2023

Report on Energy Audit

Prepared for

SAHYA ARTS AND SCIENCE COLLEGE, Vellambram in Re survey No: 417/0-3, Ward No:4, Wandoor Panchayath, Malappuram District

ENERGY AUDIT REPORT –prepared for SAHYA ARTS AND SCIENCE COLLEGE, Vellambram in Re survey No: 417/0-3, Ward No:4, Wandoor Panchayath, Malappuram District.

Prepared for	SAHYA ARTS AND SCIENCE COLLEGE, Vellambram in Re survey No: 417/0-3, Ward No:4, Wandoor Panchayath, Malappuram District
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Report No 07/24/SAHYA

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Document history

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WILDLIFE RESEARCH & CONSERVATION TRUST

A non-profit public charitable trust- Reg. No. 580/2005 ESTD in 2005, under the Societies Registration Act [No.21/1860]

Consultancy No 04/24 24.05.2024

AUDIT CERTIFICATE

PRESENTED TO

SAHYA ARTS AND SCIENCE COLLEGE

Has been assessed by the WRCT for the comprehensive study of institutional working framework, to fulfil the requirement of

ENERGY AUDIT

The energy-saving requirement of the institution have been verified in the report submitted and were found to be satisfactory. The efforts taken by the management and faculty towards all types of energy used in the institution are highly appreciated and found noteworthy

Dr. K.S Anoop Das

Dr. Dhanya R

ACKNOWLEDGEMENTS

Wildlife Research and Conservation Trust would like to thank the management of SAHYA Arts and Science College for assigning this important task of Green Audit. We appreciate the cooperation of the team SAHYA Arts and Science College for the completion of the assessment.

Firstly, we thank Dr. (Lt.Cdr.) C.K. Abdul Rabbi Nistar, The Principal, Mr. E Abdul Razak, Manager, Mr. Pappatta Kunhi Mohamed, President, Mr. Shareef Thurakkal, Secretary and for their cooperation and visionary attitude. We would also like to thank Ms. Nataksha N Coordinator IQAC, for her continuous support and guidance. We are also thankful to Afrahanath P.K of Dept of English, staff members who were actively involved while collecting the data and conducting sampling. We are also thankful to the students and non-teaching staff at SAHYA College.

Last but not least, we would like to the management committee for allowing us to evaluate the greenery of the campus. WRCT Green Audit Team has prepared this Green Audit Report for SAHYA based on the surveys.

ABBREVIATIONS

A	**Amps**
AC	**Air Conditioner**
AC	**Alternating Current**
AMET	**Academy of Maritime Education and Training**
CFL	**Compact fluorescent lamp**
CIP	**Comprehensive Inspection Programme**
DC	**Direct Current**
HSD	**High-Speed Diesel**
Hz	**Hertz**
kg	**Kilogram**
kVA	**kilo-volt-ampere**
kW	**kilo Watts**
kWh	**kilowatt hour**
kW	**Kilowatt peak**
LED	**Light Emitting Diode**
LPG	**Liquefied Petroleum Gas**
MMS	**Module mounting structure**
MPPT	**Maximum Power Point Tracker**
NAAC	**The National Assessment and Accreditation Council**
SEC	**Specific Energy Consumption**
SPV	**Solar Photovoltaic**
STC	**Standard Test Condition**
TV	**Television**
V	**Volts**
W	**Watts**
W/m2	**watt per square metre**

INTERPRETATION

In this report, unless the contrary intention appears;

Energy Conservation means steps taken to reduce and use as much energy as necessary through changing energy consumption behavior, e.g. Switching off lights when not in use.

Energy Efficiency means using less energy to provide the same service/output, eg. Replacing inefficient light bulbs with efficient ones.

Faulty means equipment not working or made correctly; having defects.

Potential savings mean the actual reduction in operating expenses from the improved energy efficiency generated by an energy conservation or efficiency activity.

Retrofitting means upgrading an existing system to improve energy efficiency.

Tariff means the amount of money charged by the supplier (utility) per kWh for the use of electrical energy.

