

ENERGY AUDIT

STUDY PERIOD (TWO YEARS) 2021-22 & 2022-23

Sustainability study

AUDIT REPORT

Studied for
SUFA EDUCATIONAL AND WELFARE SOCIETY'S

D.S.R. College of Education

Gut No:17, Near Sharnapur Railway Crossing, Wanjarwadi Road, Aurangabad . MS – 431005

Studied by

Valid till June 2024



Disclaimer

The Audit Team has prepared this report for the **SUFA EDUCATIONAL AND WELFARE SOCIETY'S D S R College of Education** located at Gut No:17,Near Sharnapur Railway Crossing, Wanjarwadi Road, Aurangabad based on the data submitted by the College and analyzed 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 a 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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Greenvio Solutions

We are an Environmental and Architectural Design Consultancy firm
Maharashtra- 401208

Acknowledgment

The Audit Assessment Team thanks the **Sufa educational and welfare society's D S R College of Education** 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 **Dr. Shaikh Ramzan**, Chairman; **Mr. Anwar Husain** Secretary; **Mr. Shaikh Bashir**, Member; and everyone from the Management.

Our heartfelt thanks to the Chairperson of the entire process **Dr. Syed Azaz Ali**, Principal, for the valuable input.

We are also thankful to **College's Taskforce and the faculty members** who have collected data required– **Dr. Shaikh Mohammadi**, and **Dr. Syda Qudsiya**, **Mr. Kakasaheb Randive**, **Dr. Shirin Riyaz Patel** (Special mention for the excellent coordination)

We highly appreciate the assistance of **Mr. Fazel Ahmed Khan 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

About the Institution

D S R College of Education has always been a hub of innovative activity and is continuously on the lookout for opportunities to collaborate with the industry as well as other academic institutions the world over.

Innovation and research at the Institute has been given a fillip with the establishment of Centers of Excellence in various areas ranging from Public Policy and Corporate Governance to Insurance to Financial Markets and Risk Management. The D S R College of Education was conceptualized as the University's response to the manpower needs of labor market that was rapidly overtaken by advances in the field of Managements.

A feature that sets apart D S R College of Education from other T-colleges is the carefully selected mix of students with diversity as a stated objective so that students can leverage from each other's experience in addition to theoretical studies in the classroom, thereby creating a truly enriching learning experience.

As the global business scenario gets increasingly complex and dynamic, D S R College of Education prepares students to manage and lead in such dynamic business situations by providing a diverse and challenging environment where they can learn and grow and finally walk out, ready to lead and inspire.

The College has a motto of ***“Quality teacher Education for Minority Community”***. It provides the Teacher Training program. The College works towards training young men and women to be competent, committed, and compassionate, and lead in all walks of life.

Statements of the Institution

Vision

The institute envisions to *The vision of the College states, 'No Profit No Loss Bases Quality Education for minority community'.*

Mission

The College seeks to realize its Vision with a Mission to:

The mission of Our College is to be a better future for all and to provide innovative educational environment, opportunity and experiences individuals from minority communities

The surrounding premises around the Institution

The Premises is situated amidst the landscape serene **Aurangabad region of Maharashtra state** with immense peace and calmness in the surroundings as there are residential areas around the premises. The location of the College is feasible to the nearby essential amenities such as Public Health

Center, Fire Station, Civic body-Public administrative buildings, Recreational gardens, and Police Station which are not too close but nearby.

Assessment of the College

Affiliations and approvals

The College has all its courses **approved by NCTE, recognized by Government of Maharashtra & Affiliated to Dr. Babasaheb Ambedkar Marathwada University.**

Certification

- **AISHE** – The code is C-34380

2. Institution overview

Populace analysis for the Academic year 2021-22

Students data

The student data (shared by the College) shows there were a total of **67 Boys and 46 Girls students**, thus there were **a total of 123 students** on the premises.

Staff data

Type	Male	Female	Total
Admin Staff	2	0	2
Teaching Staff	4	6	10
Non-Teaching Staff	5	2	7
Total Staff Members	11	8	14

The staff data shows the premises had a total of **19** Staff Members.

