

ENERGY AUDIT

STUDY PERIOD (TWO YEARS) 2020 - 2021 AND 2021-2022

Sustainability study

AUDIT REPORT

Studied for
Shri Vishweshwar Shikshan Prasarak Mandal's
Shivlingeshwar College of Pharmacy
Post Almala, Taluka Ausa, District Almala,
Maharashtra 413520, India

Studied in the capacity of
An accredited & Certified Green Building Professional



Studied by

Valid till December 2023

Disclaimer

The Audit Team has prepared this report for the **Shri Vishweshwar Shikshan Prasarak Mandal's Shivlingeshwar College of Pharmacy** located at Post Almala, Taluka Ausa, District Almala, Maharashtra 413520, India based on input data submitted by the College analysed by the team to the best of their abilities.

The details have been consolidated and thoroughly studied as per the various guidelines for Green Buildings available in National and International Standards; the report has been generated based on comparative analysis of the existing facilities and the prerequisites formulated by various standards. The inputs derived are a result of the inspection and research. These will further enhance and develop a Healthy and Sustainable Institution.

These can be implemented phase wise or as a whole depending on the decision taken by the Hon'ble Management and College. The warranty or undertaking, expressed or implied is made and no responsibility is accepted by Audit Team in this report or for any direct or consequential loss arising from any use of the information, statements or forecasts in the report.

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The Report is prepared by the Team of Greenvio Solutions under their brand and department – Sustainable Academe as Consultancy firm with the Project Head - Ar. Nahida Shaikh who is as an Accredited and Certified Green Building Professional-Architect. Green Building consultancy is her forte and she is one of the most sought after names when it comes to providing excellent quality services within the stipulated time frame.

The Study is conducted in capacity of Accredited & Certified Green Building Professional with extensive experience.

Greenvio Solutions

Developing Healthy and Sustainable Environments

We are an Environmental and Architectural Design Consultancy firm

Sustainable Academe is our department for conducting Audits

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Acknowledgement

The Audit Assessment Team thanks the **Shri Vishweshwar Shikshan Prasarak Mandal's Shivlingeshwar College of Pharmacy, Maharashtra** for assigning this important work of Energy Audit. We appreciate the cooperation extended to our team during the entire process.

Our special thanks are due to **Mr. Dharashive Shivcharan Limbanapa**, President; **Mr. Kapse Prabhakar Nagnath**, Vice President; **Mr. Dharashive Basweshwar Shivcharan**, Secretary; **Mr. Khichade Mahadev Ramling**, Joint Secretary; **Mr. Dharashive Prashant Shivcharan**, Treasurer and everyone from the Management.

Our heartfelt thanks to Chairperson of the entire process **Dr. Dharashive Vishweshwar Mahishankar**, Principal for the valuable inputs.

We are also thankful to **College's Task force the faculty members** who have collected data required **Dr. Sameer Shafi**, Academic Incharge and Assistant Professors – **Mr. Somwanshi Bhagwat**, **Mr. Sachin Hangargekar**.

We highly appreciate the assistance of **Mr. Dharashive Yogeshwar Shivcharan**, Admin Incharge; **Mr. Arab Hasan Mubarak**, Non-Teaching Staff Member and the **entire Teaching, Non-teaching and Admin staff** for their support while collecting the data.

Sustainable Academe

Brand of Greenvio Solutions, Palghar District, Maharashtra- 401208

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1. Introduction

1.1 About the Institution

The institute campus area is 27 Acres featuring with well equipped Lab, Library & Reading room. It also features a computer lab with Wi-Fi and Lease line with 100 mbps high speed internet connection. 240 students are taking pharmacy education. The institute is providing platform of students in different competitions such as State Level paper presentation, sports for overall development of students. The excellent academic infrastructure of the Institute is supplement with facilities for outdoor and indoor games as well as cultural activities.

The main multi-storeyed building is with all the state of the art infrastructural facilities like well-equipped Pharmaceutical Laboratories, Computer Laboratory, Library etc.... The institution emphasizes discipline oriented, high academic standards by keeping specific institutional objectives. The faculty comprises of highly competent, qualified and well experienced academicians and provides excellent coaching and motivation to the students.

The discipline and calm atmosphere in the campus which is absolutely necessary for the education is highly appreciated by the parents and senior students. The growth of the institutions is not only steady but Fast and Furious too. Our aim is to foster the innovative ideas and vision of the profession of pharmacy through our Budding pharmacist. We prepare the students with appropriate skill and knowledge to care the Health of a person.

