GV/EA/03-24/273

Energy Audit Certificate (As per Green Building Parameters)

The study is conducted as per Indian and International Green Building Standards initiated in the capacity of an Accredited & Certified Green Building Professional

It is awarded for **2022-2023 and 2023-2024** to the Esteemed Institution

(Analysed for 2 years and extended validity for 1 year, thus total 3 years)

Laxmi Charitable Trust's

Shri. Chinai College of Commerce & Economics

Dr.S.Radhakrishnan Marg, Andheri (East) Mumbai - 400069, Maharashtra, India

(Site visit held on 06 March 2024)

As part of the Institution's initiatives for a Healthy & Sustainable Institute the audit was conducted.
We appreciate the immense efforts taken by Staff and students towards the Energy Management and Conservation.

Issued on **Monday, 18 March 2024** and valid till **28 February 2025**

Ar. Nahida Abdulla Shaikh
"Elite 100 Green Architects of India" Econaur, 2022
Certified G.B.P. (Registration. No. 22/718)

Project Head and Green Building Professional-Consultant
Sustainable Academe I Sustainability Department of Greenvio Solutions, Naigaon
An environment Design and Consultancy developing Healthy and Sustainable Environments
Email: **sustainableacademe@gmail.com** I **greenviosolutions@gma**

Greenvio

Website: https://thegreenviosolutions.co.in/

SHRI CHINAI COLLEGE OF COMMERCE & ECONOMICS ANDHERI 400 069.

ENERGY AUDIT

STUDY PERIOD (TWO YEARS) 2022 – 2023 & 2023 - 2024

Sustainability study

AUDIT REPORT

Studied for

Laxmi Charitable Trust's

Shri. Chinai College of Commerce & Economics

Dr.S.Radhakrishnan Marg, Andheri (East),

Mumbai - 400069, Maharashtra, India

Studied in the capacity of

Accredited and Certified GBP

Studied by

Greenvio Solutions

Website: https://thegreenviosolutions.co.in/

Email: greenviosolutions@gmail.com

Background reference image Janko Ferlic on pexels

Disclaimer

The Audit Team has prepared this report for the **Laxmi Charitable Trust's Shri. Chinai College of Commerce & Economics** located Dr.S.Radhakrishnan Marg, Andheri (East) Mumbai - 400069, Maharashtra, India based on input data submitted by the Institute analysedby 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

Sustainable Academe is our department for conducting Audits Palghar

District, Maharashtra- 401208

sustainableacademe@gmail.com

Acknowledgement

The Audit Assessment Team extends its appreciation to the **Laxmi Charitable Trust's Shri. Chinai College of Commerce & Economics, 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.B.B.Kamble** (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 member – ***Prof. Ashok Bharsakle, Prof. Geeta Rathod, Prof. Florency D'souza & Prof. Kirti Rajne***
- Non-teaching staff member – ***Mr. Kiran L. Patil***
- Admin staff member – ***Mrs. Shraddha Pednekar***

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

Contents

1. Introduction

1.1 About statements of the Institute

1.1.1 Vision

The Institute proposes

- To inculcate values of regularity, punctuality and discipline so that students grow up to be responsible citizens.
- To promote overall personality development of students via extracurricular activities like sports, advertising event, etc.
- To develop and prepare students for facing challenges in the competitive world by using their potential in academic and co-curricular activities
- To generate a sense of belonging towards the institution by mutual interaction between past and present students
- To utilize the college infrastructure for well-being of the students as well as the neighbourhood community

1.1.2 Mission

The Institute adheres and focuses

- To provide foundation for academic excellence
- To provide growth of through various extracurricular activities by overall development
- To build a strong environment for continuous teaching learning progress
- Develop students mind from entrepreneurial perspective and ensure correct decision making
- To enable students become responsible citizens

1.2 Assessment of the Institute

1.2.1 Affiliations

The course provided by the College is affiliated to the **University of Mumbai**, a Public State University in Mumbai, one of the largest university systems in the world.

1.2.2 Certification

The **All India Survey on Higher Education (AISHE)** code is C-34139

1.2.3 Recognitions

The College has been recognized under section 2 (f) and 12 (B) of the UGC Act, 1956 byUniversity Grants Commission, New Delhi.