Populace analysis for the Academic year 2022-23

Students data

The student data (shared by the College) shows there were a total of **57 Boys and 54 Girl students**, thus there were **a total of 111students** on the premises.

Staff data

Type	Male	Female	Total
Admin Staff	2	0	2
Teaching Staff	13	8	21
Non-Teaching Staff	7	1	8
Total Staff Members	22	9	31

The staff data shows the premises had a total of **31** Staff Members.

Total College Area & College Building Spread Area

The **total site area is 3 acres** and the **total Built-up area of the College is 37,997 sq. ft.** for a **total of 159 footfalls.**

College Infrastructure

Establishment

The college is established in 2003. The college is located pretty close to nature and hence has a very fresh environment which is absolutely pollution free and healthy. The Building is a Reinforced Cement Concrete (RCC) framework building.

Spatial Organization

The overall ambiance of the College is warm and inviting. The classrooms and other Spaces have ample natural ventilation in the form of clear glass windows with fresh air ventilation. The architecture of the building is quite well designed. The color palette not just helps the building to stand out but also provides an Institutional arena. There are provisions for lifts and a staircase for accessibility on the premises, whereas there are amenities such as CCTV, Fire extinguishers, smoke detectors, a first aid box, etc.

Operation and Maintenance of the premises

The interview session was held with the staff regarding the operation and working hours. The Institution is open from Monday to Saturday. The first and third Saturdays are off. The schedule is mentioned below.

S. No.	Section	Spaces	Time	Hours/ day	Days in a year
1	Main Institutional College	Student areas and Teaching faculty	10:00 a.m. to 05:00 p.m.	6	280
2	General areas	Admin areas and library, Passage, staircase, toilet	09:30 a.m. to 05:00 p.m.	7.5	300

3. Green Building Study Audit

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.

Analysis of the Green Building Study Audit

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 campus

Green Audit

- Green initiatives
- Hygiene audit
- Water Audit - Analysis of the current water consumption of campus; Scope to include 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 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.

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.

Timeline of the activities for the Green Building Study Audit

- | | |
|----------------|---|
| • 02 May 2022 | – Allotment and Initiation by the College |
| • 23 May 2022 | – Induction Meeting |
| • 31 May 2022 | – Data submitted by College |
| • 09 June 2022 | – Submission of the Report |

4. Energy Audit

Sources of Energy consumption

The sources of energy consumption in a building comprise Lighting, Refrigeration, Ventilation, Cooling, Computers, Office equipment, cooking, space-heating, water heating, and others.

For study purposes, the sources are divided into primary and secondary sources, where the primary is considered for the generation and consumption purposes and secondary Sources are additional sources used as an alternative backup. The study emphasizes the consumption patterns, strategies adopted at present, and recommendations that can be implemented to improve the power consumption and utilization pattern.

Primary sources

These are the sources that are consumption and production

- **Electrical (Metered)** – This source studies the elements which are connected through a metered system of electrical consumption. Light, fans, air conditioners, equipment, and pumps are the consumers that comprise this category.
- **Renewable (Solar or other)** – There are no energy sources available at present.

Secondary sources

The college is located in an urban area and has minimal to zero power cuts, thus there are rare secondary sources of energy supply at present.

Inverter, UPS – These are utilized in the administrative areas and are used for 5 hours in a month. .

Site investigation analysis

The data investigated and collected through interviews are summarized below:

- The **switch-off drills are practiced at present**, and the maintenance staff and Lab Attendants put off switches of all equipment regularly.
- All the **computers are shut off after use** and also put on power-saving mode.
- There are **Ultra-violet lights used only in the scientific labs for experiment purposes, apart from these any other harmful lights used** in the premise.

Utility bill audit

Actual Billed Electrical Consumption

The admin department had shared the bills for the Meters connected to Buildings which is the main source of energy supply. The supplier is Maharashtra State Electricity Distribution Limited.