Vampire Load means the way power is consumed by electronic and electrical appliances while they are switched off or in standby mode (consuming electricity at a cost but not doing any work).

INTRODUCTION

Sahya Arts & Science College campus is located in Wandoor, Malappuram, Kerala, India, under the management of Sahya Pravasi Co-operative Society Limited. Sahya Arts and Science College, has been fostering higher education since its inception in 2013. Following the sanctioning of administrative approval the college, affiliated with the University of Calicut, commenced five undergraduate programs for the academic year 2013-14. With a commitment to evolving into a distinguished institution of higher learning, the college boasts sufficient infrastructure to support its vision. The main college building, which encapsulates a blend of natural beauty and eco-friendliness, stands on a vast expanse of five acres of scenic land, situated five kilometers from Wandoor, by the old railway station in Vellampuram. This serene and expansive setting provides an ideal environment conducive to academic endeavors and the scholarly pursuit of knowledge.

The campus spans ten acres and is encircled by lush greenery and hillocks. The college offers the best setting for learning because of its tranquil mood and picturesque surroundings. The College is committed to making special provisions for integrated and interdisciplinary courses, educating and training human resources for the country's development, initiating appropriate measures for promoting innovation in teaching and learning and paying special attention to improving the social and economic conditions and welfare of the people, especially about their intellectual, academic and cultural development.

FACILITIES OFFERED BY THE COLLEGE

LIBRARY

The library has a wide collection of resources taking into consideration the course contents and research needs of the College. The library's learning resource collections are developed aiming at providing the highest level of research and teaching support to the programmes and research thrust areas. The collection is reviewed every year to be relevant to the emerging and developing areas of research. The library is growing in its breadth and depth it holds about 5,924 plus books and subscribes to over 6 print journals and magazines and few e-journals. The library has software and computerized library facilities.

WI-FI AND ICT FACILITY

The college is wi-fi enabled and students can access the internet based on a personal ID and password provided by the college. The college also has a lab that enables students to access a large variety of resources on the web includes journals, databases, and books.

HOSTEL FACILITY

Limited Hostel accommodation for women is available on a first come first allotment basis. The hostel fees are stipulated as per the norms of the college.

GAMES AND SPORTS

The college is well aware of the importance of physical activities and organised sports and games programmes, which should be combined with the student's academic pursuits. Keeping in view the limited space available at the present location of the college, sports facilities are available on the campus.

CANTEEN

The college offers a canteen facility where snacks, tea, coffee/dining in the facility is available.

TRANSPORT FACILITY

The college has its bus which is available for the students and staff for their convenience

CONFERENCE FACILITY

The college has well-equipped facilities for conferences, workshops and seminars with seating capacity ranging from 100 persons.

OBJECTIVES

The Energy Audit was defined to meet the following objectives:

- Conduct an audit or observation of the energy consumption of electrical appliances within the buildings owned by SAHYA College.
- Review and analyse energy usage history to create a baseline for which savings can be measured in the audited building.
- Determine what can be done to reduce energy consumption throughout the buildings and what options are available for system improvements if funding is available.

- Identify and evaluate measures that could improve the environmental performance of the buildings/wards and provide recommendations.
- To identify sustainable energy sources, methods and practices on the campus

SUMMARY OF RECOMMENDATIONS

The purpose of this Energy Audit was to seek opportunities to improve the energy efficiency of the SAHYA College. Reducing energy consumption despite improving human comfort, health and safety were of primary concern.

Beyond just identifying the energy consumption pattern, this audit sought to detect and categorize the most energy-efficient appliances. Additionally, some daily practices relating to common appliances have been shared which may help reduce the energy consumption. Data collection for the energy audit of the college was carried out by the WRCT Team. The Energy Audit Report accounts for the energy consumption patterns of the College on the actual survey and detailed analysis during the audit.

The work comprehends the area-wise consumption traced using suitable equipment. The analysis was carried out by our team with the support of the staff members from SAHYA College. The report provides a list of possible actions to preserve and efficiently access the available source, and resources and their saving potential was also identified. We look forward towards optimization so that the authorities, students and staff members will follow the recommendations in the best possible way. The report is based on certain generalizations including the approximations wherever necessary. The views conveyed may not reveal the general opinion. They merely represent the opinion of the team guided by the interviews of clients.

