

ENERGY AUDIT

STUDY PERIOD (TWO YEARS) 2021 - 2022 & 2022 - 2023

Sustainability study
AUDIT REPORT

Studied for
Sindhi Seva Samiti's
Sindhi Institute of Management

No. 33/2B, Kempapura,
Hebbal Bangalore – 560024, Karnataka, India

Studied in the capacity of

Accredited and Certified
Green Building Professional



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Valid till **August 2024**

Disclaimer

The Audit Team has prepared this report for the **Sindhi Seva Samiti's Sindhi Institute of Management** located at No. 33/2B, Kempapura, Hebbal Bangalore – 560024, Karnataka, India based on input data submitted by the Institute 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.

The audit is a thorough study based on the inspection and investigation of data collected over a period of time and should not be used for any legal action. This is the property of Greenvio Solutions and should not be copied or regenerated in any form.

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

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Acknowledgement

The Audit Assessment Team thanks the **Sindhi Seva Samiti's Sindhi Institute of Management, Karnataka** for assigning this important work of Energy Audit. We appreciate the cooperation extended to our team during the entire process.

Our special thanks are extended are due **to everyone from the Governing body.**

Our heartfelt thanks are extended to the Chairperson of the entire process **CMA. Prof D Gopinath**, (Director/Principal) for the valuable inputs.

We are also thankful to College's Task force the faculty members who have played a major role in data collection – **Ms. Badrunnisa Shaikh** (Institute Coordinator) (*Special mention for the excellent coordination*); **Mr. Srinivas** (Estate Manager) and **Mr. Parameshappa** (Admin staff)

We highly appreciate the assistance of 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 History

Sindhi Institute of Management started in 2014 is a leading provider of globally recognized, Industry relevant Masters of Business Administration program.

It works closely with corporate partners to ensure its programs are specifically tailored to reflect global market trends, and to offer complete flexibility for the students as they work towards success in a way that is suited to their career ambitions, and compatible with their personal commitments.

1.2 About the Institute

Sindhi Institute of Management initially was affiliated to the University of Mysore from 2014. It provided MBA Programme which is approved by UGC. The programme was excellent with students securing 100 percent results with an amazing lot of students having been placed in top companies of India.

The year 2018 was a landmark year for Sindhi Institute of Management. The year 2018 Sindhi Institute of Management got itself approved by the AICTE to offer MBA programmes and was affiliated to the Bengaluru Central University.

The focus now is on getting the best of facilities with continuous Industry Institute Interaction so that the students get the best of both the worlds that is Academic and Industry.

1.3 About the statements of the Institute

1.3.1 Vision

The Institute proposes "To nurture creativity, talent and performance by providing high quality education in a state-of-the-art environment and mould aspiring youth into future leaders."

1.3.2 Mission

The Institute adheres and focuses towards

- ⇒ Inculcating high value through integrity.
- ⇒ Empowerment through knowledge.
- ⇒ Development through social conscience.
- ⇒ Community upliftment through employability.

1.3.3 Aim

The Institute has formulated the aim "Commitment to reach global standards and impart quality education integrated with values to students enabling them to excel in the fields of Management; To cater to the ever changing and challenging needs of the society and the industry and also make them responsible citizens of the country."

1.3.4 Objectives

The objective of the Institute is:

- ⇒ To develop spirit of inquiry, scientific temperament and pursuit of knowledge among students and faculty.
- ⇒ To impart quality education that would endow students with knowledge and skills that will endure them for life.
- ⇒ To create an environment in the institution that is conducive for achieving academic excellence.
- ⇒ To usher in total quality management.

- ⇒ To impart value based education.
- ⇒ To sensitize students on gender related issues and strive towards women's empowerment and gender equality.
- ⇒ To strive towards development of healthy stake holders' relationships.
- ⇒ To bring about transparency in organizational functioning through decentralized governance and participative management.
- ⇒ To improve ethics and work culture in the institution.
- ⇒ Sensitise students and create a sense of responsibility towards social, environmental issues and national development."

1.4 Assessment of the Institute

1.4.1 Affiliations

The Institute is affiliated to **Bengaluru City University**; a state university in Bengaluru (Bangalore), Karnataka, India.

1.4.2 Certification

The College has received the Certifications of the **All India Survey of Higher Education (AISHE) code C – 62530** provided by Govt. of India.

1.4.3 Approvals

The technical courses provided by the College are by the **All India Council for Technical Education (AICTE), New Delhi.**

2. Overview

2.1 Populace analysis for Batch 2022-2024

2.1.1 Students data

The data (shared by the Institute) shows there were **41 male and 49 female students**.

