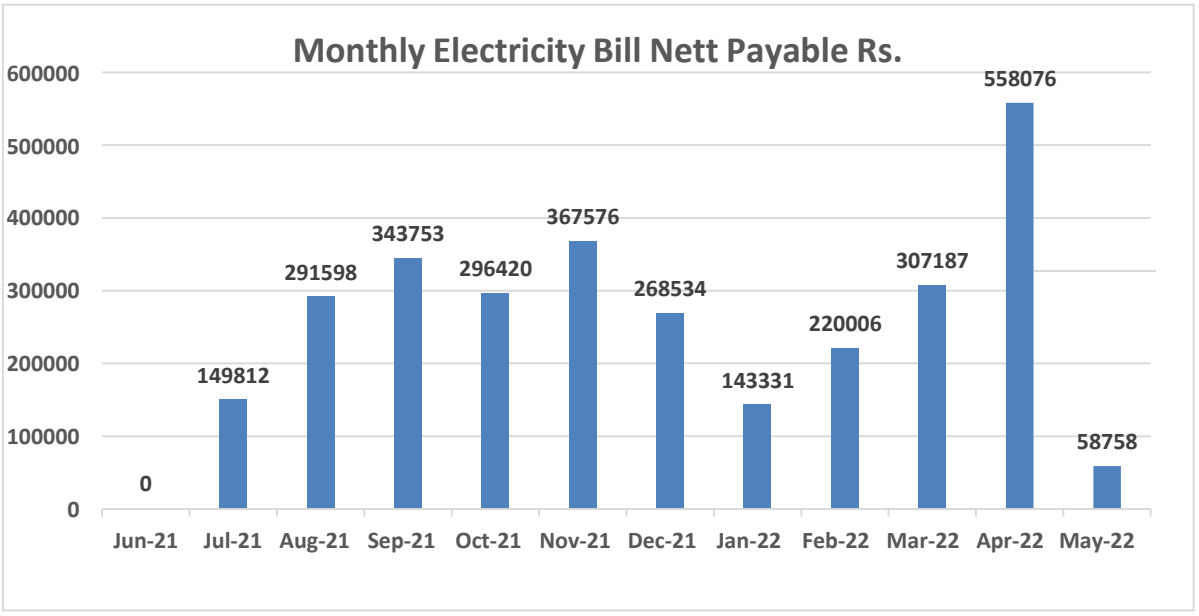


Fig 2.2: Monthly Grid Electricity Bill Net Payable

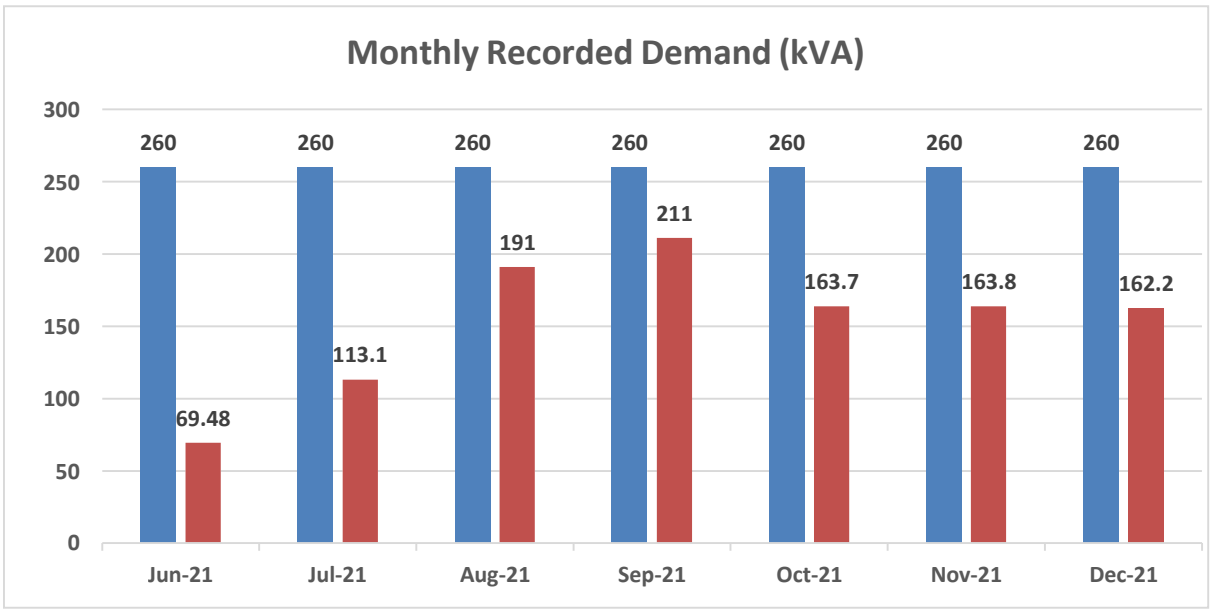


Fig 2.3: Monthly Recorded Demand Variation

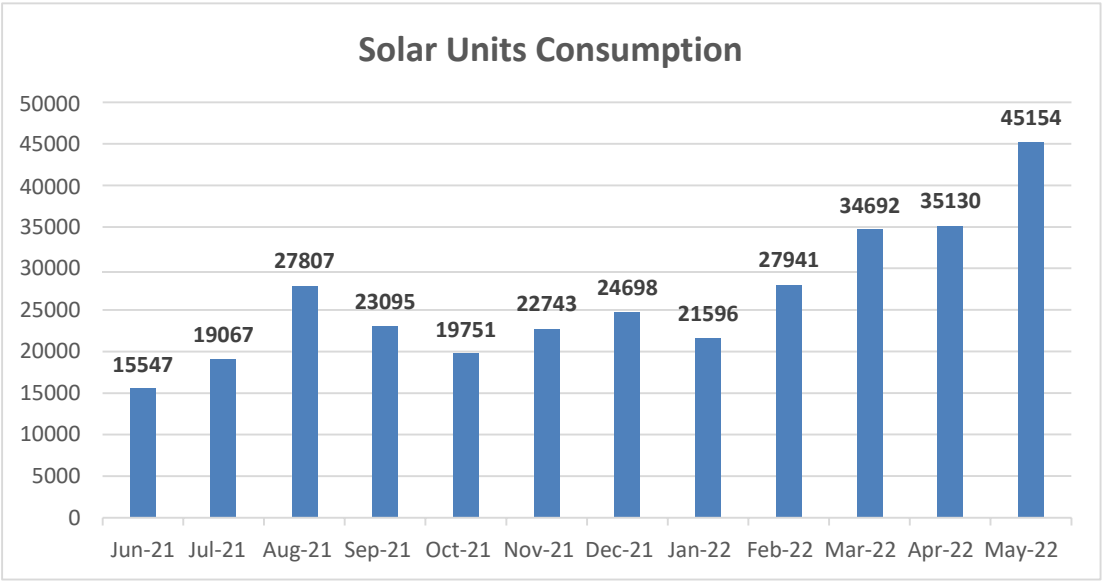


Fig 2.4: Monthly Solar Power Consumed

The key observations made from the analysis of the above data are furnished in Table 2.2 below:

Table 2.2: *Summary of Electrical Energy Consumption Data of the entire campus and colleges (Aditya Educational Academy) – January 2021 – December 2021*

S. No.	Item	Value
1	Contract Maximum Demand (CMD) kVA	260
2	Average recorded demand , kVA	165
3	Average billed demand, kVA	214
4	Demand variation, kVA	69.5 to 267
5	Solar power plant capacity of the campus, kW	500
6	Solar power generated, kWh	489,496
7	Solar power used for captive requirement, kWh	317,221
8	Solar power export to grid, kWh	172,275
9	Annual billed grid electricity consumption, kVAh /year	424,773
10	Total electricity consumption of the campus, kWh	741,994
11	Total annual electricity bill, Net Payable bill Rs. Rs. lakhs/year	30.05
12	Power factor	0.92
13	Average cost of electricity, Rs/kWh (only grid power)	10.1

Considered Rs 10.00/kWh for electrical energy savings in the report

2.3 GHG Emissions

The major energy form used for the institute is grid electricity supplied by AP Eastern Power Distribution Company Ltd (APEPDCL): The emission factor for grid electricity is 0.92 kgs of CO2/kWh and is calculated month wise and is furnished below in Table 2.3

Table 2.3: *GHG emissions due to grid electricity use*

Month& Year	Monthly units	Monthly GHG Emissions (tCO2)
Jun-21	12459	11.46
Jul-21	22422	20.63
Aug-21	35779	32.92
Sep-21	40740	37.48
Oct-21	39444	36.29
Nov-21	45857	42.19
Dec-21	34068	31.34
Jan-22	23210	21.35
Feb-22	30877	28.41
Mar-22	36411	33.50
Apr-22	47184	43.41
May-22	56322	51.82
	424,773	**390.79**

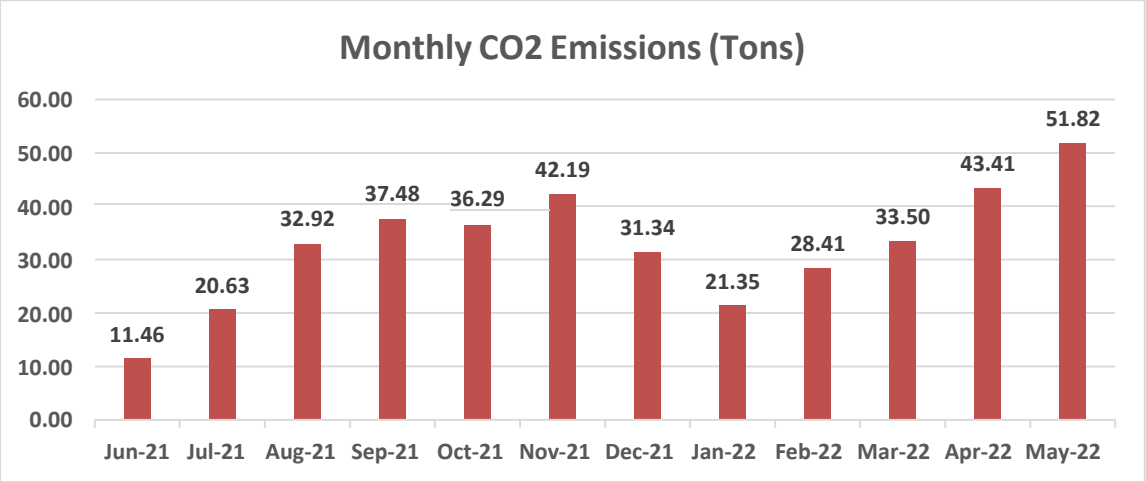


Fig 2.6: Monthly Carbon dioxide Emissions due to grid electricity use

2.4 Solar Power Plant GHG Emissions Reduction

The management has installed a roof top SPV Power plant as an initiative to offset GHG emissions to the world. The capacity of the SPV power plant is 500 kW with net metering facility.

