ENERGY AUDIT

STUDY PERIOD (TWO YEARS) 2019-20 & 2020-21

Sustainability study

AUDIT REPORT

Studied for

Shree Chanakya Education Society's

Indira College of Engineering & Management

Gat No 276, Tal. Maval, S.NO 64,65, Indira College Road, off Pune Mumbai Expressway, Parandvadi, Maharashtra 410506

Studied by

Greenvio Solutions

Valid till June 2023

Background reference image Janko Ferlic on pexels

Disclaimer

The Audit Team has prepared this report for the **Shree Chanakya Education Society's Indira College of Engineering and Management** located at *Gat No 276, Tal. Maval, S.NO 64,65, Indira College Road, off Pune Mumbai Expressway, Parandvadi, Maharashtra 410506* based on input data submitted by the College and analyzed by the team to the best of their abilities.

The details have been consolidated and thoroughly studied as per the various guidelines for Green Buildings available in National and International Standards; the report has been generated based on a comparative analysis of the existing facilities and the prerequisites formulated by various standards. The inputs derived are a result of the inspection and research. These will further enhance and develop a Healthy and Sustainable Institution.

These can be implemented phase-wise or as a whole depending on the decision taken by the Hon'ble Management and College. The warranty or undertaking, expressed or implied is made and no responsibility is accepted by Audit Team in this report or for any direct or consequential loss arising from any use of the information, statements, or forecasts in the report.

The audit is a thorough study based on the inspection and investigation of data collected over a while 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 an Accredited and Certified Green Building Professional-Architect; I.A.(IMS) 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 incapacity of an 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

Palghar District, Maharashtra- 401208

sustainableacademe@gmail.com

Acknowledgment

The Audit Assessment Team thanks the **Shree Chanakya Education Society's Indira College of Engineering and Management** for assigning this important work of Energy Audit. We appreciate the cooperation extended to our team during the entire process.

Our special thanks are due to **Dr. Tarita Shankar,** Chairperson; **Prof. Chetan Wakalkar,** Group Director; **Mr. Adesh Gaekwad,** Trustee and Director – Projects; **Mr. Sandip Gaekwad**, Trustee & Director HR and everyone from the Management- Indira Group of Institutes.

Our heartfelt thanks to the Chairperson of the entire process **Dr. Sunil B. Ingole,** Principal, for the valuable input.

We are also thankful to **College's Taskforce and the faculty members** who have collected data required **Dr. Kiran D. Devade,** HoD First-Year Engineering and Associate Professor Mechanical Engineering Department **(Special mention for the excellent coordination)**

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

Contents

1. Introduction

1.1 About Shree Chanakya Education Society

It was established in February 1994, under the visionary leadership of Dr. Tarita Shankar, to provide top-quality post-graduate education in the fields of Business Management, International Business, and Information Technology. By consistently providing quality education over the past few decades, institutes at Indira Group are now considered one of the best institutes in Pune. At a time when India was struggling to put its economy back on its feet, after the nation having pawned the "family jewels" just to keep afloat, Dr. Tarita Shankar sensed that education too would have to become more broad-based and more vocational if India was to stand up to the world competition in quality and price for its products.

The then Finance Minister had prescribed for the economy and so, in 1994, began a saga of growth and quality in education; a story that is just reaching its zenith with 14 full fledged Institutes registering a strong presence on Pune's educational horizon. Since its inception, the Institutes managed by SCES, have maintained high academic standards and have successfully provided trained manpower to the industrial and services sector of the country. These institutes are now listed among the top colleges not just in Pune, but also in Maharashtra and India. With a modest strength of 60 students pursuing a single course, SCES has grown steadily and today boasts of 14 Institutes, having more than 8000 students from all over India pursuing multi-disciplinary, graduate & post-graduate programs. The objective of the institute is to provide 'Management education in a corporate environment', which has been possible due to the sincere and dedicated efforts of the members of SCES, who have invaluable experience in varied areas like academics, industry, service, and the social world.

1.2 Statements of the Institution

1.2.1 Vision

"The institute envisions to "***develop itself into a center of academic excellence in the field of Engineering and Management education to develop future technocrats and managers having the right knowledge, skill, and attitude to serve the society and industries to fulfill their ever-changing requirements."***

1.2.2 Mission

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

1. ***To train our students to become the best Engineering Entrepreneurs today, who will lead the organizations successfully into the future; locally, nationally, and globally.***
2. ***To provide an environment that fosters continuous improvement & innovation with related technical support & facilities to enhance student and faculty effectiveness.***
3. ***To provide programs focusing on the holistic development of the individual with an emphasis on personality grooming, physical fitness, and a strong sense of social and environmental responsibility.***
4. ***To improve logic & scientific reasoning and develop a global mindset amongst the students and prepare them to work in a heterogeneous environment.***

1.3 About the Institution

The College has a motto of **"Empowering minds to elevate lives."** It is affiliated with the Savitribai Phule Pune University and provides the following programs:

- **Graduation** – It offers the following courses Bachelor of Engineering (B.E.)
  - Civil Engineering
  - Computer Engineering
  - Mechanical Engineering
- **Post-Graduation** – It offers the following courses
  - Masters of Business Administration (MBA)
  - Masters of Computer Application (MCA)

The College works towards training young men and women to be competent, committed, and compassionate, and lead in all walks of life.

1.4 The surrounding premises around the Institution

The Premises is situated amidst the landscape serene **Pune region of Maharashtra state** with immense peace and calmness in the surroundings as there are residential areas around the premises. The location of the College is feasible to the nearby essential amenities such as Public Health Center, Fire Station, Civic body-Public administrative buildings, Recreational gardens, and Police Station which are not too close but nearby.

1.5 Assessment of the College

1.5.1 Affiliations and approvals

The College has all its courses approved and affiliated with the **Savitribai Phule Pune University,** *a collegiate public state university located in the city of Pune, Maharashtra.*

1.5.2 Certification

- **AISHE –** The code is *C-41944.*
- **NIRF –** The College has been *participating in the NIRF rankings every year.*

1.5.3 Accreditation

NAAC - The College had received a CGPA of 2.92 with a 'B++' Grade in its First cycle of Accreditation in2019.

1.6 Achievements of the College

The College has a tremendous track record of excellence for the educational services provided, below are some of the achievements.

- ***Outstanding Engineering Institute (West) -2015***
- ***ABP News Educational Award for best academy and Industry Interface -2017***
- ***Outstanding Engineering College -2017***
- ***Top Private Engineering Institute (Western Region) -2020***
- ***Top Private Business School (Western Region) -2020***
- ***Best Educational Institute -2021***
- ***Best Campus Placement and Industry academia Interface -2022***

2. Institution overview

2.1 Populace analysis for the Academic year 2019-20

2.1.1 Students data

The student data (shared by the College) shows there were a total of **1,176 Boys and 192 Girls students,** thus there were **a total of 1,368 students** on the premises.

2.1.2 Staff data

Type	Male	Female	Total
Admin Staff	23	4	**27**
Teaching Staff	45	41	**86**
Non-Teaching Staff	20	2	**22**
Total Staff Members	**88**	**47**	**135**

Table 1: Staff data of the Institution for 2019-20

The staff data shows the premises had a total of **135** Staff Members.

2.2 Populace analysis for the Academic year 2020-21

2.2.1 Students data

The student data (shared by the College) shows there were a total of **985 Boys and 493 331 students,** thus there were **a total of 1,316 students** on the premises.

2.2.2 Staff data

Type	Male	Female	Total
Admin Staff	22	2	**24**
Teaching Staff	41	34	**75**
Non-Teaching Staff	11	2	**13**
Total Staff Members	**74**	**38**	**112**

Table 2: Staff data of the Institution for 2020-21

The staff data shows the premises had a total of **112** Staff Members.

2.3 Total College Area & College Building Spread Area

The **total site area is 10 acres** and the **total Built-up area of the College is 1,70,803 sq. ft.** for **a total of 1,428 footfalls.**

2.4 College Infrastructure

2.4.1 Establishment

The College was established in 2007. The college is located pretty close to nature and hence has a very fresh environment which is absolutely pollution free and healthy. The Building is a Reinforced Cement Concrete (RCC) framework building.

2.4.2 Spatial Organisation

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

2.4.3 Operation and Maintenance of the premises

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

S. No.	Section	Spaces	Time	Hours/ day	Days in a year
1	Main Institutional College	Student areas and Teaching faculty	09:30 a.m. to 05:30 p.m.	7	280
2	General areas	Admin areas and library, Passage, staircase, toilet	09:00 a.m. to 05:00 p.m.	8	300

Table 3: Schedule of the timings of the premises

3. Green Building Study Audit

3.1 About the Green Building Study Audit

It is a systematic study of the aspects which make the Institution a 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

- Analysis of the Lights, Fans, AC, Equipment
- Renewable energy
- Scope for reducing the current energy bills if any
- Improvement in the thermal comfort of the campus

Green Audit

- Green initiatives
- Hygiene audit
- Water Audit - Analysis of the current water consumption of campus; Scope to include Rainwater harvesting and Wastewater treatment on the premises.
- Waste Audit - Current waste produced, its segregation, and usage; Strategies to be adopted for waste management and awareness

Environmental Audit

- Analysis of the current landscape + hardscape of the premises
- Analysis of the flora and fauna of the premises
- Strategies adopted at present to enhance vegetation
- Measures that can be adopted for ecological improvement of the premises.

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 Timeline of the activities for the Green Building Study Audit

- 23 March 2022 – Allotment and Initiation by the College
- 29 March 2022 – Induction Meeting
- 03 April 2022 – Survey of students and staff completed
- 29 April 2022 – Data submitted by College
- 27 May 2022 – Submission of the Draft Report
- 15 June 2022 – Submission of the Main Report

4. Energy Audit

4.1 Sources of Energy consumption

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

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

4.1.1 Primary sources

These are the sources that are consumption and production

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

4.1.2 Secondary sources

The college is located in an urban area and has minimal to zero power cuts, thus there are no secondary sources of energy supply at present.

1. **Inverter, UPS –** These are utilized in the administrative areas; amounting to Rs. 2,29,500/- is spent annually on an average towards annual maintenance charges.
2. **Battery –** These are utilized in the administrative areas; amounting to Rs. 1,10,000/- is spent annually on an average towards annual replacement charges.
3. **Gas cylinders –** These are utilized in the chemistry laboratory; amounting to Rs. 2,000/- is spent annually on an average.
4. **Diesel Generator –** There are no diesel generators available at present.

4.2 Site investigation analysis

The data investigated and collected through interviews are summarised below:

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

4.3 Utility bill audit

Actual Billed Electrical Consumption (2019-20)

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

Sr. No.	Month	Units Consumed	Amount
1	Jun-19	18,040	3,96,925
2	Jul-19	27,100	4,09,823
3	Aug-19	26,340	4,67,138
4	Sep-19	29,525	5,97,907
5	Oct-19	26,448	4,72,332
6	Nov-19	26,222	4,68,742
7	Dec-19	24,307	4,47,643
8	Jan-20	25,729	4,71,754
9	Feb-20	26,233	4,82,777
10	Mar-20	26,233	4,73,762
11	Apr-20	9,419	2,64,028
12	May-20	8,152	2,48,744
13	Jun-20	8,622	2,54,110

14	Jul-20	8,227	2,49,464
15	Aug-20	9,683	2,60,054
16	Sep-20	9,540	1,85,102
17	Oct-20	9,858	1,88,986
18	Nov-20	11,145	2,03,693
19	Dec-20	10,557	1,97,123
20	Jan-21	11,034	2,02,810
21	Feb-21	11,145	2,04,251
22	Mar-21	11,714	2,10,642
23	Apr-21	8,810	1,81,343
24	May-21	7,871	1,69,987
25	Jun-21	8,481	1,77,810
26	Jul-21	7,692	1,79,952
27	Aug-21	9,143	1,86,441
28	Sep-21	9,559	1,91,436
29	Oct-21	9,723	1,93,314
30	Nov-21	9,987	1,96,128
31	Dec-21	12,435	2,25,882
32	Jan-22	12422	2,25,507
33	Feb-22	14142	2,46,910
Total		**4,85,538**	**95,32,520**

Table 4: Billed electrical consumption in 2019-20

The above data was studied further and thus it was found that the amount spent by the College on outer electrical supply was **Rs. 95,32,520/- annually for 4,85,538 units. On an average (monthly basis) Rs. 2,88,864/- was spent for 14,713 units.**

4.4 Survey Results

An online survey was conducted to analyze the student and staff views about the Energy management practices adopted in College, following is the result received.

4.4.1 Participation

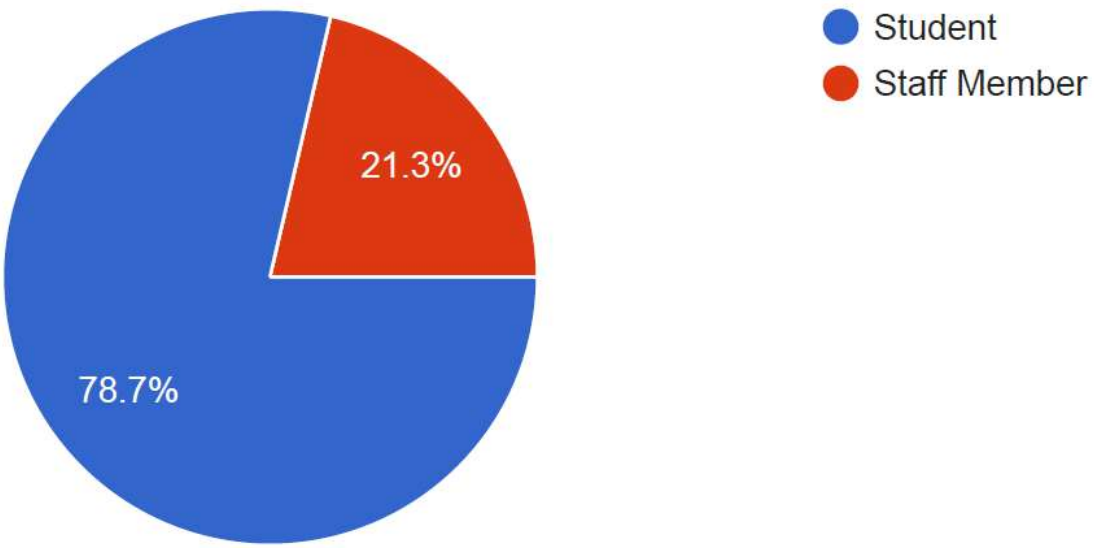


Figure 1: Participation analysis in the survey

A total of **89 responses** were received out of which 79% were students.