1.2 Statements of the Institution

1.2.1 Vision

The College proposes "To be a college of excellence, providing holistic academic standards in Pharmacy"

1.2.2 Mission

The College adheres and focuses

- ➡ Promote excellent standards of education to economically, educationally and socially weaker section of society especially from rural areas.
- ➡ Provide quality education of international standards to students and help

them to become Pharmacist of higher calibre while upholding human values.

- Develop, promote and nurture research activities in Pharmaceutical sciences and translating research into health care."

1.3 Assessment of the Institute

1.3.1 Affiliations

The Institute is affiliated to **SRTMU, Nanded** a collegiate public state university located in Maharashtra, India.

1.3.2 Certification

The College has received the All India Survey of Higher Education Certification and its code is C-7600.

1.3.3 Approval

The technical courses provided by the College are approved by the Pharmacy Council of India, New Delhi.

1.4 Achievements of the Institute

The Institute has received the following awards

- Adarsh Educational Institution Award, 2017
- Outstanding work in the field of Education, 2018
- Shikshan Maharishi Vasantryao Kale Education Service Award , 2018

2. Institution overview

2.1 Populace analysis for Academic year 2021 - 2022

2.1.1 Students data

The student data (shared by the College) shows there were a total of **291 Boys and 246 Girl students**, thus there were **a total of 537 students** on the premises.

2.1.2 Staff data

Type	Male	Female	Total
Admin staff	01	00	1
Teaching staff	22	14	36
Non-Teaching staff	18	03	21
Total Staff Members	41	17	58

Table 1: Staff data of the Institution for 2021 - 2022

The staff data shows the premises had a total of **58** Staff Members.

2.2 Populace analysis for Academic year 2020 - 2021

2.2.1 Students data

The student data (shared by the College) shows there were a total of **229 Boys and 170 Girl students**, thus there were **a total of 399 students** on the premises.

2.2.2 Staff data

Type	Male	Female	Total
Admin staff	01	00	01
Teaching staff	19	10	29
Non-Teaching staff	12	2	14
Total Staff Members	32	12	44

Table 2: Staff data of the Institution for 2020 - 2021

The staff data shows the premises had a total of **44** Staff Members.

2.3 Total College Area & College Building Spread Area

The **total site area is 2 Acres & total Built-up area of College is 47,850 sq. ft. for around 595 populace footfalls.**

2.4 College Infrastructure

2.4.1 Establishment

The College was established in 1998.

2.4.2 Spatial Organisation

The college has ample and wide open classes with facilities appropriate for an educational space. There are open spaces with a beautiful entrance approach. The balance of hardscape and softscape provides a landscape serene ambience. **Overall the Infrastructure of the Building is excellent in terms of the Architecture Design.**

2.4.3 Operation and maintenance of the premises

The data collection session was held with the staff regarding the operation and working hours. The schedule is mentions that the College is working Monday to Saturday (Excluding the Second and Fourth Saturdays) with timings being 09:00 hours to 15:30 hours.

3. Green Building Study as a Research based technical audit

3.1 About the Green Building Study Audit

It is a systematic study of the aspects which make the Institution sustainable and healthy premises for its inhabitants.

3.2 Analysis of the Green Building Study Audit

The procedure included detailed verification for the following:

Energy Audit

- Analysis of the Lights, Fans, AC, Equipment
- Renewable energy
- Scope for reducing the current energy bills if any
- Improvement in the thermal comfort of the premises

Green Audit

- Green initiatives
- Hygiene audit
- Water Audit - Analysis of the current water consumption of campus; Rainwater harvesting and Wastewater treatment on the premises.
- Waste Audit - Current waste produced, its segregation, and usage; Strategies to be adopted for waste management and awareness

Environmental Audit

- Analysis of the current landscape + hardscape of the premises
- Analysis of the flora and fauna of the premises
- Strategies adopted at present to enhance vegetation
- Measures that can be adopted for ecological improvement of the premises.

3.3 Strategy adopted for Green Building Study Audit

The strategies included data collection from the admin department, actual inventory, investigation to check the operation and maintenance, analysis of the data collection, and preparation of the Report.

3.4 Activities undertaken for the Green Building Study Audit

- 15 December 2022 - Allotment and Initiation by the Institute
- 27 December 2022 - Induction Meeting
- 23 September 2022 - Survey of students and staff completed
- 30 December 2022 - Site visit at the Institute

On-site investigation and physical verification
Audit Team during the visit on 30 December 2022



Key facilities on the site



On-site review with the team for site management, green wall and other features



Exit meeting with the Team

4. Energy Audit

4.1 Sources of Energy consumption

The premise uses following sources of energy consumption.

4.1.1 Primary sources

- **Electrical (Metered)** – Light, Fans, Equipments, Pumps comprise these sources.
- **Renewable energy** – There are sources available in the premises.