So far, about 489.496 *MWh has been generated from June 2021 to May 2022, the solar power is used for captive requirement for the campus, the power is also exported to grid during holidays is about 172.275 MWh. Due to solar power plant, about 450.3 tons of* CO_2 *is avoided in the climate every year and is almost offset of the grid power used during the same period.*

2.5 Power Factor and Maximum Demand

Power factor, billing demand and recorded MD for period from *January 2021 to December 2021* is collected and presented in Table 2.4 below:

Table 2.4: *Monthly Power Factor and Recorded Maximum Demand*

Month	CMD (kVA)	Recorded Demand (kVA)	PF
Jun-21	260	69.48	208
Jul-21	260	113.1	208
Aug-21	260	191	208
Sep-21	260	211	211
Oct-21	260	163.7	208
Nov-21	260	163.8	208
Dec-21	260	162.2	208
Jan-22	260	127.26	208
Feb-22	260	186.7	208
Mar-22	260	267.12	267.12
Apr-22	260	--	--
May-22	260	--	--
Average	**260**	**165.4**	**0.92**

(a) Contract Demand

- Contract Maximum Demand is 260 kVA and average recorded demand is 165 kVA, the RMD is low, as the college is out of operation due to COVID Problem
- The highest maximum demand recorded during the last 12 months is 267 kVA due to low PF, few capacitors may be failed, or output may be deteriorated
- The maximum demand is OK for the present utilization and is satisfactory.
- The minimum billing demand is 80% of the CMD and is 208 kVA

(b) Power Factor

The average monthly power factor was 0.92 as noted and as per electric bills. The power factor is low, and it is suggested to improve the power factor.

At present, the distribution companies are billing on kVAh basis and not on kWh. Hence, there is direct impact on the power factor. If the power factor is unity, the kWh is equal to kVAh, if the power factor is less than unity, the kVAh billing increases. Hence, it is suggested to maintain the power factor close to unity.

Apart from reduction in electricity bill, the demand charges reduces and stabilizes system voltage.

Hence, it is recommended to install additional capacitor banks for improving the power factor from 0.92 to 1.00. Based on the present PF and present load usage, about 50 kVAR capacitor banks always to be connected at the main bus bar in the facility for maintaining unity Power factor or automatic power factor controller can be installed. The cost benefit analysis of improving the power factor is furnished below:

Table 2.4: *Cost Benefit Analysis of Improving Power Factor*

S.no	Details	Value
1	Present average power factor	0.92
2	Power factor after improvement	1
3	Average monthly energy consumption , Lakh kVAh	30907
4	Average monthly electricity bill, Rs. In lakhs	2.16
5	% Reduction in energy bill, %	8

6	Energy savings kVAh (rounded off) per month, kVAh Energy savings per annum, kVAh	2473 29671
7	Unit cost of Electricity, Rs./Unit	10
8	Monetary Savings ,Rs in lakhs/year	2.97
9	Investment required for KVAR capacitor bank , Rs lakhs	0.25
10	Payback, Months	1.0

2.7 Harmonics

This term refers to a wide variety of electromagnetic phenomena that characterize the voltage and current at a given location of a power system any power problem manifested in voltages, current, or frequency deviations those results in failure or malfunctioning of customer equipment. Power quality has become increasingly important for industrial and commercial electric power customers, particularly as today control processes rely on computerized equipment which is sensitive to power system interruptions and disturbances.

As harmonic levels increase, the probability of experiencing problems also increases. Typical problems include:

- Malfunctioning of microprocessor-based equipment by disruptions of operations.
- Heating effects in power handling equipment's such as motors, transformers, overheating in neutral conductors. There by reduces the operating life
- Deterioration or failure of power factor correction capacitors.
- Erratic operation of breakers and relays.
- Pronounced magnetic fields near transformers and switchgear.

The harmonics were measured for the selected panel stand UPS. The Voltage & Current harmonics are ranged as below:

Table 2.4 *Harmonics Measurements values for Panel by Harmonic Analyzer*

Reference	***$THD_{rms,v}$***	***$THD_{rms,i}$***
Main panel	0.6% to 1.7% Voltage Harmonics within the limits	3.0% to 8.5%
Recommendation	No Harmonics exists and harmonics are within the limits	

2.6 DG Sets

The institution has three DG sets of 160 kVA each for meeting the total campus load of 160 kVA (1no). The DG sets are operated as per the requirement and during grid power failures.

CHAPTER 3

Fans & Air conditioners

This chapter presents the type of air conditioners and fans used, their energy performance, and cost-effective energy conservation measures for reducing energy consumption in air conditioners and fans.

Hostels

The institution has two hostel blocks for boys and girls separately.

S.No	Hostel Block	Rooms	Students	Fans	C.F.L	Tube Lights	LED
1.	B	152	291	324	-	317	331
2.	D	255	160	335	-	336	374

There are 407 rooms in the hostel and 451 students residing in the hostels. The main electrical equipment's/gadgets used are fans. Tube lights, geysers, ACs etc.

3.1 Details of Fans

The ceiling fans are installed, and the inventory of the fans and connected load is given below in Table 3.1:

Table 3.1:*No. of Fans installed and Wattage*

S.No.	Name of the Building	Fans each 50Watt
1	Cotton Bhavan	269
2	KL Rao Bhavan	435
3	Bill Gates Bhavan	587
4	Abdul Kalam Bhavan	384
5	Ratan Tata Bhavan	134
6	Hostel	659
	Total	**2084**
	Connected load kW	**123.4**

3.2 Fans- Observations & recommendations

- Fans are provided with fixed and running capacitor. The speed drops if the value deteriorates with time. Timely replacement of capacitor is necessary.
- Presently, in many rooms conventional electrical regulators are installed and it is suggested to replace old conventional regulators with new electronic type regulators.
- In majority of the rooms, the fans are consuming more power than rated.

a) Cost benefit Analysis of Replacing old Ceiling Fans with new efficient fans

Energy savings can be achieved by replacing the existing old ceiling fans with 5 Star Rating (BEE) energy efficient ceiling fans:

- Option 1: 5 Star rated Fans
- Option 2: Super Fans

Initially, it is recommended to replace old fans of 100 nos. and after successfully achieving the savings, other fans can be replaced in a phased manner. The cost benefit analysis made for a sample of replacement of 100 fans fewer than two Options are furnished below:

i) Option (1) Replace old fans with 5 Star Rated Fans

Star Rating	Min. Air Delivery (AD) m^3/ min	Input Power in Watts	Service Factor (SV=AD/ Power) m3/min/Watt	Cost (Rs)
5 Star	215-225	50-53	>=4	1,850-2,200

A few good brands of the 5 Star rated Fans are Ortem, Relaxo, Orient, Usha, Crompton Greaves, Bajaj, and Havells. Normally, these fans come with a warranty of two years.

ii) Option 2: Super-Efficient Ceiling Fans

Features of Super-Efficient Ceiling fans are:

- Energy savings, more than 50% savings, lower electricity bill
- Remote control, no regulator needed, saves space on switchboard
- High air delivery
- Inverter/UPS friendly – Runs twice longer, no extra noise, no speed drop
- No speed change due to supply variations or low voltage
- Power factor better than 0.9
- Service value of more than 6 - more air per watt
- BLDC Motor runs cool - No heat generated

- LED Indication for remote operation
- Attractive colors and designer leaves
- 5 years warranty
- Cost Around Rs 3,200 per Fan

Presently, Super fan is the company, which manufactures these types of fans.

The comparison of ordinary fan, 5 star fan, and super fan in terms of design and operational aspects are furnished below in Table 3.2:

Table 3.2: *Comparison between Ordinary Fan, 5 Star Rated fan & Super Fan (1200mm)*

S.No	Parameter	Ordinary fan	5 Star rated Fan	Super fan
1	Rated Power, Watt	60-90	40	30
2	Min. Air Delivery, m^3/min	210-215-220	215-220	220
3	Service Factor, m^3/min/Watt	3.35-3.73	4.0-5.0	6.28
4	Cost, Rs/Fan	1200-1300	1800	2500
5	Life, Years	10-12	10-15	15
6	Warranty, Years	1	2	3-5

The cost-benefit analysis of replacing the existing ordinary fans with (i) 5 star rated fans and (ii) super-efficient fans is provided in Table 3.3:

Table 3.3: *Cost Benefit Analysis of Replacing Fans with 5 Star Rated & Super-Efficient Fans*

Description	Unit	Option1: 5 Star Rated Fans	Option2: Super-Efficient Fans
Number of Fans (*Considered 100 Nos. as sample for case study*)	Nos.	100	100
Actual power consumed	Watts	70	70
Power consumption of new Fan	Watts	40	30
Average operation	hours/day	8	8
	Days/year	250	250
Annual energy savings	kWh/yr.	6,000	10,000
Cost of energy	Rs/kWh	10	10
Total Annual saving	Rs	60,000	1,00,000
Cost of new Efficient fans	Rs/Fan	1,800	2,500
Investment	Rs	1,80,000	2,50,000
Simple Payback period	Months	36	30

Note: Price is subjective and be further reduced if taken on bulk quantity. The average life of fans is 10 years.

Initially, the management can replace 100 no's in first phase and after successfully achieving savings and recurring savings, all the fans can be replaced for power savings.

3.3 Air conditioners

The air-conditioning systems available at Institute are of split air conditioners. There are total of 16 air conditioners in the hostel and college administration block. The rated capacity of AC's is 1.5 TR each and total capacity is 72 TR.

S.No.	Name of the Building	AC 1.5 Ton
1	Cotton Bhavan	19
2	KL Rao Bhavan	5
3	Bill Gates Bhavan	22
4	Abdul kalam Bhavan	2
5	Ratan Tata Bhavan	-

3.4 Air conditioners -Observations & Recommendations

(a) Observations

It is beneficial to install 5 Star rated ACs in future as 5 star rated ACs will consume less power than 3 star rated, and additional investment is less as compared to the savings. Air conditioners over 10 years can be replaced with new 5 star rated ACs.