2.1.2 Staff data

S. No.	Type	Male	Female	Total
1	Admin staff	01	00	01
2	Teaching staff	05	07	12
3	Non-Teaching staff	04	00	04
Total Staff Members		10	07	17

Table 1: Staff data of the Institution for Batch 2022-2024

The staff data shows the Institute premises had a total of **17 Staff Members**.

2.2 Populace analysis for Batch 2021-2023

2.2.1 Students data

The data (shared by the Institute) shows there were **46 male and 38 female students**.

2.2.2 Staff data

S. No.	Type	Male	Female	Total
1	Admin staff	01	00	01
2	Teaching staff	05	07	12
3	Non-Teaching staff	04	00	04
Total Staff Members		10	07	17

Table 2: Staff data of the Institution for Batch 2021-2023

The staff data shows the Institute premises had a total of **17 Staff Members**.

2.3 Total Institute Area & Institute Building Spread Area

The **site area is 2.44 acres** and the **Built-up area is 17,152.608 sq. ft.** for an approximately **107 footfalls.**

2.4 Institute Infrastructure

2.4.1 Establishment

The Institute was established in **2018.**

2.4.2 Spatial Organisation

There are provisions for staircase for accessibility on the premises, whereas there are amenities such as CCTV, a first aid room, etc.

The Institute 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.

2.5 Operation and Maintenance of the premises

The interview session and data collection session was held with the staff regarding the operation and working hours. The schedule shared by the team shows that the Institute is working Monday to Saturday beginning at 08:00 hours up to 18:00 hours.

3. Research

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 as follows:

- Investigation
- Technical discussion with team
- Observations
- Inferences

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

- Discussion with the Institute
- Allotment and Initiation by the Institute
- Data collection
- Submission of the files

4. Observation

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.

4.1 Participation



Figure 1: Participation analysis in the survey

A total of **13 responses** were received out of which 100% were staff members.

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%)

4.2 About the Energy management practices adopted by Institute

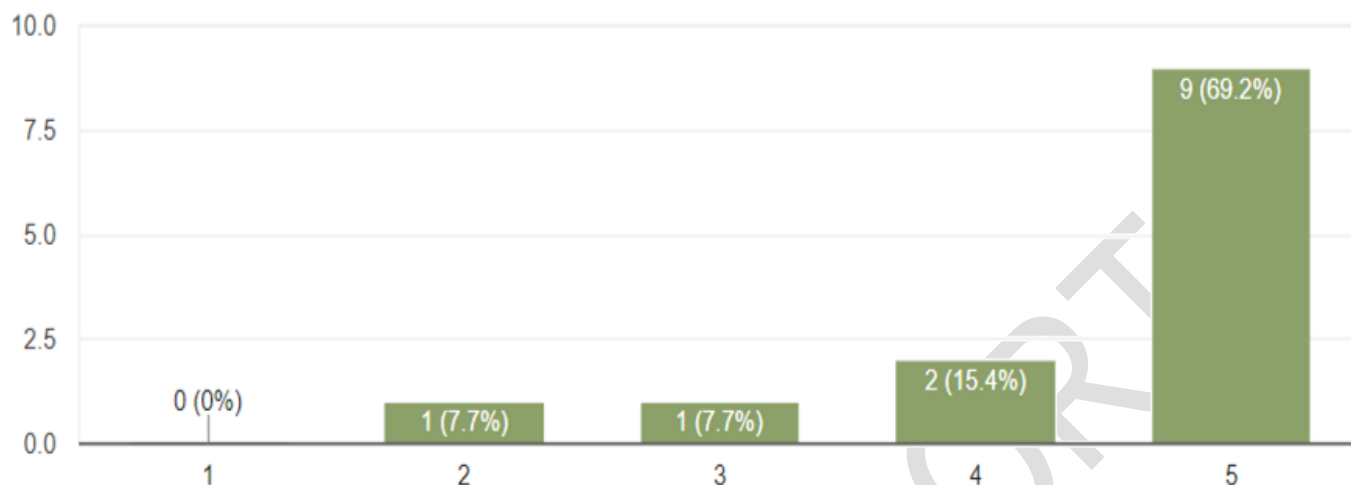


Figure 2: Energy management practices in the Institute

Observation: The students and staff almost 69% of the respondents found practices to be Excellent (Rating of 5); whereas almost 15% of the respondents found practices to be Very Good (Rating of 4); and 8% of the respondents found practices to be Good (Rating of 3).