Below are some recommendations based on general observations carried out throughout the buildings.

The recommendations (Table 1) are categorized with **A** being the most urgent where immediate actions are needed to be executed (first or second week of receiving this report). **B** can be 1 to 2 months after receiving this report, while **C**

will depend on the availability of funds.

Table 1: Recommendations

Recommendations		
Category A (most urgent)	**Category B (Near future)**	**Category C (if funds available)**
Apply energy conservation measures. Isolate or unplug vampire loads from power when not in use (i.e. chargeable equipment, computer and any other electronic devices with standby modes).	Establish an Energy Efficiency and Conservation steering committee to take the lead with EE&C initiatives and management within the buildings.	Where applicable, replace all conventional light fittings with LEDs throughout the building. Also, remove unnecessary lights or reduce the number of lights per location.
Automation of electrical fittings, implementation water metering, IoT-based energy efficiency practices and gadgets to save energy systems should be implemented		
Implement an Annual Maintenance Contract for electrical and electronic goods as it will help to properly maintain goods or services for a period of time. This periodical assessment will help to save energy.	Promote the use of energy conservation by using BLDC and five-star electrical equipment.	Institutions should frame an Energy Management Policy and should be implemented effectively. Yearly institutes should have an energy management plan.

Awareness programme for the campus community(e.g. education, training programme, seminar, workshop, camp, etc.).	MoU with Governmental and non-governmental agencies such as the Energy Management Centre (EMC) to ensure the energy conservation and efficiency in the campus	Good practices such as sign boards indicating Switch OFF / ON, Danger near the Electrical and Power transformers equipment in the campus
Remove faulty light holders and bulbs or remove the live wire from the socket inside the light holder.	Renovate or improve the lighting control, i.e. add more switches to existing rooms/spaces where only one switch controls more than 10 lights	Replace all lights with energy-efficient light bulbs,
Remove any faulty appliances located in the building.	Use fans in places where possible	The conservation and efficiency mechanisms are tools for reducing energy consumption.
Isolate or unplug faulty air conditioners if found within the building and, ensure service of the air conditioner units quarterly.	Remove the air conditioner if the room is very poorly sealed (i.e. if the room has no seals on the door and is frequently open at times).	Replace old existing outdoor air conditioner units with efficient ones (if funding is available).
Explore maximum natural sources of light/ air ventilation in indoor areas. The institute should have a detailed plan to implement a fenestration plan, skylight roof ratio, and Daylight illuminance		Automatic Lighting Shutoff with occupancy Sensors and Timers, Master control devices etc can be implemented as a good energy conservation practice.

plan to implement energy conservation strategies.		

ENERGY CONSUMPTION

To understand the Energy Consumption trends and for analysing the average monthly consumption we have collected electricity energy bills from April 2024 to March 2024. The details of "Meter Connection" at "SAHYA" Arts and Science College" are as follows. Facilities visited during the energy audit are provided in Table 2.

Name - SAHYA Arts and Science College

Table 2. Facilities visited during energy audit

Sl. No	Sections Visited	Date of Visit
1	Class Rooms	07.04.2024
2	Office	07.04.2024
3	Library	07.04.2024
4	Laboratory	07.04.2024
5	Hostel	07.04.2024
6	Auditorium	07.04.2024
7	Guest room	07.04.2024
8	Canteen	07.04.2024

Summary of Yearly Electricity Consumption and Total Bill Amount

To get the Energy consumption trend we have collected annual expenditure from 2018-2023 (Table 3). The annual electricity consumption pattern showed an increasing trend. The highest expenditure was recorded during 2023-2024 (Table 3). This shows an expected pattern as the demand for infrastructure development is high as the institution enhances its quality of education and related amenities. To understand the Energy consumption trend and to develop the baseline parameter we have collected monthly energy bills for the 4 months i.e. from April 2023 to August

2022 (Table 4). We analysed the amount paid in Rupees for electricity bills is provided in Table 4 and the average amount is 8903.5 Rs.