(b) Recommendations

(i) Install Energy Saver for ACs

Airtron is the most advanced AC SAVER with all the controls of a Precision AC.

Airtron's dual sensors reference the Room and Coil Temperature and working in tandem with its multiple algorithms in a "closed -loop circuit" ensure the high savings and adapts AC to Ambient Temperatures and Climatic changes, by maintaining room temperature while compressor run time is reduced.

Airtron allows to program the AC to climate & geographical locations and automatically adjusts itself to change the ambient conditions to save electricity. AIRTRON is available with a Remote for setting the Room Temperature and in Non-Flammable Polycarbonate Enclosure with SMPS Power Supply, to tolerate wide Voltage and Current fluctuations, Surges, Spikes and Sags.

Airtron has been validated on all ACs- Inverters, 5 Star, Splits, Multi-Splits, Packages, Ductable, Windows, Cassettes from 1.0 - 20.0 TR.

The salient features of Airtron AC saver are:

- ✓ Most advanced AC saver
- ✓ Display Room & Coil Temperature
- ✓ Automatically adapts AC to changes in ambient temperature & Climate
- ✓ Easy to install
- ✓ Applicable on ACs from 1.0 to 20TR, saves equally on inverters & 5 Star/ 1-Star AC's
- ✓ Energy saving up to 15 to 20%

Table 3.5: *Cost-benefit Analysis - Installation of AC Saver*

Description	Unit	Split AC
Total number of ACs	Nos.	48
Total AC load	kW	86.4
No. of hours of operation/ day	Hours/day	6
No. of days per annum	Days/year	200
Annual Energy Consumption	kWh/year	1,03,680
Power saving due to AC Saver @15%	kWh/year	15,552
Annual monetary savings(*@Rs.10.0 per kWh*)	Rs.	1,55,520
Investment for AC Savers *(@Rs.5,000 x 48 no's*	Rs.	2,40,000
Payback period	Months	19

3.4.1 Best Practices for Efficient Operation Air Conditioners

- *False ceiling*: excellent quality false ceiling must be maintained in the air conditioned rooms by keeping all doors and windows closed properly to prevent cool air go out and warm air come in.
- *Curtains*: Always keep curtains on windows to prevent direct sunlight inside the room to avoid heating of cooled air. This reduces AC load significantly.
- *Maintenance*: Proper maintenance and cleaning of ACs is required at regular intervals to make it work efficiently. Any dirt in filter may reduce efficiency of ACs very significantly.
- *Operation*: ACs should be switched on 15 minutes before actual use and should be switched off before leaving the room
- Outdoor units need to be kept under shady area and direct expose to sunlight will increase the power consumption of the compressor

- AC false ceiling to be provided for the AC rooms, for better air conditioning and reduction of room area and heat losses
- By adopting the above measures, a minimum of 10% to 15% of electricity consumption by ACs can be reduced.

CHAPTER 4

Lighting

4.1 Details of Lighting

Lighting system was assessed through visual observation and technical specification data were noted. The inventory data of the luminaries was provided by the department. The total lighting load of the unit is considerable of the total electrical load of the unit and hence, lighting needs equal emphasis along with other energy consuming areas. The plant has the following types of luminaries as under:

- LED Tube Lights
- LED Street Lights
- CFLs

Table 4.1:*Lighting load details*

S.No.	Name of the Building	C.F.L 10Watt	Tube Lights 20Watt	LED
1	Cotton Bhavan	62	161	
2	KL Rao Bhavan	44	324	
3	Bill Gates Bhavan	21	376	
4	Abdul Kalam Bhavan	83	244	
5	Ratan Tata Bhavan	16	97	
6	Hostel Block D		317	331
7	Hostel Block B		336	374
	Total	**226**	**1855**	**705**
		2.26	**37.1**	**14.1**

Majority of the tube lights are LED tube lights in the institution, and some are CFLs. The total connected load of lighting is 53.46 kW. It is suggested to replace the CFLS with LEDs bulbs or lights. The cost benefit analysis is furnished below:

Table 4.1:*Cost benefit Analysis of replacing CFLs with LEDs.*

Description	Unit	CFLS
Total number of CFLs	Nos.	226
Wattage	W	10
No. of hours of operation/ day	Hours/day	6
No. of days per annum	Days/year	250
Annual Energy Consumption	kWh/year	3,390
Power saving due to LEDs @50%	kWh/year	1,695
Annual monetary savings(*@Rs.10.0 per kWh*)	Rs.	16,950
Investment for AC Savers *(@Rs.100/- per bulb or light*	Rs.	22,600
Payback period	Months	16

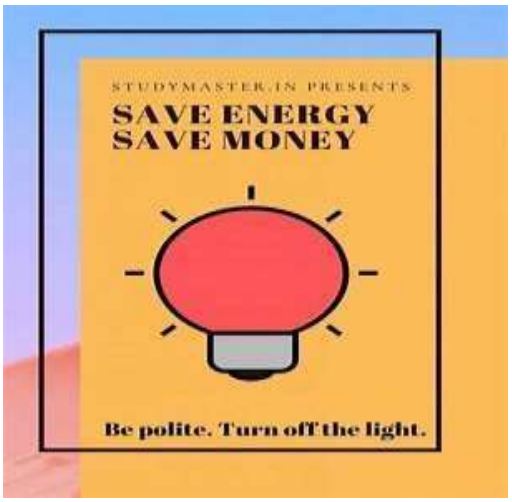
CHAPTER 5

General Observations

5.1 General Observations

All Class Rooms, hostel rooms and laboratories are observed to have Display Messages or Posters regarding optimum use of electrical appliances in the room like, lights, fans, computers, and projectors. Few sample posters is furnished below:

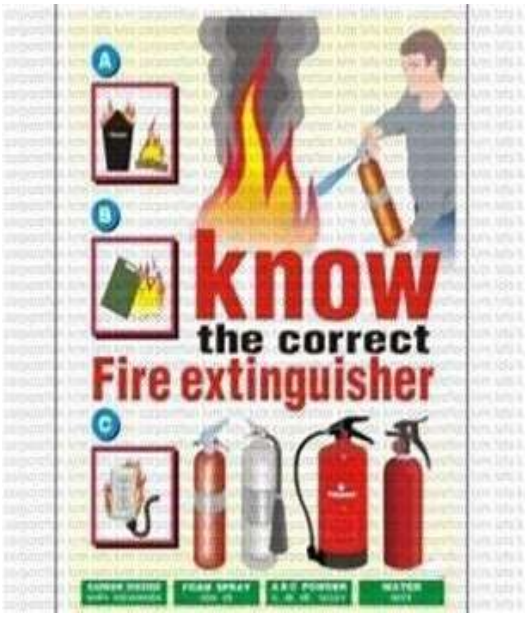
(a) Sample Posters for Awareness towards Energy Conservation



Also have stickers/labels of slogans/lines for energy saving in Class rooms/ Common areas

- Energy saved is energy produced.
- Switch of Lights/ Fans if not used
- Conservation: It does not cost. It saves.
- Spare a Watt; Save a Lot
- Save Today. Survive Tomorrow
- Energy misused cannot be excused

(b) Safety posters



ENVIRONMENTAL AUDIT REPORT

2021-2022

ADITYA ENGINEERING COLLEGE (AEC)

Prepared BY

Global Green Solutionz

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Acknowledgement

Global Green Solutionz (GGS) is thankful to the management and staff of Aditya Engineering College for awarding Environmental Audit for their college at Surampalem, East Godavari, Andhra Pradesh.

The Study team members of Global Green Solutionz would sincerely like to thank all the Department Heads and support staff members of Aditya Engineering College for providing the necessary support in order complete the Environmental audit.

For Global Green Solutionz

M. Srikanth

GLOBAL GREEN SOLUTIONZ HYDERABAD

Srikanth Meesa,
CEO, Global Green Solutionz

ABOUT THE COLLEGE

Aditya Engineering College was founded as the premier promoter of quality education in coastal districts of Andhra Pradesh during 2001-02 under the aegis of Aditya Academy. Sri N. Sesha Reddy, as a founder chairman, promoted the educational institution, with a mission, to offer the best engineering education with unmatched innovations in the process of teaching and learning by aiming at the all-round development of the students.

The College is situated in an eco-friendly area of 180 acres with thick greenery at Surampalem, Gandepalli Mandal, East Godavari District, Andhra Pradesh. The College is 15 KM away from Samalkot Railway Station on Howrah-Chennai Railway line in South Central Railway. The College is 35 Km away from Kakinada and Rajahmundry on ADB Road.

The College has six academic blocks with a total carpet area of 35,425 Sq. Mts. apart from two boys hostels and one girls hostel building. The particulars of academic buildings and the departments / offices accommodated are as follows.

S.No	Building Name	Department/Office
1	Cotton Bhavan	Administrative Office, Examination Cell, Accounts, Admission Office, ECE.
2	K.L. Rao Bhavan	Mechanical, Electrical, Petroleum Technology, Mining Engineering and Agricultural Engineering
3	Bill Gates Bhavan	CSE, IT, H&BS, Civil, Management Sciences
4	Abdul Kalam Bhavan	MCA

The college proudly offers 11 UG and 9 PG programmes in engineering, MCA, MBA and MBA (Integrated) with 20 years of rich standing in the educational era. Besides, the college has added many feathers in its cap which include AA+ Grade by Careers 360, South India 4th rank by Digital Mailers, South India 6th rank by Silicon India, 13th rank out of top 25 engineering colleges by 4Ps, a niche in Asia top 100 colleges by WCRC leaders, Best Placement Award by ASSOCHAM, All India 98th rank-DQ CMR top T-School survey by DATA Quest and 13th position in Top 20 colleges of India by the Sunday Indian. These districts recognitions speak volumes of the institute's objective to promote engineering excellence. The total student strength is 4986 with faculty strength of 264 thus giving rise to healthy faculty student ratio.

It is approved by AICTE, recognized by Govt. of Andhra Pradesh, Permanently affiliated

to Jawaharlal Nehru Technological University Kakinada (JNTUK) and is accredited by National Assessment and Accreditation Council (NAAC) with 'A Grade. The college also received UGC recognition under Sections 2(f) & 12(B) of the UGC Act.