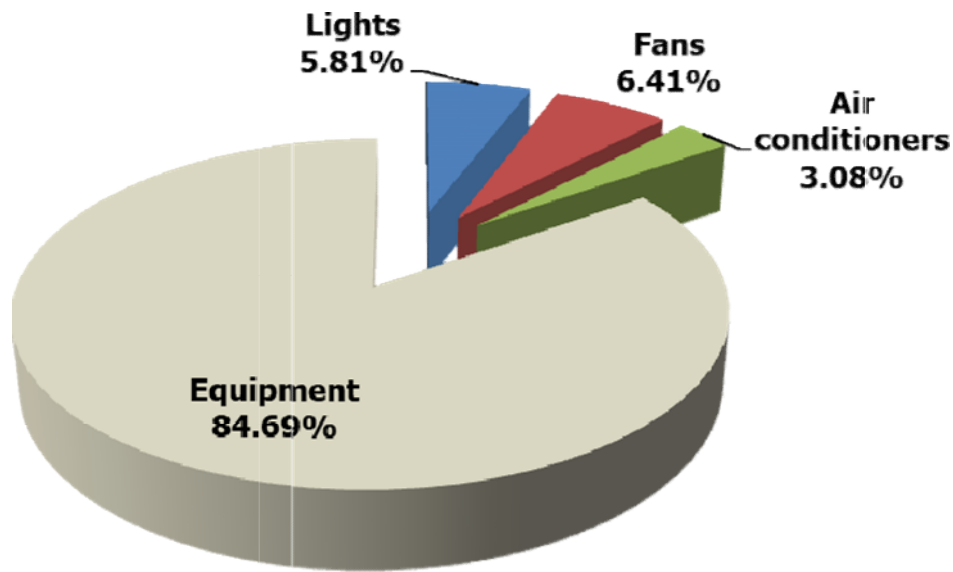
Sr. No.	Month	Units Consumed	Amount
1	May-23	718	1,2989.00
2	Apr-23	698	4,822.00
3	Mar-23	709	5,910.00
4	Feb-23	413	3,955.00
5	Jan-23	593	5,851.00
6	Dec-22	611	5,081.00
7	Nov-22	765	5,758.00
8	Oct-22	719	5,690.00
9	Sep-22	682	4,937.00
10	Aug-22	693	4,122.00
11	Jul-22	563	6,428.00
12	Jun-22	513	6,911.00
Total		7,677	72,454.00

The above data was studied further and thus it was found that the amount spent by the College on outer electrical supply was **Rs. 72,454/- annually for 7,677 units. On an average (monthly basis) Rs. 6,038/- was spent for 640 units.**

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 collection 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 conditioners, and equipment. The inventory and data collection for sources of energy consumed in the premise are summarized in the following sections.

Note: The following analysis is combined for the entire premise taking into consideration the duration before the pandemic to understand the consumption pattern on a regular day.



The above graph shows that equipment consumes 84.69% followed by fans at 6.41% the lights at 5.81% and the air conditioners consume 3.08% of the total calculated electrical energy.

Lights

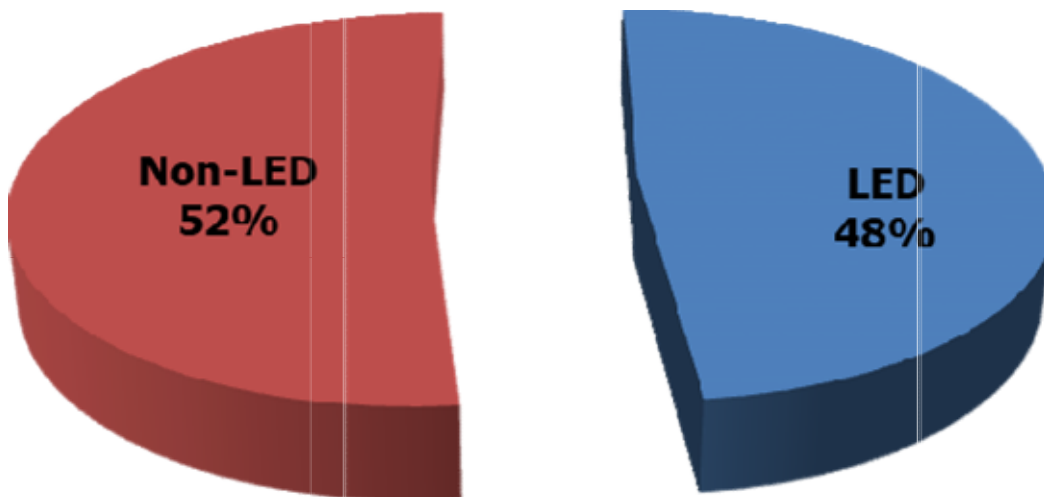
Types of lights based on the numbers

There are a total of **99 lights on the premises**; the following table shows the various types of lights on the premises.

