# ENERGY AUDIT

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

Sustainability study

# AUDIT REPORT

**Studied for**

**Ashoka Education Foundation's**

**Ashoka Center for Business and Computer Studies**

Nandanvan Estate, Near Chandi Village,
Anandwalli, Gangapur Road, Nashik-422003, Maharashtra, India

**Studied in the capacity of**

**Accredited and Certified GBP**

**Studied by**

Website: https://thegreenviosolutions.co.in/
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*Background reference image Janko Ferlic on pexels*

# Disclaimer

The Audit Team has prepared this report for the **Ashoka Education Foundation's Ashoka Center for Business and Computer Studies** located at *Nandanvan Estate, Near Chandi Village, Anandwalli, Gangapur Road, Nashik-422003, Maharashtra, 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 internal team. 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.

**Ar. Nahida Abdulla**

**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 extends its appreciation to the **Ashoka Education Foundation's Ashoka Center for Business and Computer Studies, 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 extended are due to everyone from the Management.

Our heartfelt thanks are extended to the Chairperson of the entire process **Dr. P. A. Ghosh** (Principal) for the valuable inputs.

We are also thankful to Institute's Task force who have played a major role in data collection.

- Teaching staff members – ***Mrs. Komal Suyog Kadam***
- Non-teaching staff members – ***Mr. Atul Gangurde***
- Admin staff members – ***Mr. Kiran Bhamre***

**Sustainable Academe**
Brand of Greenvio Solutions, Palghar District, Maharashtra- 401208

# Contents

# 1. Introduction

## 1.1 About the Institution

*Established in June 2009 by Ashoka Education Foundation with various courses of Higher Education. Nation's sustainable and inclusive economic growth depends upon its capacity to generate and advance the information technology knowledge.*

*The higher education system in the country has an important role to play in this area. Ashoka Center for Business and Computer Studies has come forward to share this responsibility by providing qualified Professionals to the existing industries.*

*ACBCS offers high-quality programs in different areas Computer Science, Computer Applications and Business Administration.*



## 1.2 Statements of the Institution

### 1.2.1 Vision

The Institute proposes *"To embed need based knowledge through holistic approach to create responsible future generation with deep rooted ethos of Indian culture and tradition."*

### 1.2.2 Mission

The Institute adheres and focuses *"To make the students thinker for self-exploration with technical and skill specific knowledge to create young professionals."*

## 1.3 Assessment of the Institute

### 1.3.1 Affiliations

The College has all its courses approved and affiliated to the **Savitribai Phule Pune University,** formerly the University of Poona, is a collegiate public state university located in the city of Pune, India.

### 1.3.2 Recognitions

The College has been recognized under section *2 (f) of the UGC Act, 1956* by University Grants Commission, New Delhi.

### 1.3.3 Certification

The institute has received the following Certifications

- AISHE – The code is C-42104
- ISO 9001:2015 Certification

# 2. Overview

## 2.1 Summarised Populace analysis for 2022-2023

### 2.1.1 Students data

The data (shared by the Institute) shows there were **860 students.**

### 2.1.2 Staff data

| S. No. | Type | Male | Female | Total |
|---|---|---|---|---|
| **1** | Admin staff | 07 | 02 | **09** |
| **2** | Teaching staff | 28 | 09 | **37** |
| **3** | Non-Teaching staff | 05 | 12 | **17** |
| **Total Staff Members** | | **40** | **23** | **63** |

*Table 1: Staff data of the Institution for 2022-2023*

The staff data shows the Institute premises had **63 Staff Members.**

## 2.2 Summarised Populace analysis for 2021-2022

### 2.2.1 Students data

The data (shared by the Institute) shows there were **766 students.**

### 2.2.2 Staff data

| S. No. | Type | Male | Female | Total |
|---|---|---|---|---|
| **1** | Admin staff | 05 | 02 | **07** |
| **2** | Teaching staff | 28 | 07 | **35** |
| **3** | Non-Teaching staff | 03 | 12 | **15** |
| **Total Staff Members** | | **36** | **21** | **57** |

