ENERGY AUDIT 2019-21

AUDIT REPORT

Studied for

Dr. Babasaheb Ambedkar Memorial Society's

Dr. Ambedkar College of Arts, Commerce and Science

Civil Lines, Chandrapur – 442 401

Analysed by

Greenvio Solutions

21 December 2021

Background reference image Janko Ferlic on pexels

Disclaimer

Green Audit Team has prepared this report for the **Dr. Babasaheb Ambedkar Memorial Society's Dr. Ambedkar College of Arts, Commerce and Science, Civil Lines, Chandrapur – 442 401** based on input data submitted by the College analysed by the team to the best of their abilities.

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

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

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The Report is prepared by the Team of Greenvio Solutions under their brand and department – Sustainable Academe as Consultancy firm along with Ar. Nahida Shaikh as an Accredited Green Building Professional.

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Greenvio Solutions

Developing Healthy and Sustainable Environments

We are an Environmental and Architectural Design Consultancy firm

Sustainable Academe is our department for conducting Audits

Palghar District, Maharashtra- 401208

sustainableacademe@gmail.com

Acknowledgement

Green Audit Assessment Team thanks the **Dr. Babasaheb Ambedkar Memorial Society's Dr. Ambedkar College of Arts, Commerce and Science, Civil Lines, Chandrapur – 442 401** 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 **Hon'ble Arun Ghotekar, President; Hon'ble Ashok Ghotekar, Vice President; Hon'ble Waman Modak, Secretary** and everyone from the Management.

Our heartfelt thanks to Chairperson of the entire process **Dr. Rajesh Dahegaonkar, Principal** for his valuable inputs.

We are also thankful to College's Task force the faculty members who have collected data required for green audit **Dr. Amrut Lanje, Associate Professor; Dr. P. H. Munjankar, Associate Professor** and **Dr. Nitin D. Ghugare; Assistant Professor**.

The kind gesture for the inventory and data collection of the **Admin Staff** is quite commendable.

We highly appreciate the assistance of **the entire Teaching and Non-teaching staff** for their support while collecting the data.

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

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1. Introduction

1.1 About the Dr. Babasaheb Ambedkar Memorial Society, Chandrapur

It was formed on 21 June 1970 by Late Bar. Rajbhau Khobragade. The Society has implemented the goal of educating the students in the best way possible by uplifting the academic status of the students through quality education and adopting the local village for overall community development. Meticulous joint efforts of the students and staff have made the institution one of the most sustainable premises in the locality.

1.2 Vision of the College

To kindle the spirit of learning among the youth, to uplift the lives of downtrodden, Minority communities, eradicate their poverty and make them lead a sustainable life, to consistently pursue excellence preserving the tradition of high reputation while meeting the challenges of globalised world.

1.3 Institution and the surrounding premises

The Premises is situated amidst the landscape serene of **Chandrapur district of Maharashtra State** with immense peace and calmness in the surroundings. The college is surrounded by open landscape on North and West side, whereas there are residential areas on the East and South side. There is a broad and open to sky frontal approach which provides quite a beautiful appreciation space while approaching the premise. The location of 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.

Dr. Ambedkar College of Arts, Commerce and Science was established on 21st June 1970 and is run by Dr. Babasaheb Ambedkar Memorial Society, Chandrapur. The college was accorded a Buddhist religious Minority Status in 2012. It is situated in the heart of Chandrapur, known as the city of "Black gold". The founder member of this college, Late Barrister Rajabhau Khobragade was the Vice- President of Rajya Sabha in 1960. The primary aim of establishing this college is to eradicate illiteracy among

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Bhahujan Samaj. The college mainly caters to SC/ST/NT and other backward category students from rural and tribal areas. The college has a vast campus with facilities like boys hostel, girls hostel, spacious playground, gym, sports facility, canteen, auditorium, library, laboratories, Dr. Ambedkar study centre, NCC, NSS, Career Guidance Cell and Women's Cell. The college has Arts, Commerce and Science faculties and PG courses in English, Marathi, Economics, Political Science, History, Sociology, Geography and Commerce. It also successfully runs PG courses in Electronics, Botany, Zoology, Maths and Chemistry. The Junior Wing of the college has Arts, Commerce and Science. It also runs higher secondary certificate vocational courses. The college functions efficiently under the guidance of the present Principal Dr. Rajesh Dahegaonkar. The college has efficient and scholarly teaching staff. The teaching and the non-teaching staff work for the betterment of the students.

