

# ENERGY AUDIT

STUDY PERIOD (TWO YEARS) 2020 – 2021 & 2021 – 2022

Sustainability study  
**AUDIT REPORT**

**Studied for**  
Shiksha Mandal, Wardha's  
**G. S. College of Commerce & Economics,**  
**Nagpur (Autonomous)**

Civil Lines, Law College Square, Amaravati Road,  
Nagpur – 440 010, Maharashtra, India

**Studied in the capacity of**  
**Accredited with IGBC and Certified with ASSOCHAM GEM**  
Registered Architect & Green Building Professional



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Issued on **21 February 2023** and Valid till **February 2024**

### Inferences of the Site visit

Audit conducted by : Nahida Shaikh, IGBC AP, GEM CP, Architect

Accredited and Certified Green Building Professional

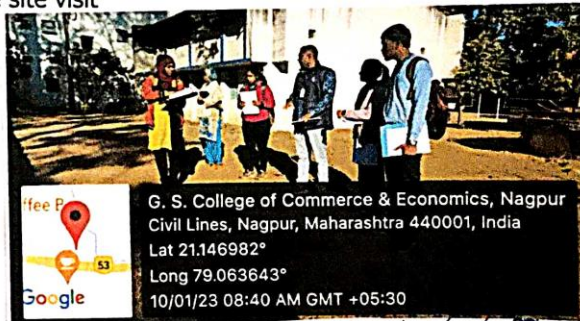
ASSOCHAM GEM Certified Professional Registration number 22/718

Link for the Verification website [https://www.green-assochem.com/manage\\_gem\\_cp.php?page=12](https://www.green-assochem.com/manage_gem_cp.php?page=12)

Institute: G.S. College of Commerce & Economics, Nagpur Date: 10/01/2023  
 Audits covered: Green Energy & Environment Audit Day: Tuesday

Observations (position)	Inferences
<ul style="list-style-type: none"> <li>- Tree Transplantation &amp; adoption, maintenance</li> <li>- Green Building, water &amp; waste management</li> <li>- 100% LEED</li> <li>- protected plants</li> <li>- Immense bamboo planted</li> </ul>	<ul style="list-style-type: none"> <li>- Increase awareness</li> <li>- Improve compound wall design</li> <li>- Increase documentation</li> </ul>

#### Evidence of the site visit



College Name: G.S. college of Comm & Eco, Nagpur  
 Signature: S.S. Kathale  
 Name: Dr. S.S. Kathale  
 Designation: Offg. Principal  
 Date: 10/01/2023  
Offg. Principal  
G.S. College of Commerce & Economics, Nagpur.

Signature of Ar. Nahida Shaikh,  
 ASSOCHAM GEM CP 22/718

*Nahida Shaikh*  
 10/01/23

For Greenvio Solutions  
 Signature: [Signature]  
 Name: Mrs F. A. Shaikh  
 Designation: Manager  
 Date: 10/01/2023



## Disclaimer

The Audit Team has prepared this report for the **Shiksha Mandal, Wardha's G. S. College of Commerce & Economics, Nagpur (Autonomous)** located at Civil Lines, Law College Square, Amaravati Road, Nagpur – 440 010, Maharashtra, 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.

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

Sustainable Academe is our department for conducting Audits

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# Acknowledgement

The Audit Assessment Team thanks the **Shiksha Mandal, Wardha's G. S. College of Commerce & Economics, Nagpur (Autonomous), Maharashtra, India** 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 **Hon'ble Mr. Shekhar Bajaj**, President/Trustee; **Hon'ble Mr. Sanjay Bhargava**, Chairperson/Trustee and everyone from the Management.

Our heartfelt thanks to Chairperson of the entire process **Dr. Mrs. S. S. Kathaley**, Officiating Principal for the valuable inputs.

We are also thankful to **College's Task force the faculty members** who have collected data required **Dr. R. T. Sahu**, IQAC Coordinator & Chairman, Board of Studies in Commerce; [\*Prof. A. S. Jain, Secretary, Academic Council \(Special mention for the excellent coordination\)\*](#); **Dr. D. V. Chavan**, Chairman, Board of Studies in Languages; **Dr. V. N. Thangan**, Chairman, Board of Studies in Accountancy; **Dr. S. D. Morey**, Chairman, Board of Studies in Economics; **Dr. S. S. Gadekar**, Chairman, Board of Studies in Business Management; **Prof. P. J. Yadao**, Chairman, Board of Studies in Information Technology; **Dr. Y. H. Kedar**, Convener, GS-Eco Club; **Prof. Nitin K. Kapgate**, Expert, Environmental Studies.

We highly appreciate the assistance of **Ms. Jayashri Ilamkar**, Head Clerk; **Mr. Rahul Khanorkar**, Non-teaching Staff; **Ms. Vandana Joseph**, Non-teaching Staff 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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DETAILED REPORT

# 1. Introduction

## 1.1 About the Institution

G. S. College of Commerce and Economics, Nagpur was established to fulfil the requirement of Commerce education in the region during the pre-Independence period. **It is the first Commerce College in the city of Nagpur and only the second in Nagpur University.** It has carved a niche for itself as premier Commerce College in the country and is known for its high academic standards, qualitative growth and ethical practices. **The college today stands tall as the first Autonomous Commerce College in the RTM Nagpur University.**

It was **essentially conceived as a specialized Commerce College** and today it is justifying its genesis through the successful implementation of both under-graduate and post-graduate courses, Junior College, multiple complementary certificate courses. Efforts by a team of well-qualified teachers and researchers, and the right combination of curricular, co- curricular and extra-curricular activities have ensured that **the students emerge as not only competent professionals but also good citizens.**

## 1.2 Mission Statement of the Institution

- *To impart theoretical as well as professional instruction in different fields of commerce education.*
- *To provide all possible facilities to build up personality and character of students.*
- *To inculcate among students love for our country, national unity and habit of social service.*
- *To make students conversant with current knowledge in the field of commerce and industry, and to create awareness about global scenario in the field trade, commerce and industry.*
- *To develop among students the capacity to be efficient managers, responsible businessmen and administrators.*

## 1.3 Assessment of the Institute

### 1.3.1 Affiliations

The Institute is affiliated to **Rashtrasant Tukadoji Maharaj Nagpur University (R.T.M.U.N.)**, formerly Nagpur University, is a public state university located in Nagpur, Maharashtra. It is one of India's oldest universities, as well as the second oldest in Maharashtra.