4.4.2 Review of the Energy management practices on 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 the graph depict the Number of participant's responses in numerical (Percentage of the participant response) – For example 101 responses (44.5%)

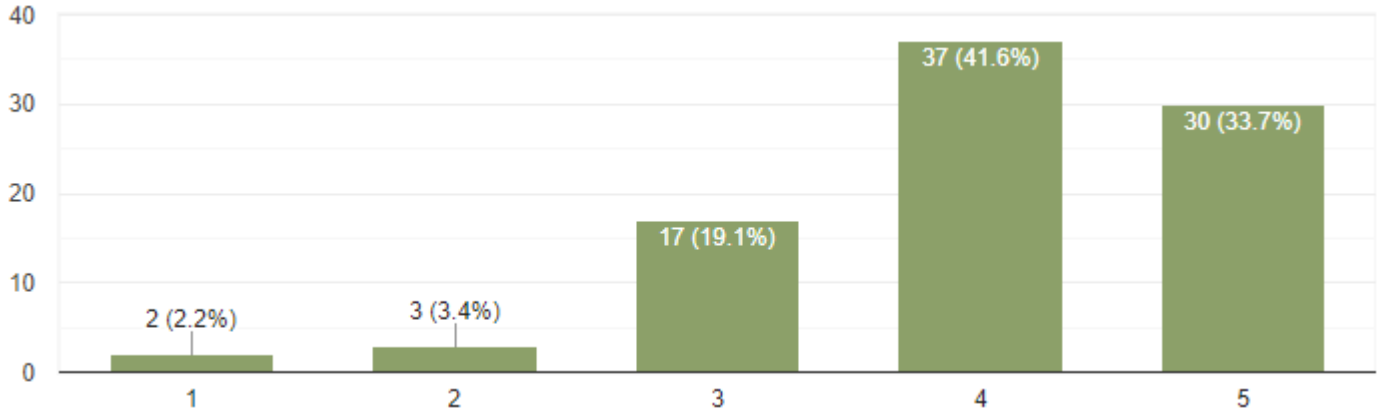


Figure 2: Energy management practices in college

The students and staff **(almost 34%)** of the respondents found the practices to be excellent and **42% found the practices to be very good.**

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 collection and interviews with the staff. The additional data such as wattage is taken from market research. In terms of electrical consumption, the main sources are lights, fans, air conditioners, and equipment. The inventory and data collection for sources of energy consumed in the premise are summarised in the following sections.

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

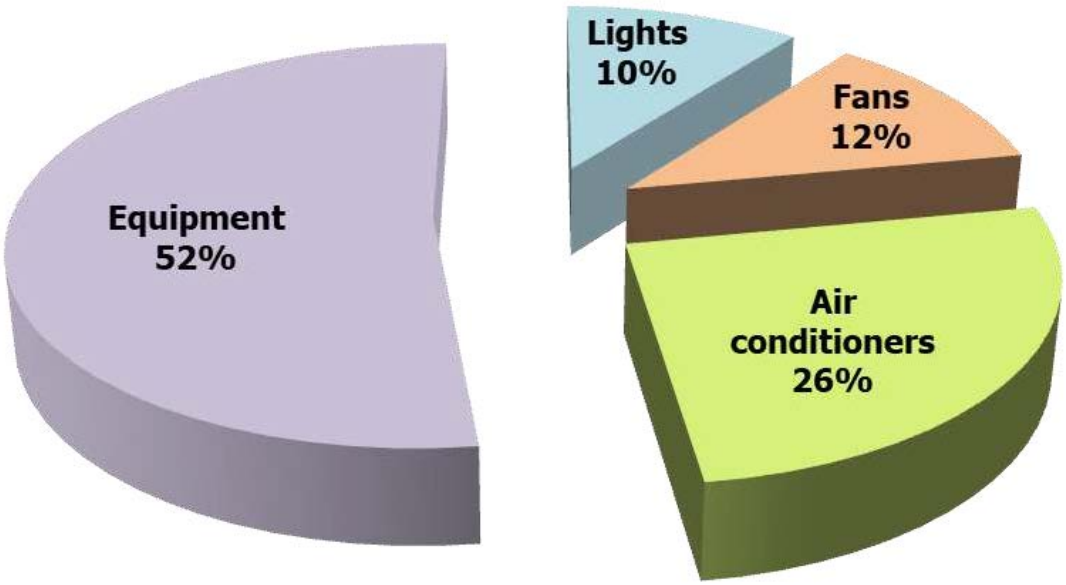


Figure 3: Summary of the calculated electrical consumption as per inventory

The above graph shows that equipment consumes 52% followed by air conditioners at 26% the fans at 12% and the lights consume 10% of the total calculated electrical energy.

4.6 Lights

4.6.1 Types of lights based on the numbers

There are a total of **1,375 lights on the premises;** the following table shows the various types of lights on the premises.

S. No.	Type	Nos.
1	CFL	39
2	Incandescent	6
3	Non-LED	449
4	LED	881
Total		**1,375**

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

4.6.2 Types of lights based on the power consumption

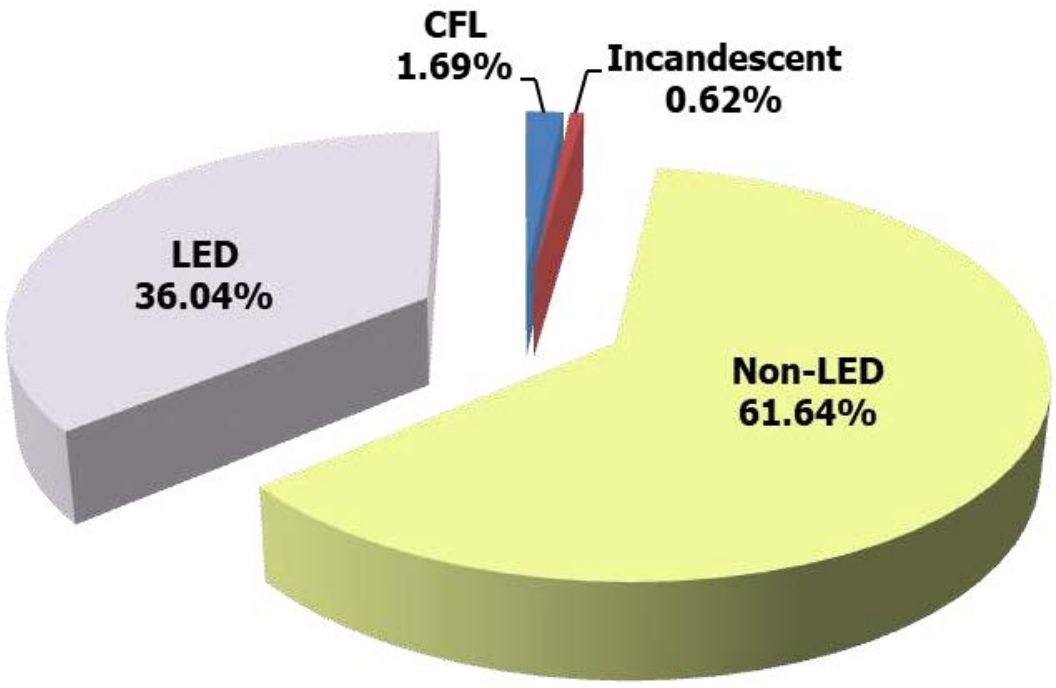


Figure 4: Energy consumed by types of lights in the premise based on the usage study

The analysis of the types of Lights on-premises shows **Non-LED lights 61.64%** followed by **LED lights consuming 36.04%;** the **CFL lights consuming 1.69%** and the **Incandescent lights consuming 0.62%**

4.6.3 Block-wise consumption analysis

The energy consumption of lights is **34,589 kWh** of energy; the following graph shows the block-wise consumption.

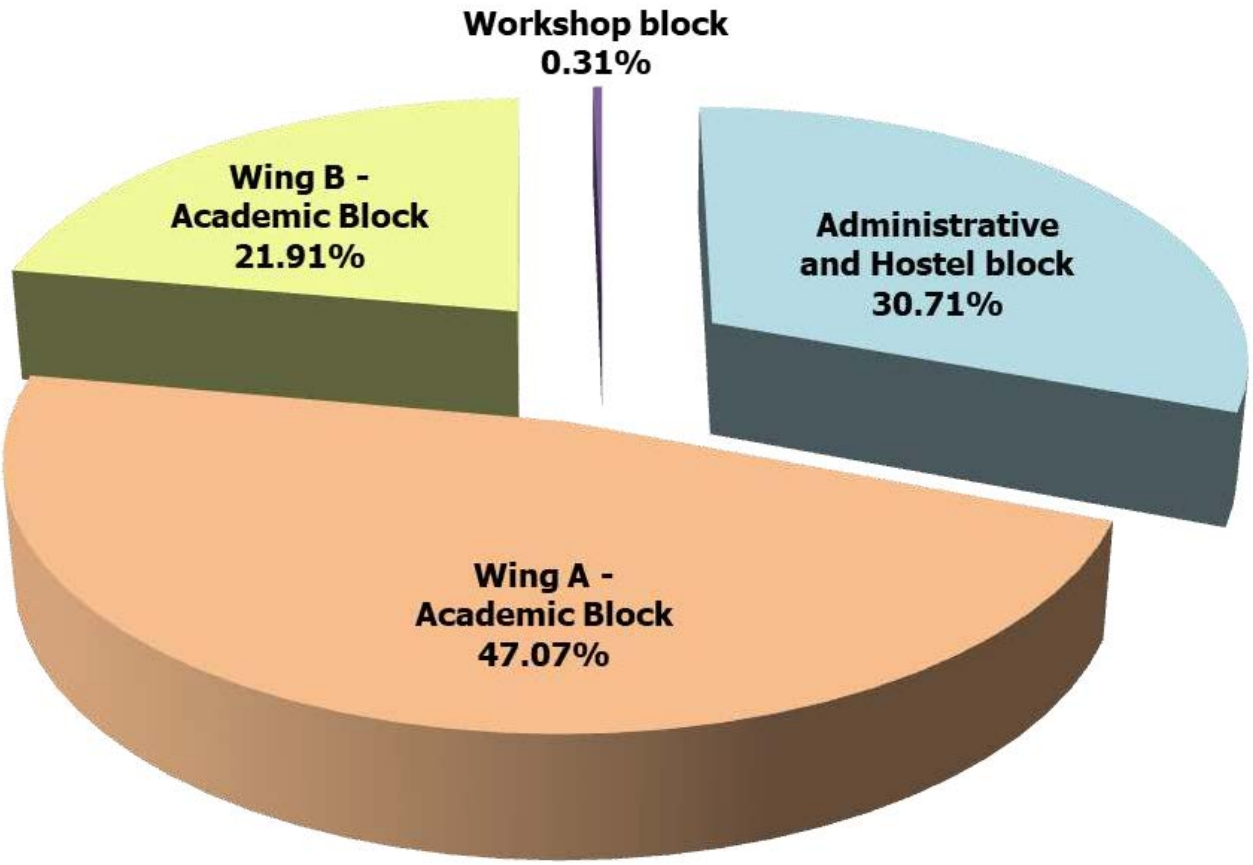


Figure 5: Energy consumed by lights block-wise

The above analysis shows the lights on the **Wing A - Academic Block consume 47.07%** and the ones on the **Administrative and Hostel blocks consume 30.71%;** the **Wing B - Academic Block consume 21.91%** and the ones on the **Workshop block consume 0.31%** of the total power consumed by lights.

4.6.4 Requirement of NAAC

4.6.4.1 Alternative energy initiative

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

4.6.4.2 Percentage of lighting power requirement met through LED lights

The premise has LED Lights to contribute to 64% in terms of number and **36.04% 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.

4.6.5 Site investigation observations

Some of the points noticed are as follows:

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

4.7 Fans

4.7.1 Types of fans based on the numbers

There are a total of **631 fans** on the premises. The following table shows the various types of fans on the premises.

S. No.	Type	Nos.
1	Wall mounted fan	10
2	Table Fan	1
3	Exhaust fan	10
4	Ceiling fan	609
5	Pedestal fan	1
Total		**631**

Table 6: Summary of the types of fans on-premise

4.7.2 Types of fans based on the power consumption

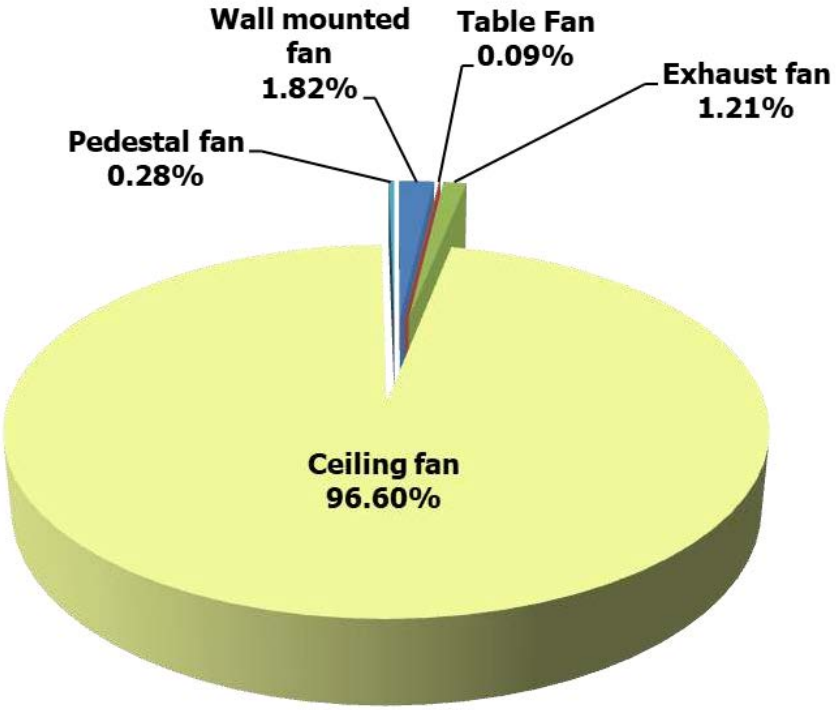


Figure 6: Energy consumed by types of fans in the premise based on the usage study

The analysis of the types of fans on-premises shows **ceiling fans consume 96.60%** and the **wall-mounted fans consume 1.82%;** the **exhaust fans consume 1.21%;** the **pedestal fans consume 0.28%** and the **table fans consume 0.09%**

4.7.3 Block-wise consumption analysis

The energy consumption of fans is **38,065 kWh** of energy; the following graph shows the floor-wise consumption.