Table 3: Total electricity consumption trend (INR)

Year	**2018-2019**	**2019-2020**	**2020-2021**	**2021-2022**	**2022-2023**	**2023-2024**
Electricity Charges (KSEB)	35614	141738	87127	134066	181934	580479

Table 4. Monthly Electricity Consumption and Total Bill Amount

Month	**Net Reading**	**Amount in INR**
April 18	1104	13225
June 18	494	2289
July 18	616	8397
August 18	950	11703

Expenditure on energy sources

The various sources of energy types such as diesel (for generators and vehicles), electricity, and cooking gas were in the list (Figure. 1). The major source of expenditure was for fuels for vehicles (51000 Rs) followed by electricity (15000 Rs) and fuel for generator (12000 Rs). The total number of electrical equipment and its energy consumption pattern at equipment wise is listed in figure (2&3). A total of 27 electrical equipment was listed from Class Rooms, Laboratory, Library, Office, Hostel, Auditorium, Guest room and Canteen. The highest number of electrical facility was noted from plug points, followed by light and

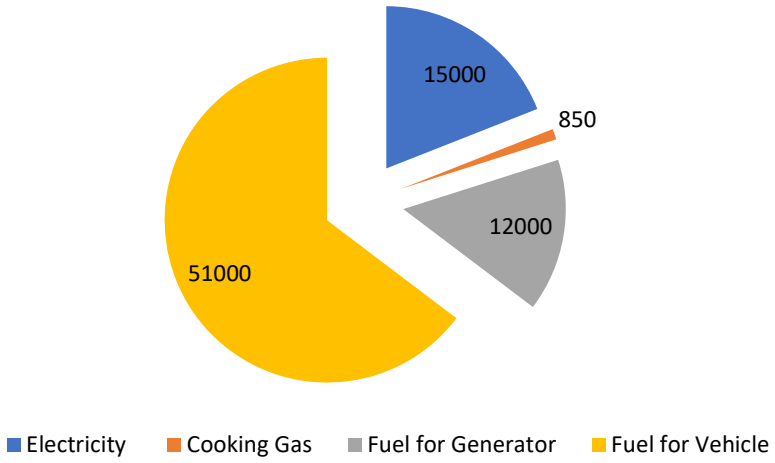

Figure 1: The expenditure on energy sources

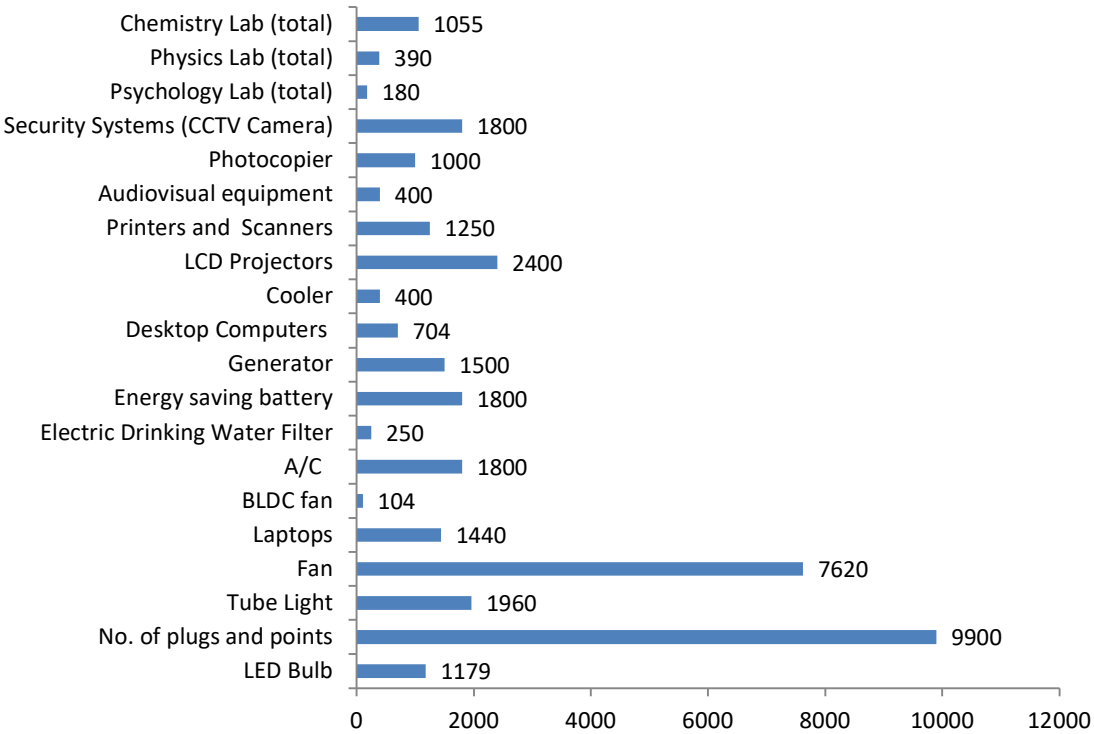

Figure 2: The energy consumption pattern and equipment list

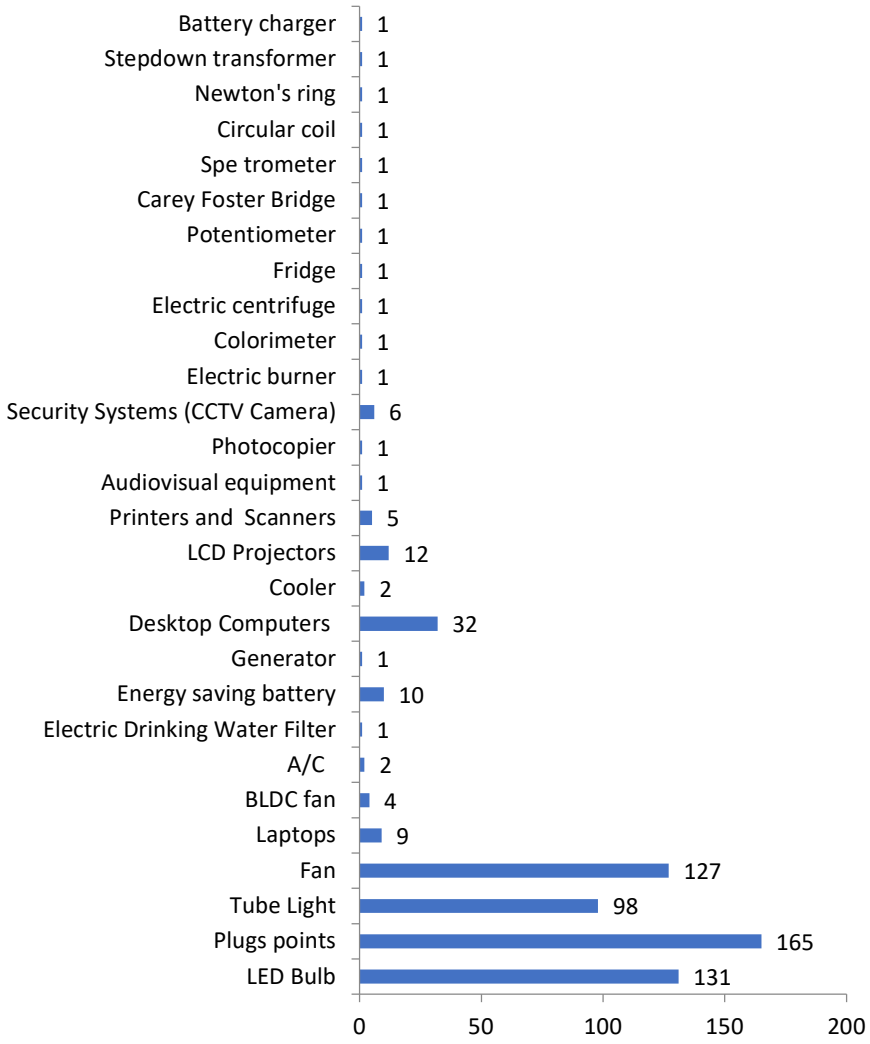

Figure 5: Total number of electrical equipment

ANALYSIS OF THE LIGHTING SYSTEM

Brief description of the existing system

For assessing the energy efficiency of the lighting system, an Inventory of the Lighting System has been noted/collected, with the aid of a lux meter, measurement and documentation of the lux levels at various locations at the working level has been provided in table 5.