S. No.	Type	Nos.
1	LED	68
2	Non-LED	31

Types of lights based on the power consumption

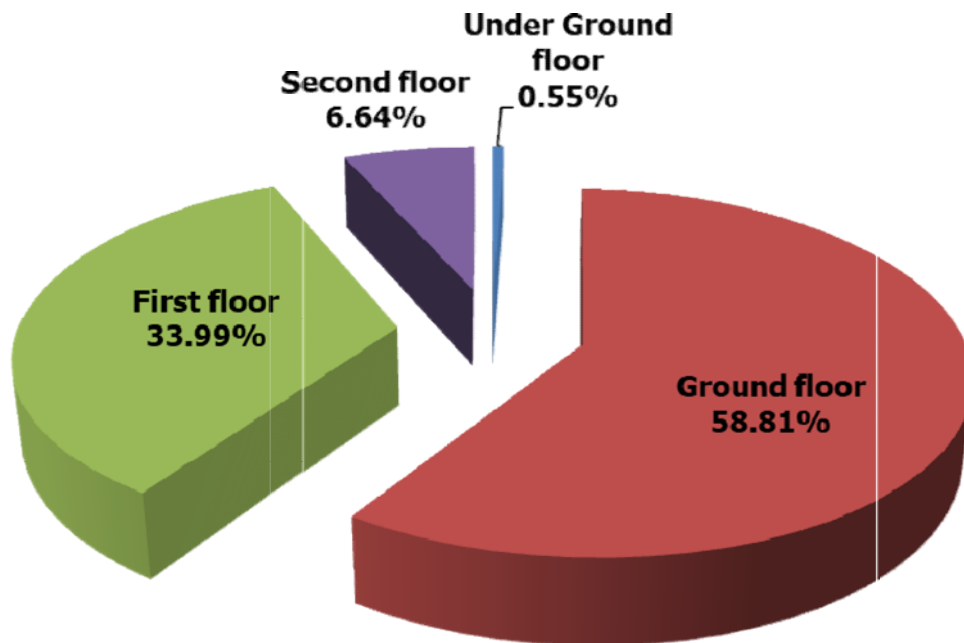
The energy consumption of fans is **1,301 kWh** of energy



The analysis of the types of Lights on-premises shows **Non-LED lights 52%** followed by **LED lights consuming 48%**

Floor-wise consumption analysis

The following graph shows the block-wise consumption.



The above analysis shows the lights on the **Ground floor consume 58.81%** and the ones on the **First floor consume 33.99%**; the **Second floor consume 6.64%** and the ones on the **Underground floor consume 0.55%** of the total power consumed by lights.

Requirement of NAAC

Alternative energy initiative

Percentage of power requirement met by renewable energy sources – There are no solar panels at present, thus zero percent of the power requirement is met by solar energy.

Percentage of lighting power requirement met through LED lights The premise has LED Lights to contribute to 69% in terms of number and **48% 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.

Site investigation observations

Some of the points noticed are as follows:

1. All lights are in working conditions
2. Daily monitoring and check are done by the maintenance staff.
3. There was no fuse defect observed.