4.1.2 Secondary sources

These are available in the form of Gas cylinders for general purposes and the Inverter, batteries as a backup.

4.2 Site investigation analysis

The Site investigation observations and interviews with the Maintenance staff, Electrical department in charge are summarised below:

- The **switch-off drills are practised at present**, the maintenance staff and Lab Attendants put off switches of all equipments regularly.
- All the **computers are shut-off after use** and also put on power saving mode.

4.3 Actual Electrical Consumption as per Bills

4.3.1 Consumption study

The admin department had shared the bills for Meter which is connected to the Building and is the main source of energy supply. The details are documented below.

Sr. No.	Month/Year	Units Consumed	Amount
1	January, 2022	3,192	11,420
2	February, 2022	650	18,120
3	March, 2022	788	6,110
4	April, 2022	1,301	9,990

5	May,2022	980	17,640
6	June, 2022	3,170	16,260
7	July, 2022	1,983	16,460
8	August, 2022	1,718	14,310
9	September, 2022	3,131	11,850
10	October, 2022	2,233	30,510
11	November, 2022	3,743	12,670
12	December, 2022	1,636	13,660

Table 3: Details of the electrical consumption

The summary of the above study shows the average consumption varies for each month.

4.4 Survey Results

An online survey was conducted to analyse the student and staff views about the Energy management practices adopted in College, following is the result received.

4.4.1 Participation

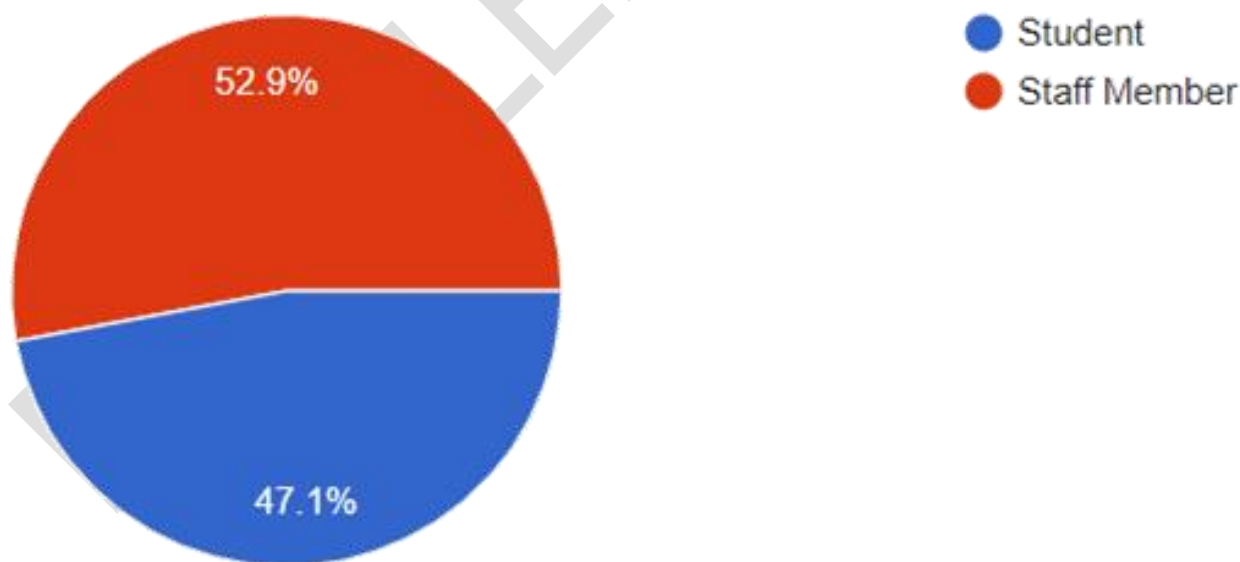


Figure 1: Participation analysis in the survey

A total of **51 responses** were received out of which 47% were students.

4.4.2 Review of the Energy management practices in the premises

Note: The Participants were asked to review the practice on a scale of 1-5 with scale components as follows:

- ➡ Scale 1 – Poor
- ➡ Scale 2 – Satisfactory
- ➡ Scale 3 – Good
- ➡ Scale 4 – Very good
- ➡ Scale 5 – Excellent

The figures in each of the columns of graph depict the Number of participants responses in numerical (Percentage of the participant response) – For example 101 responses (44.5%)