*Table 2: Staff data of the Institution for 2021-2022*

The staff data shows the Institute premises had **57 Staff Members.**

# 3. Research

## 3.1 Site Area

The **site area is 1.44 acres with a built-up area of 27,876 sq. ft.**

## 3.2 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.

## 3.3 Analysis of the Green Building Study Audit

The procedure included detailed verification as follows:

- Investigation
- Technical
- Observations
- Inferences

## 3.4 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.

# 4. Investigation

*Plate 1: Discussion with the team*

*Plate 2: Investigation of the fire & life safety practices and internal spaces of campus*


*Plate 3: Discussion with the internal team*

# 5. Documentation

## 5.1 Primary sources of energy consumption

- **Electrical (Metered) –** Light, Fans, Equipments, Pumps comprise these sources.
- **Renewable energy –** There are **154 nos. of SOLAR PANELS' as sources of renewable energy** available.

## 5.2 Secondary sources of energy consumption

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

| S. No. | Name | Nos. |
|---|---|---|
| **1** | UPS | 2 |
| **2** | Inverters/Generators | 1 |
| **3** | Batteries | 60 |
| **4** | Gas cylinders | 3 |
| **5** | Induction stove | 1 |

*Table 3: Details of secondary sources of energy consumption*

## 5.3 Actual electrical consumption as per bills

The information was shared for the meters:

| S. No. | Month | Year | Amount | (A) Total units consumed | (B) Solar units generated | (C = A-B) Gross units consumed after deduction |
|---|---|---|---|---|---|---|
| **Academic year 1** | | | | | | |
| **1** | June | 2021 | 22,372 | 4,535 | 1,819 | 2,716 |
| **2** | July | 2021 | 26,467 | 4,333 | 1,102 | 3,231 |
| **3** | August | 2021 | 47,410 | 3,777 | 891 | 2,886 |
| **4** | September | 2021 | 40,053 | 4,091 | 859 | 3,232 |
| **5** | October | 2021 | 29,199 | 4,299 | 1,487 | 2,812 |
| **6** | November | 2021 | 44,140 | 3,236 | 507 | 2,729 |
| **7** | December | 2021 | 45,431 | 3,537 | 381 | 3,156 |

| | | | | | | |
|---|---|---|---|---|---|---|
| **8** | January | 2022 | 31,338 | 3,912 | 1,173 | 2,739 |
| **9** | February | 2022 | 34,020 | 2,829 | 1,064 | 1,765 |
| **10** | March | 2022 | 57,330 | 4,710 | 878 | 3,832 |
| **11** | April | 2022 | 62,590 | 5,362 | 789 | 4,573 |
| **12** | May | 2022 | 70,388 | 6,950 | 1,124 | 5,826 |
| **Academic year 2** | | | | | | |
| **13** | June | 2022 | 73,143 | 5,633 | 550 | 5,083 |
| **14** | July | 2022 | 62,928 | 4,903 | 546 | 4,357 |
| **15** | August | 2022 | 64,863 | 5,368 | 691 | 4,677 |
| **16** | September | 2022 | 89,507 | 6,860 | 514 | 6,346 |
| **17** | October | 2022 | 59,543 | 6,239 | 1,327 | 4,912 |
| **18** | November | 2022 | 76,813 | 5,274 | 237 | 5,037 |
| **19** | December | 2022 | 65,749 | 4,471 | 275 | 4,196 |
| **20** | January | 2023 | 51,160 | 3,529 | 731 | 2,798 |
| **21** | February | 2023 | 50,740 | 3,600 | 807 | 2,793 |
| **22** | March | 2023 | 71,290 | 4,741 | 334 | 4,407 |
| **23** | April | 2023 | 83,360 | 6,322 | 279 | 6,043 |
| **24** | May | 2023 | 89,280 | 6,873 | 378 | 6,495 |