Inference: Since the majority responses are for 'Excellent – Rating 5' which is more than 50% thus the said section 'DOES NOT' require improvement.

5. Documentation

The premise uses following sources of energy consumption.

5.1 Primary sources of energy consumption

- **Electrical (Metered)** – Light, Fans, Equipments, Pumps comprise these sources.
- **Alternate sources of energy** – There are multiple sources available in the premises as documented below:

S. No.	Name	Nos.
1	Solar street lights	06
2	Induction stove	01

Table 3: Details of the alternate sources of energy

5.2 Secondary sources of energy consumption

The premise uses batteries, inverters & UPS as backup for administrative purposes. The details of the existing sources are documented below:

S. No.	Name	Nos.
1	UPS	04
2	Inverters	04
3	Batteries	54

Table 4: Details of secondary sources of energy consumption

5.3 Actual Electrical Consumption as per Bills

The Institute has solar street lights on the rooftop through which certain energy produced. This is a good practice but requires improvement.

S. No.	Month	Year	Amount	Units consumed (Billing demand)
Academic year 1				
1	June	2022	2,29,820	255

2	July	2022	1,99,985	255
3	August	2022	3,22,114	255
4	September	2022	2,52,616	255
5	October	2022	2,37,070	255
6	November	2022	2,82,384	255
7	December	2022	2,56,754	255
8	January	2023	2,64,122	255
9	February	2023	2,77,199	255
10	March	2023	2,58,696	255
11	April	2023	2,29,875	255
12	May	2023	2,98,319	255
Academic year 2				
13	June	2023	3,58,389	255
14	July	2023	3,56,058	255

Table 5: Details of the electrical consumption

5.4 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 is summarised in the following sections.

The following documentation is based on the consumption practice of the premises on a regular working day.

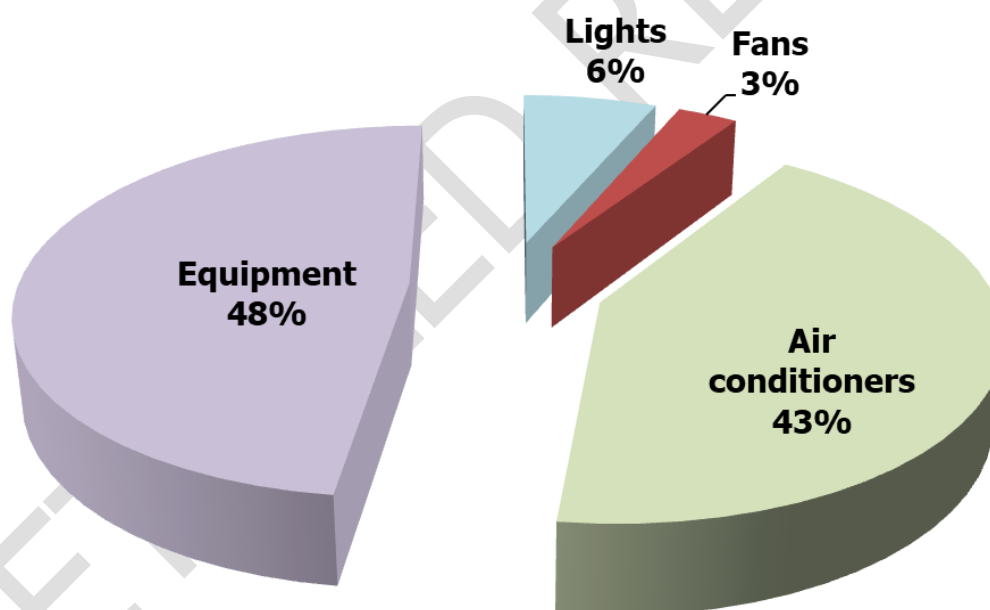


Figure 3: Summary of the calculated electrical consumption as per inventory

The above graph shows that equipment consumes 48% whereas the air conditioners consume 43% while the lights consume 6% and the fans consume 3% of the total calculated electrical energy.

5.5 Lights

5.5.1 Types of lights based on the numbers

There are a total of **199 LED (Energy efficient appliance) lights** on the premises.

5.5.2 Types of lights based on the power consumption

The energy consumption of lights is **9,936 kWh** of energy.

The analysis shows **LED lights consume 100%** of the total power consumed by lights.