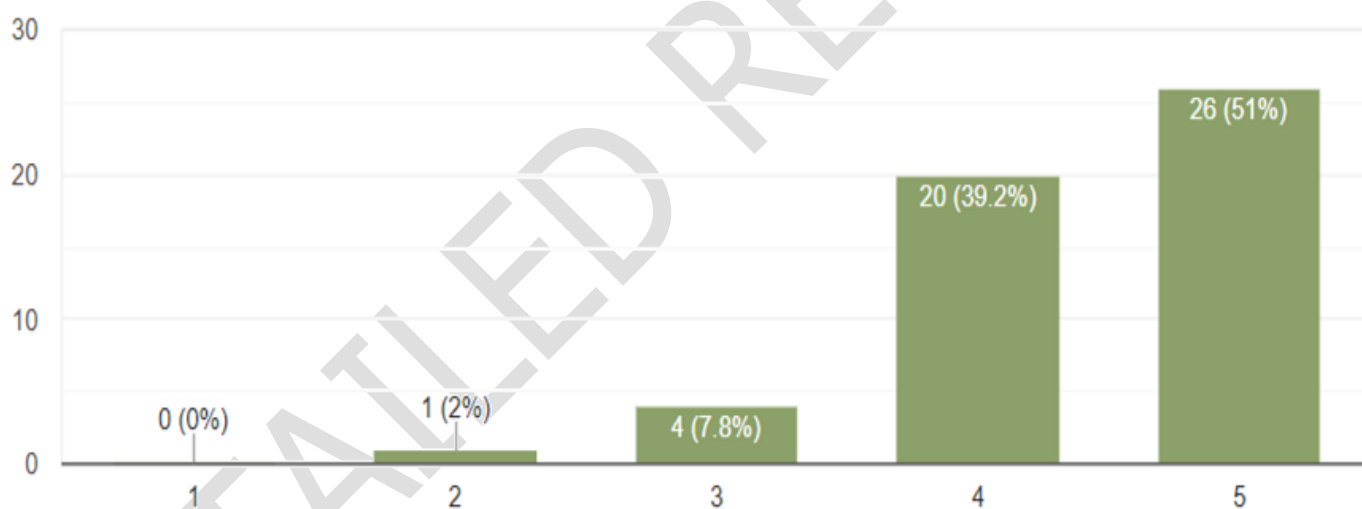


Figure 2: Energy management practices in college

The students, staff **(almost 51%)** of the responses found the practices to be **excellent (rating 5)** and **39% of the responses** found practices to be **very good (rating 4)**.

4.5 Calculated Electrical Consumption as per inventory

The electricity bills provide actual consumption data. The following is the calculated consumption. It is done to understand the percentage of energy usage in the premises by various applications. It is based on the inventory collected and interviews with the staff.

The additional data such as wattage is taken from market research. In terms of electrical consumption, the main sources are lights, fans, air conditioner, and equipment. The inventory and data collection for sources of energy consumed in the premise in summarised in the following sections.

Note: The following analysis is combined for entire premise taking into considerations the duration before pandemic to understand the consumption pattern as post pandemic the premise is used only for a few hours.