For assessing the energy efficiency of the laboratory equipment an Inventory of the laboratory equipment system has been noted/collected (Table 5). The highest electricity consumption was recorded from the equipment such as electric burner (500 W) and fridge (400 W).

Table 5. Inventory of Laboratory equipment

Equipment	**Unit in Watt**
Weigh Machines	60
Electric burner	500
Colorimeter	35
Electric centrifuge	60
Fridge	400
Potentiometer	60
Carey Foster Bridge	60
Spectrometer	150
Circular coil	60
Newton's ring	60
Stepdown transformer	250
Battery charger	240
BTL experiment	180

Table 5. Data on Light intensity Measurement with Lux meter

Description	Lux	Remark
Class Rooms	120 to 235	Acceptable
Offices	135 to 240	Acceptable
Corridors	45 to 90	Acceptable
Washrooms	45 to 80	Acceptable
Outdoor	40 to 95	Acceptable

Laboratory	160 to 280	Acceptable
Parking area	45 to 95	Acceptable
Canteen	73 to 185	Acceptable

OBSERVATION

College has initiated LED-based lighting solution, but still, there are 401 (36W) CFL lights and 100 tube lights. LEDs save energy, the life span is much greater and emits virtually no heat. We recommend replacing the tube lights and CFL lights with LEDs.

We also recommend using solar lights for open areas like parking, ground, street lights, etc. The table below shows the performance characteristics comparison of all luminaries.

GREEN INITIATIVES MONITORED AT THE INSTITUTE

Green practices help to address current environmental challenges, alleviate climate change and associated impacts and also to conserve resources. Hence such initiatives are essential for nurturing a more sustainable, resilient, and healthier earth. Green practices promote planet-friendly habits and also raise environmental ethics among the inhabitants. A sustainable environment in college campuses has a positive impact on students' lives daily. Studies have shown that students studying in active green campuses have better knowledge retention capacity. The following practices were noted during the audit period at SAHYA College, Wandoor.

Sl.No	Green Practices	Status	Details
1	Banning of plastic carry bags	Yes	
3	Banning spiral binding using plastic sheets	No	
4	Promotion of reusable pen/ink pen	Yes	
5	Promotion of printing of two sides of pages for assignments and dissertations	No	
6	Promotion of digitization in office/administrative files	Yes	
7	Promotion of digitized assessment methods for students (eg: class tests/assignments etc.)	Yes	
8	Filter water facility Training of crafts/artwork for upcycling of non-degradable wastes	Yes	
9	Promotion of five-star electrical equipment	Yes	
10	Promotion LED bulbs	Yes	
11	Sustainable biodegradable waste disposal method	Yes	
12	Rainwater harvesting	Yes	
13	Solar energy generation and consumption	Yes	
14	Whether the solar energy produced in the institute being shared with other govt/private/household entities?	Yes	The excess amount of energy produced is transferred to the grid for public use
15	Whether the rainwater harvested in the institute being shared with other govt/private/household entity?	Yes	

16	Wastewater/grey water treatment is practised or not	Yes	
17	Nature Club/ Boomithrasena / NSS	Yes	Nature Club and NSS
18	Recycled water is used for garden/ farm purposes	Yes	
19	the waste bins have colour codes according to the type of waste (Y/N)	Yes	
20	What are the methods followed for disposing of non-degradable wastes: recycling/collection and disposing of with the help of Panchayath etc?	Haritha Karma Sena	
21	Solar power energy production (Y/N), capacity and consumption.	Yes	
22	Rain water harvesting method is practiced? (Y/N): bund/tank/mazhakkuzhikal	Yes	Tank, Mazhakuzhi.
23	Presence of bio park/medicinal garden/butterfly garden/Pachathuruth by Haritha Mission	Yes	Medicinal garden
24	Use of sustainable transport is promoted in the campus vicinity	Yes	Cycling facility is established
25	Water management plan used	Yes	
27	Are there any signs reminding peoples to turn off the water	Yes	
28	Agriculture/gardening initiatives by the students/NSS etc.	Yes	