5.6 Fans

5.6.1 Types of fans based on the numbers

There are a total of **83 ceiling fans** on the premises.

5.6.2 Types of fans based on the power consumption

The energy consumption of fans is **4,491 kWh** of the energy. The analysis shows that the **Ceiling fans consume 100%** of total power consumed by fans.

5.7 Air conditioners

5.7.1 Types of air conditioners based on the numbers

There are **15 air conditioners** on the entire premises.

5.7.2 Building-wise consumption analysis

The energy consumption of air conditioners is **65,430 kWh** of energy.

5.7.3 About the replacement of current air conditioners

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

5.7.4 Site investigation observations

- Though the air conditioners are not bad for the environment as they dehumidify the air in case of **the campus it is adding to the electrical loads to a great extent.** As the (Calculated) electrical load of the fans is 4,491 kWh whereas the air conditioners comprise of the loads of 65,430 kWh.
- The Team needs to have **a practical solution worked out in coordination** with the Architect-Green Building Consultant of the research project (Project Head of the team who has submitted the Report) – Engineer of the Building and the Stakeholders (Staff members) of the building because a practical input can be worked out room wise what alternative solution can be implemented.
- This project can then be **executed through a practical and time bound research wherein the finding** can be documented before and after the alternatives; some of the alternatives that can be refurbished are noted below:

5.7.5 Alternatives towards maintenance of air conditioned spaces

Note: The following information has been documented from the site <https://www.energuide.be/en/questions-answers/what-are-the-alternatives-to-air-conditioning/2121/>



Using the principle as the improved fan, the adiabatic cooler draws in the room air which then goes through a humid heat exchanger, coming out all cooled and fresh;

The cooler unit uses little in the way of power (from 45 to 90 W), is less, will operate for 10 to 30 hours straight and is perfectly suited for rooms from 20 to 30 m². The water tank can be filled with ice cubes but needs to be filled at all times.

Plate 1: The adiabatic cooler



Creating a "Venturi effect" (just like an aircraft's turbine engines), these non-moving bladeless fans not only come in sleek designs, they are also very powerful and efficient.

Bladeless fans are very safe and do not pose any risk to children. Like their equivalents, conventional fans, they also come in swinging and speed-adjustable versions.

Plate 2: The bladeless fan



These outdoor misting fans are installed outdoors in the garden or on a patio, in the shade of a parasol or a sun blind. They give off a very fine mist which cools the surrounding area using the same principle as evaporation. Once properly adjusted, they will deliver an agreeable coolness without any humidity.

Given very high temperatures, misting fans can also be used indoors, provided they are set up in large rooms, and only for a limited length of time. In this case, it will need to be connected to a cold water tap.

Plate 3: The patio misting fan

5.8 Equipment

5.8.1 Types of Equipment

There are **402 nos. of equipment** in the Educational sector.

5.8.2 Types of equipment as per their energy contribution

The energy consumption of equipment is **73,572 kWh** of energy.