*Table 4: Details of the electrical consumption*

**The observation related to above information states:**

- The **total units** consumed in past two years **~1,15,382 units (Electrical + solar)**
- The **average units** consumed every month are **~ 4,808 units (Electrical + solar)**
- The **total units** consumed in past two years is **~ 18,743 units (Only solar)**
- The **average units** consumed every month are **~ 781 units (Only solar)**
- **Alternate source of energy is available in form of solar panels on the rooftop.**
- **The percentage of energy met by alternate (solar (renewable)) source is very less and comes to around 16%**

*Plate 4: Solar panels in the premises*

*Plate 5: Solar inverter in the premises*

## 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 in summarised in the following sections.

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

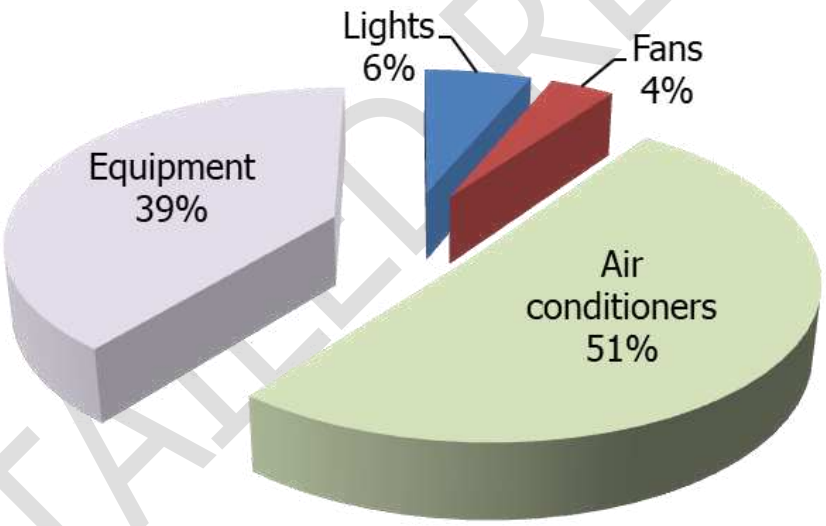



*Figure 1: Summary of the calculated electrical consumption as per inventory*

The above graph shows that air conditioners consume 51% whereas the equipment consume 39% while the lights consume 6% and the fans consume 4% of the total calculated electrical energy.

## 5.5 Lights

### 5.5.1 Types of lights based on the numbers

There are **939 lights on the premises;** the following table shows the various types of lights on the premises.

| S. No. | Type | Nos. |
|---|---|---|
| 1 | **LED lights** *(Energy efficient appliance)* | 814 |
| 2 | **Halogen lights** *(Non-Energy efficient appliance)* | 1 |
| 3 | **Non-LED lights** *(Non-Energy efficient appliance)* | 124 |

*Table 5: Summary of the types of lights on-premise*

### 5.5.2 Types of lights based on the power consumption

The energy consumption of lights is **30,052 kWh** of energy.

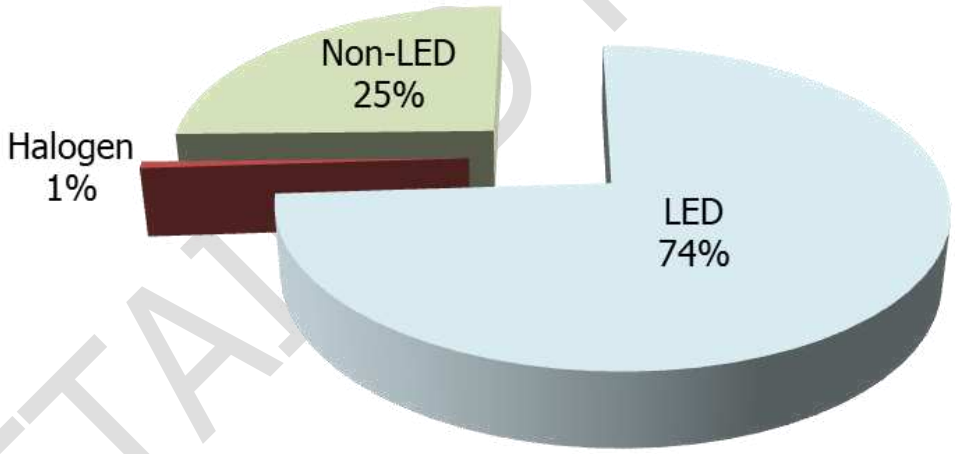



*Figure 2: Energy consumed by types of lights in the premise based on the usage study*