Aditya Engineering College will do its best to offer an innovative environment wherein your dreams will be realized: dreams for higher knowledge, dreams for scientific inquiry, dreams for technology creation, dreams for co-curricular activities, and dreams to change the world.

Under Graduate Courses:

- B.Tech Civil engineering
- B.Tech Electrical and Electronics Engineering
- B.Tech Mechanical Engineering
- B.Tech Electronics and Communication Engineering
- B.Tech Computer Science and Engineering
- B.Tech Information Technology
- B.Tech Petroleum Technology
- B. Tech Agriculture Engineering
- B. Tech Mining engineering
- B.Tech Artificial Intelligence & Machine Learning
- B.Tech Computer Science and Engineering (Data Science)

Post Graduate Courses:

- M.Tech Structural Engineering
- M.Tech VLSI Design
- M.Tech Computer Science & Engineering
- M.Tech Power Electronics &Drives
- M.Tech Thermal Engineering
- M.Tech Petroleum Engineering
- M.B.A Master of Business Administration
- Integrated M.B.A Integrated Master of Business Administration
- M.C.A Master of Computer Applications

LAND USE ANALYSIS, AEC COLLEGE, SURAMPALEM, ANDHARA PARADESH (2022)

GENERAL OVERVIEW OF THE CONCEPT OF LANDUSE:

Land use involves the management and modification of natural environment or wilderness into built environment such as settlements and semi-natural habitats such as arable fields, pastures, and managed woods. It refers the activities and the various uses which are carried on and derived from land. Viewing the earth from space, it is now very crucial in man's activities on natural resource. In situations of rapid changes in land use, observations of the Earth from space give the information of human activities and utilization of the landscape (Howarth 1981).

The collection of remotely sensed data facilitates the synoptic analyses of earth system, functions, patterning, and change in the local, regional as well as at global scales over time. Satellite imagery particularly is a valuable tool for generating land use map using google maps.

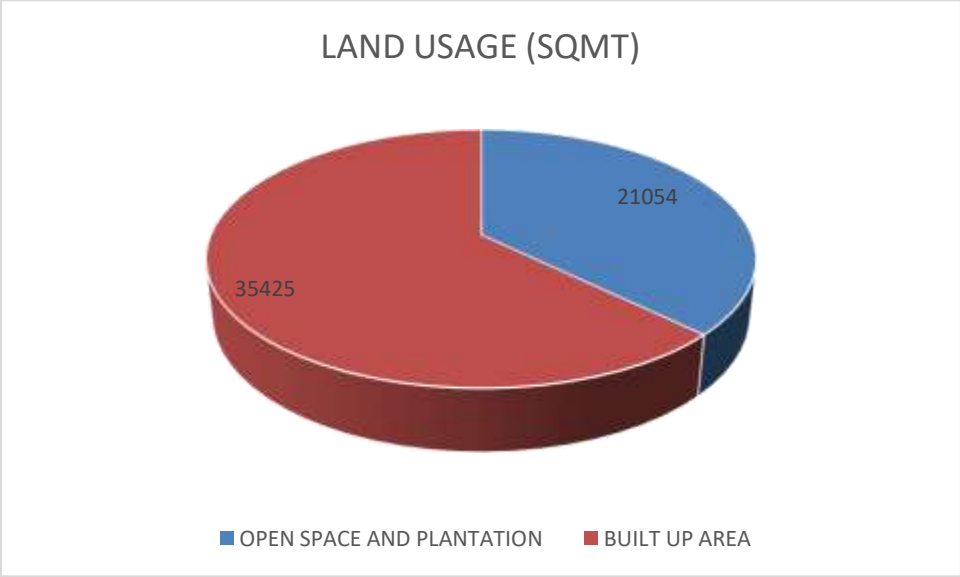
Site layout map of Aditya Engineering College (AEC)

METHODOLOGY ADOPTED FOR LAND USE MAPPING

Three types of data that are GPS points, field survey data and Google earth data for Georeferencing have been used in this study. Land use map of the study area have been prepared using the above three types of data with the help of google maps.

LAND USE DATA OF AEC, Surampalem

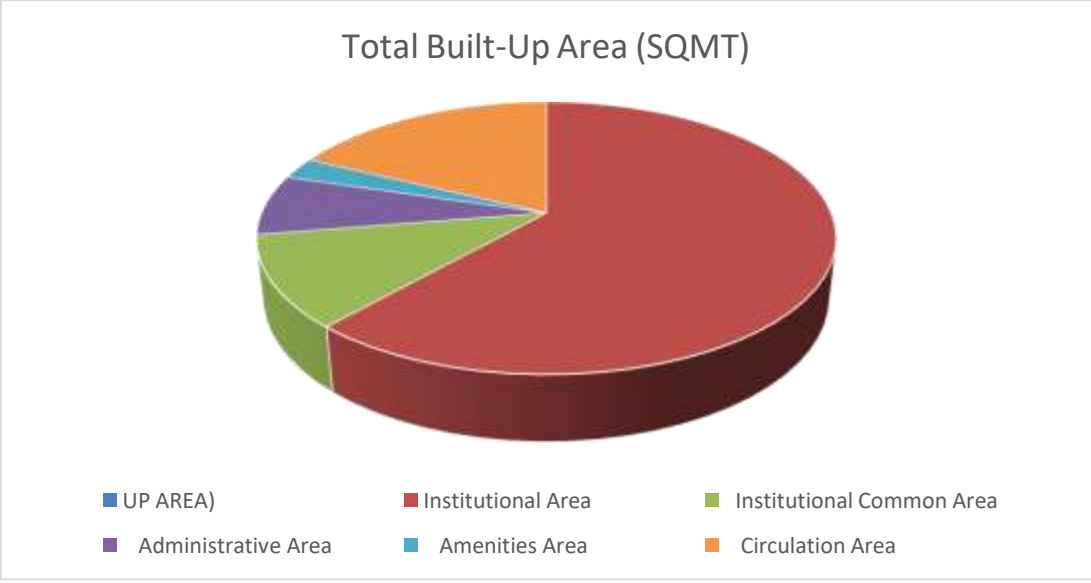
CATEGORIES OF LAND USE	AREA IN SQ METRES
OPEN SPACE AND PLANTATION	21054
BUILT UP AREA	35425
TOTAL AREA	56,479



The total area of AEC College is 56,479 sq. meters out of which the built-up area is 63% (i.e., 35425 sq. meters) and open space & plantation area is 37% (i.e., 21054 sq. meters).

LAND USE (BUILT UP AREA) ANALYSIS:

CATEGORIES OF LAND USE (BUILT UP AREA)	AREA IN SQ METRES
Institutional Area	21809.3
Institutional Common Area	3848.7
Administrative Area	2544
Amenities Area	903
Circulation Area	6320
TOTAL AREA	**35425**



The institutional area sums up to 21809.3 sq. meters, followed by circulation area 6320 sq. meters. Institutional common area is 3848.7 sq. meters. Administrative Area is 2544 sq. meters and the amenities occupy about 903 sq, meters.

AEC, which was established during the year 2001-02, has an eco-friendly environment. It has a long legacy of healthy environmental practices including periodic plantation, their preservation and maintenance. Its land use is such that about 24 % of the total area is occupied by open land and plantation that generates a better and sustainable campus environment.

TREE DIVERSITY OF AEC COLLEGE, Surampalem

AEC is within the geo-position between latitude 17.08967 N, and longitude 82.06680 E at Surampalem, 30 Km from Kakinada city India. It encompasses an area of about 180 acres of greenery in Surampalem. The area is immensely diverse with a variety of tree species performing a variety of functions. Most of these tree species are planted in different periods of time through various plantation programmes organized by the college management and have become an integral part of the college.

The trees of the college have increased the quality of life, not only the college fraternity but also the people around of the college in terms of contributing to our environment by providing oxygen, improving air quality, climate amelioration, conservation of water, preserving soil, controlling climate by moderating the effects of the sun, rain and wind. Leaves absorb and filter the sun's radiant energy, keeping things cool in summer. We often make an emotional connection with these trees and sometime become personally attached to the ones that we see every day. Thus, the college has been playing a significant role in maintaining the environment and its surrounding areas.

AEC campus is having total green area of **21,054 m²**

S.No.	component	Area in m²
1	Lawn	5585
2	Tree cover	6767
3	Potted plants	1426
4	Shrubs and hedges	7276

Below stated information is provided by the college management team:

- AEC campus has Garden on 21,054 square meters area. The garden has different sections in which specific types of plants are planted with respect to their medicinal importance and Vedic reference. Boards are displayed for each section and plants names. Sprinkler system is provided in herbal garden.
- Large trees and potted plants were seen in the campus. Plantation improves aesthetics and helps as buffer in reducing noise level, maintaining temperatures of the area. As informed by the garden supervisor, around 80 trees are present in the campus.
- Garden is managed by gardener. Organic fertilizers and pesticides are used for plants if necessary.

ELECTRICAL POWER CONSUMPTION AT AEC COLLEGE

Total Energy consumption: At AEC College, being one of the reputed colleges in the Andhra Pradesh consumed on an average 393948 kWh (units) of electricity per month which turns out to be 32829 kwh during 2021.

Transformer capacity : 500KV

Diesel generator, if any and capacity : 160KV

No. of pumps – 25 Borewell and sump pumps –10+15 HPs -10

Borewell	10
Sump pump	15

No. of building – Names with no. of rooms in each building

S.No.	Name of the Building	No. of Rooms
1	Cotton Bhavan	40
2	KL Rao Bhavan	73
3	Bill Gates Bhavan	91
4	Abdul kalam Bhavan	59
5	Abdul kalam Bhavan Extension	19
6	Ratan Tata Bhavan	-

Hostel details, no. of rooms, no. of students staying – inventory of lights, fans, ACs and geysers, if any

S.No	Hostel Block	Rooms	Students	Fans	C.F.L	Tube Lights	LED
1.	**B**	**152**	**291**	**324**	**-**	**317**	**331**
2.	**D**	**255**	**160**	**335**	**-**	**336**	**374**

Building wise inventory details
Type of tube lights, wattage, no. of fans, no. of ACs,

S.No.	Name of the Building	Fans each 50Watt	C.F.L 10Watt	Tube Lights 20Watt	AC 1.5 Ton
1	Cotton Bhavan	**269**	**62**	**161**	**19**
2	KL Rao Bhavan	**435**	**44**	**324**	**5**
3	Bill Gates Bhavan	**587**	**21**	**376**	**22**
4	Abdul kalam Bhavan	**384**	**83**	**244**	**2**
5	Abdul kalam Bhavan Extension	**134**	**16**	**97**	**-**
6	Ratan Tata Bhavan	**-**	**-**	**-**	**-**

Renewable energy: There is a Rooftop solar PV System of 500 KW capacity has been installed to cater to the energy needs of the college.