The college which started with just 420 students has now over 4500 students studying in various courses. The dream of founder members seems to have been fulfilled.

- **Bachelors Programme**
  - Arts (B.A.)
  - Commerce (B. Com)
  - Science (B. Sc)
- **Master Programme**
  - Arts (M.A. in the following programmes)
    - Economics
    - English
    - Geography
    - History
    - Marathi
    - Political Science
    - Sociology
  - Commerce (M. Com)
  - Science (M. Sc)
    - Botany
    - Chemistry
    - Electronics
    - Mathematics
    - Zoology
- **Ph.D Programme**

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The College aspires at training young women and men to be competent, committed and compassionate and lead in all walks of life. It has the following aim and objectives.

- To preserve human values of equality, freedom, fraternity, amity, compassion and tolerance among students.
- To provide opportunities to premising students from Minority communities who have been denied progress and prestige by religious, social system for many years.
- To create opportunities of education for the poor students of rural areas.
- To develop the overall personality of students alongwith their educational, physical, mental and intellectual development.
- To inculcate the spirit of service, sense of sacrifice and social commitment among students.
- To exhort the students regularly to give utmost importance to moral principal in their personal and social life.
- To educate the students in order to make them realize the significance of parliamentary democracy, secularism, socialism and supremacy of Indian constitution and the rule of law.
- To enable the students to accept the change in every walk of life and face the challenges that come along with it.
- To develop analytical, intellectual and logical thinking among students.
- To awaken the students to believe it is not caste, religion, sect, language, region or creed but nationalism which is the supreme loyalty of all.

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1.4 Assessment of the College

Affiliations - The Institute is affiliated to Gondwana University, Gadchiroli.

Recognitions - University Grant Commission (UGC) by 2(f) 12(b)

Certification – The Institute has received the following Certifications

- ISO 9001:2015

- NIRF
- AISHE

Accreditation

The following are details of the reaccreditation of the Institute.

Cycle	First	Second
CGPA	63	2.76
Grade	C+	B++
Year	2004	2017

Table 1: NAAC Accreditation details of the Institute

The college is due to enter its Third cycle of NAAC soon.

1.5 Achievements of the College

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

S.No.	Faculty name	Award	Year
1.	Dr. Rajesh R. Dahegaonkar (Principal)	Adarsha Shikshak award	2003
		Chatrapati Shiwaji Maharaj award	2003
		Best Educationist Award by International Institute of Education and Management	2018
2.	Dr. V. Y. Gedam (Professor)	State Level Shikshak Ratna award by Samta Sahitya Academy, Pune Shikshak Ratna award	2015
		State Level Best Programme Officer Award as per notification by Government of Maharashtra.	2016
		University Level Best NSS Programme Officer Award during the session 2015-2016 by Gondwana University, Gadchiroli	2016
		Shikshak Ratna award	2015
		Best N.S.S. officer award by Gondwana University, Gadchiroli	2016
		Global Teacher Role Model Award by Manushybal Vikas Lokseva Acadamy	2019
		Gondwana University Covid Worrier Award by Youth and Sports ministry, Govt. of India	2021
3.	Dr. A. S. Lanje (Asso. Professor)	F.I.P. award by U.G.C.	2007
		Bharat Vidya Rattan Award by Indian Solidarity Council, New Delhi	2018