2. Overview

2.1 Summarised Populace analysis for 2023-2024

2.1.1 Students data

The data (shared by the Institute) shows there were **1,118 students.**

2.1.2 Staff data

S. No.	Type	Male	Female	Total
1	Admin staff	05	03	**08**
2	Teaching staff	09	08	**17**
3	Non-Teaching staff	04	00	**04**
Total Staff Members		**18**	**11**	**29**

Table 1: Staff data of the Institution for 2023-2024

The staff data shows the Institute premises had **29 Staff Members.**

2.2 Summarised Populace analysis for 2022-2023

2.2.1 Students data

The data (shared by the Institute) shows there were **1,179 students.**

2.2.2 Staff data

S. No.	Type	Male	Female	Total
1	Admin staff	05	03	**08**
2	Teaching staff	09	08	**17**
3	Non-Teaching staff	04	00	**04**
Total Staff Members		**18**	**11**	**29**

Table 2: Staff data of the Institution for 2022-2023

The staff data shows the Institute premises had **29 Staff Members.**

3. Research

3.1 Site Area

The **site area is 2.58 acres**

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: Assessment of the energy and electrical areas

Plate 2: Open space with plantations and Fire and life safety measure through extinguishers in premises

Plate 3: Water areas including pipes and bore wells in the premises

5. Documentation

5.1 Primary sources of energy consumption

- **Electrical (Metered) –** Light, Fans, Equipments, Pumps comprise these sources.
- **Alternate sources of energy consumption–** There are **NO SOURCES** available.

5.2 Secondary sources of energy consumption

The premise does not have any data or battery back-up sources available. It only has gas cylinder in the common canteen that has been leased to an external vendor.

5.3 Actual electrical consumption as per bills

The information was shared for the single meter available in the premises.

S. No.	Month	Year	Amount	(A) Total units consumed	(B) Solar units generated	(C = A-B) Gross units consumed after deduction
Academic year 2022-23 (Meter No 1)(CA no102691206)						
1	June	2022	18,580	3,275	0	3,275
2	July	2022	34,700	3,282	0	3,282
3	August	2022	34,040	3,222	0	3,222
4	September	2022	34,160	3,260	0	3,260
5	October	2022	33,390	3,186	0	3,186
6	November	2022	36,718	3,378	0	3,378
7	December	2022	36,550	3,363	0	3,363
8	January	2023	30,570	2,810	0	2,810
9	February	2023	33,840	3,112	0	3,112
10	March	2023	36,890	3,412	0	3,412
11	April	2023	39,350	3,587	0	3,587
12	May	2023	38,180	3,464	0	3,464
Academic year2023-24						
1	June	2023	44,080	4,002	0	4,002
2	July	2023	33,760	3,091	0	3,091
3	August	2023	39,650	3,600	0	3,600

4	September	2023	34,520	3,131	0	3,131
5	October	2023	46,300	4,203	0	4,203
6	November	2023	29,240	2,662	0	2,662
7	December	2023	33,200	3,009	0	3,009
8	January	2024	34,030	3,109	0	3,109
9	February	2024	33,870	3,096	0	3,096
Academic year 2022-23 (Meter No 2) (CA No.100503948)						
1	June	2022	3,890	526	0	526
2	July	2022	17,310	1,596	0	1,596
3	August	2022	21,010	1,950	0	1,950
4	September	2022	22,290	2,072	0	2,072
5	October	2022	25,560	2,383	0	2,383
6	November	2022	14,120	1,297	0	1,297
7	December	2022	19,680	1,772	0	1,772
8	January	2023	16,080	1,441	0	1,441
9	February	2023	12,890	1,142	0	1,142
10	March	2023	21,530	1,942	0	1,942
11	April	2023	21,548	2,465	0	2,465
12	May	2023	32,590	2,547	0	2,547
Academic year 2023-24						
1	June	2023	9,190	787	0	787
2	July	2023	31,110	1,933	0	1,933
3	August	2023	60,820	2,627	0	2,627
4	September	2023	27,530	2,458	0	2,458
5	October	2023	23,360	2,079	0	2,079
6	November	2023	14,201	1,242	0	1,242
7	December	2023	18,040	1,591	0	1,591
8	January	2024	17,754	1,565	0	1,565
9	February	2024	15,270	1,341	0	1,341