The college has also started using clean energy since 2018 from the 500 KW solar power plant installed near the college. It has produced 488434 units of clean energy during the financial year 2021-22.

WEATHER DATA OF Kakinada: AEC COLLEGE

Month-wise weather data of Kakinada City (30 Km from Surampalem AEC) For the year 2021

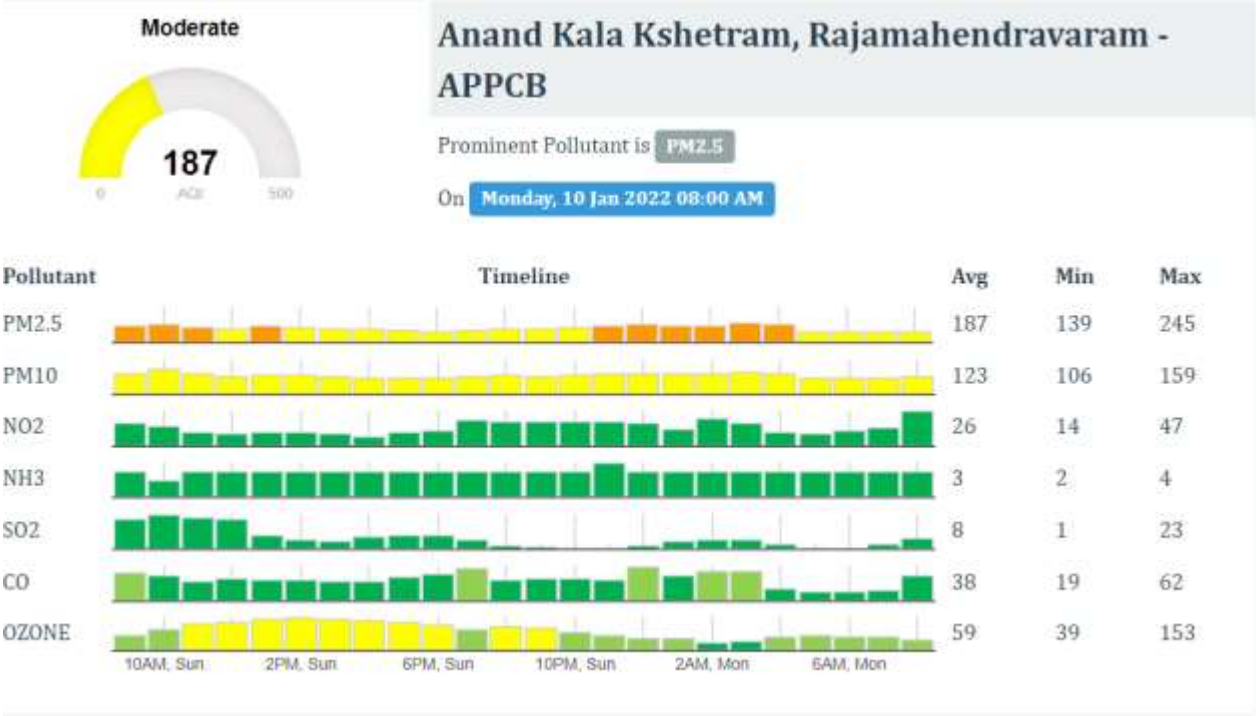
Mnth	Max Temp (C^0)	Min Temp (C^0)	Precipitation (mm)
January	34.6	20.3	12.6
February	37.8	21.7	10.3
March	40.0	24	7.5
April	42.8	26.2	16.4
May	46.9	27.8	42.3
June	47.4	27.3	122.8
July	41.7	26.2	175.4
August	38.4	25.9	176.9
September	37.9	25.9	199.4
October	37	24.8	243.
November	35.9	22.5	98.8
December	34	20.3	10.7

From the above table, it is evident the temperature is high in the month of June and low in the month of December. The rain fall is high during the month of September and low in the month of February.

AIR QUALITY IN KAKINADA: AEC COLLEGE

The climate of AEC college campus located at Surampalem near Kakinada city outskirts. It was noticed the college is away from the bustling city Kakinada and the campus is fully green with many trees and plantations.

Air Quality determination
Moderate: Air quality index (OVERALL 187) in **Rajamahendravaram weather station (34 km from Surampalem), India**



The air quality index is found 187 as per the publicly available data for the month January 2022. This indicates moderate air quality at the nearby air quality monitoring station. However, as the AEC campus is surrounded by greenery and plantation the air quality is of much better quality.

Indoor Air Quality:

The interviews with the college staff have revealed the below:

- During day- time Air Quality Index (AQI) of 45-60 because of campus greenery
- In kitchens present in Cafeteria, LPG is used for cooking which is a clean fuel.
- In classrooms the mode of ventilation is natural draft (through windows) and is enhanced by fans. Large windows and cross-ventilation are observed in corridors. Air conditioners are used in some offices, computer laboratories and computer server room.
- Exhaust fans are provided in chemistry laboratory and all kitchens.

WATER ANALYSIS AT AEC

The overhead tanks installed at the top of all the building blocks provided water for domestic use within the blocks of Aditya Engineering College. The bore well is used to feed the overhead tanks with groundwater. The water used in restrooms, wash basins, and other areas comes only from overhead tanks, which have been cleaned every three months. When it came to drinking water, cooling water tanks on the top level. The waste water collected from the drinking water basins is utilized for watering of plants on the garden.

AEC consumes the ground water which is stored in the sump and overhead tanks. The sump capacity is 130 KL.

It was informed that there is 2000 Liters per hour of Reverse Osmosis plant. It was observed the RO plant is working efficiently.

Green audit team noticed that the drinking water quality was found good and potable.

Green audit team has noticed that there is a water harvesting pit where the RO reject is

used to recharge the ground water. Approximately 40% of the water entering the RO water gets rejected which is used to recharge the ground water.

Wastewater: Wastewater is mainly generated from toilet flushing and kitchens. Wastewater generated from academic blocks as well as hostels is collected in septic tanks and passed to surrounding trees and plants through canals.

Rainwater harvesting:

Rainwater collected from building roofs is gathered in the building blocks' interior gardens. Some rainwater is directly absorbed into the ground, while some is used for vegetation development. The majority of the precipitated water was channeled to the inner garden area's outlet, where it entered the combined drainage system. The drained water was sent to the campus's open ponds, while precipitation that fell near the ponds was also transported through drains and gathered in the ponds.

The rainwater is fed into the surface pond nearby the college. The picture of the pond is provided below.

The pond water is used for gardening needs of the college.

Liquid Waste Management:

The liquid wastes generated in the campus include Sewage, Laboratory, Laundry, hostel and canteen effluent waste. The above waste is treated through Pond setup in the institute with a capacity of 95000 KLD (Kilo Liters per Day). The entire treated water is used for watering the gardens and lawns maintained in the campus. Therefore, the entire waste water generated in the campus is treated and reused. The laboratory waste water does not contain hazardous chemicals and periodical monitoring is done by the maintenance team.

NOISE LEVEL IN THE SURROUNDING OF AEC COLLEGE

Our site visit observations, revealed that the noise levels were found satisfactory and within the permissible limits.

WASTE MANAGEMENT AT AEC COLLEGE

Management of solid waste is an important driver in Green Audit. Solid waste not properly managed leads to the degradation of the environment which, in turn, affects the flora and fauna. Keeping this in mind, the College has been strictly implementing scientific solid waste management to maintain the green status of the campus.

The present Prime Minister of India Sri Narendra Modi launched 'Swachh Bharat Abhiyan' (Clean India Mission) on 2nd October, 2014. In this mission, the proper use of dust/waste bins is one of the major priorities. For the implementation of this mission, collective mass effort is necessary. For proper segregation and management. proper use of waste bins is the only solution for waste management purpose in the college campuses.

Waste Management includes the management and handling of all types of wastes. This waste types include the following:

Wet Waste: Wet waste includes the organic waste such a food waste, kitchen waste after peeling the vegetables and garden waste etc.

Dry Waste: Dry waste can be categorized into different wastes such as plastic waste, E-Waste, bio-medical waste, Construction & demolition waste and hazardous waste.

Paper Waste:

In order to reduce the paper waste, the management started digitization. It has implemented good practices such as prints and photocopies are taken on both sides of the pages. Further, the campus has E-book facility since 2018 all the book are available on the college website for the students at any time. Further, records of books and e-books are well kept and were available for review.

Internal notices and communications are through E-mail/SMS. AEC has Learning Management System (LMS) where notices are sent, exam results are displayed and attendance is recorded digitally.

Other good practices followed by AEC are provided below:

- Biometric attendance is provided for AEC staff.
- Paper notices are displayed on the notice boards. The dissertation reports, journals, and answer papers are stored as per the University rules.
- Around 10 kg paper waste is being generated by AEC each year. Old papers and books are given to the recycler Aditya Notebooks
- AEC encourage students to use eco-friendly material and recycle old papers/ scrap for decoration purpose during college festivals.

Solid Waste:

Being an institute with residential facility, considerable quantity of wet (food/ organic) waste is generated in the premises.

Below information is obtained from the college:

Pollution from waste is aesthetically unpleasing and results in large amounts of litter in our communities which can cause health problems. It is a great concern relating to environment and society Aditya Engineering College took major steps to manage the waste to protect and create a clean and pleasant environment. The departments as well as administrative offices generates some waste and put in two bins for wet waste and dry waste kept in departments and corridors. Each building has several dust bins from where the housekeeping staff collects the trash. In the same manner waste from canteens, residential quarters, Hostel and guest houses is collected. The collected waste is dumped in big containers (wet and dry) by the housekeeping staffs regularly. The whole waste is then segregated and then the waste that can be used for composting is dumped for vermicomposting. Vermicomposting unit converts the biodegradable waste to fertilizer. This fertilizer is used to promote the lemon orchard located in the AEC campus. AEC discourages use of plastic; particularly single use plastics in campus. Paper wastes from departments, Library, Administrative offices, Hostels, are disposed through vendors. The wastes are properly stacked in designated place and later disposed through vendors for proper waste management. Aditya promotes digital platform to reduce the usage of paper for communication and sharing documents.