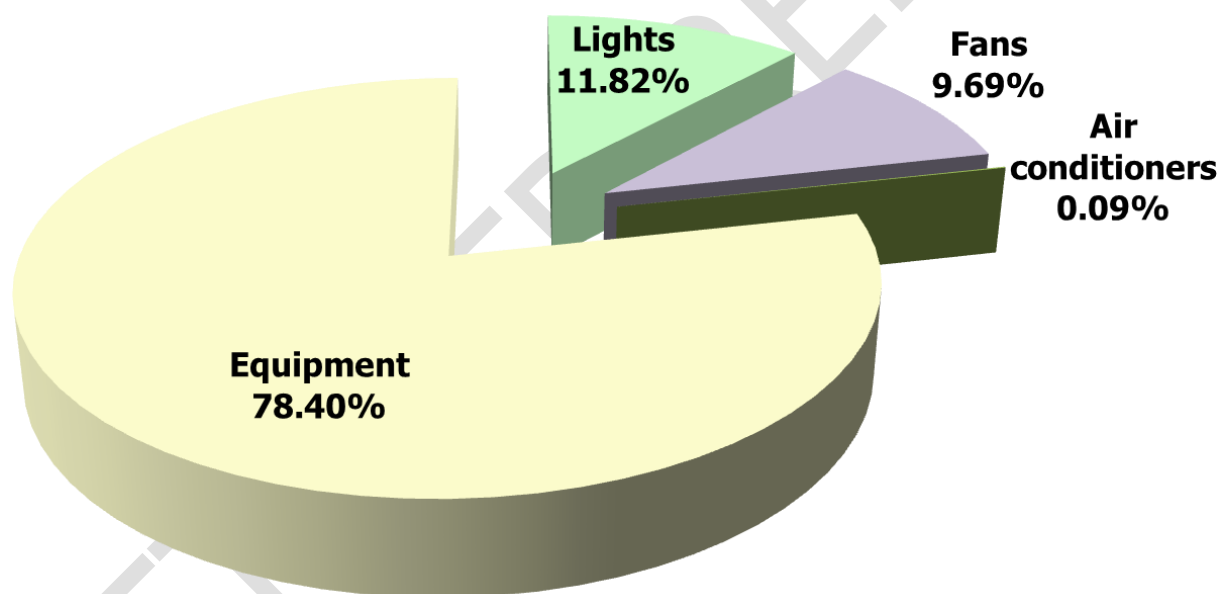


Figure 3: Summary of the calculated electrical consumption as per inventory

The above graph shows that Equipment consumes 78.40%; Lights consume 11.82% while the Fans consume 9.69% whereas the air conditioners consume 0.09% of the total calculated electrical energy.

4.6 Lights

4.6.1 Types of lights based on the numbers

There are a total of **285 LED lights on the premises**; the following table shows the various types of lights on the premises.

4.6.2 Types of lights based on the power consumption

The energy consumption of lights is **12,624 kWh** of energy and the **LED lights consume 100%** of the same.

4.6.3 Requirement of NAAC

4.6.3.1 Alternative energy initiative

Percentage of power requirement met by renewable energy sources – The College does has solar panels; around 20-25% of the power requirement is met through the current solar panels installed.

4.6.3.2 Percentage of lighting power requirement met through LED lights

The premise has LED Lights to contribute to 100% in terms of number and **100% of the power requirement** is met through the same. As per our study, we could conclude that both of these are the highest contributions among all the types of lights.

4.6.4 Site investigation observations

- All lights are in working conditions.
- There was no fuse defect observed.

4.7 Fans

4.7.1 Types of fans based on the numbers

There are a total of **145 fans** in the premises. The following table shows the various types of fans in the premises.

S. No.	Type	Nos.
1	Ceiling fans	126
2	Exhaust fans	6
3	Table fans	4
4	Wall mounted fans	9

Table 4: Summary of the types of fans in premise

4.7.2 Types of fans based on the power consumption

The energy consumption of fans is **10,356 kWh** of energy; the following graph shows the type of fans.

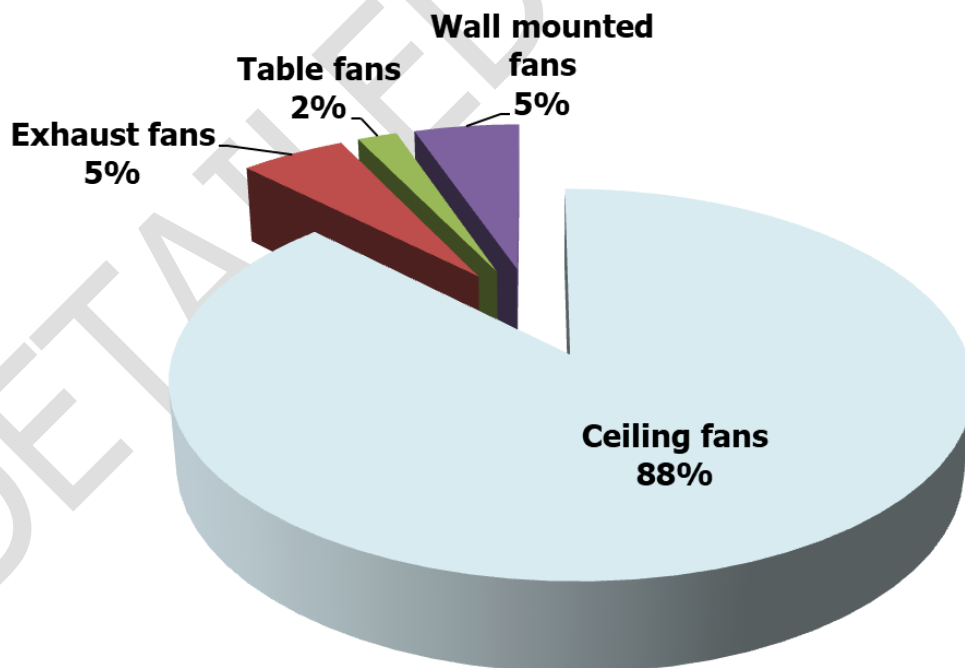


Figure 4: Energy consumed by types of fans in the premise based on the usage study

The analysis of the types of fans in premises shows **Ceiling fans consume 88%; whereas the Exhaust and wall mounted fans consume 5% each and the table fans consume 2%** of the total power consumed by fans.