The analysis of the types of Lights on-premises shows **LED lights consume 74%** whereas the **Non-LED lights consume 25%** while the **Halogen lights consume 1%** of the total power consumed by lights.

## 5.6 Fans

### 5.6.1 Types of fans based on the numbers

There are **353 fans** on the premises as follows:

| S. No. | Type | Nos. |
|---|---|---|
| **1** | Ceiling fans | 283 |
| **2** | Medium Motor exhaust fans | 64 |
| **3** | Pedestal fans | 4 |
| **4** | Wall Mounted fans | 2 |

*Table 6: Summary of the types of fans in the premises*



### 5.6.2 Types of fans based on the power consumption

The energy consumption of fans is **18,025 kWh** of the energy.

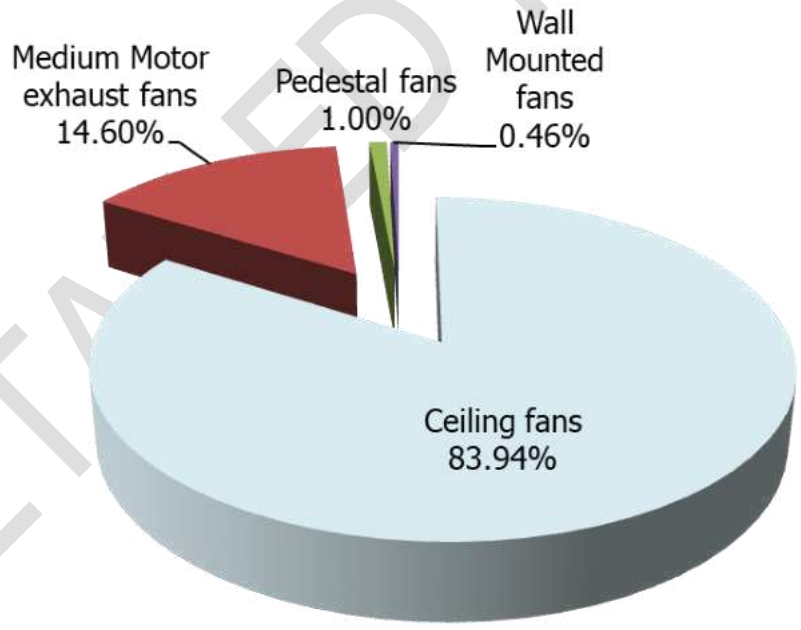



*Figure 3: Types of fans based on power consumption*

The above analysis shows that the **Ceiling fans consume 83.94%** whereas the **medium motor exhaust fans** consume 14.60% while the **pedestal fans consume 1%** and the **wall mounted fans consume 0.46%** of total power consumed by fans.

## 5.7 Air conditioners

### 5.7.1 Types of air conditioners based on the numbers

There are **25 air conditioners** on the entire premises**.**

### 5.7.2 Building-wise consumption analysis

The energy consumption of air conditioners is **2,45,551 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.

## 5.8 Equipment

### 5.8.1 Types of Equipment

There are **503 nos. of equipment** in the Educational sector.

### 5.8.2 Types of equipment as per their energy contribution

The energy consumption of equipment is **1,90,276 kWh** of energy.