Academic year 2022-23 (Meter no.03) (CA No 100462000)						
1	June	2022	6,860	745	0	745
2	July	2022	5,400	465	0	465
3	August	2022	8,150	726	0	726
4	September	2022	4,670	397	0	397
5	October	2022	5,650	488	0	488
6	November	2022	5,000	427	0	427
7	December	2022	4,500	369	0	369
8	January	2023	5,010	416	0	416
9	February	2023	4,340	354	0	354
10	March	2023	7,132	611	0	611
11	April	2023	4,956	405	0	405
12	May	2023	5,840	483	0	483
Academic year 2023-24						
1	June	2023	7,325	617	0	617
2	July	2023	5,785	477	0	477
3	August	2023	5,970	499	0	499
4	September	2023	7,930	673	0	673
5	October	2023	4,880	396	0	396
6	November	2023	4,540	365	0	365
7	December	2023	3,860	302	0	302
8	January	2024	4,820	390	0	390
9	February	2024	3,871	303	0	303

Table 3: Details of the electrical consumption

The observation related to above information states:

- The **total amount** spent in past two years is **Rs. 12,97,880/-**
- The **average amount** spent every month are **Rs. 20,601/-**
- The **total units** consumed in past two years **~ 1,15,918 units (Electrical)**
- The **average units** consumed every month are **~1,840 units (Electrical)**
- **The percentage of energy met by alternate (solar panels (renewable)) source is zero in terms of electrical contribution.**

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.

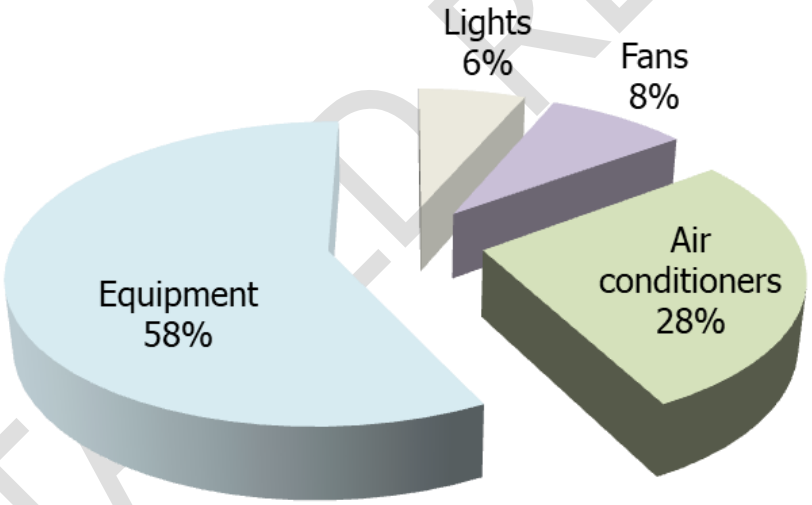

Figure 1: Summary of the calculated electrical consumption as per inventory

The above graph shows that equipment consume 58% whereas the air conditioners consume 28% while the fans consume 8% and the lights consume 6% of the total calculated electrical energy.

Note: The Institute has to undertake a lot of structural and electrical work on an urgent basis.

5.5 Lights

5.5.1 Types of lights based on the numbers

There are **328 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)	306
2	**CFL lights** (Non-Energy efficient appliance)	5
3	**Non-LED lights** (Non-Energy efficient appliance)	17

Table 4: 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 **14,253 kWh** of energy.

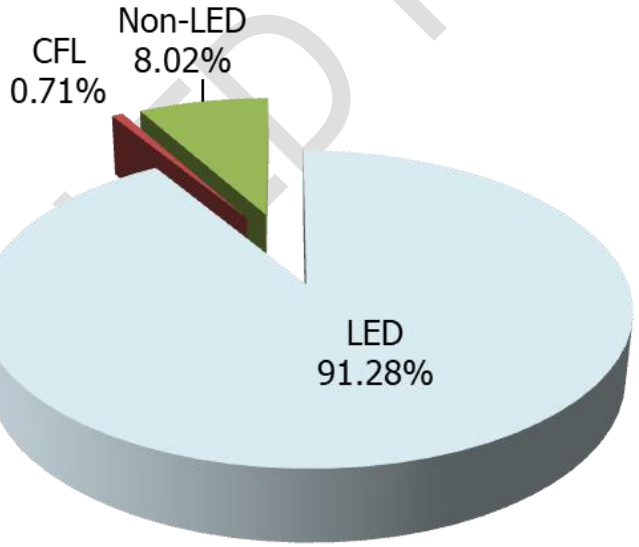

Figure 2: Energy consumed by types of lights in the premise based on the usage study

The analysis of the types of Lights on-premises shows **LED lights consume 91.28%** whereas the **Non-LED lights consume 8.02%** while the **CFL lights consume 0.71%** of the total power consumed by lights.