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		Young scientist award	2008
		Best paper award for poster presentation	2009
		I2OR National Elite Teacher Award 2021 0n 5 September, 2021, by , instituted by the International Institute of organized Research (I2OR) which is a registered MSME with the Ministry of Micro, Small and Medium Enterprises, Government of India	2021
		International Scientist Award on Engineering, Science and Medicine **Best Researcher Award** By VDGOOD Professional Association India September- 2021	2021
		Best Paper Award on best oral Presentation for the paper "Dielectric Measurements of Tin Oxide (SnO_2) nanoparticles at low Temperature" **A. S. Lanje**, R. B. Pode, S. J. Sharma, R. S. Ningthoujam and R. K. Vatsa Presented at National Conference on Recent Trends in Basic and Applied Materials Organized by Institute of Science, Nagpur. On 11 & 12th Jan 2009	2009
4.	Dr. P. M. Shende (Asso. Professor)	F.I.P. award by UGC	2007
5.	Dr. S. R. Gawali (Asst. Professor)	Distinguished Fellow Award (FVMS) given by Vishwashanti Multipurpose Society, Nagpur for exceptional Skill Devotion Dedication and Professionalism and Innovative Ideas in Science.	2014
6	Dr. N. S. Ramteke (Asst. Professor)	Mahatma Jyotiba Fule Samta Puraskar given by Samta Sahitya Academy, Yeotmal	2012
7	Shri. M. T. Sontakke (Associate Professor)	Shri Shivchatrapati Shivaji Maharaj Samta Puraskar by Samta Sahitya Academy, Yeotmal.	2012
8	Dr. M. N. Raipure (Asst. Professor)	Mahatma Jyotiba Fule Samaj Gaurav Puraskar	2011
		Nari Ratna award	2011
9	Ku. B. D. Ratnaparkhi (Asst. Professor)	Krantijyoti Savitribai Fule Samata award	2011
		Dr. Babasaheb Ambedkar Samaj Ratna award	2011
10	Shri. J. R. Chimurkar (Asst. Professor)	Mahatma Jyotiba Fule Samaj Gaurav Puraskar	2012
11	Shri. D. J. Ramteke (Asso. Professor)	Mahatma Jyotiba Fule Samaj Gaurav Puraskar	2011
		Shikshk Ratna Samata Praskar	2012
12	Ku.V. M. Dhadade (Asso.	Maniratna Shikshak Gaurav Puraskar (Best Teacher award)	2011

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	Professor)		
13	Dr. B. M. Moon (Asst. Professor)	Dr. Babasaheb Ambedkar Samaj Ratna Samman	2013
		Matoshri Ramabai Tarun Sanghatna Puraskar	2012
14	Dr. D. M. Pimpalshende (Asst. Professor)	Dr. Panjabrao Deshmukh Samajbhushan Puraskar, Nagpur	2014
15	Shri V. K. Kale (Asst. Professor)	Dr. Babasaheb Ambedkar Teacher award	2009
		Mahatma Jyotiba Fule Samaj Gaurav Puraskar	2013
16	Dr. M. B. Bhagat (Asst. Professor)	Rajiv Gandhi National Research Fellowship award by UGC, Delhi	2006
		Gold medal for Ph.D. Thesis	2012
		Three Gold medal for first University merit	2004
17	Shri. S. G. Petkar (Asst. Professor)	Dr. Babasaheb Ambedkar Shikshak Puraskar	2009
18	Dr. B. M. Moon (Asst. Professor)	Dr. Babasaheb Ambedkar Samaj Ratna Samman	2013
		Matoshri Ramabai Tarun Sanghatna Puraskar	2012
19	Dr. V. P. Dakhane (Asst. Professor)	F.I.P. award	2007
		Second award for poster presentation	2008
		University Level Research Festival AVISHKAR -2019 First Award in Category "Medicine and Parmacy by Gondwana University, Gadchiroli	2019
20	Shri S. W. Patil (Asst. Professor)	University Level Research Festival AVISHKAR -2019 First Award in Category Pure Science (Post PG Level) by Gondwana university	2019

Table 2: Details of the various Awards received by the Institution

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2. Institution overview

2.1 Populace analysis for Academic year 2019-20

2.1.1 Students data

The student data (shared by the College) shows there are total of **1,413 Girl and 1,054 Boys** students.

2.1.2 Staff data

Type	Male	Female	Total
Admin staff	1	0	**1**
Teaching staff	27	8	**35**
Non-Teaching staff	12	2	**14**
Total	**40**	**10**	**50**

Table 3: Staff data of the Institution for 2019-20

The staff data shows the premise has a total of **50** staff members.

2.2 Populace analysis for Academic year 2020-21

2.2.1 Students data

The student data (shared by the College) shows there are total of **1,566 Girl and 1,197 Boys** students.

2.2.2 Staff data

Type	Male	Female	Total
Admin staff	1	0	**1**
Teaching staff	28	6	**34**
Non-Teaching staff	11	2	**13**
Total	**40**	**8**	**48**

Table 4: Staff data of the Institution for 2020-21

The staff data shows the premise has a total of **48** staff members.