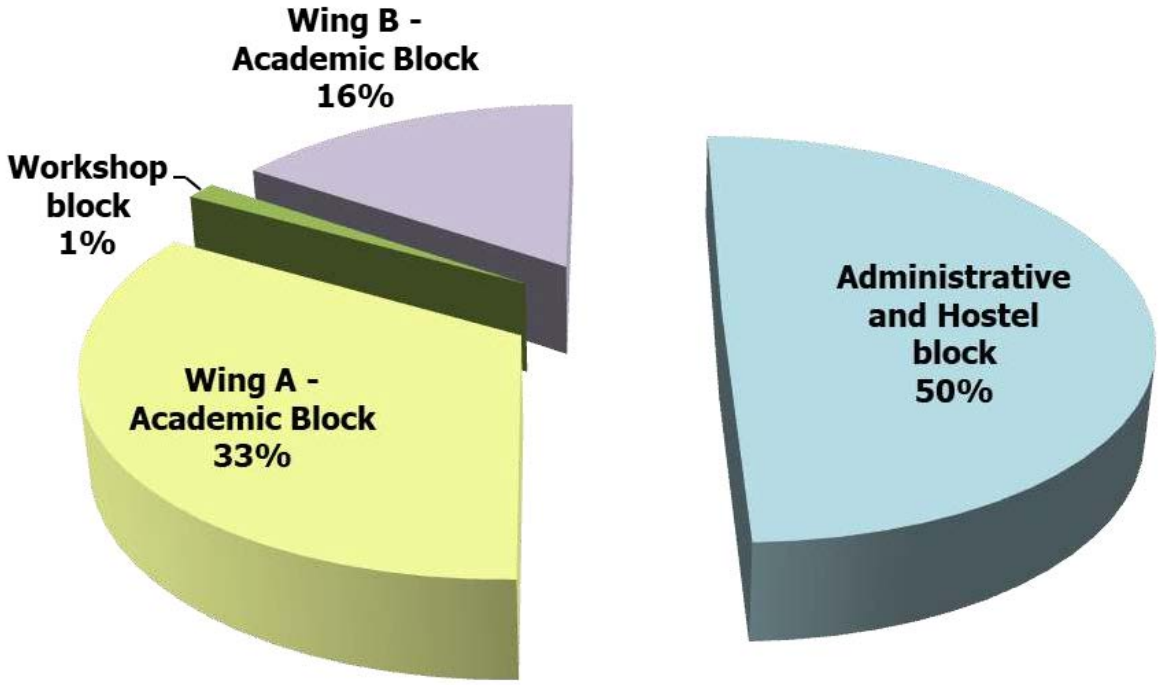


Figure 7: Energy consumed by fans block-wise

The above analysis shows the fans on the **Administrative and Hostel blocks consume 50%** and the ones on the **Wing A - Academic Block consumes 33%;** the **Wing B - Academic Block consume 16%** and the ones on the **Workshop block consume 1%** of the total power consumed by fans.

4.7.4 Site investigation observations

Some of the points noticed are as follows:

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

4.8 Air conditioners

4.8.1 Types of air conditioners based on the numbers

There are **9 air conditioners** on the entire premises**.**

4.8.2 Block-wise consumption analysis

The energy consumption of air conditioners is **85,316 kWh** of energy; the following graph shows the block-wise consumption.

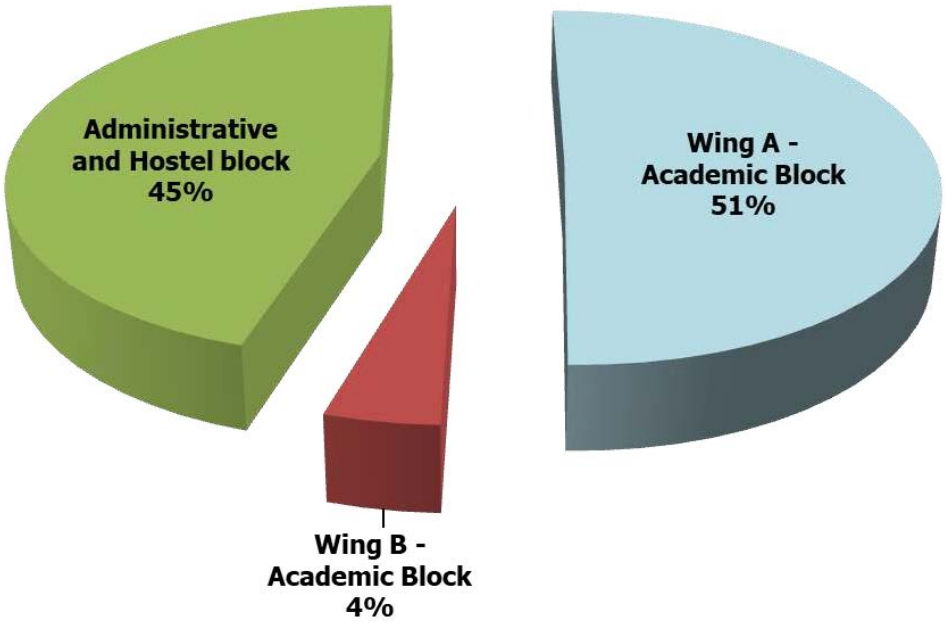


Figure 8: Energy consumed by air conditioners block-wise

The above analysis shows the air conditioners on the **Wing A - Academic Block consume 51%** and the ones on the **Administrative and Hostel blocks consume 45%** and the **Wing B - Academic Block consume 4%;** of the total power consumed by air conditioners.

4.8.3 Site investigation observations

Some of the points noticed are as follows:

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

4.8.4 About the replacement of current air conditioners

The current air conditioners are well maintained, though there is not an immediate requirement for replacement however, whenever the college undergoes redevelopment or a new floor is constructed there can be provisions for replacement with energy-efficient appliances or new air conditioners that require less power consumption.

4.9 Equipment

4.9.1 Types of equipment based on the numbers

There are a total of **61 types of equipment totaling 821 numbers** on the premise. The various types are mentioned in the table below.

S. No.	Name of the equipment	kwh
1	AHT	1
2	Amplifier, PA system	1
3	BOD Incubator	1
4	CNC machine	1
5	Compressor	1
6	Cash counting machine	1
7	CSM	1
8	Cooler	1
9	Drill machine	2
10	DST	1
11	GHD	1
12	FCA	1
13	Fridge	1
14	Freezer	3
15	Dosa Machine	1
16	Gravy Machine	1
17	Lathe machine	25
18	Milling machine	1
19	Hand cutting machine	1
20	Hot Plate	1
21	Induction	1
22	Heating Bed	3
23	Mixer	4
24	Griller	1
25	Gravy Machine	1
26	NCA	1
27	Power press	1
28	Power saw	1
29	Plastic moulding machine	2

30	Radial drill machine	1
31	Rockwell	1
32	Rectifier	1
33	SBA	1
34	RAC	1
35	Routers	29
36	Universal testing machine	1
37	Vibrator	1
38	UST	1
39	Server Room	1
40	VCR	1
41	UTT	1
42	Tail Lamp	1
43	Treadmill	2
44	Wood Lathe	2
45	Wet grinder	1
46	Aquaguard	2
47	Bench Grinder	2
48	Coffee Machine	2
49	Desktop computer	457
50	Geyser	86
51	Mosquito Machine	4
52	Motor starter	3
53	Oven	2
54	Printer	30
55	Projector	18
56	Scanner	3
57	Washing Machine	6
58	TV	3
59	Water Cooler	5
60	Water Filter	86
61	Xerox Machine	4

Table 7: Types of equipment in the premise as per the quantity

4.9.2 Types of equipment based on the power consumption

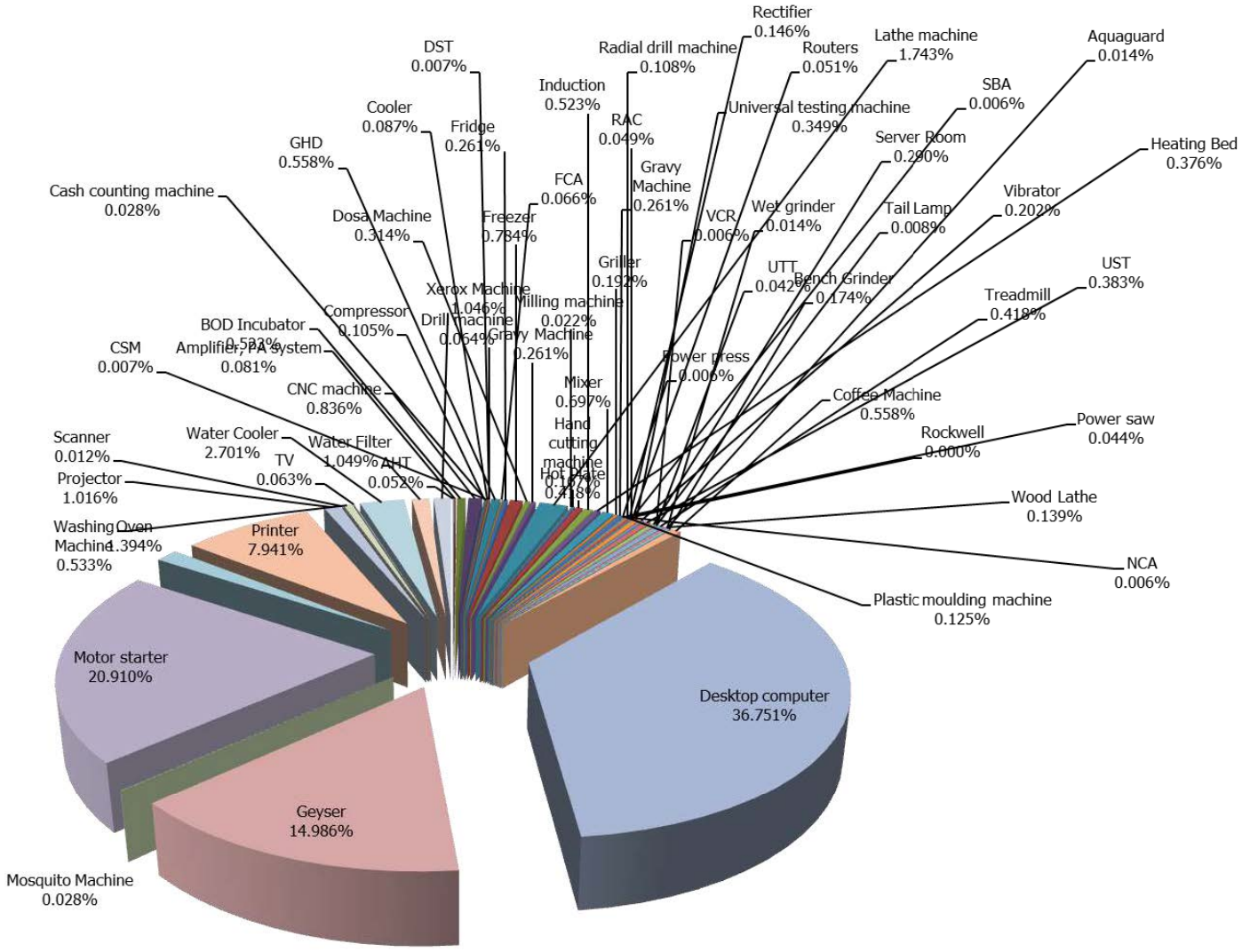


Figure 9: Summary of energy consumed by equipment on the premises

The above summary shows that the **desktop computer consumes more energy at 36.751%** while the **motor starter consumes 20.910%** the **geyser consumes 14.986%** and the **printer consumes 7.941%** these are the maximum consumers as compared to other equipment. *The lift pumps are excluded in this calculation since these are used by the shared Institutions on the premises.*

4.9.2 Block-wise consumption analysis

The energy consumption of Equipment is **1,71,715 kWh** of energy; the following graph shows the block-wise consumption.

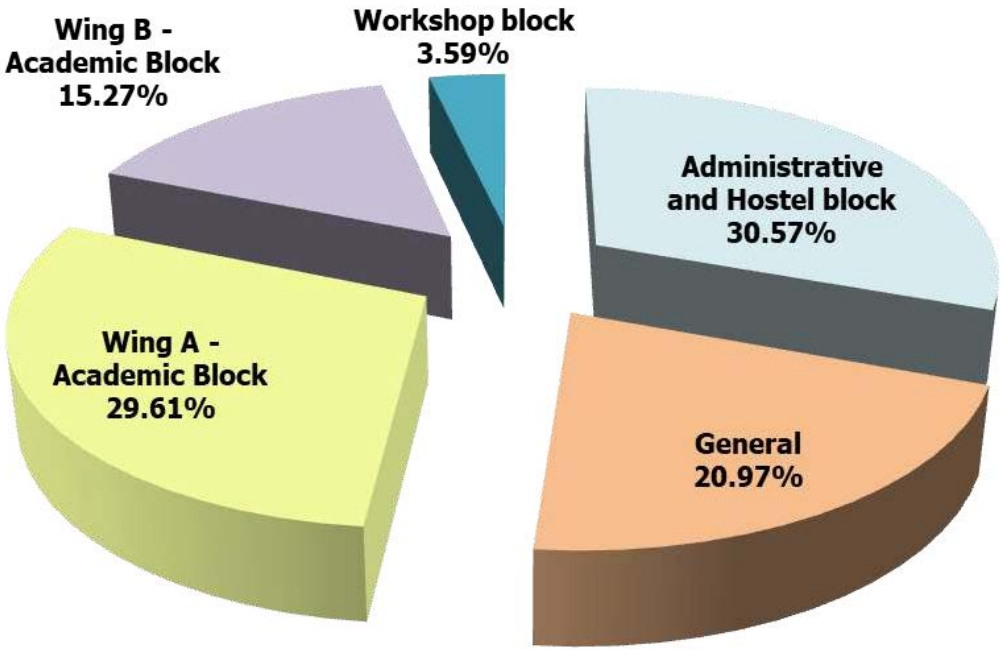


Figure 10: Energy consumed by equipment block-wise

The above analysis shows the equipment on the **Administrative and Hostel blocks consume 30.57%;** and the ones on the **Wing A - Academic Block consume 29.61%;** the **General block consumes 20.97%;** the **Wing B - Academic Block consume 15.27%** and the ones on the **Workshop block consume 3.59%** of the total power consumed by equipment.

4.9.3 Site investigation observations

Some of the points noticed are as follows:

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

4.10 Recommendations for a Sustainable Habitat

Over time energy-efficient appliances have been a boon not only to the energy-saving parameters they adhere to but also to the eco-friendly habits it helps to inculcate. An institution such as Schools and Colleges is the best way to implement these initiatives. It creates awareness among the students at a young age. The Institutions also act as a symbol and representative of being an energy-efficient premise.

Following the analysis, we found some of the suggestions which can be implemented for an energy-efficient Institution. This would help in the reduction of the current electrical consumption by a major percentage.

4.10.1 Electromechanical systems – Electrical and Lighting

Section 1 – Lights

Non-LED, CFL, and Incandescent lights

The current light analysis shows that Non-LED tube lights consume anywhere between 24W, 36W, and 40W and the mercury lights consume 100W when in use; these should be replaced with LED lights which consume on an average 16-20W when in use.

Our technical analysis shows that there would be a reduction of an average of **71% reduction** in energy consumption through lights specifically as a part of the electro-mechanical system if all **Non-LED, CFL, and Incandescent lights** are replaced on all floors and blocks = with an energy-efficient appliance whenever the college undergoes renovation.

Section 2 – Fans

Ceiling fans

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

Section 3 – Equipment

Desktop computers to laptops

Among all equipment, it suggested replacing the desktop computers with laptops as this would be energy efficient. A normal desktop computer consumes an average of 250W and it is to be connected all time when it has to be used. On the contrary, a laptop consumes 40W and has a battery backup that lasts up to 4 hours.

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

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

- Some of the senior staff members may be more convenient with computers, replacement with a laptop might result in a change of the working patterns and hours which may affect the productivity.
- Laptops – in the case are not handled with care such as if dropped unintentionally might result in data imbalance.
- Students who are not day scholars can use a laptop at their convenience, whereas in common areas there can monitoring of the usage hours hence computers may be a preferable option then laptops in certain spaces.
- Similarly, depending on the pandemic situation in case it might be possible due to irregular usage the device might have issues while functioning.