Fans

Types of fans based on the numbers

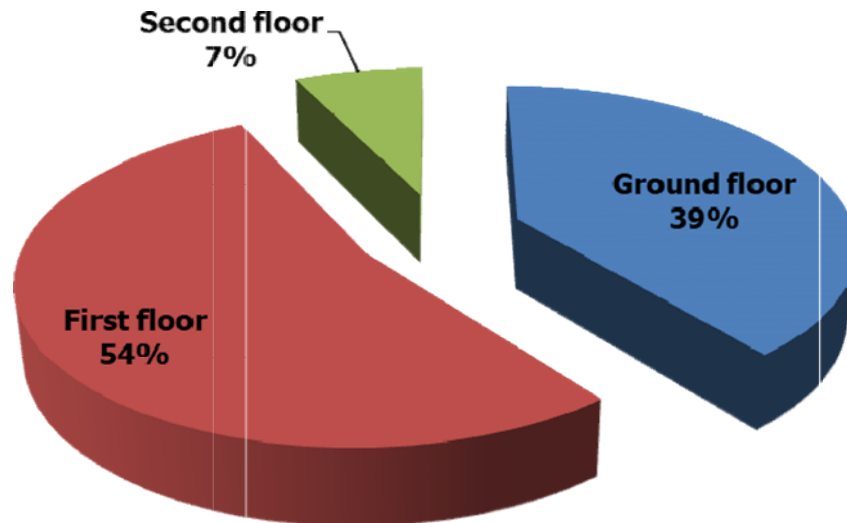
There are a total of **34 fans** on the premises.

Types of fans based on the power consumption

The energy consumption of fans is **1,435 kWh** of energy. For study purpose only the ceiling type of fans were considered as per the data shared by the College. Thus the ceiling fans consume 100% of the energy.

Floor-wise consumption analysis

The following graph shows the floor-wise consumption.



The above analysis shows the fans on the **First floor consume 54%** the ones on the **Ground floor consume 39%** and the ones on the **Second floor consume 7%** of the total power consumed by fans.

Site investigation observations

Some of the points noticed are as follows:

1. All fans are in working conditions
2. Daily monitoring and check are done by the maintenance staff and admin staff excellently.

Air conditioners

Types of air conditioners based on the numbers

There are **2 air conditioners** on the entire premises.

Floor-wise consumption analysis

The energy consumption of air conditioners is **690 kWh** of energy; all of the air-conditioners are located on the Ground floor, thus floor-wise study is excluded.

Site investigation observations

Some of the points noticed are as follows:

1. Daily monitoring and check are done by the maintenance staff and admin staff skillfully.
2. The Outdoor units were not properly cleaned and maintained and had dust collection problems.

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 or a new floor is constructed there can be provisions for replacement with energy-efficient appliances or new air conditioners that require less power consumption.

Equipment

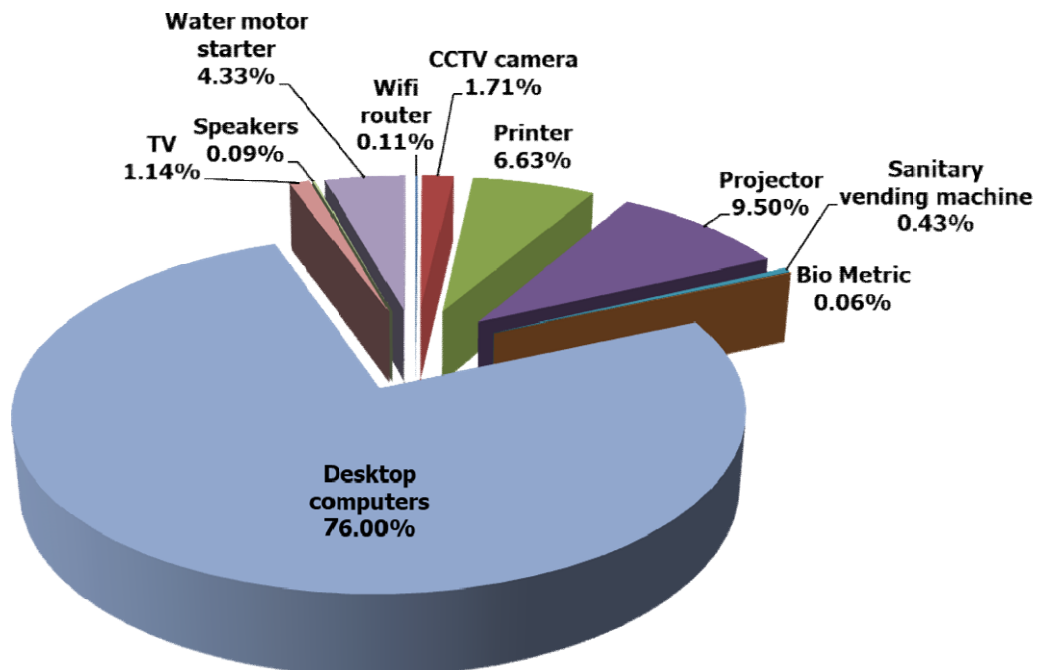
Types of equipment based on the numbers

There are a total of **10 types of equipment totaling 59 numbers** on the premise. The various types are mentioned in the table below.