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2.3 Total Institute Area & College Building Spread Area

The **total site area is 5 Acres** and the **total Built-up area of College is 1,09,550 sq. ft.** for **a total of 2,811 footfalls.**

2.4 Institute Infrastructure

2.4.1 Establishment

The College is run by **Dr. Babasaheb Ambedkar Memorial Society, Chandrapur**. It was established in 1970. The Society has rich tradition of Quality education of over 50+ years. The Building is a Reinforced Cement Concrete (RCC) framework building. **Overall the Infrastructure of the Building is excellent in terms of the Architecture Design and Green Building Design. The Premise covers quite a few of the requirements for a Green Habitat.**

2.4.2 Spatial Organisation

The overall ambience 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 colour palette not just helps the building to stand out but also provides an Institutional arena. It balances with the local architecture with the natural landscapes of huge trees all around. The design emphasis on providing calmness to the built form and gradually merges with the serene landscape.

The floor to floor height is more than 10 feet. There is no provision for lifts in the premise, whereas there are amenities such as CCTV, Fire extinguishers, Library and first aid box. The premise houses the following areas:

- Educational Building
- Science Building
- Administrative Office
- Sports Building
- NCC Building

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2.4.4 Operation and Maintenance of the premises

The interview session with the staff regarding the operation and working hours is summarized in the table. The Institutions are open Monday to Saturday for full day. Sunday is an off for all. Below mentioned in the table are the average working hours. The detail wise timing for each is mentioned below.

S. No.	Section	Spaces	Time	Hours / day	Days in a year
1	Degree College	Student areas and Teaching faculty	8:30 a.m. to 5 p.m.	8.5	210
2	General areas	Admin areas and library, Passage, staircase, toilet	8:30 a.m. to 5 p.m.	8.5	210

Table 5: Schedule of the timings of the premises

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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 premise for its inhabitants.

3.2 Analysis for 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 Rain water harvesting and Waste water treatment in campus
- 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 campus
- Analysis of the flora and fauna of campus
- Strategies adopted at present to enhance vegetation
- Measures that can be adopted for ecological improvement of campus

3.3 Strategy adopted for Green Building Study Audit

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

3.4 Timeline of the activities for Green Building Study Audit

- 9 September 2021 – Discussion with the College
- 30 November 2021 – Data submitted by College
- 21 December 2021 – Submission of draft Report

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4. Energy Audit

4.1 Sources of Energy consumption

The premise uses following sources of energy consumption.

4.1.1 Primary sources

Electrical (Metered) – Light, Fans, air conditioner and Equipments are major sources.

4.1.2 Secondary sources

The backup systems are used as secondary sources.

4.2 Site investigation analysis

The Site investigation observations and interviews with the Maintenance staff, Electrical department in charge are summarised below:

- The **switch-off drills are practised at present,**
- The **inbuilt power saving mode** in every Computer is functioning.
- There are **no Ultra-violet lights and any other harmful lights used** in the premise.
- All class rooms and office are **ventilated using natural light.**

4.3 Actual Electrical Consumption as per Bills

The admin department had shared some of the bills for Meters as this is the main source of energy supply.

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4.4 Calculated Electrical Consumption as per inventory

The electricity bills provide actual consumption data. The following is the calculated consumption. It is done to understand the percentage of energy usage in the premises by various applications. It is based on the inventory collected and interviews with the staff. The additional data such as wattage is taken from market research. In terms of electrical consumption, the main sources are lights, fans, ac, equipment. The inventory and data collection for sources of energy consumed in the premise in summarised in the following sections.

Note: The following analysis is combined for entire premise taking into considerations the duration before pandemic to understand the consumption pattern as post pandemic the premise is used only for a few hours.