### 1.3.2 Accreditation

The following are details awarded by the National Assessment & Accreditation Council.

Cycle	First	Second	Third
<b>CGPA</b>	-	2.87	3.03
<b>Grade</b>	B+	B	A
<b>Year</b>	2003	2009	2018

*Table 1: NAAC Accreditation details of the Institute*

The College is due to enter its Fourth cycle of NAAC.

### 1.3.3 Certification

The College has received the following Certifications

- NIRF – Participated in the National Institutional Ranking Framework.
- AISHE – The All India Survey of Higher Education code is C-18681.
- Academic Audit – The College has undertaken the Academic Audit every year.
- Autonomous Status – The College has received the autonomous status in 2018.

## 1.4 Achievements of the Institute

The Institute has a tremendous track record of excellence in Built form and educational services provided, below are some of the achievements of the prestigious Institute.

- Ideal Management Award, The Rashtrasant Tukadoji Maharaj Nagpur University, Nagpur
- Best NSS Unit Award, The Rashtrasant Tukadoji Maharaj Nagpur University, Nagpur
- Best NSS Programme Officer, The Rashtrasant Tukadoji Maharaj Nagpur University, Nagpur

## 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 **794 male and 466 female** thus a total of **1,260 students** on the premises.

#### 2.1.2 Staff data

Type	Male	Female	Total
Teaching staff	13	10	23
Non-Teaching staff	6	16	22
<b>Total Staff Members</b>	<b>19</b>	<b>26</b>	<b>45</b>

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

The staff data shows the premises had a total of **45** 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 **423 male and 818 female** thus a total of **1,241 students** on the premises.

#### 2.2.2 Staff data

Type	Male	Female	Total
Teaching staff	15	10	25
Non-Teaching staff	6	16	22
<b>Total Staff Members</b>	<b>21</b>	<b>26</b>	<b>47</b>

*Table 3: Staff data of the Institution for 2020 - 2021*

The staff data shows the premises had a total of **47** Staff Members.



## 2.3 Total College Area & College Building Spread Area

The **total site area is 7 acres & total Built-up area of College is 1,75,095 sq. ft. for around 1,305 populace footfalls.**

## 2.4 College Infrastructure

### 2.4.1 Establishment

**The College was established in 1945.**

### 2.4.2 Spatial Organisation

The College is **designed into a cluster of multiple blocks.** These blocks are **architecturally planned to invite the natural light** and reduce the dependence on artificial ventilation for thermal comfort of the users. The **spatial organization is balanced with the hardscape and softscape** in and around the well-spaced blocks thus **providing a calm and peaceful arena for an Educational Institute.**

### 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 with timings being 08:20 hours to 17:00 hours.

## 3. Green Building research process

### 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
- ➔ Green Audit
- ➔ Environmental Audit

### 3.3 Strategy adopted for Green Building Study Audit

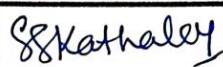





The strategies included data collection from the admin department, actual inventory, investigation to check the operation and maintenance, analysis of the data collection, and preparation of the Report.

### 3.4 Activities undertaken for the Green Building Study Audit

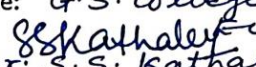
- ➔ Allotment and Initiation by the Institute
- ➔ Survey of students and staff completed
- ➔ Site visit at the Institute
- ➔ Submission of the Certificate


### Induction Meeting

Institute: G.S. College of Commerce & Economics, Nagpur Date: 10/01/2023  
Audits covered: Green Energy & Environment Audit Day: Tuesday

S. No	Name	Designation	Signature
1.	Dr. S.S. Kathaley	Offg. Principal	
(Exceed)	2. Mrs Farida Shaikh	Manager	
(Exceed)	3. As. Nahida Abdulla	IGBL, GEMCP	
4.	Dr. Ranjana Sahu	IQAC co-ordinator.	
5.	Prof. Akash Jain	Crt. 7 Incharge	
6.	Shri Nitin Kapgate	Envt. studies (Sub. Expert)	
7.	Dr. P.M. Paradkar	Campus Beautification Committee convenor	



College Name: G.S. College of Comm. & Economics, Nagpur.  
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Name: Dr. S.S. Kathaley  
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For Greenvio Solutions  
Signature:   
Name: Mrs F. A. Shaikh  
Designation: Manager  
Date: 10/01/2023

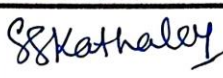







Offg. Principal.  
G.S. College of Commerce  
& Economics, Nagpur.

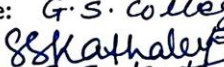



### Induction Meeting

Institute: G.S. College of Commerce & Economics, Nagpur Date: 10/01/2023  
Audits covered: Green, Energy & Environment Audit Day: Tuesday

S. No	Name	Designation	Signature
1.	Dr. S.S. Kathaley	Offg. Principal	
(External) 2.	Mrs. Farida Shaikh	Manager	
(External) 3.	Ax. Nalida Abdulla	IGBL, GEMCP	
4.	Dr. Ranjana Sahu	IQAC co-ordinator.	
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Offg. Principal.  
G.S. College of Commerce  
& Economics, Nagpur.