4.7.3 Floor -wise consumption analysis

The following graph shows the Floor-wise consumption of only Ceiling fans since they form a majority.

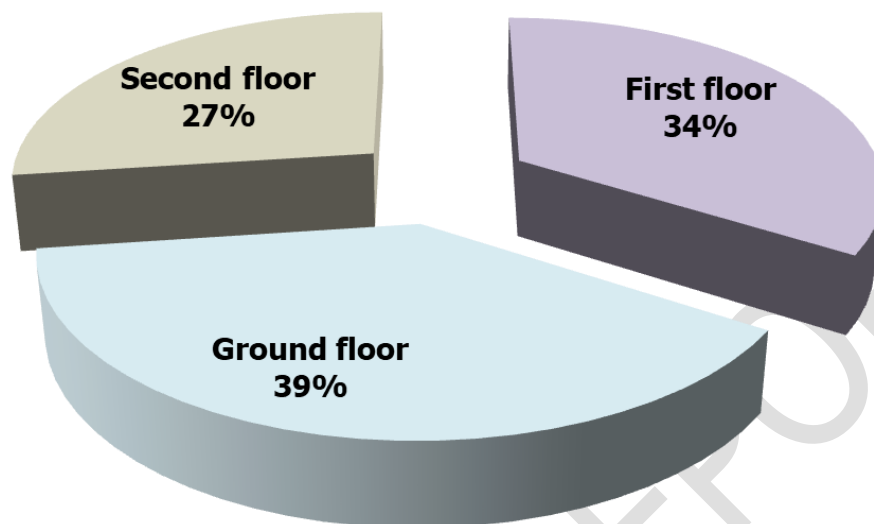


Figure 5: Energy consumed by fans floor wise

The above analysis shows the fans in the **Ground floor consume 39%; the ones in the First floor consume 34% whereas the ones in the Second floor consumes 27%** of the total power consumed by fans. Whenever there is an opportunity for general replacement the first priority should be given to lights in the Ground floor.

4.7.4 Site investigation observations

Some of the points noticed are as follows:

1. All fans are in working conditions
2. Daily monitoring and check is done by the maintenance staff and admin staff in an excellent manner.

4.8 Air conditioners

4.8.1 Types of air conditioners based on the numbers

There is only **one air conditioner** on the entire premises.

4.8.2 Building-wise consumption analysis

The energy consumption of air conditioners is **100 kWh** of energy.

4.8.3 Floor -wise consumption analysis

Since there is only one air conditioner which is located on the ground floor thus floor-wise study is excluded for this section.

4.8.4 Site investigation observations

Some of the points noticed are as follows:

1. Daily monitoring and check are done by the maintenance staff skilfully.
2. The Outdoor units were not properly cleaned, maintained and had no dust collection problems.

4.8.5 About the replacement of current air conditioners

The current air conditioners are well maintained, though there is not an immediate requirement for replacement however, whenever the College undergoes redevelopment there can be provisions for replacement with energy-efficient appliances or new air conditioners that require less power consumption.

4.9 Equipment

4.9.1 Types of Equipment

There are **15 types of equipment totalling to 154** in the premises as follows; (The College is a technical premise hence there are certain scientific equipment which are subjective for their usage, thus these have been excluded and the research is based only the general usage pattern.)

S. No.	Name	Nos.
1	Wifi Router	3
2	CCTV	24
3	Printer	5
4	Scanner	6
5	Water Cooler	3
6	Xerox Machine	1
7	Projector	4
8	Refrigerator	2
9	TV	2
10	Geyser	1
11	Sanitary Vending Machine	1
12	Intercom	56
13	Biometric	1
14	Desktop Computers	40
15	Speakers	5

Table 5: Types of equipment in the premise as per the quantity

4.9.2 Types of equipment as per their energy contribution

The energy consumption of equipment is **83,760 kWh** of energy.