E-Waste:

Being one of the progressive colleges in India, AEC has also moved to on-line learning system through it's e-courses. This includes classrooms, library, internal mails etc. All the classrooms are digitized. It also has an E-library, student & staff portal for academic work, biometric attendance system for staff, etc.

Electronic goods are put to optimum use; the minor repairs are set right by the Laboratory assistants and teaching staff; and the major repairs are handled by the Technical Assistant and are reused. AEC has entered MoU with ELECTROPRO SYSTEMS which buys our damaged computers and other non-reparable e-waste and issues a recycling certificate. ELECTROPRO procures the equipment which cannot be refurbished for re-use is dismantled and remanufactured into raw materials (i.e. metals, plastics, glass) to be marketed as recyclable. The waste compact discs and other disposable non-hazardous items are used by students for decoration during college fests as a creative means of showcasing the waste management practice that has been induced in the minds of the students.

Transportation

AEC is located in surampalem, which is 35 km from Kakinada and 35 km from Rajahmundry. AEC provides buses and cars for transportation for students/ staff. Most of the staff pool buses and cars and a few staff members travel by private vehicles. AEC management encourage students and staff to use the college buses (40) or public transport system to reduce carbon emissions.

Sustainability Initiatives

Due to minimum consideration for environment & sustainability, the world is facing problems of ozone depletion, climate change, water scarcity and sustainable resource management. AEC organizes guest lectures on Environmental conservation, biodiversity, etc. every year.

AEC has a demonstrated consistent commitment towards nature and environment. AEC started Haritha eco green club, which offers wide spectrum of environmental and nature activities and platforms to enhance awareness and exhibit the relationship with nature. Various activities organized by 'Haritha 'involved guest lectures, nature visits, workshops and competitions.

NSS groups of AEC organized the green activities and awareness campaigns such as plantation camps in college, rally in nearby villages.

Recommendations/ Suggestions

For Indoor Air Quality

- Indoor plants can be chosen in such a way that they give aesthetic appearance as well as health benefits.
- Information on sources, impacts and mitigation of indoor air pollution to be displayed within AEC for increasing awareness about indoor air pollution. E.g. Signage can be put in chemistry laboratory for handling fuming chemicals.

Water Conservation

- Provide information on water usage and savings to students/ staff through notices, screen savers in computer laboratories, and encourage reduction/ wastage of water.
- Replace all old water faucets with water saving faucets, aerator taps, jet sprays etc. Installation of such faucets can save water and help in minimizing the water footprint.
- Dual flushing system can be installed for toilet flushing, with appropriate instructions, which will save considerable amount of water.
- Grey water/ sewage recycling system can be installed for flushing toilets. This will reduce the fresh water footprint.
- Signage/ posters should be posted in high water consumption areas in Academic Blocks to increase awareness regarding water conservation.
- As the source of water is borewell, AEC can install water meter on borewell line to monitor daily borewell withdrawal.
- Implementation of the STP could reduce the dependency on the ground water.

GREEN AUDIT REPORT

2021-2022

ADITYA ENGINEERING COLLEGE (AEC)

Prepared BY

Global Green Solutionz

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Acknowledgement

Global Green Solutionz (GGS) is thankful to the management and staff of Aditya Engineering College for awarding Green Audit for their college at Surampalem, East Godavari, Andhra Pradesh.

The Study team members of Global Green Solutionz would sincerely like to thank all the Department Heads and support staff members of Aditya Engineering College for providing the necessary support in order complete the green audit.

For Global Green Solutionz.

Srikanth Meesa

M. Srikanth

GLOBAL GREEN SOLUTIONZ HYDERABAD

INTRODUCTION

The term “Green” means eco-friendly or not damaging the environment. This can acronymic ally is called as “Global Readiness in Ensuring Ecological Neutrality” (GREEN). Green audit was initiated in the beginning of 1970s with the motive of inspecting the work conducted with in the organizations whose exercises can cause risks to the health of inhabitants and the environment. It exposes the authenticity of the proclamations made by multi-national companies, armies and national governments with the concern of health issues as the consequence of environmental pollution Green Audit is one of the systematic audits to assess the impact of the institutions on the environment with respect to land, air, water, solid waste, noise etc. In order to conduct the green audit a systematic identification, recording, reporting and analysis is essential. The objective is to analyze environmental practices within and outside of the concerned facilities, which will have an impact on the eco-friendly ambience. Green audit is one of the useful tools for a college to determine how and where they are using the vital resources such as energy, water etc. Thus, it provides the opportunity to identify the potential options to conserve these precious natural resources. the college can then consider how to implement changes and make savings. It also includes the determination of various types of wastes and how to manage them effectively without polluting the environment. It can create health consciousness and promote environmental awareness, values and ethics. It provides staff and students better understanding and encourages them to cultivate the green practices in the campus. It is the need of the hour for the colleges to evaluate its own contributions toward a sustainable future. Environmental sustainability has become one of the pressing issues for the nation, the role of higher educational institutions in relation to environmental sustainability is more prevalent.

The rapid urbanization and economic development at local, regional and global level has led to several environmental and ecological impacts. On this background it becomes essential to adopt the system of the Green Campus for the institutes which will lead for sustainable development and at the same time reduce a sizable amount of atmospheric carbon-di-oxide from the environment. The National Assessment and Accreditation Council, New Delhi (NAAC) has made it mandatory that all Higher Educational Institutions should submit an annual Green Audit Report.

OBJECTIVES:

The main objective of the green audit is to promote the Environment Management and Conservation in the College Campus. In recent time, the Green Audit of an institution has been becoming a paramount important for self-assessment of the institution which reflects the role of the institution in mitigating the present environmental problems. The college has been putting efforts to keep our environment clean since its inception. But the auditing of this non-scholastic effort of the college has not been documented. Therefore, the purpose of the present green audit is to identify, quantify, describe and prioritize framework of Environment Sustainability in compliance with the applicable regulations, policies and standards.

The main objectives of carrying out Green Audit are:

- To secure the environment and cut down the threats posed to human health by analyzing the pattern and extent of resource use of the campus
- To map the Geographical Location of the college
- To record the meteorological parameter of Surrepalem where college is situated.
- To estimate the Energy and water requirements of the college
- To document the Waste disposal system
- To document the ambient environmental condition of air, water and noise of the college
- To introduce and aware students to real concerns of environment and its Sustainability.

METHODOLOGY:

It is the duty of the originations to carry out the green audits of their on-going process for various reasons such as; to make sure whether they are performing in accordance with relevant rules and regulations, to improve the procedure and ability of materials, to analyze the potential duties and to determine a way in which can lower the costs and add to the revenue. Through, green audit, one gets a direction as to how to improve the condition of the environment and there are various factors that have determined the growth of carrying the green audit.

Green audit is assigned to the criteria 7 of NAAC, National Assessment and Accreditation council which is a self-governing organization of India that declares institutions as Grade A, Grade B and Grade C, according to the scores assigned at the time of accreditation.

The Intention of Green Audit is to upgrade the environment condition in and around the institutes, colleges, companies and other organizations. It is carried out with the aid of performing tasks like waste management, energy saving and others to turn it into better environmentally friendly institute.

Step Under Green Audit:

- **Plan the audit:** Green auditing related data was collected during July 2022
- **Select the audit team:** AEC has hired Global Green Solutionz (GGS) to conduct the green audit. GGS has appointed a is well qualified team that has good knowledge in the field of environment.
- **Schedule the audit facility:** The audit facility is the AEC campus including the connected hostels.
- **Acquire the background information:** GGS team has interviewed the appointed green audit coordinators from AEC college. They have submitted the relevant data related to landscaping, built up area, energy and water related data which are part of the report.

Benefits of Green Audit:

- To Shield the environment
- To recognize the cost saving methods through waste minimizing and managing
- To point out the prevailing and forthcoming complications
- Authenticate conformity with implemented laws
- Empower the organizations to frame the better environmental performance
- It portrays the good image of the institution which helps building better relationships with group of stakeholders

ABOUT THE COLLEGE

Aditya Engineering College was founded as the premier promoter of quality education in coastal districts of Andhra Pradesh during 2001-02 under the aegis of Aditya Academy. Sri N. Sesha Reddy, as a founder chairman, promoted the educational institution, with a mission, to offer the best engineering education with unmatched innovations in the process of teaching and learning by aiming at the all-round development of the students.

The College is situated in an eco-friendly area of 180 acres with thick greenery at Surampalem, Gandepalli Mandal, East Godavari District, Andhra Pradesh. The College is 15 KM away from Samalkot Railway Station on Howrah-Chennai Railway line in South Central Railway. The College is 35 Km away from Kakinada and Rajahmundry on ADB Road.

The College has six academic blocks with a total carpet area of 35,425 Sq. Mts. apart from two boys hostels and one girls hostel building. The particulars of academic buildings and the departments / offices accommodated are as follows.

S.No	Building Name	Department/Office
1	Cotton Bhavan	Administrative Office, Examination Cell, Accounts, Admission Office, ECE.
2	K.L. Rao Bhavan	Mechanical, Electrical, Petroleum Technology, Mining Engineering and Agricultural Engineering
3	Bill Gates Bhavan	CSE, IT, H&BS, Civil, Management Sciences
4	Abdul Kalam Bhavan	MCA

The college proudly offers 11 UG and 9 PG programmes in engineering, MCA, MBA and MBA (Integrated) with 20 years of rich standing in the educational era. Besides, the college has added many feathers in its cap which include AA+ Grade by Careers 360, South India 4th rank by Digital Mailers, South India 6th rank by Silicon India, 13th rank out of top 25 engineering colleges by 4Ps, a niche in Asia top 100 colleges by WCRC leaders, Best Placement Award by ASSOCHAM, All India 98th rank-DQ CMR top T-School survey by DATA Quest and 13th position in Top 20 colleges of India by the Sunday Indian. These districts recognitions speak volumes of the institute's objective to promote engineering excellence. The total student strength is 4986 with faculty strength of 264 thus giving rise to healthy faculty student ratio.

It is approved by AICTE, recognized by Govt. of Andhra Pradesh, Permanently affiliated to Jawaharlal Nehru Technological University Kakinada (JNTUK) and is accredited by National Assessment and Accreditation Council (NAAC) with 'A Grade. The college also received UGC recognition under Sections 2(f) & 12(B) of the UGC Act.