## 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 solar street lamps in the premises.

#### 4.1.2 Secondary sources

These are available in the form of Inverters, Diesel generator for general and backup purposes.

### 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

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.	Name of Building	Month	Year	Units Consumed	Amount
1)	Bajaj Bhawan	December	2022	3,275	71,210/-
2)	Library	November	2022	1,589	13,880/-
3)	Heritage Building	November	2022	1,025	9,110/-

*Table 4: Details of the electrical consumption*

### 4.3.1 Inferences based on the data

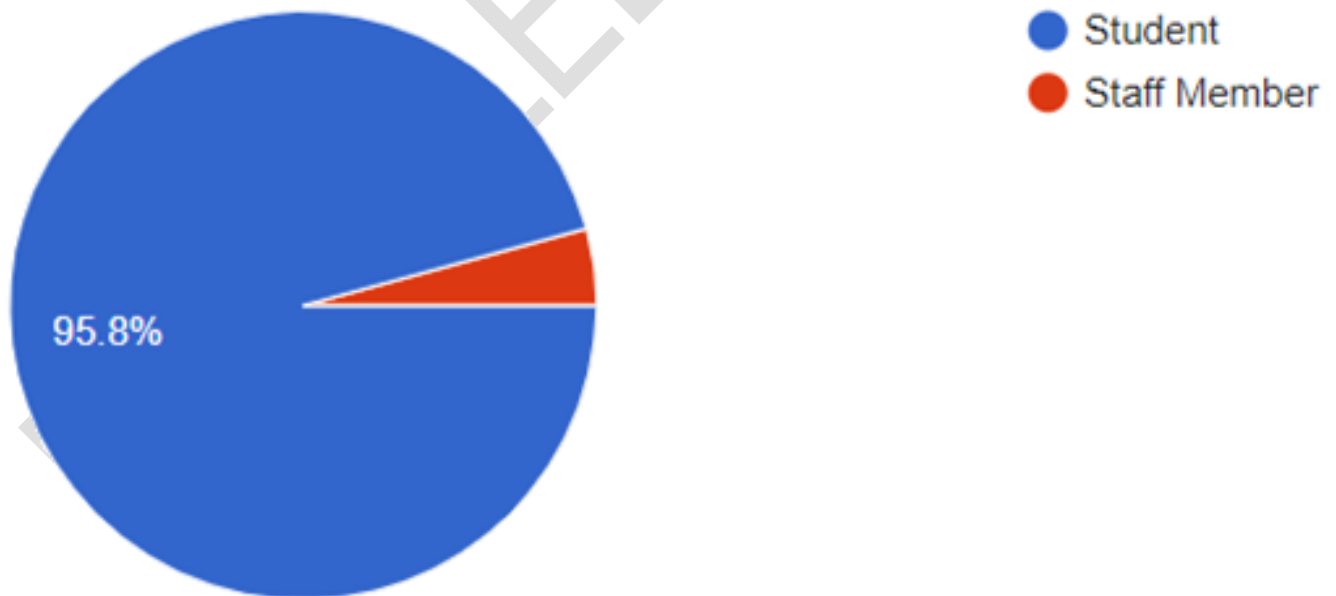
The analysis of actual electrical energy consumption is summarised below.

- ⇒ The average consumption varies for each month.
- ⇒ At present the Institute is spending a huge amount every month on the electricity bills.
- ⇒ Some appropriate renewable energy planning should be adopted.
- ⇒ Similarly, a schedule-wise detail documentation of daily energy consumption should be maintained.

## 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*

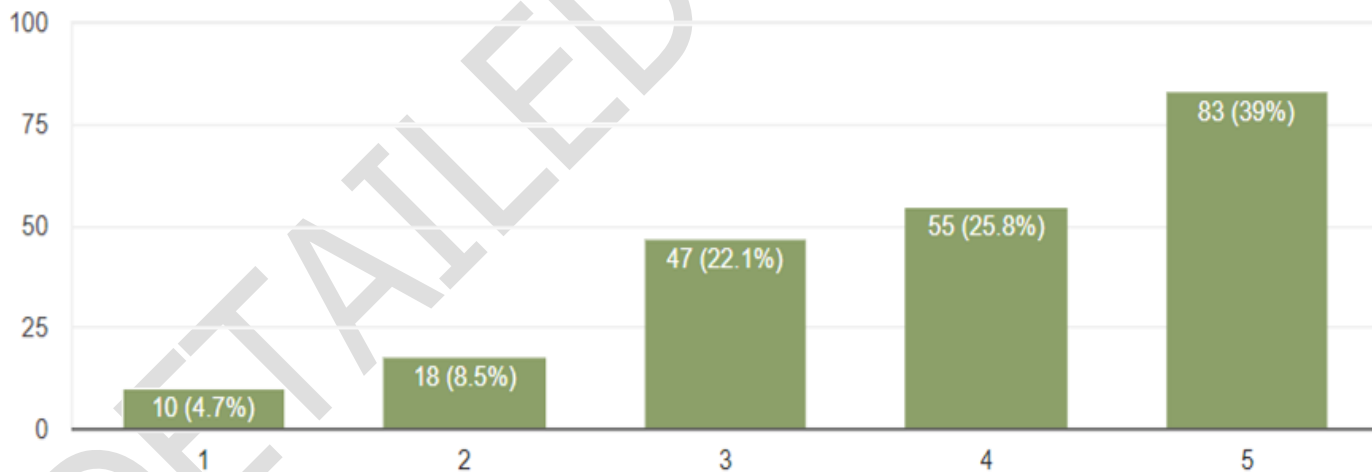
A total of **213 responses** were received out of which 96% were students.