Thus the University should analyze the above points and then devise a strategy for the replacement, essentially when the devices get damaged or are not in working condition they can surely be replaced.

As well as once they are not in working condition the proposed strategy should be linked to e-waste management as well.


Panasonic

5. Towards a Healthy & Sustainable Institution

5.1 Recommendations based on the study

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

a) **Cutlery in the Canteen –** The regular plastic and steel plates, and spoons used in the Canteen can be replaced with eco-friendly/ organic leaves, paper straws, disposable plates, and edible spoons made out of sugarcane waste or bamboo.

b) **Eco clubs –** There can be an eco-club with students working on pilot projects toward the environment and surrounding up-gradation.

c) **Terrace farming -** There can be a provision for terrace farming; this would enhance the biodiversity, increase awareness, and food grown can be used in Canteen.

d) **Signages –** In addition to the signages being in regular language there can be additional signages in braille language for the specially-abled students.

5.2 Survey Results

An online survey was conducted to analyze the student and staff views about what changes according to you can be undertaken for Green audit improvement in College premise and activity. **Some of the suggestions are listed below:**

- Use of student-built technology for waste and resource recycling.
- To increase tree cover & promote a clean environment in our college.
- To conduct more and more programs to aware the students of the greeneries and beauty of nature.
- They should conduct one session a week for awareness of the green environment.

However, it should be noted that the College has taken up multiple initiatives and because of the pandemic, the students have not practically visited the premises so some of these points are not mandatory at the moment.

6. References

1. Uniform Plumbing Code – India, 2008
2. IGBC Green Existing Buildings – Operation & Maintenance (O&M) Rating system, Pilot version, Abridged Reference Guide, April 2013
3. IGBC Green Landscape Rating system, March 2013
4. BOMA Canada Waste Auditing Guide, Best Environmental Standards, BOMA BEST – Canada
5. Used only for understanding Universal design - Universal Accessibility Guidelines for Pedestrian, Non-motorized vehicle and Public Transport Infrastructure – Report guidelines by Samarthyam (National center for Accessible Environments) – an initiative supported by Shakti Sustainable Energy Foundation.
6. U.S. Energy Information Administration


INDIRA
COLLEGE OF ENGINEERING

Environment Audit

Study Period (Two Years) 2019-20 & 2020-21

Sustainability study

AUDIT REPORT

Studied for

Shree Chanakya Education Society's

Indira College of Engineering & Management

Gat No 276, Tal. Maval, S.NO 64,65, Indira College Road, off Pune Mumbai Expressway, Parandvadi, Maharashtra 410506

Studied by

Greenvio Solutions

Valid till June 2023

Background reference image Nic Y C Gua on unsplash

Disclaimer

The Audit Team has prepared this report for the **Shree Chanakya Education Society's Indira College of Engineering and Management** located at *Gat No 276, Tal. Maval, S.NO 64,65, Indira College Road, off Pune Mumbai Expressway, Parandvadi, Maharashtra 410506* based on input data submitted by the College and analyzed by the team to the best of their abilities.

The details have been consolidated and thoroughly studied as per the various guidelines for Green Buildings available in National and International Standards; the report has been generated based on a comparative analysis of the existing facilities and the prerequisites formulated by various standards. The inputs derived are a result of the inspection and research. These will further enhance and develop a Healthy and Sustainable Institution.

These can be implemented phase-wise or as a whole depending on the decision taken by the Hon'ble Management and College. The warranty or undertaking, expressed or implied is made and no responsibility is accepted by Audit Team in this report or for any direct or consequential loss arising from any use of the information, statements, or forecasts in the report.

The audit is a thorough study based on the inspection and investigation of data collected over a while 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 an Accredited and Certified Green Building Professional-Architect; I.A.(IMS) 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 incapacity of an 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

Palghar District, Maharashtra- 401208

sustainableacademe@gmail.com

Acknowledgment

The Audit Assessment Team thanks the **Shree Chanakya Education Society's Indira College of Engineering and Management** for assigning this important work of Environment Audit. We appreciate the cooperation extended to our team during the entire process.

Our special thanks are due to **Dr. Tarita Shankar,** Chairperson; **Prof. Chetan Wakalkar,** Group Director; **Mr. Adesh Gaekwad,** Trustee and Director – Projects; **Mr. Sandip Gaekwad**, Trustee & Director HR and everyone from the Management- Indira Group of Institutes.

Our heartfelt thanks to the Chairperson of the entire process **Dr. Sunil B. Ingole,** Principal, for the valuable input.

We are also thankful to **College's Taskforce and the faculty members** who have collected data required **Dr. Kiran D. Devade,** HoD First-Year Engineering and Associate Professor Mechanical Engineering Department **(Special mention for the excellent coordination)**

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

Contents

1. Introduction

1.1 About Shree Chanakya Education Society

It was established in February 1994, under the visionary leadership of Dr. Tarita Shankar, to provide top-quality post-graduate education in the fields of Business Management, International Business, and Information Technology. By consistently providing quality education over the past few decades, institutes at Indira Group are now considered one of the best institutes in Pune. At a time when India was struggling to put its economy back on its feet, after the nation having pawned the "family jewels" just to keep afloat, Dr. Tarita Shankar sensed that education too would have to become more broad-based and more vocational if India was to stand up to the world competition in quality and price for its products.

The then Finance Minister had prescribed for the economy and so, in 1994, began a saga of growth and quality in education; a story that is just reaching its zenith with 14 full fledged Institutes registering a strong presence on Pune's educational horizon. Since its inception, the Institutes managed by SCES, have maintained high academic standards and have successfully provided trained manpower to the industrial and services sector of the country. These institutes are now listed among the top colleges not just in Pune, but also in Maharashtra and India. With a modest strength of 60 students pursuing a single course, SCES has grown steadily and today boasts of 14 Institutes, having more than 8000 students from all over India pursuing multi-disciplinary, graduate & post-graduate programs. The objective of the institute is to provide 'Management education in a corporate environment', which has been possible due to the sincere and dedicated efforts of the members of SCES, who have invaluable experience in varied areas like academics, industry, service, and the social world.

1.2 Statements of the Institution

1.2.1 Vision

"The institute envisions to "***develop itself into a center of academic excellence in the field of Engineering and Management education to develop future technocrats and managers having the right knowledge, skill, and attitude to serve the society and industries to fulfill their ever-changing requirements."***

1.2.2 Mission

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

1. ***To train our students to become the best Engineering Entrepreneurs today, who will lead the organizations successfully into the future; locally, nationally, and globally.***
2. ***To provide an environment that fosters continuous improvement & innovation with related technical support & facilities to enhance student and faculty effectiveness.***
3. ***To provide programs focusing on the holistic development of the individual with an emphasis on personality grooming, physical fitness, and a strong sense of social and environmental responsibility.***
4. ***To improve logic & scientific reasoning and develop a global mindset amongst the students and prepare them to work in a heterogeneous environment.***

1.3 About the Institution

The College has a motto of **"Empowering minds to elevate lives."** It is affiliated with the Savitribai Phule Pune University and provides the following programs:

- **Graduation** – It offers the following courses Bachelor of Engineering (B.E.)
  - Civil Engineering
  - Computer Engineering
  - Mechanical Engineering
- **Post-Graduation** – It offers the following courses
  - Masters of Business Administration (MBA)
  - Masters of Computer Application (MCA)

The College works towards training young men and women to be competent, committed, and compassionate, and lead in all walks of life.

1.4 The surrounding premises around the Institution

The Premises is situated amidst the landscape serene **Pune region of Maharashtra state** with immense peace and calmness in the surroundings as there are residential areas around the premises. The location of the College is feasible to the nearby essential amenities such as Public Health Center, Fire Station, Civic body-Public administrative buildings, Recreational gardens, and Police Station which are not too close but nearby.

1.5 Assessment of the College

1.5.1 Affiliations and approvals

The College has all its courses approved and affiliated with the **Savitribai Phule Pune University,** *a collegiate public state university located in the city of Pune, Maharashtra.*

1.5.2 Certification

- **AISHE –** The code is *C-41944.*
- **NIRF –** The College has been *participating in the NIRF rankings every year.*

1.5.3 Accreditation

NAAC - The College had received a CGPA of 2.92 with a 'B++' Grade in its First cycle of Accreditation in2019.

1.6 Achievements of the College

The College has a tremendous track record of excellence for the educational services provided, below are some of the achievements.

- ***Outstanding Engineering Institute (West) -2015***
- ***ABP News Educational Award for best academy and Industry Interface -2017***
- ***Outstanding Engineering College -2017***
- ***Top Private Engineering Institute (Western Region) -2020***
- ***Top Private Business School (Western Region) -2020***
- ***Best Educational Institute -2021***
- ***Best Campus Placement and Industry academia Interface -2022***

2. Institution overview

2.1 Populace analysis for the Academic year 2019-20

2.1.1 Students data

The student data (shared by the College) shows there were a total of **1,176 Boys and 192 Girls students,** thus there were **a total of 1,368 students** on the premises.

2.1.2 Staff data

Type	Male	Female	Total
Admin Staff	23	4	**27**
Teaching Staff	45	41	**86**
Non-Teaching Staff	20	2	**22**
Total Staff Members	**88**	**47**	**135**

Table 1: Staff data of the Institution for 2019-20

The staff data shows the premises had a total of **135** Staff Members.

2.2 Populace analysis for the Academic year 2020-21

2.2.1 Students data

The student data (shared by the College) shows there were a total of **985 Boys and 493 331 students,** thus there were **a total of 1,316 students** on the premises.

2.2.2 Staff data

Type	Male	Female	Total
Admin Staff	22	2	**24**
Teaching Staff	41	34	**75**
Non-Teaching Staff	11	2	**13**
Total Staff Members	**74**	**38**	**112**

Table 2: Staff data of the Institution for 2020-21

The staff data shows the premises had a total of **112** Staff Members.

2.3 Total College Area & College Building Spread Area

The **total site area is 10 acres** and the **total Built-up area of the College is 1,70,803 sq. ft.** for **a total of 1,428 footfalls.**

2.4 College Infrastructure

2.4.1 Establishment

The College was established in 2007. The college is located pretty close to nature and hence has a very fresh environment which is absolutely pollution free and healthy. The Building is a Reinforced Cement Concrete (RCC) framework building.

2.4.2 Spatial Organisation

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

2.4.3 Operation and Maintenance of the premises

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

S. No.	Section	Spaces	Time	Hours/ day	Days in a year
1	Main Institutional College	Student areas and Teaching faculty	09:30 a.m. to 05:30 p.m.	7	280
2	General areas	Admin areas and library, Passage, staircase, toilet	09:00 a.m. to 05:00 p.m.	8	300

Table 3: Schedule of the timings of the premises

3. Green Building Study Audit

3.1 About the Green Building Study Audit

It is a systematic study of the aspects which make the Institution a 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

- Analysis of the Lights, Fans, AC, Equipment
- Renewable energy
- Scope for reducing the current energy bills if any
- Improvement in the thermal comfort of the campus

Green Audit

- Green initiatives
- Hygiene audit
- Water Audit - Analysis of the current water consumption of campus; Scope to include Rainwater harvesting and Wastewater treatment on the premises.
- Waste Audit - Current waste produced, its segregation, and usage; Strategies to be adopted for waste management and awareness

Environmental Audit

- Analysis of the current landscape + hardscape of the premises
- Analysis of the flora and fauna of the premises
- Strategies adopted at present to enhance vegetation
- Measures that can be adopted for ecological improvement of the premises.

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 Timeline of the activities for the Green Building Study Audit

- 23 March 2022 – Allotment and Initiation by the College
- 29 March 2022 – Induction Meeting
- 03 April 2022 – Survey of students and staff completed
- 29 April 2022 – Data submitted by College
- 27 May 2022 – Submission of the Draft Report
- 15 June 2022 – Submission of the Main Report

4. Site Study

The following listed are some of the positive site elements which are beneficial to the college in terms of tangible and intangible benefits.

- **Location -** The Shree Chanakya Education Society's Indira College of Engineering and Management is located at Gat No 276, Tal. Maval, S.NO 64,65, Indira College Road, off Pune Mumbai Expressway, Parandvadi, Maharashtra 410506 and falls under the *Mawal Taluka, Parandwadi Village, Pune District, and Parandwadi Gram Panchayat Municipal Corporation.*
- **Neighborhood context -** The premises are surrounded by open spaces and Residential, Commercial, and Educational areas in the immediate surroundings of the site.
- **Natural physical features –** The premises includes rich biodiversity and a good number of plants in the adjacent open space. The site does not have a major difference in the land levels (contours).
- **Manmade features –** The premises are situated in an urban area amidst residential areas and open spaces with appropriate proximity to necessary amenities. There is sufficient appreciation space for the entrance. The materials used for construction are RCC and the landscaping includes innumerable natural trees as well as potted plants.
- **Circulation –** There is a smooth transition of pedestrian traffic inside the premises due to the large entrance gate and the huge open space where vehicles of students and staff are parked.
- **Climate –** Pune has a tropical climate. In winter, there is much less rainfall in Pune than in summer. According to Köppen and Geiger, this climate is classified as Aw. The average annual temperature in Pune is 24.3 °C | 75.7 °F. The annual rainfall is 1200 mm | 47.2 inches.

(Source: https://en.climate-data.org/asia/india/maharashtra/pune-31/)

Ecological (Environment) Audit

Background reference image Yugal Shrivastava on pexels

Greenvio Solutions

5. Ecological (Environmental) Audit

The environment is an essential part of human survival. We co-exist with the environment and it cannot be termed as a separate entity. The Ecological audit helps to understand the flora, and fauna that exists and steps that can be taken to improve the same. To denote if there are problems related to sound in and around the surrounding. In terms of the carbon footprint, it helps in keeping a tab on the eco-friendly habits incorporated by the inhabitants of the premises. Health today is the topmost priority and a general understanding of the initiatives undertaken along with sufficient hygiene practices adopted. The universal design applies to all built and unbuilt spaces.

As part of our study, we could state that the Institution has developed eco-friendly practices and sustainable solutions which are well reflected in the rich biodiversity of the Premises. Being situated near the city the appreciation space towards the main entrance provides a welcoming approach to the College.

The college has huge open space used by all. The students use it as a leisure place for study and the college ground is used for sports activities. There are ample resting spaces as part of the building design which provide a resting and warm welcoming approach on the premises.

5.1 Open Space

There is a beautiful balance of natural and open spaces on the premises and the open/ vegetation spaces are balanced overall. The ground is used by students at present for sports and cultural gatherings. The design on the entire is such that the landscape and softscape spaces are very well oriented and located thus being extremely useful to Institutions on the site. **There are provisions for natural plantations which have enhanced the beauty of the space.**

There are adequate numbers of Maintenance staff allotted for upgrading the open spaces and they have done an excellent job in terms of the duty allotted. The infrastructure committee is involved in this process. The traditional tap and pipe facility is adopted for watering and the college has taken special provisions for the same. The spaces are watered daily in summer. **The efforts to maintain the existing space are commendable.**

5.2 Flora and fauna audit

5.2.1 Flora Audit

A flora survey was carried out to identify the total number of plants and trees. The landscape area has a variety of plantations constituting hundreds in numbers. Most of the trees have been planted by students, staff, management, Principal non-teaching staff, and office staff on several occasions and also during the plantation drives. **A few trees have grown naturally and have been conserved at their respective locations to maintain the beauty of the premises.** The detailed study of each type of plantation is as follows.