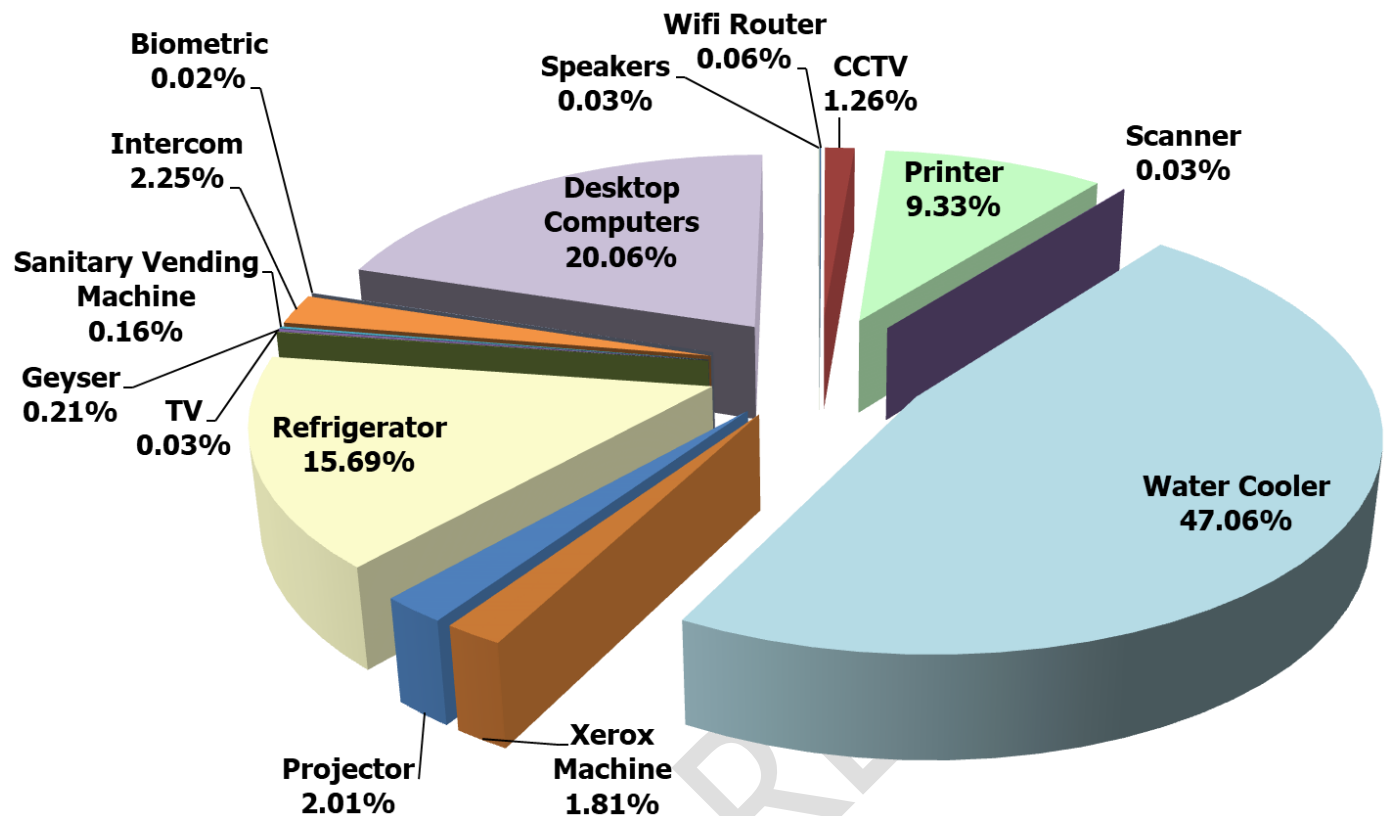


Figure 6: Summary of Energy consumed by equipment in the premises

The above summary shows that **water cooler consumes more energy at 47.06%** while **desktop computer consumes 20.06%** and the **refrigerator consumes 15.69%** these are maximum consumers as compared to other equipment.

Batteries and Inverter (when used for electrical consumption else it is a battery backup and does not require electricity as an equipment) are also one of the equipment but are excluded in this calculation.

4.9.3 Site investigation observations

Some of the points noticed are as follows:

- ➔ All equipments are in working conditions and daily monitoring and check is done by the maintenance staff and admin staff in an excellent manner.
- ➔ No defect was found in any equipment of electrical consumption.

4.10 Recommendations for a Sustainable Habitat

Over the time energy efficient appliances have been a boon not only to the energy saving parameters they adhere to but also the eco-friendly habits it helps to inculcate. The Institution such as Schools and Colleges are the best way to implement these initiatives. It creates awareness among the students at a young age. The Institutions also act as a symbol and representative of being an energy efficient premise. Following the analysis we found are some of the suggestions which can be implemented for an energy efficient Institution. This would help in reduction of the current electrical consumption by a major percentage.

1. Electromechanical systems - Electrical and Lighting

Section 1 - Fans

Ceiling fans

The current Fans are in proper working conditions and maintained well. The ceiling fans are in more quantity and consume at least 45W when in use. These should be replaced with energy efficient fans consuming 14W when in use.

Our detailed study states that is all the **ceiling fans on all floors** if replaced with star rated appliance results in a reduction of average of **69% reduction** in energy consumption if replaced with energy efficient appliance. It will be suggested to either replace these now if college can have certain plans else the replacement can be done when fans get damaged or are not in working condition.