#### 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*

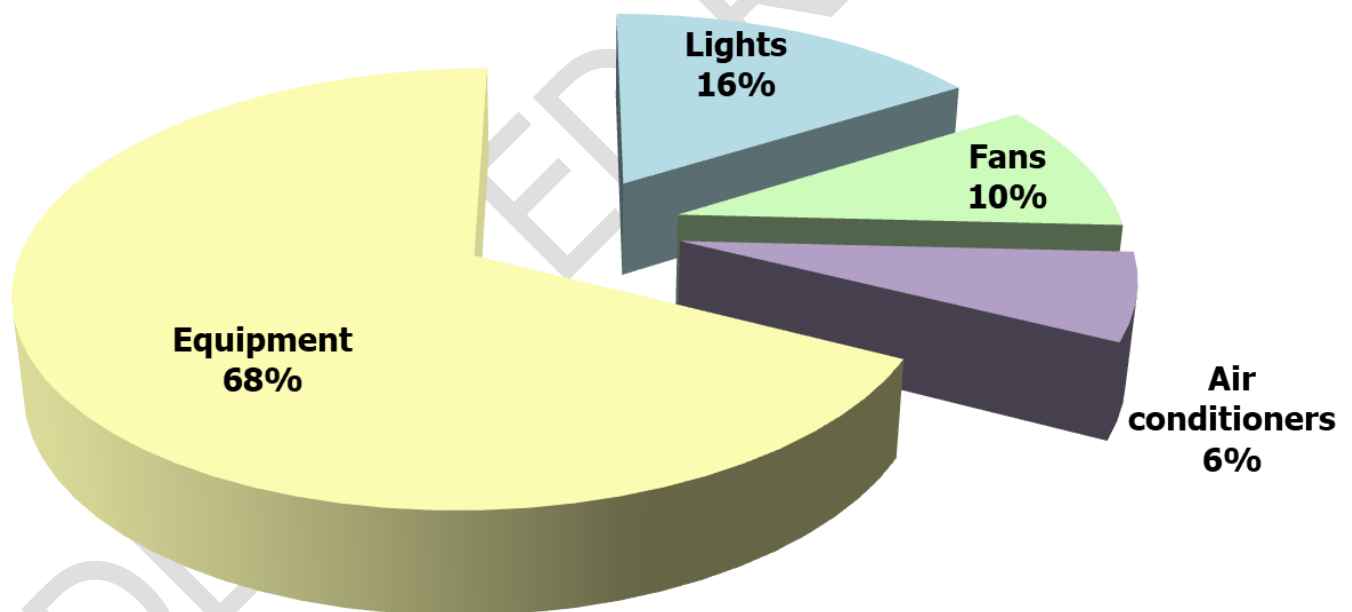
The students, staff (**almost 39%**) of the responses found the practices to be **excellent (rating 5)** and **26%** of the responses found practices to be **very good (rating 4)**.

## 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 is 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 68% whereas the lights consume 16% while the fans consume 10% and the air conditioners consume 6% of the total calculated electrical energy.



## 4.6 Lights

### 4.6.1 Types of lights based on the numbers

There are a total of **1,024 LED lights on the premises.**

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

The energy consumption of lights is **47,408 kWh** of energy and the **LED lights consume 100%** of the same.

### 4.6.3 Energy efficient premises

#### 4.6.3.1 Alternative energy initiative

**Percentage of power requirement met by renewable energy sources** – The College does not have solar panels as an alternate source of renewable energy which can be directly linked to power consumption reduction. We have conducted the verification of site and suggested to explore the possibility of solar tree, solar farm and solar panels on rooftop on flat roofs after structural audit. However, there are solar street lights available at present.

#### 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.

### 4.6.5 Section-wise recommendation related to 'lights'

Since all the lights are energy-efficient there is no requirement for replacement.

## 4.7 Fans

### 4.7.1 Types of fans based on the numbers

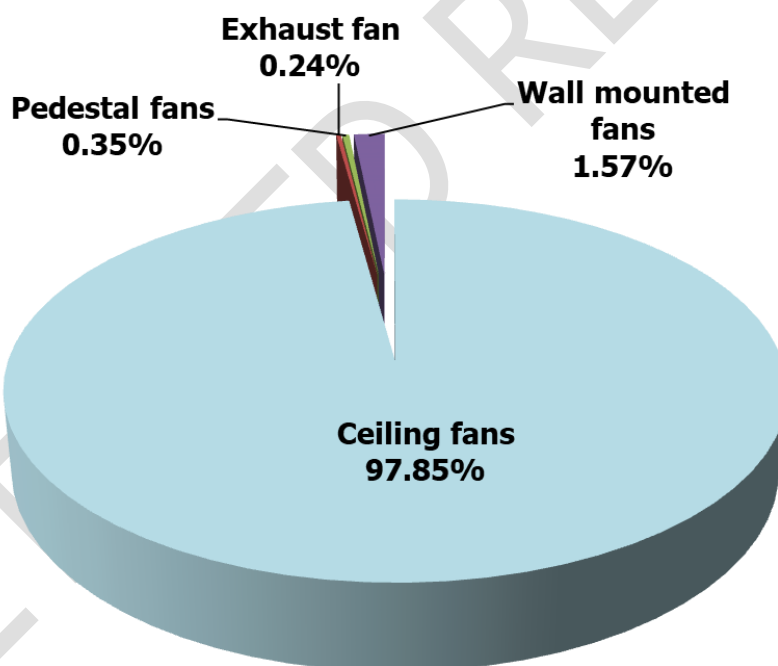
There are a total of **554 fans** on the premises as follows:

S. No.	Type	Nos.
1	Ceiling fans	541
2	Exhaust fan	1
3	Pedestal fans	2
4	Wall mounted fans	10

*Table 5: Summary of the types of fans in the premises*

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

The energy consumption of fans is **28,655 kWh** of the energy.