5.6 Fans

5.6.1 Types of fans based on the numbers

There are **196 fans** on the premises as follows:

S. No.	Type	Nos.
1	Ceiling fans	181
2	Table fan	1
3	Wall mounted fans	7
4	Small motor exhaust fans	6
5	Medium motor exhaust fan	1

Table 5: 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 **18.654 kWh** of the energy.

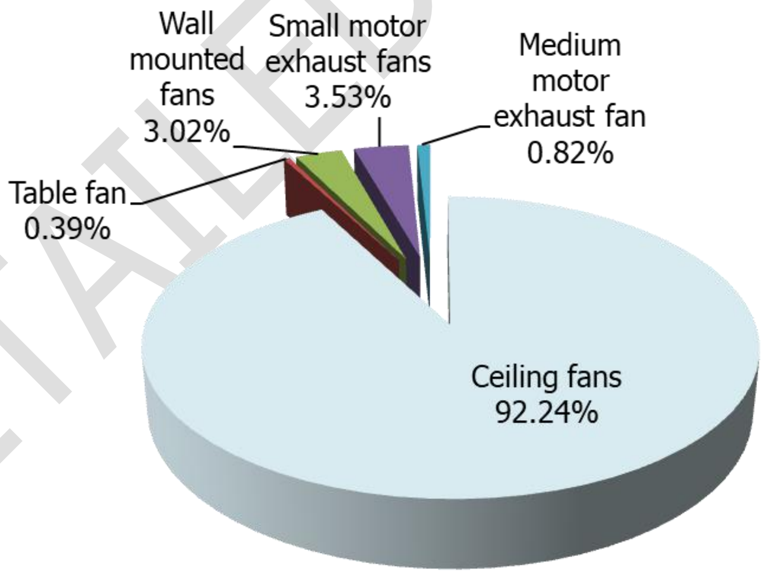

Figure 3: Types of fans based on power consumption

The above analysis shows that the **Ceiling fans consume 92.24%** whereas the **small motor exhaust fans consume 3.53%** while the **wall-mounted fans consume 3.02%** whereas the **medium motor exhaust fans consume 0.82%** while the **table fan consumes 0.39%** of total power consumed by fans.

5.7 Air conditioners

5.7.1 Types of air conditioners based on the numbers

There are **45 nos. of air conditioners** on the entire premises**.**

5.7.2 Building-wise consumption analysis

The energy consumption of air conditioners is **1,26,682 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 **169 nos. of equipment** in the Educational sector.

5.8.2 Types of equipment as per their energy contribution

The energy consumption of equipment is **60.599 kWh** of energy.