S. No.	Name of the equipment	kwh
1	Wifi router	2
2	CCTV camera	12
3	Printer	3
4	Projector	4
5	Sanitary vending machine	1
6	Bio Metric	1
7	Desktop computers	32
8	TV	2
9	Speakers	1
10	Water motor starter	1

1.9.2 Types of equipment based on the power consumption

The energy consumption of equipment is **18,948 kWh** of energy.



The above summary shows that the **desktop computer consumes more energy at 76%** while the **projector consumes 9.50%** the **printer consumes 6.63%** and the **water motor starters consumes 4.33%** these are the maximum consumers as

Site investigation observations

Some of the points noticed are as follows:

1. All types of equipment are in working conditions and daily monitoring and check are done by the maintenance staff and admin staff skillfully.
2. No defect was found in any equipment of electrical consumption.

Recommendations for a Sustainable Habitat

Over time energy-efficient appliances have been a boon not only to the energy-saving parameters they adhere to but also to the eco-friendly habits it helps to inculcate. An institution such as Schools and Colleges is 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 some of the suggestions which can be implemented for an energy-efficient Institution. This would help in the reduction of the current electrical consumption by a major percentage.

Electromechanical systems - Electrical and Lighting Section

1 - Lights

Non-LED lights

The current light analysis shows that Non-LED tube lights consume anywhere between 24W, 36W, and 40W when in use; these should be replaced with LED lights which consume on an average 16-20W when in use.

Our technical analysis shows that there would be a reduction of an average of **62% reduction** in energy consumption through lights specifically as a part of the electro-mechanical system if all **Non-LED lights** are replaced on all floors with an energy-efficient appliance whenever the college undergoes renovation.

Section 2 - 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 60W when in use. These should be replaced with energy-efficient fans consuming 32W when in use. Our detailed study states that all the **ceiling fans on all floors** if replaced with star-rated appliance results in a reduction of an average of **47% reduction** in energy consumption if replaced with an energy-efficient appliance. It will be suggested to either replace these now if the college can have certain plans else the replacement can be done when fans get damaged or are not in working condition.

Section 3 - Equipment

Desktop computers to laptops

Among all equipment, it suggested replacing the desktop computers with laptops as this would be energy efficient. A normal desktop computer consumes an average of 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 that lasts up to 4 hours.

There is **an average 84% reduction** in energy consumption if replaced with an energy-efficient appliance which is a laptop in all the areas of Educational and Residential areas.

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

- Some of the senior staff members may be more convenient with computers, replacement with a laptop might result in a change of the working patterns and hours which may affect the productivity.
- Laptops – in the case are not handled with care such as if dropped unintentionally might result in data imbalance.
- Students who are not day scholars can use a laptop at their convenience, whereas in common areas there can monitoring of the usage hours hence computers may be a preferable option then laptops 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 University should analyze the above points and then devise a strategy for 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 to e-waste management as well.



5. Towards a Healthy & Sustainable Institution

Recommendations based on the study

In addition to the recommendations provided in each section; the College can adopt the following strategies for Healthy and Sustainable Institution practices.

- a) Cutlery in the Canteen** – The regular plastic and steel plates, and spoons used in the Canteen can be replaced with eco-friendly/ organic leaves, paper straws, disposable plates, and edible spoons made out of sugarcane waste or bamboo.
- b) Eco clubs** – There can be an eco-club with students working on pilot projects toward the environment and surrounding up-gradation.
- c) Terrace farming** - There can be a provision for terrace farming; this would enhance the biodiversity, increase awareness, and food grown can be used in Canteen.
- d) Signage's** – In addition to the signage's being in regular language there can be additional signage's in Braille language for the specially-a bald students.

6. 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 center for Accessible Environments) – an initiative supported by Shakti Sustainable Energy Foundation.
6. U.S. Energy Information Administration