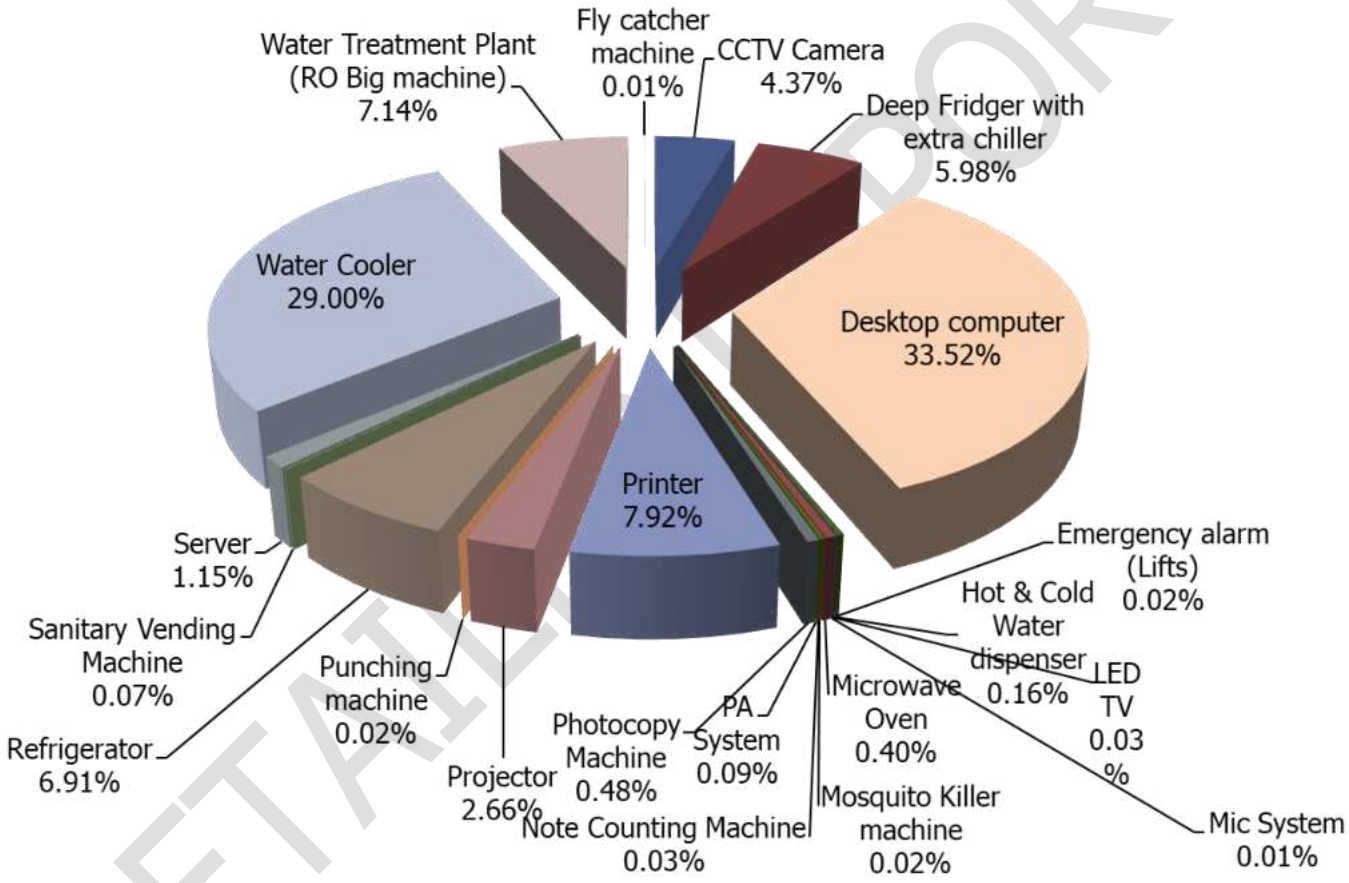



*Figure 4: Energy consumed by types of equipment in the educational sector based on the usage study*

The above summary shows that the **desktop computer consumes more energy at 33.52%** while the **water cooler consumes 29.00%** whereas the **printer consumes 7.92%** and the **water treatment plant (RO big machine) consumes 7.14%** these are the maximum consumers as compared to other equipment.