Aditya Engineering College will do its best to offer an innovative environment wherein your dreams will be realized: dreams for higher knowledge, dreams for scientific inquiry, dreams for technology creation, dreams for co-curricular activities, and dreams to change the world.

Under Graduate Courses:

- B.Tech Civil engineering
- B.Tech Electrical and Electronics Engineering
- B.Tech Mechanical Engineering
- B.Tech Electronics and Communication Engineering
- B.Tech Computer Science and Engineering
- B.Tech Information Technology
- B.Tech Petroleum Technology
- B. Tech Agriculture Engineering
- B. Tech Mining engineering
- B.Tech Artificial Intelligence & Machine Learning
- B.Tech Computer Science and Engineering (Data Science)

Post Graduate Courses:

- M.Tech Structural Engineering
- M.Tech VLSI Design
- M.Tech Computer Science & Engineering
- M.Tech Power Electronics &Drives
- M.Tech Thermal Engineering
- M.Tech Petroleum Engineering
- M.B.A Master of Business Administration
- Integrated M.B.A Integrated Master of Business Administration
- M.C.A Master of Computer Applications

LAND USE ANALYSIS, AEC COLLEGE, SURAMPALEM, ANDHARA PARADESH (2022)

GENERAL OVERVIEW OF THE CONCEPT OF LANDUSE:

Land use involves the management and modification of natural environment or wilderness into built environment such as settlements and semi-natural habitats such as arable fields, pastures, and managed woods. It refers the activities and the various uses which are carried on and derived from land. Viewing the earth from space, it is now very crucial in man's activities on natural resource. In situations of rapid changes in land use, observations of the Earth from space give the information of human activities and utilization of the landscape (Howarth 1981).

The collection of remotely sensed data facilitates the synoptic analyses of earth system, functions, patterning, and change in the local, regional as well as at global scales over time. Satellite imagery particularly is a valuable tool for generating land use map using google maps.

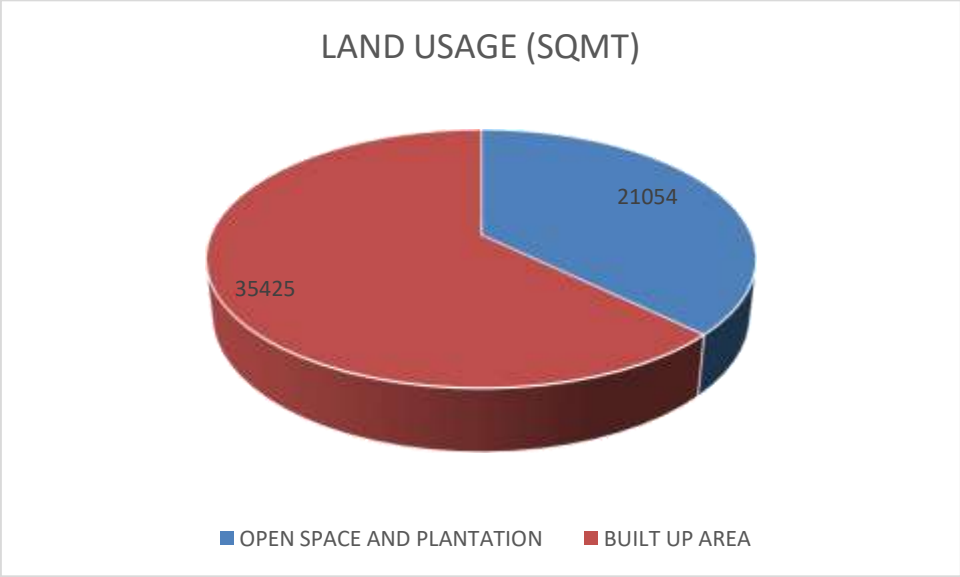
Site layout map of Aditya Engineering College (AEC)

METHODOLOGY ADOPTED FOR LAND USE MAPPING

Three types of data that are GPS points, field survey data and Google earth data for Georeferencing have been used in this study. Land use map of the study area have been prepared using the above three types of data with the help of google maps.

LAND USE DATA OF AEC, Surampalem

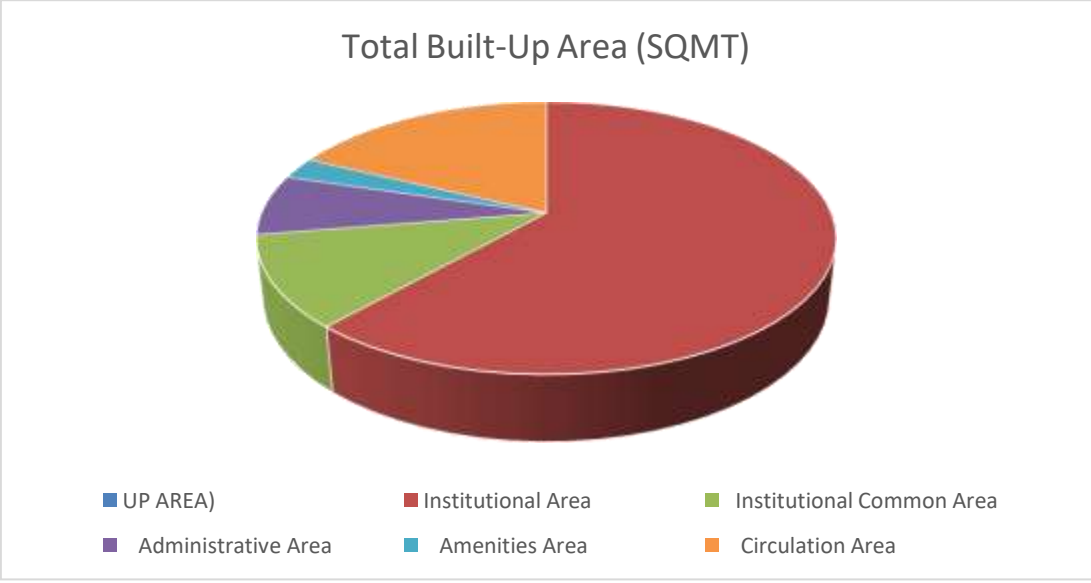
CATEGORIES OF LAND USE	AREA IN SQ METRES
OPEN SPACE AND PLANTATION	21054
BUILT UP AREA	35425
TOTAL AREA	56,479



The total area of AEC College is 56,479 sq. meters out of which the built-up area is 63% (i.e., 35425 sq. meters) and open space & plantation area is 37% (i.e., 21054 sq. meters).

LAND USE (BUILT UP AREA) ANALYSIS:

CATEGORIES OF LAND USE (BUILT UP AREA)	AREA IN SQ METRES
Institutional Area	21809.3
Institutional Common Area	3848.7
Administrative Area	2544
Amenities Area	903
Circulation Area	6320
TOTAL AREA	**35425**



The institutional area sums up to 21809.3 sq. meters, followed by circulation area 6320 sq. meters. Institutional common area is 3848.7 sq. meters. Administrative Area is 2544 sq. meters and the amenities occupy about 903 sq, meters.

AEC, which was established during the year 2001-02, has an eco-friendly environment. It has a long legacy of healthy environmental practices including periodic plantation, their preservation and maintenance. Its land use is such that about 24 % of the total area is occupied by open land and plantation that generates a better and sustainable campus environment.

TREE DIVERSITY OF AEC COLLEGE, Surampalem

AEC is within the geo-position between latitude 17.08967 N, and longitude 82.06680 E at Surampalem, 30 Km from Kakinada city India. It encompasses an area of about 180 acres of greenery in Surampalem. The area is immensely diverse with a variety of tree species performing a variety of functions. Most of these tree species are planted in different periods of time through various plantation programmes organized by the college management and have become an integral part of the college.

The trees of the college have increased the quality of life, not only the college fraternity but also the people around of the college in terms of contributing to our environment by providing oxygen, improving air quality, climate amelioration, conservation of water, preserving soil, controlling climate by moderating the effects of the sun, rain and wind. Leaves absorb and filter the sun's radiant energy, keeping things cool in summer. We often make an emotional connection with these trees and sometime become personally attached to the ones that we see every day. Thus, the college has been playing a significant role in maintaining the environment and its surrounding areas.

AEC campus is having total green area of **21,054 m²**

S.No.	component	Area in m²
1	Lawn	5585
2	Tree cover	6767
3	Potted plants	1426
4	Shrubs and hedges	7276

Below stated information is provided by the college management team:

- AEC campus has Garden on 21,054 square meters area. The garden has different sections in which specific types of plants are planted with respect to their medicinal importance and Vedic reference. Boards are displayed for each section and plants names. Sprinkler system is provided in herbal garden.
- Large trees and potted plants were seen in the campus. Plantation improves aesthetics and helps as buffer in reducing noise level, maintaining temperatures of the area. As informed by the garden supervisor, around 80 trees are present in the campus.
- Garden is managed by gardener. Organic fertilizers and pesticides are used for plants if necessary.

ELECTRICAL POWER CONSUMPTION AT AEC COLLEGE

Total Energy consumption: At AEC College, being one of the reputed colleges in the Andhra Pradesh consumed on an average 393948 kWh (units) of electricity per month which turns out to be 32829 kwh during 2021.

Transformer capacity : 500KV

Diesel generator, if any and capacity : 160KV

No. of pumps – 25 Borewell and sump pumps –10+15 HPs -10

Borewell	10
Sump pump	15

No. of building – Names with no. of rooms in each building

S.No.	Name of the Building	No. of Rooms
1	Cotton Bhavan	40
2	KL Rao Bhavan	73
3	Bill Gates Bhavan	91
4	Abdul kalam Bhavan	59
5	Abdul kalam Bhavan Extension	19
6	Ratan Tata Bhavan	-

Hostel details, no. of rooms, no. of students staying – inventory of lights, fans, ACs and geysers, if any

S.No	Hostel Block	Rooms	Students	Fans	C.F.L	Tube Lights	LED
1.	**B**	**152**	**291**	**324**	**-**	**317**	**331**
2.	**D**	**255**	**160**	**335**	**-**	**336**	**374**

Building wise inventory details
Type of tube lights, wattage, no. of fans, no. of ACs,

S.No.	Name of the Building	Fans each 50Watt	C.F.L 10Watt	Tube Lights 20Watt	AC 1.5 Ton
1	Cotton Bhavan	**269**	**62**	**161**	**19**
2	KL Rao Bhavan	**435**	**44**	**324**	**5**
3	Bill Gates Bhavan	**587**	**21**	**376**	**22**
4	Abdul kalam Bhavan	**384**	**83**	**244**	**2**
5	Abdul kalam Bhavan Extension	**134**	**16**	**97**	**-**
6	Ratan Tata Bhavan	**-**	**-**	**-**	**-**

Renewable energy: There is a Rooftop solar PV System of 500 KW capacity has been installed to cater to the energy needs of the college.