*Figure 4: Types of fans based on power consumption*

**Observation:** The documented data shows that **97.85% of the energy is consumed by the Ceiling fans** while **1.57% energy is consumed by the Wall mounted fans** while the **Pedestal fans consume 0.35% energy** and the **exhaust fans consume 0.24% energy**.

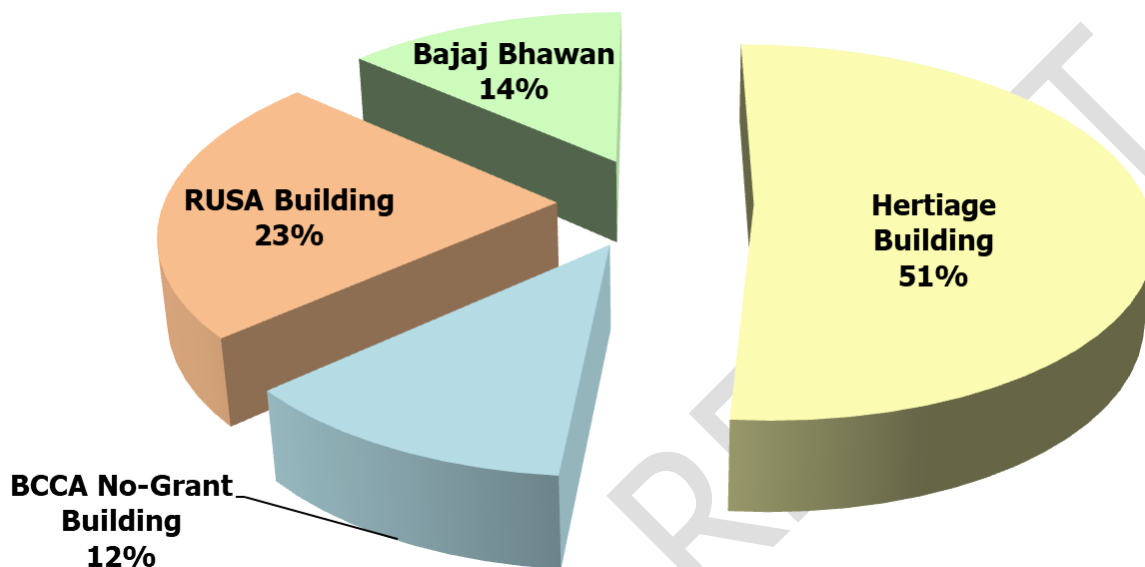
**Inference:** The number and power consumption of the ceiling fans are the maximum among all the types of fans. The replacement should be considered only for ceiling fans.

### 4.7.3 Energy efficiency-wise consumption analysis

There are no energy efficient fans in the premises.

### 4.7.4 Building-wise consumption analysis (Ceiling fans)

The following graph shows the study of only Ceiling fans since they form a majority.



*Figure 5: Energy consumed by fans campus wise*

The above analysis shows the fans in the **Heritage building consumes 51%** this is the maximum and whenever there is an opportunity for replacement this should be priority.

### 4.7.5 Site investigation observations

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.

### 4.7.6 Section-wise recommendation related to 'Fans'

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.

Our detailed study states that is all the **ceiling fans in all Buildings** if replaced with star rated appliance results in a reduction of average of **47% reduction** in energy consumption if replaced with energy efficient appliance. It will be suggested to replace these when fans get damaged or are not in working condition.

## 4.8 Air conditioners

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

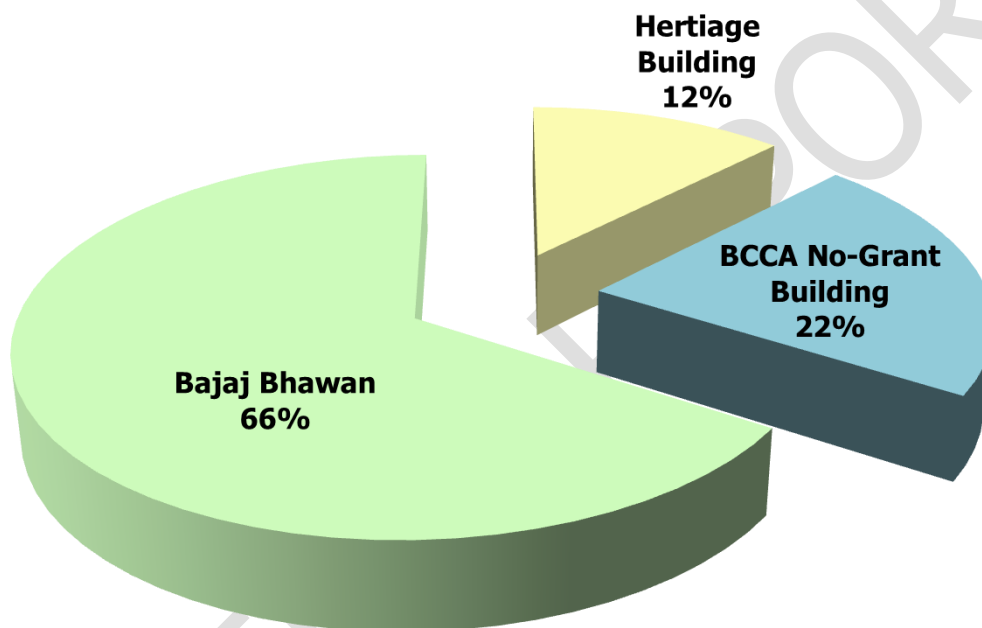
There are **22 air conditioners** on the entire premises.