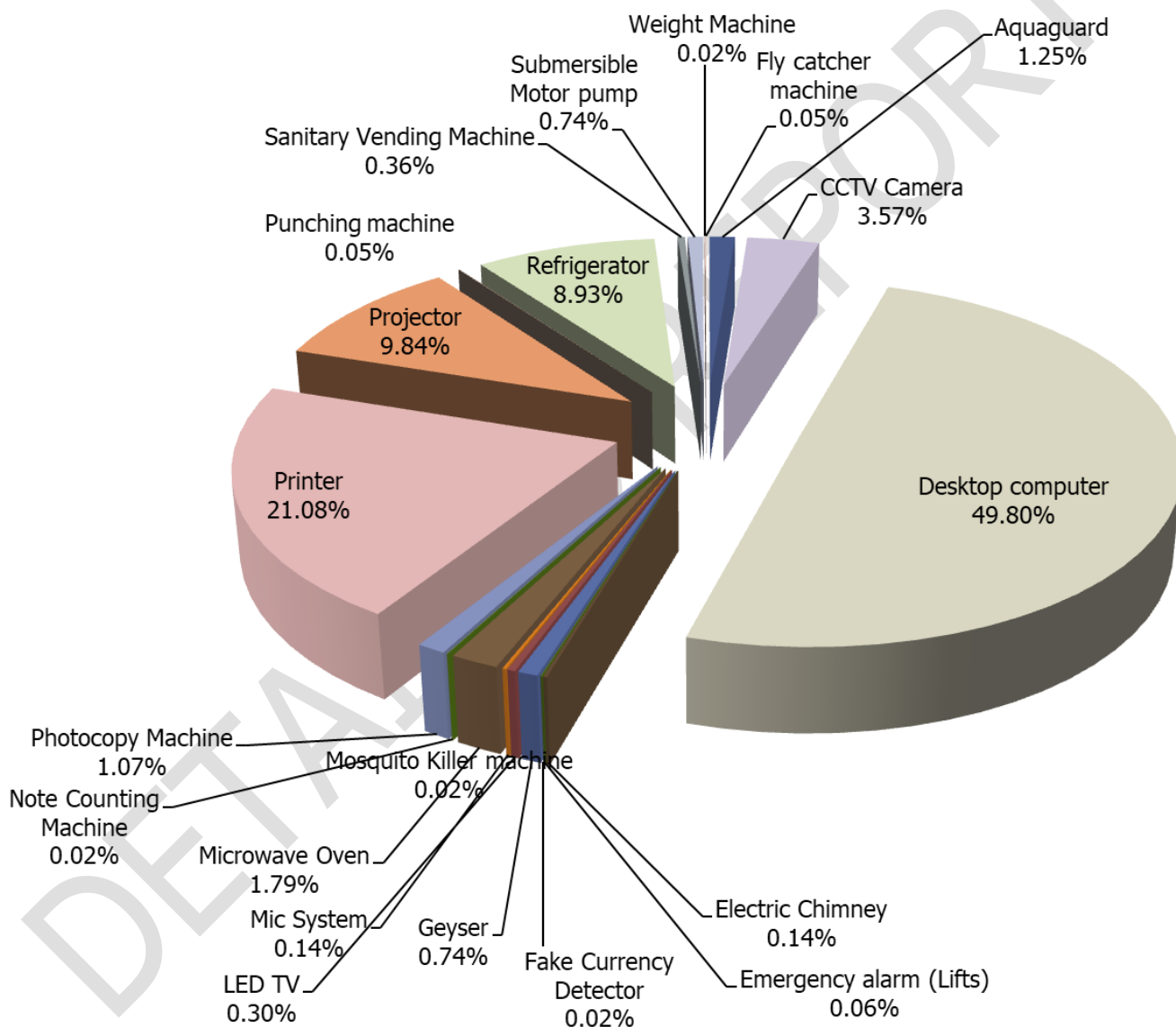


Figure 4: Energy consumed by types of equipment in the educational sector based on the usage study

The above summary shows that the **desktop computer consumes more energy at 49.80%** while the **printer consumes 21.08%** the **projector consumes 9.48%** and the **refrigerator consumes 8.93%** these are the maximum consumers as compared to other equipment.

6. Suggestion

6.1 Section-wise suggestions

The following suggestions are to be considered as a **first priority** for implementation. These **should be executed within the next 1.5 to 2.5 years from the date of the Report submission**. The Institute can execute a plan after discussion with Project Head.

6.1.1 Electromechanical systems - Electrical and Lighting

Section 1 - 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 technical research 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 Institute can have certain plans else the replacement can be done when fans get damaged or are not in working condition.

6.2 General suggestions

The following details are consolidated study recommendations related to 'entire Institute' and should be considered as **second priority** for implementation, once the section wise recommendations are implemented. The following recommendations should be **implemented within 2.5 to 3.5 years from the date of the Report submission.**

6.2.1 Alternatives to increase renewable energy

6.2.1.1 Solar tree

Since there is availability of space; the solar trees can be installed in multiple places as they will provide dual benefits of aesthetic and energy reduction.



Plate 4: Solar tree concept for the Institute (For reference purpose only)

Source: Image by <https://timesofindia.indiatimes.com/india/cmeri-installed-the-worlds-largest-solar-tree-at-durgapur/articleshow/77856790.cms>

6.2.1.2 Solar parking

The Institute can turn its existing parking areas into solar panel powered parking areas. This will provide shade and renewable energy benefit to the College.