Section 2 - Equipment

Desktop computers to laptops

Among all equipment it suggested to replace the desktop computers with laptops as this would be energy efficient. A normal desktop computer consumes on an average 250W and it is to be connected all time when it has to be used. On the contrary a laptop consumes 40W and has a battery backup which lasts up to 4 hours. There is **an average 84% reduction** in energy consumption if replaced with energy efficient appliance which is a laptop in all the areas of Educational areas.

This replacement is however is dependent on a variety of factors as follows.

- ➔ Some of the senior staff members may be more convenient with computers, replacement with laptop might result in a change of the working patterns and hours which may affect the productivity.
- ➔ Laptops – in case are not handled with care such as if dropped unintentionally might result in data imbalance.
- ➔ Students who are not day scholars can use laptop as per their own convenience, whereas in common areas there can a monitoring about the usage hours hence computers may be a preferable option then laptop in certain spaces.
- ➔ Similarly depending on the pandemic situation in case it might be possible due to irregular usage the device might have issues while functioning.

Thus the College should analyse the above points and then devise a strategy about the replacement, essentially when the devices get damaged or are not in working condition they can surely be replaced.

As well as once they are not in working condition the proposed strategy should be linked towards e-waste management as well.

2. Building management systems (Smart premises)

The College has extreme potential to become 100% energy efficient premises. In addition to provisions in the electromechanical system some facilities can be introduced towards building management systems as well. These can be undertaken equally for educational and residential sections.

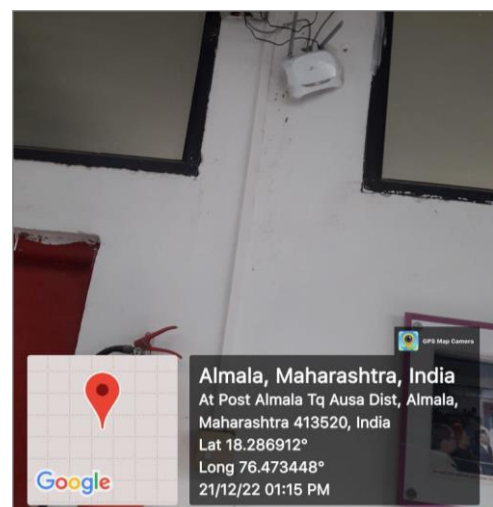
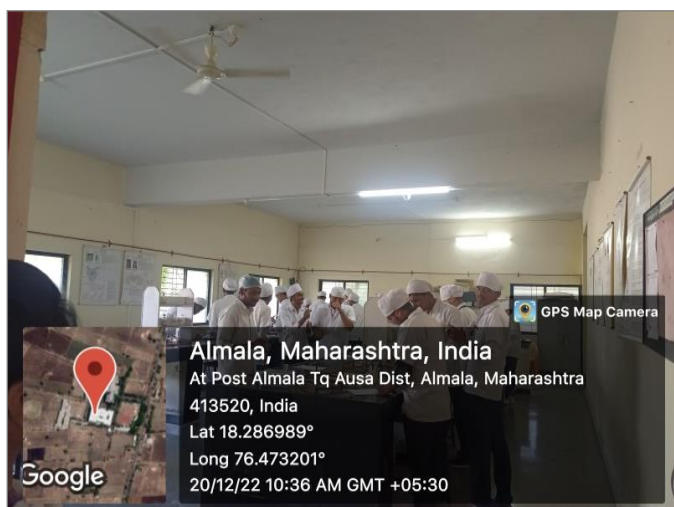
- ➔ Set the BMS time of day schedules to suit the minimum occupancy periods of the areas served and implement optimum start stop incorporating a night purge cycle, session and holiday scheduling.
- ➔ Space temperature Setback - A temperature setback is a simple strategy to help save utility cost by reducing how often your heating or cooling system operates. (morriseyengineering)
- ➔ Timer control of air conditioners.

On-site investigation and physical verification

Energy consumption practices in the premises



Energy management initiative at the College



Aspects related to energy usage in the College

5. References

1. Uniform Plumbing Code – India, 2008
2. IGBC Green Existing Buildings – Operation & Maintenance (O&M) Rating system, Pilot version, Abridged Reference Guide, April 2013
3. IGBC Green Landscape Rating system, March 2013
4. BOMA Canada Waste Auditing Guide, Best Environmental Standards, BOMA BEST – Canada
5. Used only for understanding Universal design - Universal accessibility Guidelines for Pedestrian, Non-motorized vehicle and Public Transport Infrastructure – Report guidelines by Samarthyam (National centre for Accessible Environments) – an initiative supported by Shakti Sustainable Energy Foundation.