S. No.	Plant Name	Type	Nos.
1	Duranta	Shrub	8
2	Areca Palm	Plant	18
3	Royal Poinciana	Tree	37
4	Neem Tree	Tree	29
5	Pluviosa	Tree	12
6	Red Frangipani	Tree	9
7	White Frangipani	Tree	15
8	stereospermum	Tree	15
9	Ashoka Tree	Tree	14
10	Rain Tree	Tree	26
11	Euphorvia	Plant	2
12	bunflower tree	Tree	12
13	Hemiparasitic	Tree	22
14	Foxtail Palm	Tree	43
15	Dyera costulata	Tree	12
16	Blackboard tree	Tree	53
17	Custard Apple	Tree	4
18	Papya	Tree	2
19	Kapok Tree	Tree	16
20	Chinaberry	Tree	41
21	Banyan Tree	Tree	2
22	Teak wood	Tree	23

23	Befude tree	Tree	18
24	Fragrant Champaca	Tree	6
25	Jasminum	Shrub	1
26	pongam oil tree	Tree	12
27	Mango	Tree	13
28	Punong	Tree	3
29	Sacred fig	Tree	6
30	Acalypha	Shrub	8
31	Red Cedar	Tree	18
32	Guava Tree	Tree	7
33	Jamun Tree	Tree	2
34	Moringa	Tree	15
35	Date Palm	Tree	1
36	Jackfruit	Tree	1
37	Bamboo Tree	Tree	19
38	simarouba glauca	Tree	14
39	Nirgundi	Tree	4
40	Kinai	Tree	11
41	Christmas Tree	Plant	2
42	Besbeschorneria	Shrub	11
43	Shoeblack Plant	Plant	3
44	Red Bullet wood tree	Tree	15
45	Tree Pot	Small Plants	80
46	Small Tree	Small Tree	40

Table 4: Details of the Trees on the premises

At present, there are more than 46 types and 725 numbers of platations on the premises. The benefits of having trees on the premises are innumerable, some of the key benefits are providing shade, reduction in noise pollution by acting as noise barriers and maintaining the silence zones, interactive outdoor learning spaces, lowering the stress levels by staying connected with the nature, and the use of dried leaves to for organic composting.

5.2.2 Fauna Audit

It is a beautiful site to have the birds chirping around the College premises. It highlights the ecological co-existence concept most beautifully. The surveyed data of the fauna shows that there are Butterflies, Ants, Spiders, *Myna*, Sparrow, Squirrel, and lizards are available on the premises

5.3 Noise Audit

5.3.1 Macro level

On a macro level, there are open grounds on the site. *The approach road however has some traffic.* As the college is oriented amidst the residential areas with *sufficient* vegetation the noise levels do not affect the students and staff in their day-to-day functioning. The approach road is pretty away. ***Overall the noise level in terms of bad effects is moderate and there are positive outcomes as per our analysis on a macro level.***

5.3.2 Micro-level

The college has an adequate open space covered with huge trees prevailing naturally on the premises which act as a noise barrier; in addition, the Institution building is surrounded by Residential Buildings which further act as a benefit in reducing any noise pollution. There is no particular equipment that causes any noise effect. ***Overall the noise levels inside the premises are low which is a good approach.***

5.4 Carbon Footprint Audit

5.4.1 Eco-friendly Commuting Practices

Based on data collection and discussion with staff the following points were noted:

- **Ease of commuting –** Owing to the proximity to public transport the access is very feasible and walkable.
- **Parent's commute -** There are 2 Parent-teacher meetings held in a year and the turn-out is around 40-60%
- **Commute details** – The students and staff commute from multiple places. The details are summarised below.

S. No.	Name of all the places of commute	Distance from College
1	Somatane Phata, Talegaon, Bebedohal, Dhamane, Gahunje, Kasarsai, Vadgaon, Kanhe Phata, Urse, Shivane	Within or less than a 5 km radius
2	Kamshet, Lonavala, Mumbai, Dehuroad, Nigadi, Akurdi, Pimpri, Chinchwad, Kalewadi, Wakad, Sangavi, Pimple Gurav	More than 5 km and up to 10 km radius

Table 5: Details of the places students and staff commute from

5.4.2 Heat Island Reduction

The Institution has **adopted the following practices which are yielding positive results** in terms of the Urban Heat Island Effect which refers to an increase in temperature of the surroundings because of ineffective strategies.

- **Exposed roof areas –** The terrace is a flat roof that is absolutely clean and well maintained. *There was no weathering of the roof observed. The current practices are well maintained.*
- **Exposed non-roof hardscape areas -** There are pathways with natural and potted plantations which act as a buffer and *help keep the harmful effects due of the urban heat island effect under control.*

There are adequate measures adopted on the premises to reduce the heat island effect of Building roofs and on the site.

5.4.3 Outdoor Light Pollution Study

The college compound lights are not upward-looking thus, these do not cause light pollution.

5.5 Universally accessible premises

As per World Report on Disability, 2011 there are 180 million approx. Persons with Disabilities make it 15% of the total population of India.

There are lifts, ramps, handrails along the staircase, and low height risers in the staircases as part of universally accessible premise initiatives. The design of the premises is appropriate for access with corridors being wide enough in size. The doubly and singly loaded corridors are safe from the fire safety aspect.

5.6 Fire Safety

The Institution has undertaken adequate fire safety measures. Each floor has an open staircase without any barriers and fire extinguishers for fire safety measures. These staircases are free of any kind of storage or combustible material. **Our observation was that there are good measures adopted, however, measures such as sprinkler system, smoke detector, hydrant system, and fire safety specific signages should be present on the premises.**

5.7 Survey Results

An online survey was conducted to analyze the student and staff views about the Energy management practices adopted in College, following is the result received.

5.7.1 Participation

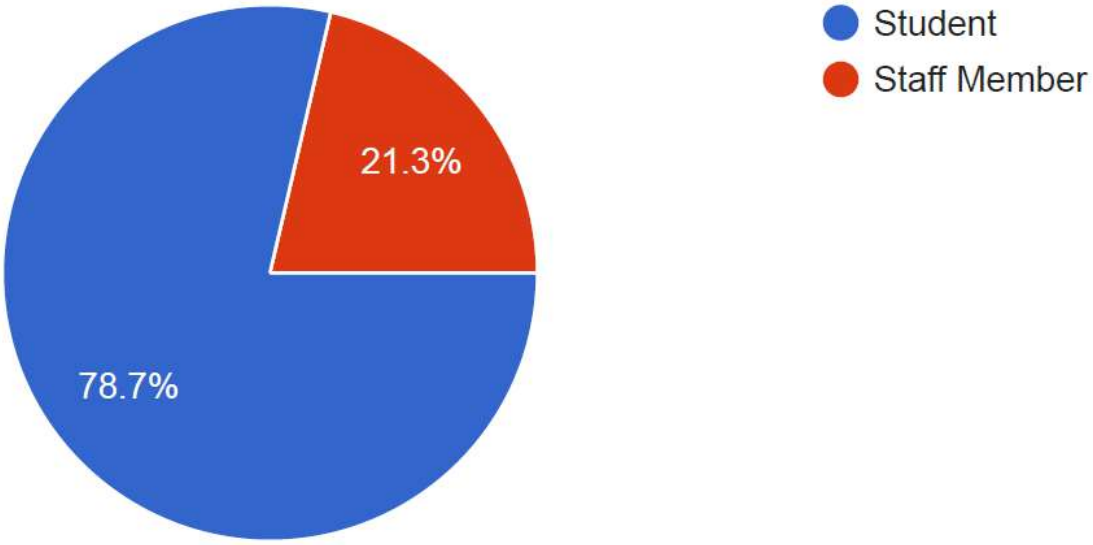


Figure 1: Participation analysis in the survey

A total of **89 responses** were received out of which 79% were students.

5.7.2 What according to you are the positive steps taken by the College towards Green Building/ Good maintenance?

We have listed some of the key responses below.

- ICEM has planted many more trees in like past few days.
- NSS team helping in cleanliness

- **The location of the college itself is close to nature. Very refreshing environment naturally. Apart from that college has planted trees and made the premises lavishly green.**
- Garbage management, tree plantation, green environment, etc.
- Our college regularly conducts practices to spread awareness about protecting and maintaining the environment.
- Our college conducts tree plantation activities and also activities like cleaning the premises and keeping the environment healthy and beneficial for all.
- **The college maintains the greenery around very efficiently and cares for the flora with consistency.**

5.8 Positive site features as per our study

a) Avoid using plastic on-premises

There are provisions for a ban on the use of plastic bags or products on the Premises.

b) OPAC system

The system in the library is beneficial for the students.

c) Paperless technologies

The college has gone technology-friendly and paperless in the functioning of the Premises.

d) Resting places

There are provisions for resting places on-premises outdoor and indoors.

e) Avoid using plastic in premise

There are provisions for a ban on the use of plastic bags or products on the Premise.

f) Ample greenery

There are provisions for the garden and plenty of traditional trees on the premises.

g) User-friendly movability on-premises

There are provisions for Kerb Ramp near the main entrance of the Building premises, also low height handrail for ease of access.

5.9 Recommendations for a Sustainable Habitat by Greenvio Solutions

Site beautification

a) Low VOC Paints and Adhesives

Whenever the College undergoes repairs or renovations there should be the use of materials with low emissions to reduce the adverse health impacts on workmen and the students occupying the space thereafter.

b) Additional facilities for birds

There can be provision for drinking water and food facility for birds visiting the College premise.

Universal Campus

Universal Toilet - There should be a minimum of 1 toilet for the specially-abled people as per guidelines prescribed by the National Building Code 2016 with size being a minimum of more than 1.5m x 1.5m

Pollution Control

Bicycles as a gift - As an appreciation gesture maybe the student's toppers/ staff best performers can be awarded a bicycle occasionally.

Smart and responsible environment systems

Smart Gardening System - The College can undertake a Smart Gardening system using IoT Technology such as an automated watering system. This will result in saving time by scheduling time for watering; Saving money and water as smart irrigation systems have automated water schedules in addition to tracking dampness of soil which helps the irrigation system know when and how much the garden needs. It also helps in healthier plants as with the help of apps, smart irrigation systems, or even smart growing containers, these tasks can be provided evenly and allow the plants to be healthier and more productive. More information on this system can be checked here https://www.happysprout.com/inspiration/what-is-smart-gardening/

On-site investigation and physical verification

The ecologically friendly ambience with facilities such as parking, greenhouses and gardens

6. Towards a Healthy & Sustainable Institution

6.1 Recommendations based on the study

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

a) **Cutlery in the Canteen –** The regular plastic and steel plates, and spoons used in the Canteen can be replaced with eco-friendly/ organic leaves, paper straws, disposable plates, and edible spoons made out of sugarcane waste or bamboo.

b) **Eco clubs –** There can be an eco-club with students working on pilot projects toward the environment and surrounding up-gradation.

c) **Terrace farming -** There can be a provision for terrace farming; this would enhance the biodiversity, increase awareness, and food grown can be used in Canteen.

d) **Signages –** In addition to the signages being in regular language there can be additional signages in braille language for the specially-abled students.

6.2 Survey Results

An online survey was conducted to analyze the student and staff views about what changes according to you can be undertaken for Green audit improvement in College premise and activity. **Some of the suggestions are listed below:**

- Use of student-built technology for waste and resource recycling.
- To increase tree cover & promote a clean environment in our college.
- To conduct more and more programs to aware the students of the greeneries and beauty of nature.
- They should conduct one session a week for awareness of the green environment.

However, it should be noted that the College has taken up multiple initiatives and because of the pandemic, the students have not practically visited the premises so some of these points are not mandatory at the moment.

7. References

1. Uniform Plumbing Code – India, 2008
2. IGBC Green Existing Buildings – Operation & Maintenance (O&M) Rating system, Pilot version, Abridged Reference Guide, April 2013
3. IGBC Green Landscape Rating system, March 2013
4. BOMA Canada Waste Auditing Guide, Best Environmental Standards, BOMA BEST – Canada
5. Used only for understanding Universal design - Universal Accessibility Guidelines for Pedestrian, Non-motorized vehicle and Public Transport Infrastructure – Report guidelines by Samarthyam (National center for Accessible Environments) – an initiative supported by Shakti Sustainable Energy Foundation.
6. Climate data https://en.climate-data.org/asia/india/maharashtra/pune-31/


INDIRA
COLLEGE OF ENGINEERING

GREEN AUDIT

STUDY PERIOD (TWO YEARS) 2019-20 & 2020-21

Sustainability study

AUDIT REPORT

Studied for

Shree Chanakya Education Society's

Indira College of Engineering & Management

Gat No 276, Tal. Maval, S.NO 64,65, Indira College Road, off Pune Mumbai Expressway, Parandvadi, Maharashtra 410506

Studied by

Greenvio Solutions

Valid till June 2023

Disclaimer

The Audit Team has prepared this report for the **Shree Chanakya Education Society's Indira College of Engineering and Management** located at *Gat No 276, Tal. Maval, S.NO 64,65, Indira College Road, off Pune Mumbai Expressway, Parandvadi, Maharashtra 410506* based on input data submitted by the College and analyzed by the team to the best of their abilities.

The details have been consolidated and thoroughly studied as per the various guidelines for Green Buildings available in National and International Standards; the report has been generated based on a comparative analysis of the existing facilities and the prerequisites formulated by various standards. The inputs derived are a result of the inspection and research. These will further enhance and develop a Healthy and Sustainable Institution.

These can be implemented phase-wise or as a whole depending on the decision taken by the Hon'ble Management and College. The warranty or undertaking, expressed or implied is made and no responsibility is accepted by Audit Team in this report or for any direct or consequential loss arising from any use of the information, statements, or forecasts in the report.

The audit is a thorough study based on the inspection and investigation of data collected over a while 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 an Accredited and Certified Green Building Professional-Architect; I.A.(IMS) 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 incapacity of an 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

Palghar District, Maharashtra- 401208

sustainableacademe@gmail.com

Acknowledgment

The Audit Assessment Team thanks the **Shree Chanakya Education Society's Indira College of Engineering and Management** for assigning this important work of Green Audit. We appreciate the cooperation extended to our team during the entire process.

Our special thanks are due to **Dr. Tarita Shankar,** Chairperson; **Prof. Chetan Wakalkar,** Group Director; **Mr. Adesh Gaekwad,** Trustee and Director – Projects; **Mr. Sandip Gaekwad**, Trustee & Director HR and everyone from the Management- Indira Group of Institutes.

Our heartfelt thanks to the Chairperson of the entire process **Dr. Sunil B. Ingole,** Principal, for the valuable input.