### 4.8.2 Types of air conditioners based on the power consumption

The energy consumption of air conditioners is **19,400 kWh** of energy.

### 4.8.3 Building-wise consumption analysis

The following graph is documented on the basis of the data collected.



*Figure 6: Analysis based on the building-wise consumption*

**Observation:** The documented data shows that **66% of the energy is consumed by the Bajaj Bhawan** while **22% energy is consumed by the BCCA No-Grant Building** and **12% energy is consumed by the Heritage Building**.

**Inference:** Whenever there is scope for replacement, first priority should be Bajaj Bhawan.

### 4.8.4 Site investigation observations

The Outdoor units are 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.

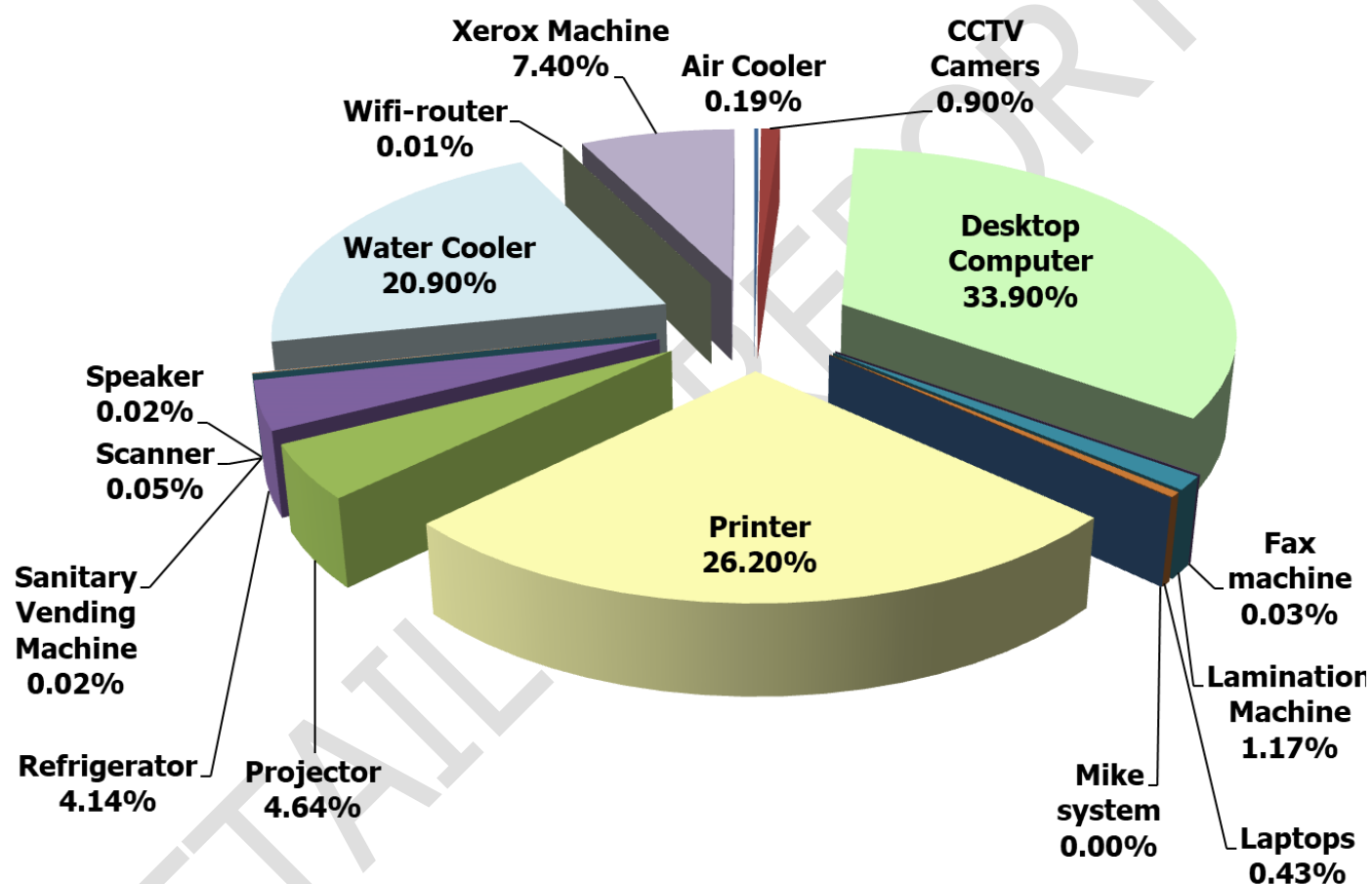
## 4.9 Equipment

### 4.9.1 Types of Equipment

There are **419 nos. of key equipment** in the premises as follows

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

The energy consumption of equipment is **1,99,323 kWh** of energy.



*Figure 7: Summary of Energy consumed by equipment in the premises*

The above summary shows that **desktop computer consumes more energy at 33.90%** while **printer consumes 26.20%** and the **water cooler consumes 20.90%** these are maximum consumers as compared to other equipment.

Inverters and Diesel generator (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:

1. No unnecessary electronic devices are plugged in.
2. During vacations all electrical devices unplugged.
3. All types of equipment are in working conditions and daily monitoring and check are done by the maintenance staff and admin staff skilfully.
4. No defect was found in any equipment of electrical consumption.