Annexure 1. Computation of consumption pattern of each device

Electric Equipment	Power Consumption Unit	Class Rooms	Office	Library	Laboratory	Hostel	Auditorium	Guest room	Canteen	Lavatory	Total Equipments	Total Power consumption
LED Bulb	9W	68	24	6	4	15	0	2		12	131	1179
No. of plugs and points	60W	110	20	18	4	4	6	2		1	165	9900
Tube Light	20W	66	4	8	4	8	6	0		2	98	1960
Fan	60W	75	6	6	12	10	8	2	8		127	7620
Laptops	160 W			9							9	1440
BLDC fan	26W	0	4								4	104
A/C	900W		2								2	1800
Electric Drinking Water Filter	250W	1									1	250
Energy saving battery	1800W		10								10	1800
Generator	1500W		1								1	1500
Desktop Computers	22 W		7	9	16						32	704
Cooler	200W		2								2	400
LCD Projectors	200W	12									12	2400
Printers and Scanners	250W		4	1							5	1250
Audiovisual equipment	400W							1			1	400
Photocopier	1000W		1								1	1000
Security Systems (CCTV Came	300W		3						3		6	1800
Psychology Lab (total)	180W											180
Physics Lab (total)	390W											390
Chemistry Lab (total)	1055W											1055
Total												**37132**

RECOMMENDATIONS

1	A policy should to be adopted for sustainable transport and energy usage. The practices such as no car/ carpooling day cane be practiced to promote public transport.
2	Enhance overall public transport system among the campus society
3	Sensor based electrical equipment
4	Increase the capacity of existing solar power sources
5	Cycling/Pedestrian friendly ramps
6.	Degradable waste management should be more effective by implementing biogas, Thumboormuzhi or biobin models.
7.	Banning of plastic/spiral binding/ reduce the use of papers can be implemented
8	Ground water recharge can be implemented
9	Automatic sprinkler system used for irrigation purpose

Bio Sketch of Authors

Dr. Anoop Das, is Heading the Centre for Conservation Ecology & Department of Zoology, at M.E.S Mampad College, India. He serves as a Visiting Professor at the Leshan Normal University, China. He has written 76 publications in various national and international journals and has bagged more than 30 national and international grants/awards. He is a Member of IUCN/SSC – South Asian Invertebrate Specialist Group since 2016. He had carried out related field research works in United States of America, United Kingdom, South Korea, Germany, Austria, Czech Republic, China, Malaysia, Singapore, Thailand, Philippines, Indonesia and Sri Lanka. Dr Das is an Expert Member of the District Environmental Appraisal Authority (DEAC) constituted by MoEFCC, Govt. of India.

Dr. Dhanya

Dr. Dhanya R has a Ph.D in Environmental Sciences from Bharathiar University, Coimbatore, Tamil Nadu and Masters in Ecology and Environmental Sciences from Pondicherry Central University. She serves as an Assistant Professor of Environmental Sciences at Thunchath Ezhuthachan Malayalam University. Her area of Interest is Ecology of human-dominated landscapes, bird diversity, conservation of native species, participatory conservation programmes and environmental education. She is a Women Scientist Awardee & won Rajat Jayanti Science Communicator Award from DST (Govt. of India). She also bagged the UNEP- Eco Peace Leadership Award (EPLC- South Korea), Idea Wild Equipment Grant (USA). She has been appointed as the UNEP-EPLC's oversea branch officer for India. She is Member of the District Environmental Appraisal Committee (DEAC) constituted by MoEFCC, Govt. of India. She has 18 international publications and 27 conference papers to her credit.


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WORLD
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