# 6. Observations

## 6.1 Investigative suggestions

The following suggestions can be implemented ***in next one year***. The Institute can execute a plan after discussion with Project Head.

Certain aspects noted below in red font should be upgraded as per the convenience of the Institute; these are common to the site and can be considered for entire premises wherever there are similar areas.

- **DG and Transformer area**
  - Add safety *signages* such as 'Danger-do not touch' etc.
  - Add *signboards* about the usage such as 'Transformer areas' and 'Diesel Generator area' etc.
  - Every user in this space should compulsorily jacket, helmet, gloves, boots while working and being a part of this space.
  - Code the earthing pits in the courtyard.
  - Add additional fire extinguishers

- **General safety aspects**
  - Rubber flooring in the laboratories to avoid an electric shock.
  - Introduce *'PASS' information board* about how to use Fire extinguisher and *'FIRE ZONE' display board* where safety equipments are kept.

# 7. Inferences

## 7.1 Section-wise suggestions

The following suggestions are to be considered as a ***first priority*** to **be executed within the next 1.5 to 2.5 years from the date of the Report submission.**

### 7.1.1 Electromechanical systems – 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 shows that there would be a reduction of an average of **69% reduction** in energy consumption if replaced with energy efficient appliance. It will be suggested to either replace these now if the Institute can have certain plans else the replacement can be done when fans get damaged or are not in working condition.

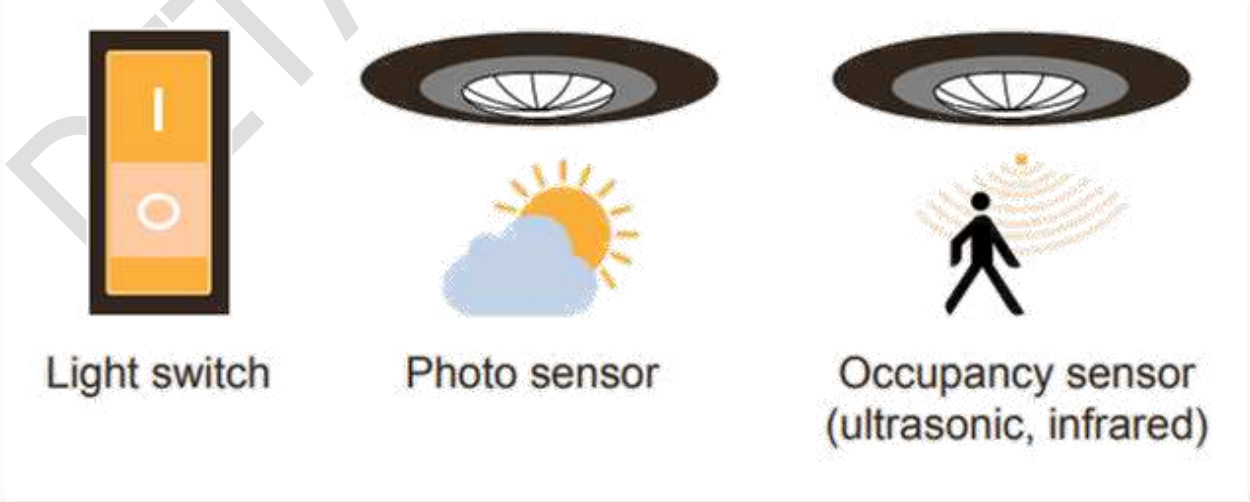
## 7.2 General suggestions

The following are consolidated study related to 'entire Institute' should be considered as ***second priority*** once section wise recommendations are implemented.

### 7.2.1 Alternatives towards Smart premises mechanisms

#### 7.2.1.1 Facility management systems, controls

(Includes electromechanical systems – Electrical, Water)




***Reference suggestions 1: Understanding the lighting concepts***

Source: https://seors.unfccc.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 fare 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.
-

#### 7.2.2.2Smart gardening

The Institute 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.

***Reference suggestions 2: 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/*

# 8. 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/