Plate 5: Solar parking concept for the Institute (For reference purpose only)

Source: Image by <https://solarpowerproject.in/solar-panels-for-parking-lots.php>

6.2.2 Alternatives towards Smart premises – General aspects

6.2.2.1 Facility management systems, controls

(Includes electromechanical systems – Electrical, Water)

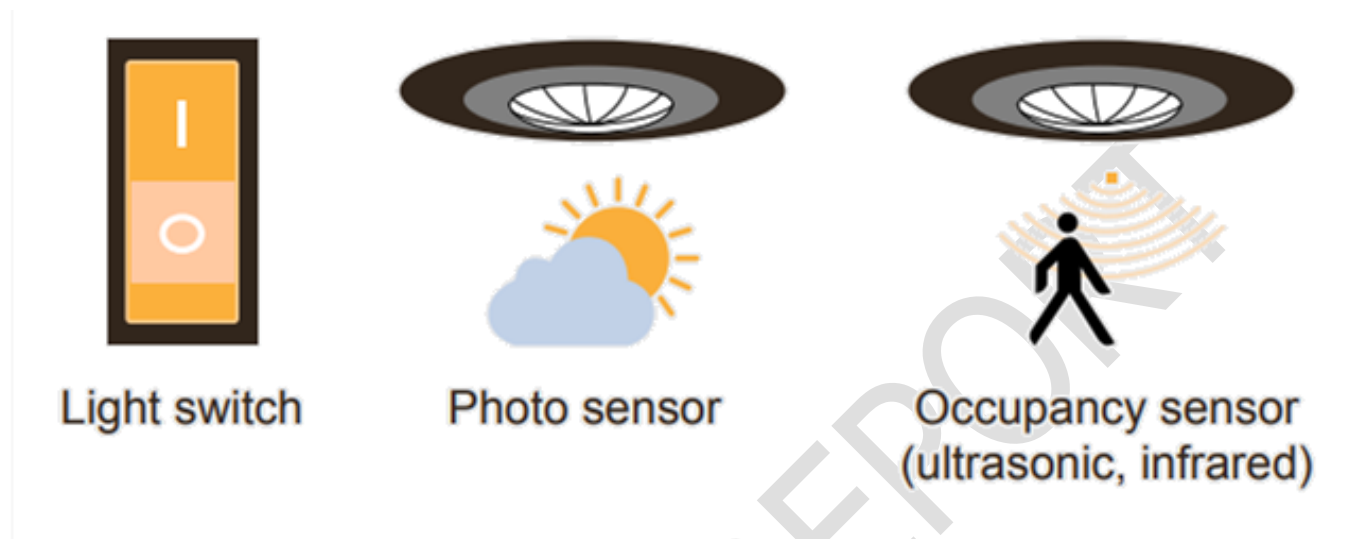


Plate 6: Understanding the lighting concepts

Source: https://seors.unfcc.int/applications/seors/attachments/get_attachment?code=NG125PFE4WHMWSYAK8TCAKIHMWX0F4QD

The above diagram provides a detailed study of how the system controls should be incorporated in the premises as far as lighting systems are considered. The suggestions for this sub-section are listed below.

- ➔ Install PIR control of the lighting in the toilet areas.
- ➔ Install low flow taps with automatic shut off in the toilets.
- ➔ Install push button timer control in all rooms lighting and ceiling fans.
- ➔ Install Power Electronics control of the Foyer notice board lighting.
- ➔ Installation of intelligent lighting controller will help in controlling the lighting energy.
- ➔ Use of photo sensor switch for street light controlling helps in conserving the lighting energy.

6.2.2.2 Smart gardening

The College can undertake a Smart Gardening system using IoT Technology. This will result in saving time by scheduling time for watering; saving money through automated water schedules tracking dampness of soil to know when, how much water garden needs.



Plate 7: Solar farm concept for the Institute (For reference purpose only)

Image source: <https://housing.com/news/smart-gardening/>

Data source: <https://www.happysprout.com/inspiration/what-is-smart-gardening/>

DETAILED



Investigative parameters – Energy Management – Solar street light and sources of energy consumption



Investigative parameters – Ecological Management – Diesel Generator, earth pit areas for backup measures



Investigative parameters – Fire and life safety measures



Investigative parameters – Ecological cover in the premises

7. Compilation

The study is based on the data collected, analyzed, rechecked, and confirmed through multiple modes. For the quality study, some standards/ notes have been referred to. These are listed and noted below. However, no direct references have been used anywhere. These are used as a base to analyze and study the data collected.

Specific references for study related to energy

- <https://www.energy.gov/eere/buildings/zero-energy-buildings>
- <https://www.dsaarch.com/zero-net-positive-energy>
- U.S. Energy Information Administration
- <https://www.happysprout.com/inspiration/what-is-smart-gardening/>
- <https://housing.com/news/smart-gardening/>
- Inference study reference image - Zsuzsa Bóka from Pixabay
- Inference study reference image - <https://solarpowerproject.in/solar-panels-for-parking-lots.php>