We are also thankful to **College's Taskforce and the faculty members** who have collected data required **Dr. Kiran D. Devade,** HoD First-Year Engineering and Associate Professor Mechanical Engineering Department **(Special mention for the excellent coordination)**

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

Contents

1. Introduction

1.1 About Shree Chanakya Education Society

It was established in February 1994, under the visionary leadership of Dr. Tarita Shankar, to provide top-quality post-graduate education in the fields of Business Management, International Business, and Information Technology. By consistently providing quality education over the past few decades, institutes at Indira Group are now considered one of the best institutes in Pune. At a time when India was struggling to put its economy back on its feet, after the nation having pawned the "family jewels" just to keep afloat, Dr. Tarita Shankar sensed that education too would have to become more broad-based and more vocational if India was to stand up to the world competition in quality and price for its products.

The then Finance Minister had prescribed for the economy and so, in 1994, began a saga of growth and quality in education; a story that is just reaching its zenith with 14 full fledged Institutes registering a strong presence on Pune's educational horizon. Since its inception, the Institutes managed by SCES, have maintained high academic standards and have successfully provided trained manpower to the industrial and services sector of the country. These institutes are now listed among the top colleges not just in Pune, but also in Maharashtra and India. With a modest strength of 60 students pursuing a single course, SCES has grown steadily and today boasts of 14 Institutes, having more than 8000 students from all over India pursuing multi-disciplinary, graduate & post-graduate programs. The objective of the institute is to provide 'Management education in a corporate environment', which has been possible due to the sincere and dedicated efforts of the members of SCES, who have invaluable experience in varied areas like academics, industry, service, and the social world.

1.2 Statements of the Institution

1.2.1 Vision

"The institute envisions to "***develop itself into a center of academic excellence in the field of Engineering and Management education to develop future technocrats and managers having the right knowledge, skill, and attitude to serve the society and industries to fulfill their ever-changing requirements."***

1.2.2 Mission

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

1. ***To train our students to become the best Engineering Entrepreneurs today, who will lead the organizations successfully into the future; locally, nationally, and globally.***
2. ***To provide an environment that fosters continuous improvement & innovation with related technical support & facilities to enhance student and faculty effectiveness.***
3. ***To provide programs focusing on the holistic development of the individual with an emphasis on personality grooming, physical fitness, and a strong sense of social and environmental responsibility.***
4. ***To improve logic & scientific reasoning and develop a global mindset amongst the students and prepare them to work in a heterogeneous environment.***

1.3 About the Institution

The College has a motto of **"Empowering minds to elevate lives."** It is affiliated with the Savitribai Phule Pune University and provides the following programs:

- **Graduation** – It offers the following courses Bachelor of Engineering (B.E.)
  - Civil Engineering
  - Computer Engineering
  - Mechanical Engineering
- **Post-Graduation** – It offers the following courses
  - Masters of Business Administration (MBA)
  - Masters of Computer Application (MCA)

The College works towards training young men and women to be competent, committed, and compassionate, and lead in all walks of life.

1.4 The surrounding premises around the Institution

The Premises is situated amidst the landscape serene **Pune region of Maharashtra state** with immense peace and calmness in the surroundings as there are residential areas around the premises. The location of the College is feasible to the nearby essential amenities such as Public Health Center, Fire Station, Civic body-Public administrative buildings, Recreational gardens, and Police Station which are not too close but nearby.

1.5 Assessment of the College

1.5.1 Affiliations and approvals

The College has all its courses approved and affiliated with the **Savitribai Phule Pune University,** *a collegiate public state university located in the city of Pune, Maharashtra.*

1.5.2 Certification

- **AISHE –** The code is *C-41944.*
- **NIRF –** The College has been *participating in the NIRF rankings every year.*

1.5.3 Accreditation

NAAC - The College had received a CGPA of 2.92 with a 'B++' Grade in its First cycle of Accreditation in2019.

1.6 Achievements of the College

The College has a tremendous track record of excellence for the educational services provided, below are some of the achievements.

- ***Outstanding Engineering Institute (West) -2015***
- ***ABP News Educational Award for best academy and Industry Interface -2017***
- ***Outstanding Engineering College -2017***
- ***Top Private Engineering Institute (Western Region) -2020***
- ***Top Private Business School (Western Region) -2020***
- ***Best Educational Institute -2021***
- ***Best Campus Placement and Industry academia Interface -2022***

2. Institution overview

2.1 Populace analysis for the Academic year 2019-20

2.1.1 Students data

The student data (shared by the College) shows there were a total of **1,176 Boys and 192 Girls students,** thus there were **a total of 1,368 students** on the premises.

2.1.2 Staff data

Type	Male	Female	Total
Admin Staff	23	4	**27**
Teaching Staff	45	41	**86**
Non-Teaching Staff	20	2	**22**
Total Staff Members	**88**	**47**	**135**

Table 1: Staff data of the Institution for 2019-20

The staff data shows the premises had a total of **135** Staff Members.

2.2 Populace analysis for the Academic year 2020-21

2.2.1 Students data

The student data (shared by the College) shows there were a total of **985 Boys and 493 331 students,** thus there were **a total of 1,316 students** on the premises.

2.2.2 Staff data

Type	Male	Female	Total
Admin Staff	22	2	**24**
Teaching Staff	41	34	**75**
Non-Teaching Staff	11	2	**13**
Total Staff Members	**74**	**38**	**112**

Table 2: Staff data of the Institution for 2020-21

The staff data shows the premises had a total of **112** Staff Members.

2.3 Total College Area & College Building Spread Area

The **total site area is 10 acres** and the **total Built-up area of the College is 1,70,803 sq. ft.** for **a total of 1,428 footfalls.**

2.4 College Infrastructure

2.4.1 Establishment

The College was established in 2007. The college is located pretty close to nature and hence has a very fresh environment which is absolutely pollution free and healthy. The Building is a Reinforced Cement Concrete (RCC) framework building.

2.4.2 Spatial Organisation

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

2.4.3 Operation and Maintenance of the premises

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

S. No.	Section	Spaces	Time	Hours/ day	Days in a year
1	Main Institutional College	Student areas and Teaching faculty	09:30 a.m. to 05:30 p.m.	7	280
2	General areas	Admin areas and library, Passage, staircase, toilet	09:00 a.m. to 05:00 p.m.	8	300

Table 3: Schedule of the timings of the premises

3. Green Building Study Audit

3.1 About the Green Building Study Audit

It is a systematic study of the aspects which make the Institution a 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

- Analysis of the Lights, Fans, AC, Equipment
- Renewable energy
- Scope for reducing the current energy bills if any
- Improvement in the thermal comfort of the campus

Green Audit

- Green initiatives
- Hygiene audit
- Water Audit - Analysis of the current water consumption of campus; Scope to include Rainwater harvesting and Wastewater treatment on the premises.
- Waste Audit - Current waste produced, its segregation, and usage; Strategies to be adopted for waste management and awareness

Environmental Audit

- Analysis of the current landscape + hardscape of the premises
- Analysis of the flora and fauna of the premises
- Strategies adopted at present to enhance vegetation
- Measures that can be adopted for ecological improvement of the premises.

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 Timeline of the activities for the Green Building Study Audit

- 23 March 2022 – Allotment and Initiation by the College
- 29 March 2022 – Induction Meeting
- 03 April 2022 – Survey of students and staff completed
- 29 April 2022 – Data submitted by College
- 27 May 2022 – Submission of the Draft Report
- 15 June 2022 – Submission of the Main Report

Green practices

Background reference image Free photos on pixabay

4. Green Practices Audit

The increasing global warming and climate change have made us realise that apart from the enormous strategies the individual small efforts need to be taken by individuals and Educational Institutes as the younger generations are the future of the world and once they are taught about these practices only then can we assume a better future.

4.1 Green practices

We observed the following points during the Site investigation and data verification of the premises; these are common for all the Buildings on the premises.

- **Architecturally planned and designed landscaped garden spaces.**
- There is the **availability of open space on the premise in addition to the provision of multiple varieties of flora.**
- **Car-pooling and cycling to college practice are observed by the staff and students.**
- The students and college authorities **jointly conduct initiatives for upgrading the premises from an environmental view.**
- **Lectures/workshops conducted on green practices and green infrastructure.**

4.2 Community development

The College has an NSS Team that conducts initiatives for the upliftment of the rural community in nearby areas. The various community development programs conducted include Tree Plantation, Life Learning, Employability Skill program introduced for the youth, Blood Donation Camp, Food Kit Distribution Program to the neighborhood community, and Relief fund programs.

A lot of efforts are involved right from planning to execution. The main motive behind these is social welfare. This kind of thought process is highly admirable. We respect and congratulate the Institute for the same.

4.3 Eco-friendly initiatives undertaken

The Institution has undertaken the following initiatives through **excellent efforts** toward saving environment measures. The data has been documented as presented below:

1. **The solar workshop** was organized by Mechanical Department on the occasion of Gandhi Jayanti on 02/10/2019
2. **NSS performed a cleanliness drive at Somatane Village** on 23/01/2020
3. **NSS team planted plants on ICEM premises** on 1/10/2020
4. **Village Cleaning at Parandwadi Village** on 11/03/2021
5. **ICEM celebrated World Environment Day with a tree Plantation campaign** on 5/6/2021
6. **NSS and Student Council jointly organized a tree plantation at ICEM premises** on 15/09/2021
7. **NSS and Student Council Organized Swachata Abhiyan in Parandwadi Village** on 22/10/2021
8. **Experts session on energy efficiency** was conducted by Prof. Pratima Gaikwad on 14/10/2020
9. **Prof. Shreyas Satpute from the Civil department, ICEM conducted the Session on Green Construction and Design.**
10. **Prof. Shubhangi Manwatkar attended ATAL FDP on "Energy Engineering"** during 9-13 November 2020
11. **Prof. Shubhangi Nanwatkar attended ATAL FDP on "Green Technology"** during 16-20 November 2020

It is very much evident that the College takes full efforts to spread awareness and provide outreach for sections of events such as Gender Equality, Health, Eco-efficiency, and National significance. However, due to the lockdown more social events could not take place.

4.4 Survey Results

An online survey was conducted to analyze the student and staff views about the Energy management practices adopted in College, following is the result received.

4.4.1 Participation

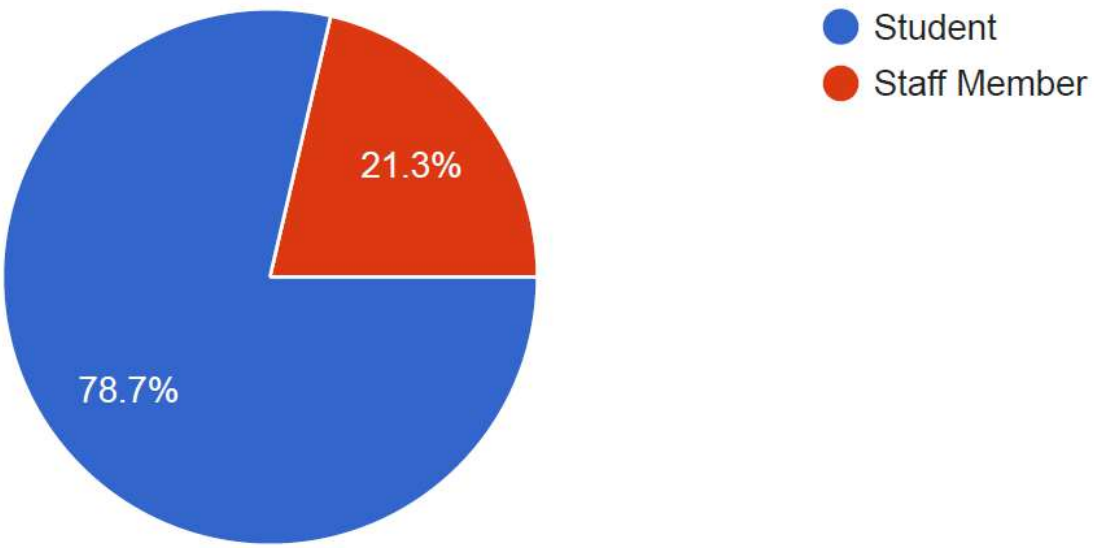


Figure 1: Participation analysis in the survey

A total of **89 responses** were received out of which 79% were students.

Note about the review-rating survey

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 the graph depict the Number of participant's responses in numerical (Percentage of the participant response) – For example 101 responses (44.5%)

4.4.2 Rate the Green awareness practices in College

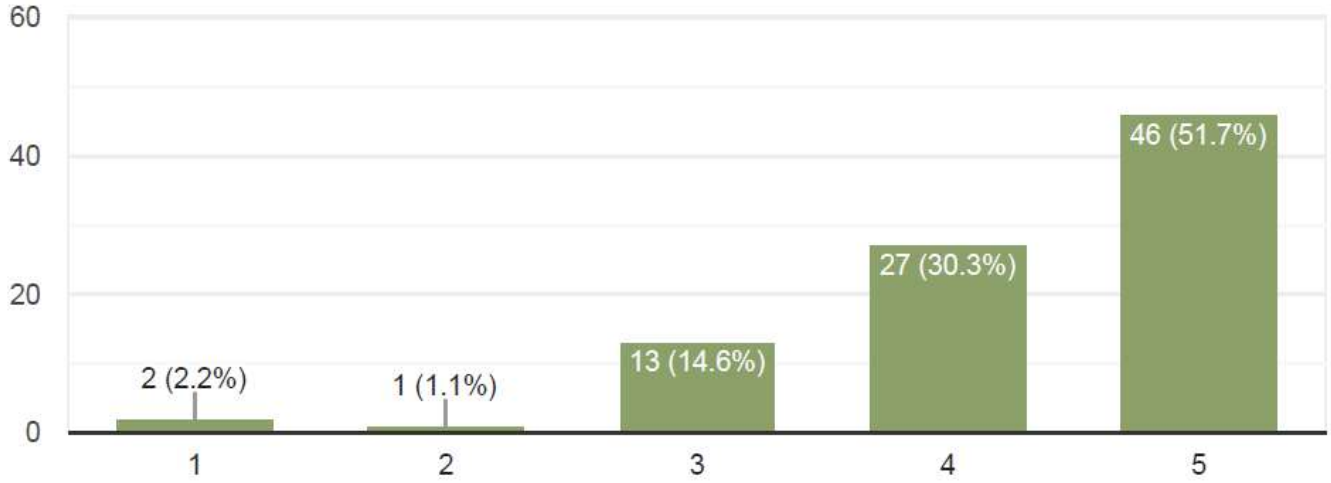


Figure 2: Green awareness practices in College

There were mixed responses received the highest was for **rating 5 (Excellent) at 52%** followed by **30% for rating 4 (Very good).**

4.4.3 Does your College conduct environment awareness programs/ webinars/ plantations/ cleanliness or similar programs?

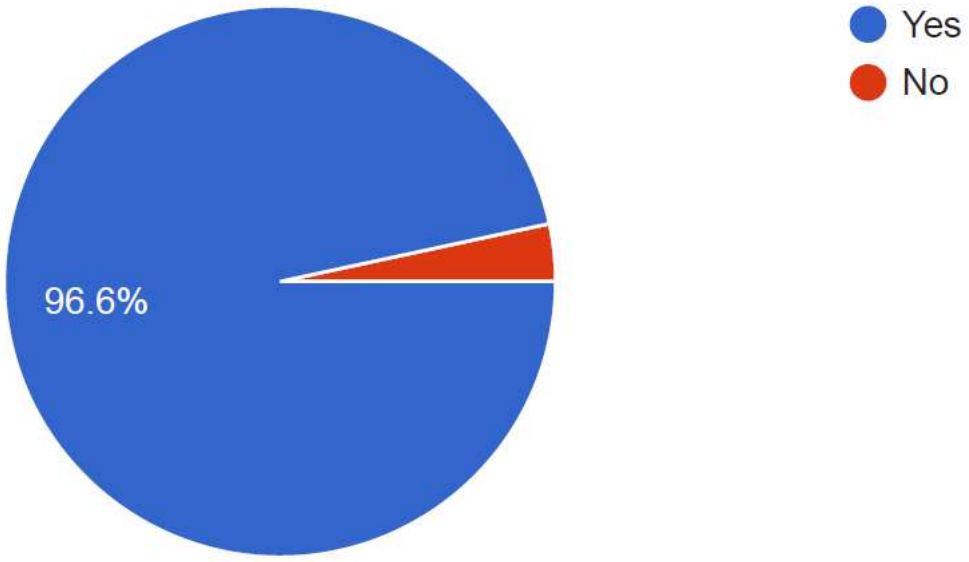


Figure 3: Confirmation of the environmental awareness programs/ webinars/ plantations/ cleanliness or similar programs conducted by the College

Of the students and staff, **97%** of responses confirmed activities are conducted which is very excellent.