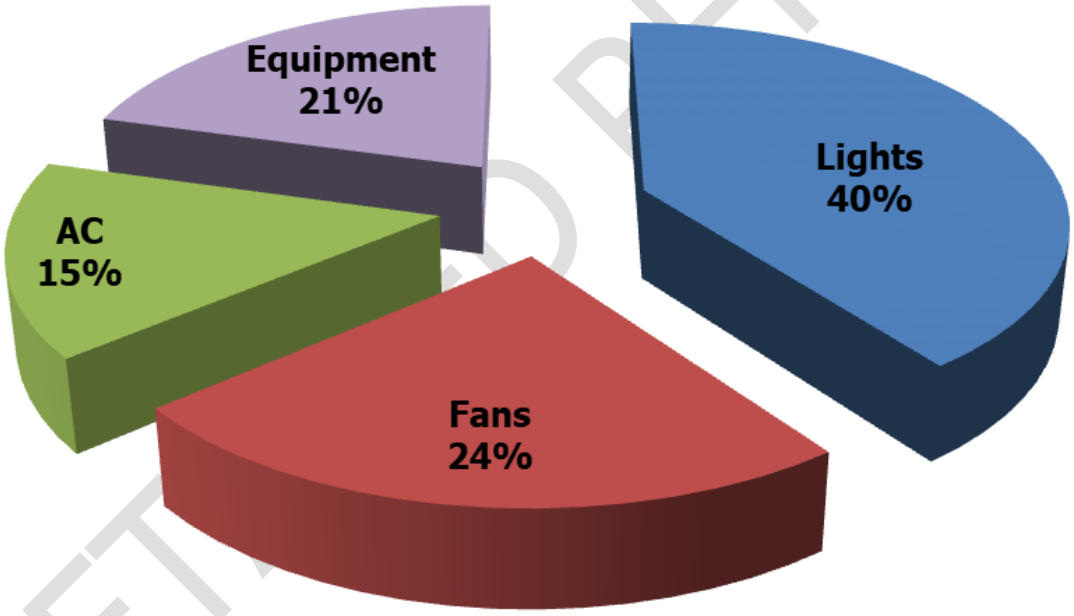

Figure 1: Summary of the Calculated Electrical Consumption as per inventory

The above graph shows that Light consumes 40% followed by Fans at 24% the Equipment at 21% and AC at 15% of the total calculated electrical energy.

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4.5 Survey Results

An online survey was conducted to analyse the views about the premise, following are some of the reviews.

4.5.1 Participation

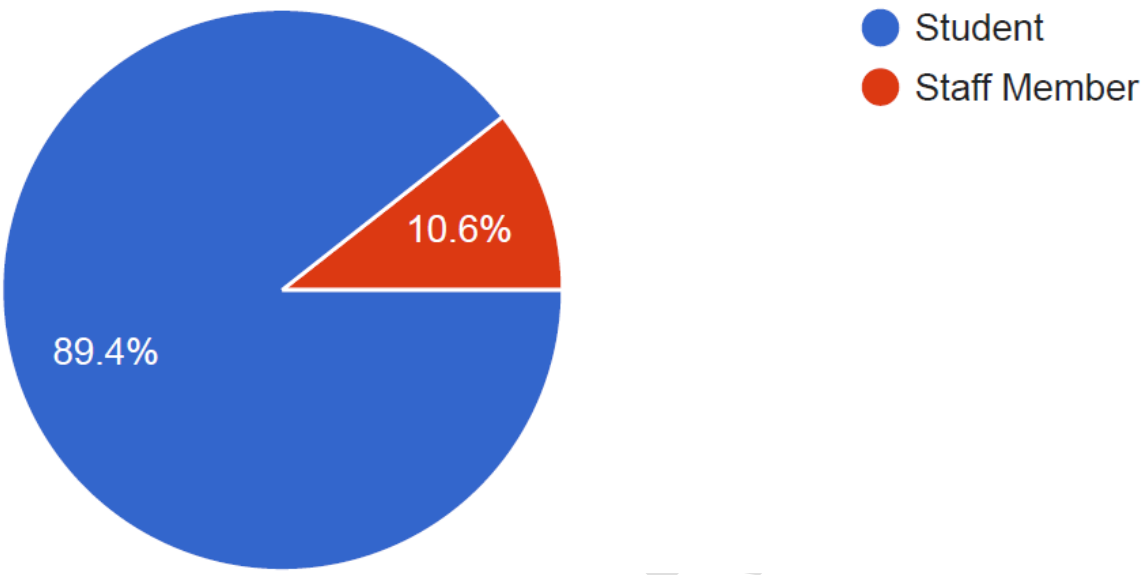

Figure 2: Participation analysis in the survey

A total of **85 responses** were received out of which 89% were students.