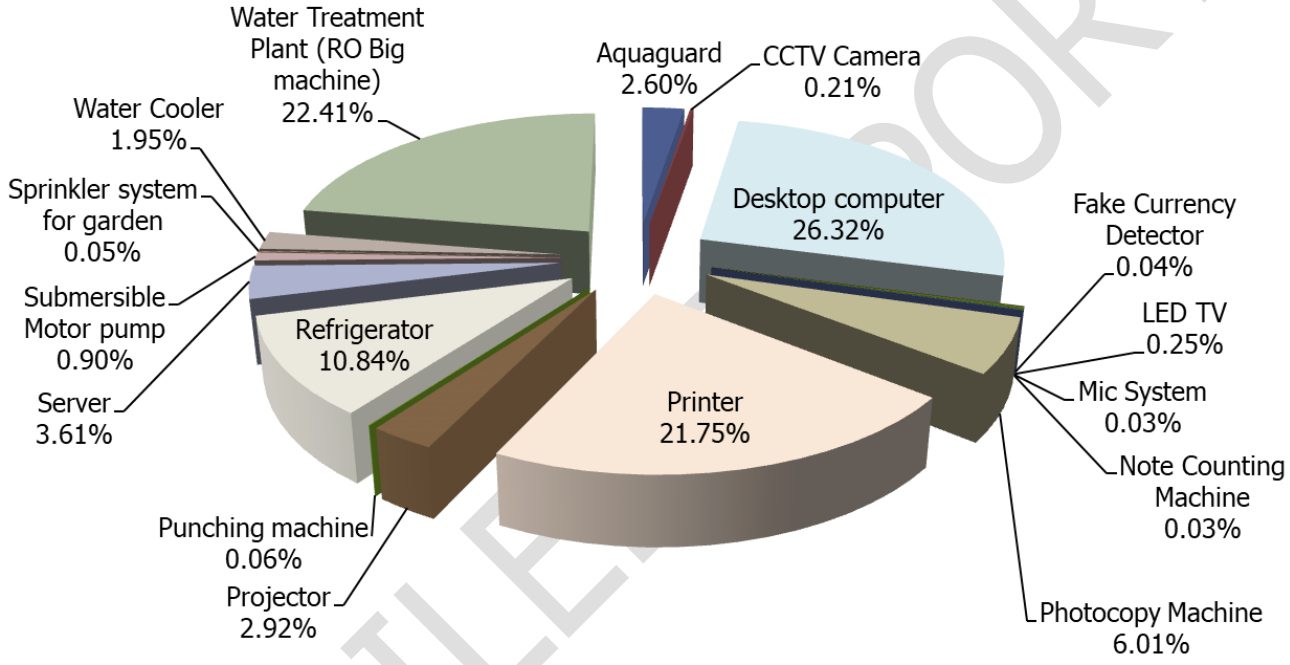

Figure 4: Energy consumed by types of equipment in the educational sector based on the usage study

The above summary shows that the **desktop computer consumes more energy at26.32%** while the **water treatment plant (RO big machine) consumes 22.41%**whereas the **printer consumes 21.75%** and the **refrigerator consumes 10.84%** these

6. Inferences

6.1 Section-wise suggestions

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

4.1.1 Electromechanical systems - Electrical and Lighting

Section 1 – Halogen, CFL and Non-led lights

The current light analysis shows that Halogen lights consume anywhere between 60W to 100W and even more when in use; these should be replaced with LED lights which consume on an average 12-18W when in use.

Our technical research shows that there would be a reduction of an average of **67% (Non- LED), 52% (CFL)** and **82% (Halogen) 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.

Section 2 - 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.

6.2 General suggestions

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

6.2.1 Alternatives towards Smart premises mechanisms

6.2.1.1 Facility management systems, controls

(Includes electromechanical systems – Electrical, Water)

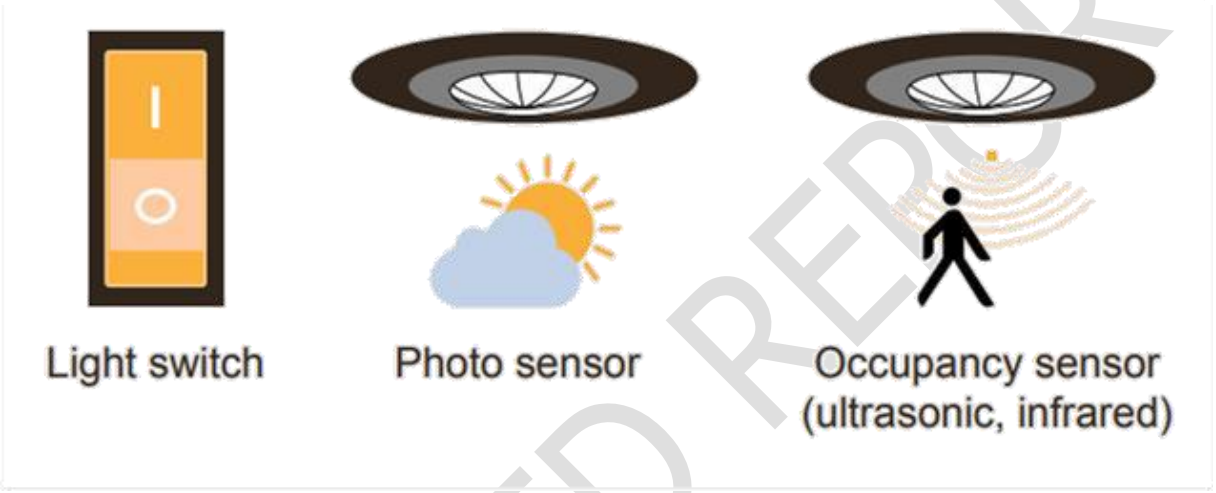

Plate 4: Understanding the lighting concepts

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

6.2.1.2 Smart 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.

Plate 5: 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/

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/

Balaji

Bhavanrao

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Digitally signed by Balaji Bhavanrao Kamble

Date:2024.04.02 12:27:12 +05'30'

Greenvio Solutions I Sustainable Academe I Developing Healthy and Sustainable Environments I
sustainableacademe@gmail.com

SHRI CHINAI COLLEGE OF COMMERCE & ECONOMICS ANDHERI 400 069.

INCHARGE PRINCIPAL
SHRI CHINAI COLLEGE OF COMMERCE & ECONOMICS ANDHERI (E), MUMBAI-400 069.