4.4.4 Do you participate in such events?

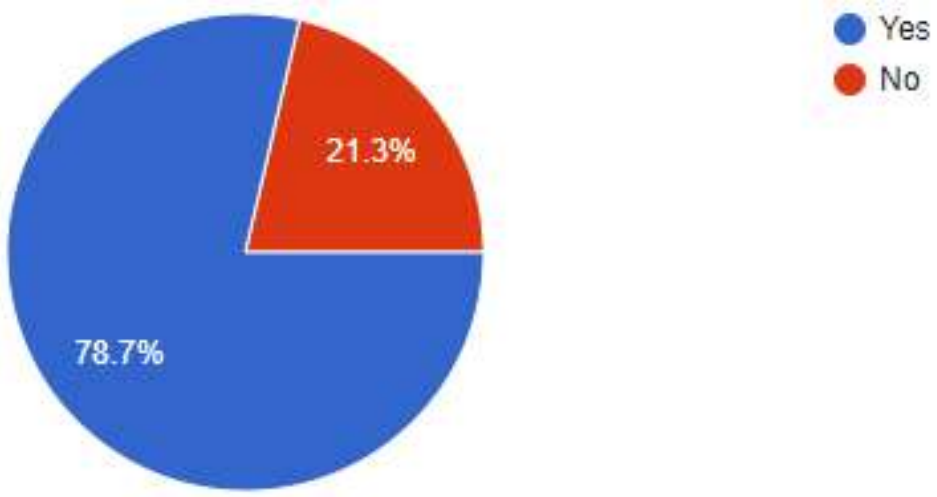


Figure 4: Participation in the environmental awareness programs/ webinars/ plantations/ cleanliness or similar programs conducted by the College

The students, and staff **almost 79%** of the responses confirmed their participation, **this is excellent and the college should continue its efforts.**

4.4.5 If yes, what has been your experience with the program?

Some of the key responses are listed below:

- Feels good to plant trees
- **It's good seeing our college building awareness in us through tree plantation drives, cleanliness drives**
- **It was a very good experience and learned new things**
- Such events were conducted before which enthusiastically took place and efficiently
- **Programs are conducted in a very good way. All volunteers have given their best in the program.**
- I'm to tell you, I'm a part of NSS and NSS conducted multiple functions which are helpful for the environment. My great experience is when our group is a visit to parandwadi.
- The programs are conducted nicely.

4.5 Recommendations for a Sustainable Habitat by Greenvio Solutions

a) Plant as a gift

As a kind gesture, the guests visiting the premise can be asked to plant a small plant on the premise itself and they can be even given plants/bouquets from the flowers of the plants on the premise as a gift.

b) Environmental awareness

There can be various artworks on the compound wall giving the message of saving the environment through the joint efforts of the students and staff thereby making the student socially and environmentally responsible citizens.

c) Tree adoption scheme

The college can adopt the One Faculty – One tree adoption scheme which is one of its kind practice, this can be very beneficial, especially during the summer season.

d) Signages on the plants mentioning scientific names

The practice of having the names of each plant and tree will provide awareness among the staff and students.

Waste Audit

Background reference image Polina Tankilevitch on pexels

Greenvio Solutions

5. Waste Audit

Waste is an inevitable part of our lives. Over the years the awareness about waste management techniques has given a rise to rethink how the waste can be avoided being sent to the landfills. The audit provides an approximation of the types of waste generated, location of waste collections, disposal techniques used, waste segregation methodologies adopted, and waste management strategies that are implemented in addition to the newer ways that can be adopted aiming to make the premise clean and sustainable. Here sustainability refers to a broader aspect to analyse whether the current techniques are having a positive or negative effect on the stakeholders of the premises.

5.1 Waste produced

5.1.1 Types and disposal of waste on premises

The types of waste and their current practice are summarised below:

S. No.	Type of waste	Source and quantity	Current Disposal method	Can be treated/ recycled?	Methodology
1	Solid waste	Toilets–Biodegradable waste of 15-20 kg per week	Led in the stormwater drains	Yes	TREATED - Small biogas plant can be proposed in open space
2	Paper waste	Newspaper and other paper	Sold to vendor	Yes	CONTINUE - with the current practice
3	E-waste	Computers - Non-biodegradable waste as per the annual year usage	Given to vendor	Yes	CONTINUE - with the current practice
4	Dry waste in form of leaves	Open space & plantations, papers - Non-biodegradable waste of 8-10 kg per week	Municipality	Yes	TREATED – A common pit can be set up
5	Liquid waste (Black-grey)	Toilets, washbasins – Around 100 – 120 liters per week during general times and 50 liters at present	WTP and STP	Yes	CONTINUE - with the current practice
6	Organic regular waste	Dust, and dirt usually dry waste from Canteen and all sources – approx. 3 to 5 kg	Municipality	Yes	TREATED – A common pit can be set up
7	Bio-waste	Sanitary pads	Dustbins and Municipality	Yes	TREATED – An incinerator and vending machine

Table 4: Summary of the types of waste produced on the premises

5.1.2 Bins summary

There are 183 Dustbins on the premises with a volume of 7 liters (small), 15 liters (medium), and more than 30 liters (large-sized). The material of the bins is plastic and wood. The analysis of dustbins is presented below.

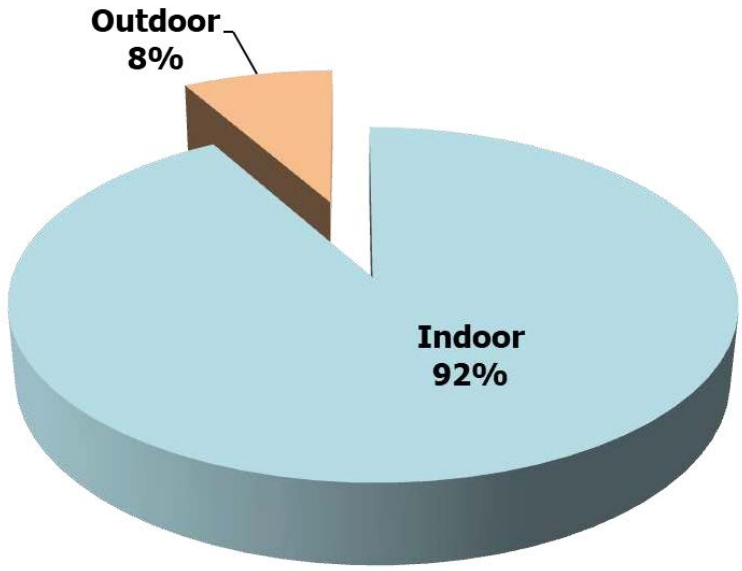


Figure 5: Analysis of dustbins location wise in the premises

The above analysis shows that **92% are present indoors & 8% outdoors.**

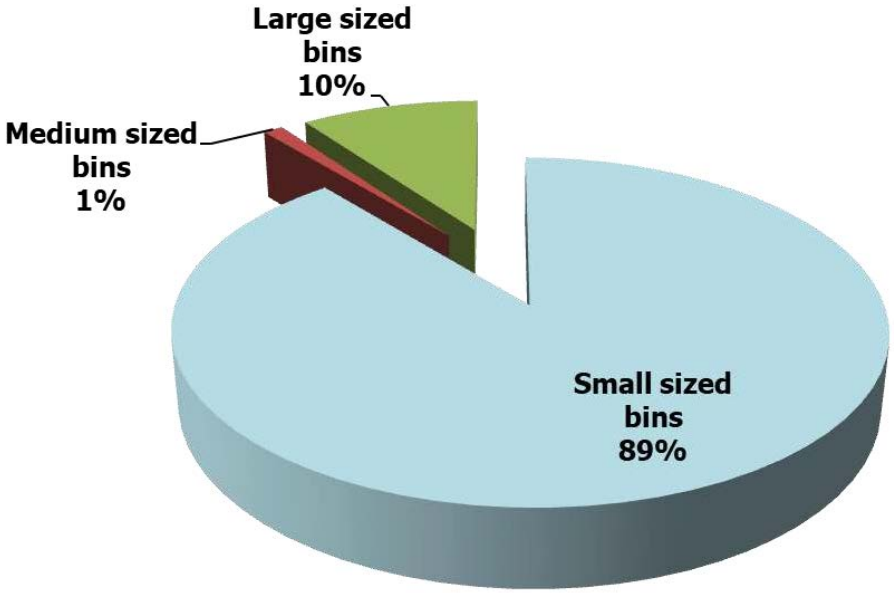


Figure 6: Analysis of dustbins size-wise in the premises

Among the dustbins that are present in the indoor areas, **89% are small-sized bins, 1% are medium-sized dustbins** and **10% are large-sized bins.**

5.2 Waste handling

Quantification wise as per Interview and survey it was found the following type of waste is Solid, Liquid, Hazardous Waste, Dry leaves, E-Waste, Canteen waste, and Unused Equipment waste is collected. The waste produced on-premises is segregated. It is collected every week. The waste is handed over to the local municipality van.

5.3 Waste management

The following practices are adopted on the premises at present.

- *The College reuses the papers.*
- *Ample measures are taken to maintain hygiene. No smell problems or health-related issues due to the waste are there.*
- *There are adequate numbers of bins present in all parts of the building.*
- *The waste does not pollute the ground or surface water.*
- *There is no problem of air pollution from waste as informed.*
- *The wastes from toilets are discharged to main drains through underground covered channels (Safety Tanks), then to STP & WTP thus avoiding any incident.*

As per our analysis, the current practices are good, however, there is scope for improvement.

5.4 Survey Results

Note about the review-rating survey

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 the graph depict the Number of participant's responses in numerical (Percentage of the participant response) – For example 101 responses (44.5%)

Rating for the views regarding the Waste management practices adopted in College, the following is the result received.

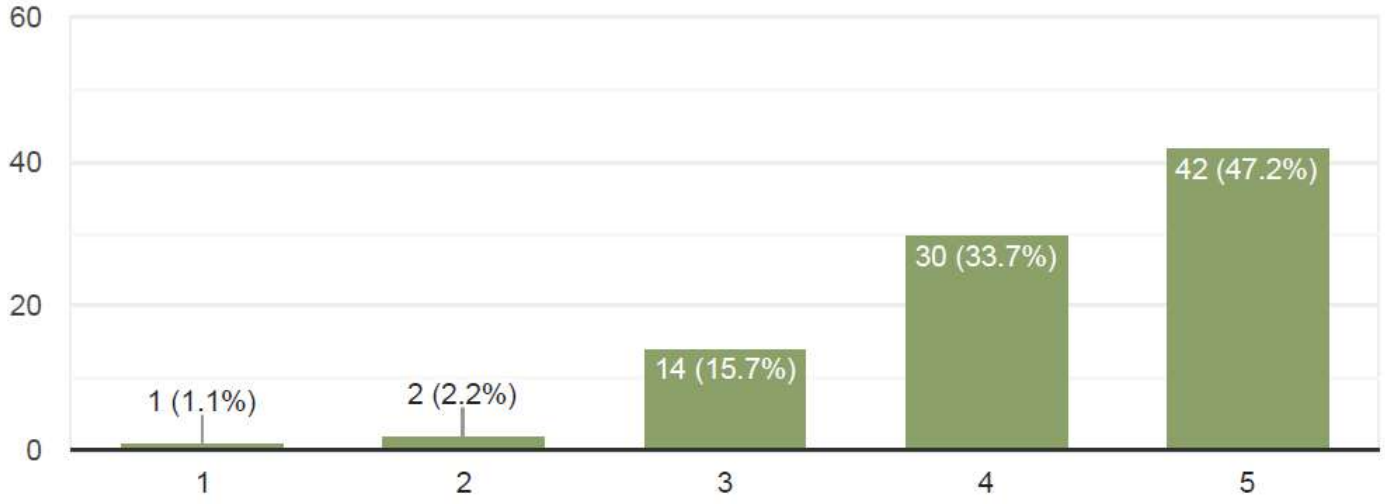


Figure 7: Waste management practices in College

There were mixed responses received; the highest was for **rating 5 (Excellent) for 47% and rating 4 (Very good) at 34%**

5.5 Recommendations for a Sustainable Habitat

a) Zero Waste practice adoption

The College can undertake a zero organic waste protocol. The following practices can be adopted as part of the same.

- The food waste generated by the students and staff is taken by them to their own homes, so that, minimum waste is generated inside the premises.
- The organic waste generated in the canteen is used as feed for a biogas plant and the biogas is used as fuel in the College canteen.
- Vegetable waste and other leaf litter can be used to feed in the vermicompost pit and the resulting vermin cast is used as manure in the garden.
- The chemicals from the laboratories are disposed of in a sealed tank along with

water so that the chemicals undergo neutralization with the water.

As part of the above, there will be a requirement for a Biogas plant, vermin-compost pit, awareness signages, sealed tank for wastewater from the chemical laboratory.

b) **Incinerators -** The Incinerators should be installed in Girl's toilets for disposal of sanitary napkins

c) **Signages -** Messages about avoiding wastage should be placed at appropriate locations.

d) **Material of the dustbin -** The current plastic dustbins should be replaced with eco-friendly material.

Water Audit

Background reference image Vlad Chetan on pexels

Greenvio Solutions

6. Water Audit

Water is one of the basic needs. Pure drinking water is a resource that needs to be preserved efficiently. A water audit helps to identify the sources of water consumption, and the water requirement by the premises is met by these sources. The points and effective usage without any wastage. Understanding the techniques which are best suited to the site to increase water conservation in terms of awareness and practice.