### 4.9.4 Section-wise recommendation related to 'Equipment'

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

The following recommendations are for the other equipment in the premises.

- Replace the Non-LED (Regular) TV Monitors with LED equipment.
- Backup computer files during vacations.
- Refrigerators and all electronic equipments should be cleaned out completely including system check up with AMC during vacations, this should be a periodic activity and the same should be documented every year.

## 5. Energy efficient building study

The following study has been analysed based on the Energy efficiency measures for building.

S. No.	Measure	Action taken
1.	Reducing heating demand	Yes
2.	Reducing cooling demand	Yes
3.	Reducing the energy requirements for ventilation	Yes
4.	Reducing energy use for lighting	Yes
5.	Reducing energy used for heating water	Can be improved
6.	Reducing electricity consumption of office equipment and appliances	Can be improved
7.	Good housekeeping and people solutions	Yes

*Table 6: Energy efficient building study*

Note: The above study is based on the Book sustainable energy regulation and policymaking for Africa.

## 6. Inferences as consolidated study

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.**

### 5.1 Solar parking

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



**Plate 1: Solar parking concept for the Institute (For reference purpose only)**

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

### 5.2 Alternatives towards Smart premises – 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.



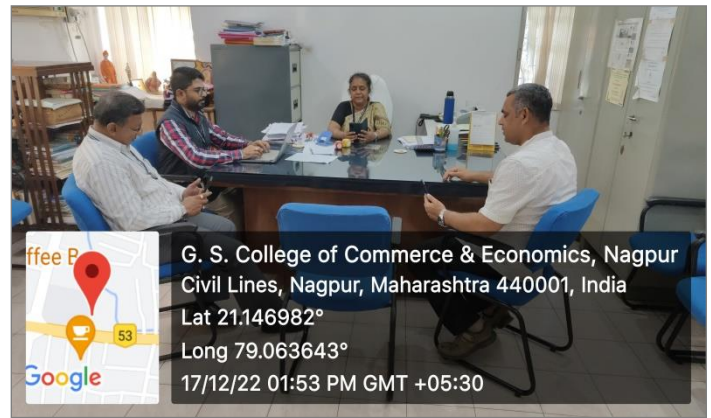
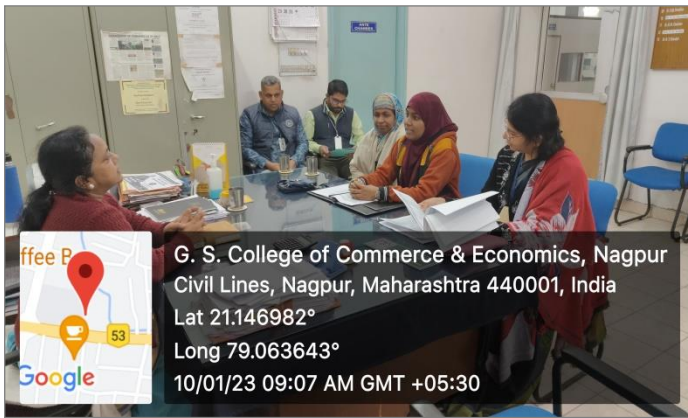
**Plate 2: Solar farm concept for the Institute (For reference purpose only)**

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

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



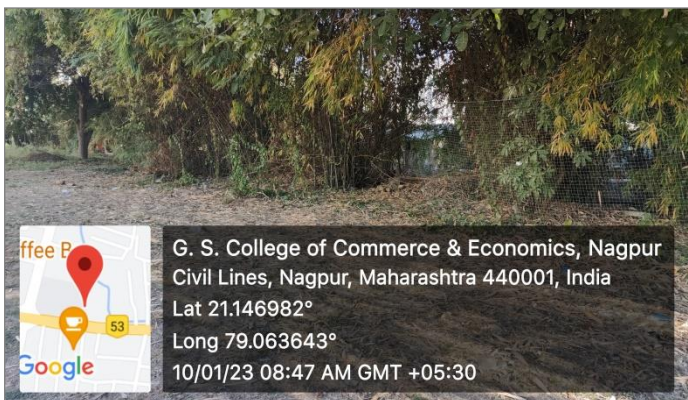
# On-site investigation and physical verification Audit Team during the visit on Tuesday, 10 January 2023



Discussion with the Core Team (On the day of visit) and review meeting (Held before the visit)



On-site review with the team for **ramp accessibility, seating facilities around the trees**