4.5.2 Energy management practices adopted in College

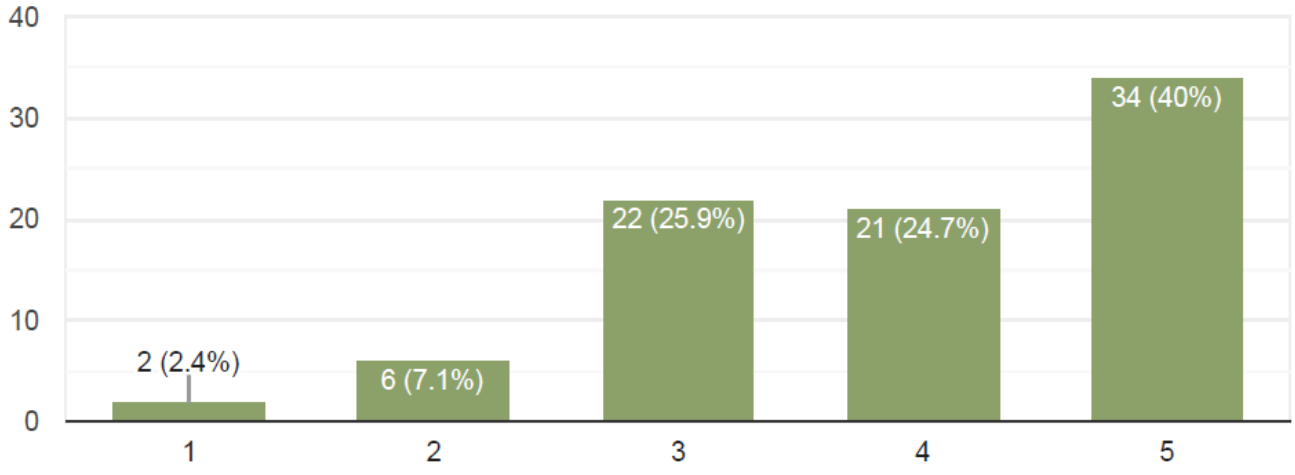

Figure 3: Energy Management practices in College

There were mixed responses received the equal also the highest was for **rating 5 (Excellent) at 40% and rating 3 (Good) at 26%**

4.6 Lights

4.6.1 Types of lights

There are a total of **171 lights in the premises;** the following table shows the various types of lights in the premises.

S. No.	Type	Nos.
1	LED	34
2	Mercury lamp	2
3	Non-LED	135
Total		**171**

Table 6: Summary of the types of Lights in premise

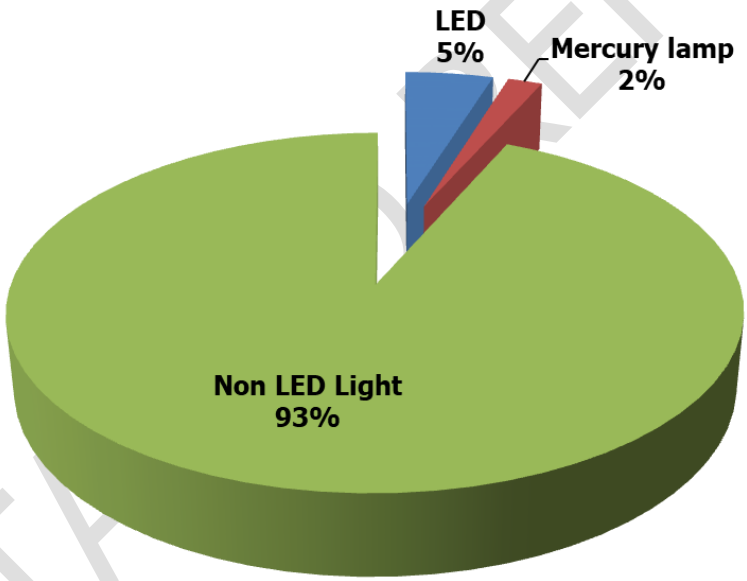

Figure 4: Types of Lights in the premise

The analysis of the types of lights in premises shows **Non-LED Lights consume 22,446 kWh at 93%** followed by **LED lights consuming 1,148 kWh at 5%** and the **Mercury lamp consumes 450 kWh at 2%**

4.6.2 Building and area wise consumption analysis

The energy consumption of Lights is **24,044 kWh** of energy; the following graph shows the floor wise consumption. This section analysis constitutes all buildings as a single entity.