6.1 Water availability and consumption

6.1.1 Sources of Primary water supply

The College requires water from the Local Municipality for drinking water purposes. The total water consumption for drinking water is as follows:

S. No.	Type	Single capacity (liters)	Nos	Total capacity (liters)
1	Filter water Tank, Ground Level	2,70,000	1	2,70,000
2	Hostel Building terrace	5,000	6	30,000
3	A Wing terrace	5,000	2	10,000
4	B Wing terrace	5,000	2	10,000
Total			**11**	**3,20,000**

Table 5: Details of the primary sources of water supply

6.1.2 Sources of Secondary water supply

The college uses the following sources of water supply for secondary usages such as watering plants, kitchen, toilets, and wash basins connected to the labs and other spaces. The specific sources are as follows:

- **Well –** There is 1 well available on the site
- **River** – Water supply is connected through the nearby river.
- **Wastewater treatment plant** – There is provision for an STP plant with a capacity of 1,50,000 liters of water storage. However, a limited capacity of water is utilized from this source.

Daily water is pumped from the well and river as per the requirement. However, the water for a secondary purpose is stored in tanks as follows:

S. No.	Type	Single capacity (liters)	Nos	Total capacity (liters)
1	Ground Level - WTP tank	1,90,000	1	1,90,000
2	STP	30,000	1	30,000
3	Cement Tank for STP water	10,000	1	10,000
4	Garden Tank PVC	5,000	1	5,000
Total			**4**	**2,35,000**

Table 6: Details of secondary sources of water supply

6.2 Water requirement

The main areas of water requirement and type of usage are as follows

- **Drinking water –** Consumption of around 2,000 liters of water through RO water plant available on the premise, the taps, and water cooler.
- **Toilet blocks**– General usage by occupants in toilets, urinals, bathrooms, and washbasins using approx. 1,000 liters of water daily
- **Cleaning of the premises –** The entire Institution is very well maintained concerning hygiene and cleaning is one of the major uses of water requirement. The toilet areas are cleaned twice daily.
- **Garden and surrounding open space** – Cleaning, and watering the plants require approximately more than a good amount of water, keeping in mind the scale of the open spaces there is a supply system connected directly, and the plants and trees are hardly watered regularly. Though they are watered on alternate days in the winter season and about 2-3 times a day in the summer season on a regular climate day it is watered 3 days a week and in the rainy season, it is dependent on the monsoon showers. The regular tap and a pipe system are practiced at present.

6.3 Survey Results

Note about the review-rating survey

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 the graph depict the Number of participant's responses in numerical (Percentage of the participant response) – For example 101 responses (44.5%)

Rating for the views regarding the water management practices adopted in College, following is the result received.

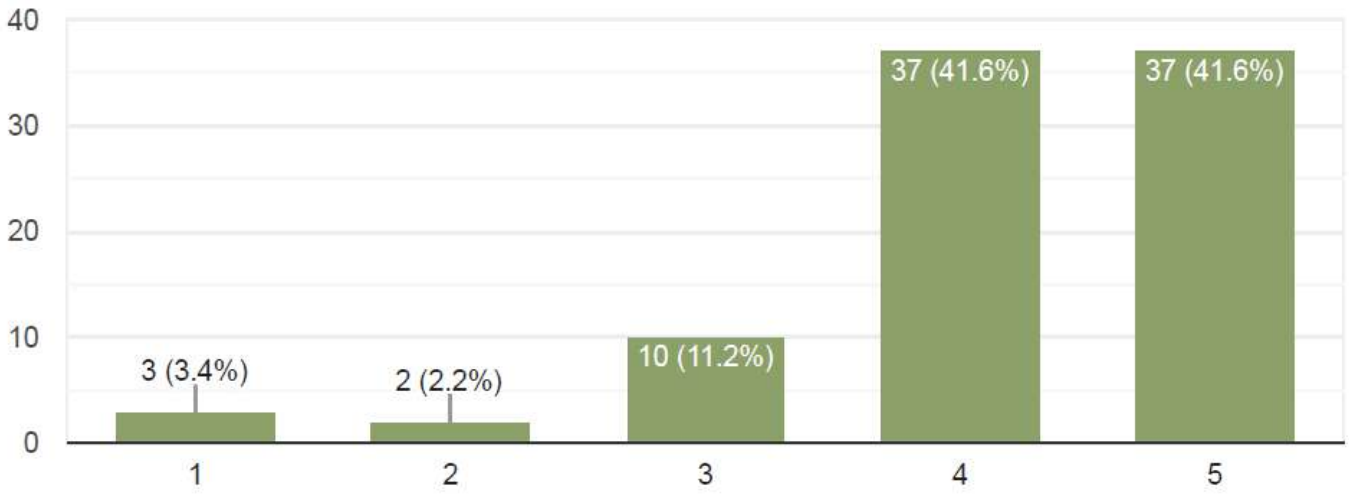


Figure 8: Water management practices in College

There were mixed responses received the equal also the highest was for **rating 4 (Very good) and rating 5 (Excellent) at 42% each.**

6.4 Areas of water usage

Based on the inventory done and data shared by the staff it was found that the premise has the following facilities:

- Urinals – 45 Nos.
- Toilets – 195 Nos.
- Washbasins – 201 Nos.
- Taps (Indoors) – 432 Nos.
- Taps (Outdoors) – 4 Nos.

As per the data shared by the College and on-site observation, it was noted that there is no water wastage of water in the form of Cleanliness of toilets.

6.5 Site investigation about water management.

The College has an excellent management system which is very appreciable. We have observed the following points.

- There is **no water leakage in the entire premise;** the pipes are well maintained with adequate hygiene.
- **The premise has efficient water management in terms of operations and maintenance.**
- The toilets are kept very tidy and are cleaned every day.
- The **wastewater does not mix with groundwater and gets directed to storm-water drains.**
- There is a sufficient number of taps on the premise.
- There is provision for a **Waste Water Treatment (WTP)** and a **Sewage Treatment Plant (STP)** on the premises.

6.6 Recommendations for a Sustainable Habitat

Below mentioned are a few suggestions for better water management practices in the premise.

a) Universal Toilet

At least 1 toilet should be made specially-abled as per universal design norms.

b) Wastewater from toilets

This should be collected and a wastewater treatment plant can be installed in the open space wherein this water can be treated and reused for gardening and toilet flushing.

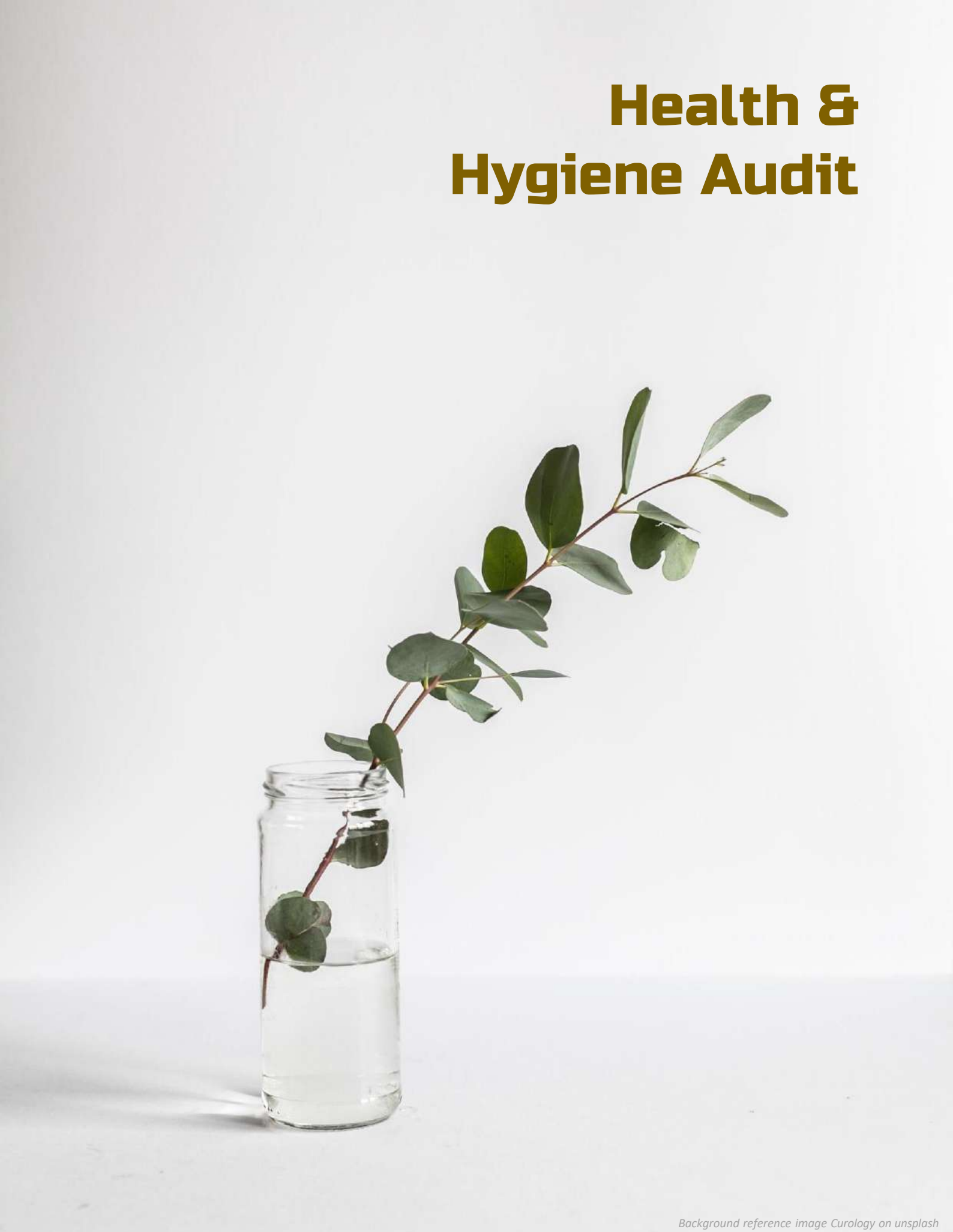
c) Signages

Messages about avoiding water wastage should be placed at appropriate locations.

d) Waterless urinals

There can be the provision of waterless urinals as a Green Building initiative in the premise, either the existing ones can be replaced with such a facility or new toilets can be constructed in this manner.

Health & Hygiene Audit



Background reference image Curology on unsplash

Greenvio Solutions

7. Health and Hygiene Audit

Hygiene is a part and parcel of our daily life. It is extremely essential to keep the surroundings clean in the same manner as we would want our houses to be. Educational Institutes have a bigger role to play to affect the young minds positively through better hygienic practices.

7.1 Facilities available

The Institution has the following facilities as part of the premise.

- Washroom facility in each of the buildings.
- Hand wash facility
- Drinking water facility in the form of Water coolers and taps
- Ample number of dustbins on the premise

7.2 Smoke Exposure

As per the Site visit, the following analysis **has a positive impact on-premises.**

- The College has No Smoking on its compound wall as part of the awareness.
- The canteen uses Gas cylinders for cooking, there is no utilization of firewood. Thus **there is no smoke from the burning of firewood and any health issues related to the same.**
- The **garbage on-premise is not burnt** and there is no air pollution because of it.
- The Institution is a tobacco and smoke-free campus which helps in adapting to a Healthy Institution
- There is parking provision inside the campus there is a slight issue of dust owing to the same but it is **balanced with the good vegetation on the premise.**

7.3 Hygiene

As per the Site visit, the following analysis **has a positive impact on-premises.**

- For the overall hygiene of the students and staff, there are facilities such as a Washroom facility on the ground floor and hand washing. The hygiene of the toilet

areas is well maintained. **The entire premises are cleaned twice daily. It is very appreciative that there is only a few Maintenance staff who strive their best to take care of the entire premise in the most excellent way possible.**

- The staffs keep a regular check on the operation and maintenance of the equipment on each floor.
- Water management initiative with appropriate hygiene is undertaken. The areas of water tanks on-site on the ground floor are clean and no mosquito breeding spots are there.
- There is a pest controls program practiced with appropriate sanitation facilities done by a local municipality on a seasonal basis to avoid seasonal diseases.
- The food premises and equipment are cleaned as per schedule with special care taken to avoid any water stagnation. The food waste and other refuse are removed periodically from food handling areas to avoid accumulation.
- As part of the Tree Plantation program, the initiative of **Swachh Bharat Abhiyan of Govt. of India** is undertaken on various occasions.
- There are appropriate storage areas that are well maintained.

7.4 On-site investigation

During the physical verification of the site, the following points were noted.

- All the facilities are cleaned daily.
- The Maintenance staff is allotted the responsibility of the washroom hygiene and they do a very commendable and excellent job to maintain the hygiene of the premise.

7.5 Recommendations for a sustainable habitat

As per site verification for this audit, the efforts of the College are highly appreciable as they are very well maintained. However, the college should practice having provisions for sanitary vending machines and incinerator machines.


Save water
Every drop is important
Save Today, Survive Tomorrow
CLEANING DATE
NEXT DUE DATE


INDIRA
ICEM - CIVIL
PAVAN

8. Towards a Healthy & Sustainable Institution

8.1 Recommendations based on the study

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

a) **Cutlery in the Canteen –** The regular plastic and steel plates, and spoons used in the Canteen can be replaced with eco-friendly/ organic leaves, paper straws, disposable plates, and edible spoons made out of sugarcane waste or bamboo.

b) **Eco clubs –** There can be an eco-club with students working on pilot projects toward the environment and surrounding up-gradation.

c) **Terrace farming -** There can be a provision for terrace farming; this would enhance the biodiversity, increase awareness, and food grown can be used in Canteen.

d) **Signages –** In addition to the signages being in regular language there can be additional signages in braille language for the specially-abled students.

8.2 Survey Results

An online survey was conducted to analyze the student and staff views about what changes according to you can be undertaken for Green audit improvement in College premise and activity. **Some of the suggestions are listed below:**

- Use of student-built technology for waste and resource recycling.
- To increase tree cover & promote a clean environment in our college.
- To conduct more and more programs to aware the students of the greeneries and beauty of nature.
- They should conduct one session a week for awareness of the green environment.

However, it should be noted that the College has taken up multiple initiatives and because of the pandemic, the students have not practically visited the premises so some of these points are not mandatory at the moment.

9. References

1. Uniform Plumbing Code – India, 2008
2. IGBC Green Existing Buildings – Operation & Maintenance (O&M) Rating system, Pilot version, Abridged Reference Guide, April 2013
3. IGBC Green Landscape Rating system, March 2013
4. BOMA Canada Waste Auditing Guide, Best Environmental Standards, BOMA BEST – Canada
5. Used only for understanding Universal design - Universal Accessibility Guidelines for Pedestrian, Non-motorized vehicle and Public Transport Infrastructure – Report guidelines by Samarthyam (National center for Accessible Environments) – an initiative supported by Shakti Sustainable Energy Foundation.


INDIRA
COLLEGE OF ENGINEERING