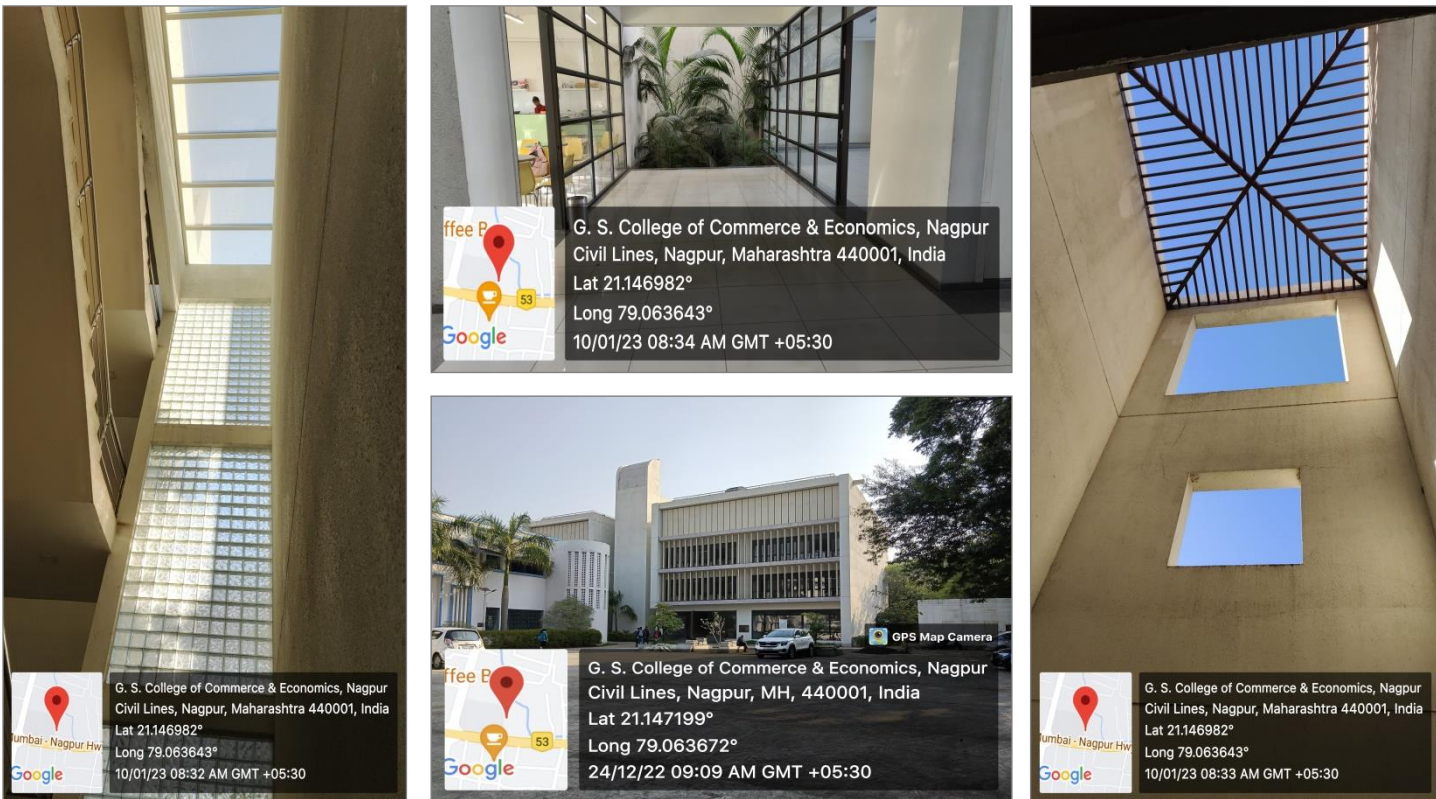


On-site review with the team for **site management, tree transplantation and tree conservation evidences**



Group photo with the team

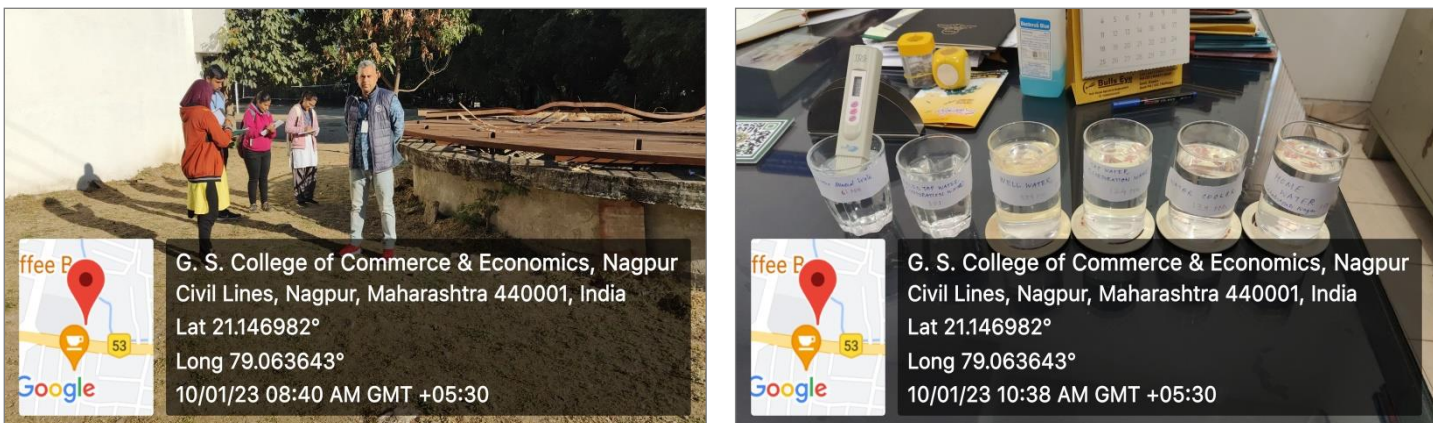
**On-site investigation and physical verification**  
**Audit Team during the visit on Tuesday, 10 January 2023**



On-site review with the team for 'Green Building – Bajaj Bhawan' in the premises  
The features include energy management, rotatable window louvers, courtyard, breakout spaces and light wells



On-site review with the team for fire and life safety systems



On-site review with the team for waste and water management (and testing of the samples)

## 7. References

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.unido.org/sites/default/files/2009-02/Module18\\_0.pdf](https://www.unido.org/sites/default/files/2009-02/Module18_0.pdf)
- ➔ <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/>
- ➔ Inference study reference images
  - <https://www.happysprout.com/inspiration/what-is-smart-gardening/>
  - <https://housing.com/news/smart-gardening/>
  - <https://solarpowerproject.in/solar-panels-for-parking-lots.php>