The college has also started using clean energy since 2018 from the 500 KW solar power plant installed near the college. It has produced 488434 units of clean energy during the financial year 2021-22.

WEATHER DATA OF Kakinada: AEC COLLEGE

Month-wise weather data of Kakinada City (30 Km from Surampalem AEC) For the year 2021

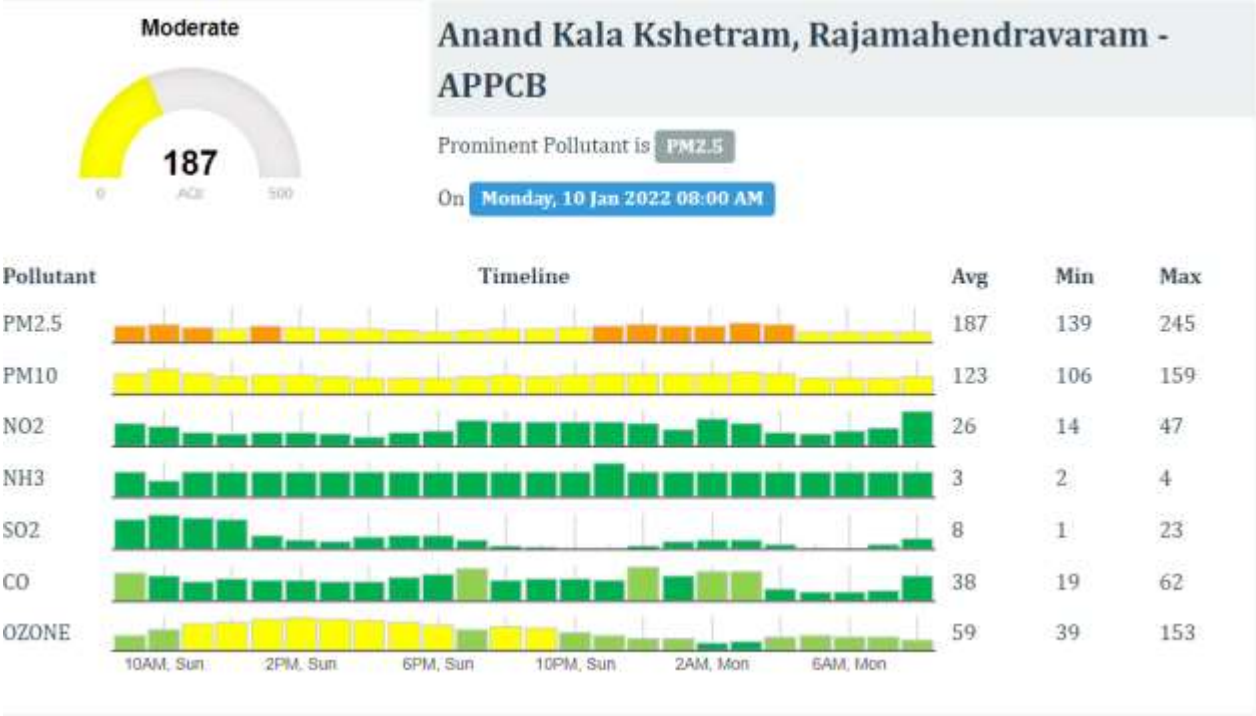
Mnth	Max Temp (C^0)	Min Temp (C^0)	Precipitation (mm)
January	34.6	20.3	12.6
February	37.8	21.7	10.3
March	40.0	24	7.5
April	42.8	26.2	16.4
May	46.9	27.8	42.3
June	47.4	27.3	122.8
July	41.7	26.2	175.4
August	38.4	25.9	176.9
September	37.9	25.9	199.4
October	37	24.8	243.
November	35.9	22.5	98.8
December	34	20.3	10.7

From the above table, it is evident the temperature is high in the month of June and low in the month of December. The rain fall is high during the month of September and low in the month of February.

AIR QUALITY IN KAKINADA: AEC COLLEGE

The climate of AEC college campus located at Surampalem near Kakinada city outskirts. It was noticed the college is away from the bustling city Kakinada and the campus is fully green with many trees and plantations.

Air Quality determination
Moderate: Air quality index (OVERALL 187) in **Rajamahendravaram weather station (34 km from Surampalem), India**



The air quality index is found 187 as per the publicly available data for the month January 2022. This indicates moderate air quality at the nearby air quality monitoring station. However, as the AEC campus is surrounded by greenery and plantation the air quality is of much better quality.

Indoor Air Quality:

The interviews with the college staff have revealed the below:

- During day- time Air Quality Index (AQI) of 45-60 because of campus greenery
- In kitchens present in Cafeteria, LPG is used for cooking which is a clean fuel.
- In classrooms the mode of ventilation is natural draft (through windows) and is enhanced by fans. Large windows and cross-ventilation are observed in corridors. Air conditioners are used in some offices, computer laboratories and computer server room.
- Exhaust fans are provided in chemistry laboratory and all kitchens.

WATER ANALYSIS AT AEC

The overhead tanks installed at the top of all the building blocks provided water for domestic use within the blocks of Aditya Engineering College. The bore well is used to feed the overhead tanks with groundwater. The water used in restrooms, wash basins, and other areas comes only from overhead tanks, which have been cleaned every three months. When it came to drinking water, cooling water tanks on the top level. The waste water collected from the drinking water basins is utilized for watering of plants on the garden.

AEC consumes the ground water which is stored in the sump and overhead tanks. The sump capacity is 130 KL.

It was informed that there is 2000 Liters per hour of Reverse Osmosis plant. It was observed the RO plant is working efficiently.

Green audit team noticed that the drinking water quality was found good and potable.

Green audit team has noticed that there is a water harvesting pit where the RO reject is

used to recharge the ground water. Approximately 40% of the water entering the RO water gets rejected which is used to recharge the ground water.

Wastewater: Wastewater is mainly generated from toilet flushing and kitchens. Wastewater generated from academic blocks as well as hostels is collected in septic tanks and passed to surrounding trees and plants through canals.

Rainwater harvesting:

Rainwater collected from building roofs is gathered in the building blocks' interior gardens. Some rainwater is directly absorbed into the ground, while some is used for vegetation development. The majority of the precipitated water was channeled to the inner garden area's outlet, where it entered the combined drainage system. The drained water was sent to the campus's open ponds, while precipitation that fell near the ponds was also transported through drains and gathered in the ponds.

The rainwater is fed into the surface pond nearby the college. The picture of the pond is provided below.

The pond water is used for gardening needs of the college.

Liquid Waste Management:

The liquid wastes generated in the campus include Sewage, Laboratory, Laundry, hostel and canteen effluent waste. The above waste is treated through Pond setup in the institute with a capacity of 95000 KLD (Kilo Liters per Day). The entire treated water is used for watering the gardens and lawns maintained in the campus. Therefore, the entire waste water generated in the campus is treated and reused. The laboratory waste water does not contain hazardous chemicals and periodical monitoring is done by the maintenance team.

NOISE LEVEL IN THE SURROUNDING OF AEC COLLEGE

Our site visit observations, revealed that the noise levels were found satisfactory and within the permissible limits.

WASTE MANAGEMENT AT AEC COLLEGE

Management of solid waste is an important driver in Green Audit. Solid waste not properly managed leads to the degradation of the environment which, in turn, affects the flora and fauna. Keeping this in mind, the College has been strictly implementing scientific solid waste management to maintain the green status of the campus.

The present Prime Minister of India Sri Narendra Modi launched 'Swachh Bharat Abhiyan' (Clean India Mission) on 2nd October, 2014. In this mission, the proper use of dust/waste bins is one of the major priorities. For the implementation of this mission, collective mass effort is necessary. For proper segregation and management. proper use of waste bins is the only solution for waste management purpose in the college campuses.

Waste Management includes the management and handling of all types of wastes. This waste types include the following:

Wet Waste: Wet waste includes the organic waste such a food waste, kitchen waste after peeling the vegetables and garden waste etc.

Dry Waste: Dry waste can be categorized into different wastes such as plastic waste, E-Waste, bio-medical waste, Construction & demolition waste and hazardous waste.

Paper Waste:

In order to reduce the paper waste, the management started digitization. It has implemented good practices such as prints and photocopies are taken on both sides of the pages. Further, the campus has E-book facility since 2018 all the book are available on the college website for the students at any time. Further, records of books and e-books are well kept and were available for review.

Internal notices and communications are through E-mail/SMS. AEC has Learning Management System (LMS) where notices are sent, exam results are displayed and attendance is recorded digitally.

Other good practices followed by AEC are provided below:

- Biometric attendance is provided for AEC staff.
- Paper notices are displayed on the notice boards. The dissertation reports, journals, and answer papers are stored as per the University rules.
- Around 10 kg paper waste is being generated by AEC each year. Old papers and books are given to the recycler Aditya Notebooks
- AEC encourage students to use eco-friendly material and recycle old papers/ scrap for decoration purpose during college festivals.

Solid Waste:

Being an institute with residential facility, considerable quantity of wet (food/ organic) waste is generated in the premises.

Below information is obtained from the college:

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Water Conservation

- Provide information on water usage and savings to students/ staff through notices, screen savers in computer laboratories, and encourage reduction/ wastage of water.
- Replace all old water faucets with water saving faucets, aerator taps, jet sprays etc. Installation of such faucets can save water and help in minimizing the water footprint.
- Dual flushing system can be installed for toilet flushing, with appropriate instructions, which will save considerable amount of water.
- Grey water/ sewage recycling system can be installed for flushing toilets. This will reduce the fresh water footprint.
- Signage/ posters should be posted in high water consumption areas in Academic Blocks to increase awareness regarding water conservation.
- As the source of water is borewell, AEC can install water meter on borewell line to monitor daily borewell withdrawal.
- Implementation of the STP could reduce the dependency on the ground water.