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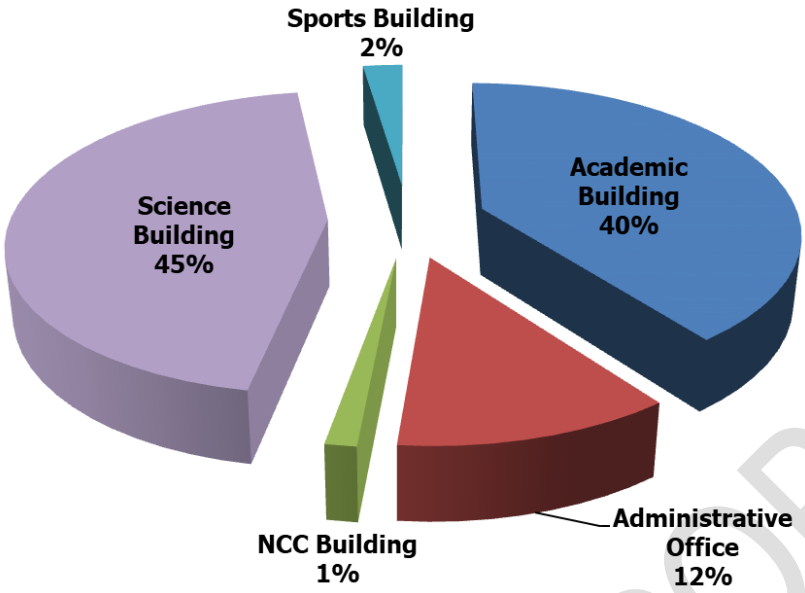

Figure 5: Energy consumed by Lights Building wise

The above analysis shows the Lights in the **Science Building consumes the highest amount of energy of 10,767 kWh at 45%** while the ones in **Academic Building consume 9,555 kWh at 40%** the ones in **Administrative Office area consume 2,831 kWh at 12%** the ones in **Sports Building consume 567 kWh at 2%** and the ones in **N.C.C. Building consume 324 kWh at 1%**

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 available in premise at present

4.6.4.2 Percentage of lighting power requirement met through LED bulbs

The premise has 20% LED Lights in terms of numbers and 4.77% of the power requirement is met through the same.

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 is done by the maintenance staff.
3. There was no fuse defect observed.

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4.7 Fans

4.7.1 Types of fans

There are a total of **190 fans** in the premise. The following table shows the various types of fans in the premises.

S. No.	Type	Nos.
1	Ceiling fans	173
2	Exhaust fans	10
3	Wall Mounted fans	7
Total		**190**

Table 7: Summary of the types of fans in premise

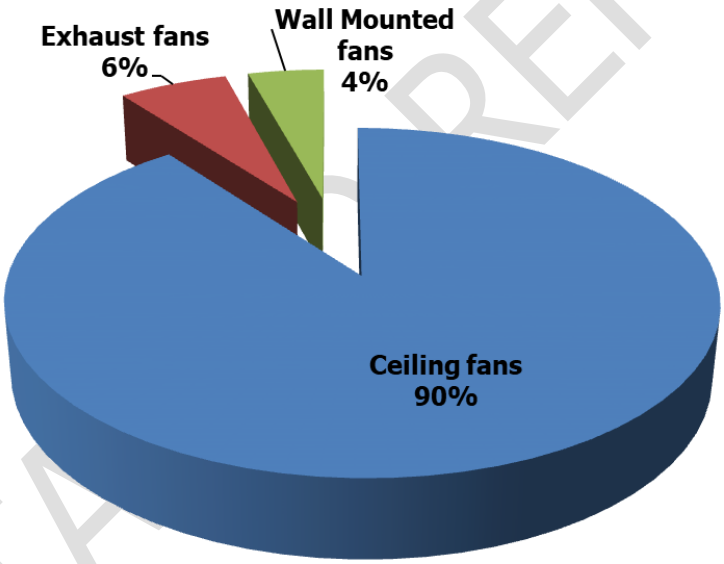

Figure 6: Types of Fans in the premise

The analysis of the types of fans in premises shows **Ceiling fans consume 12,975 kWh at 90%** the **Exhaust fans consume 875 kWh at 6%** while the **Wall mounted fans consume 613 kWh at 6%**

4.7.2 Building and area wise consumption analysis

The energy consumption of Fans is **14,463 kWh** of energy; the following graph shows the floor wise consumption. This section analysis constitutes all buildings as a single entity.

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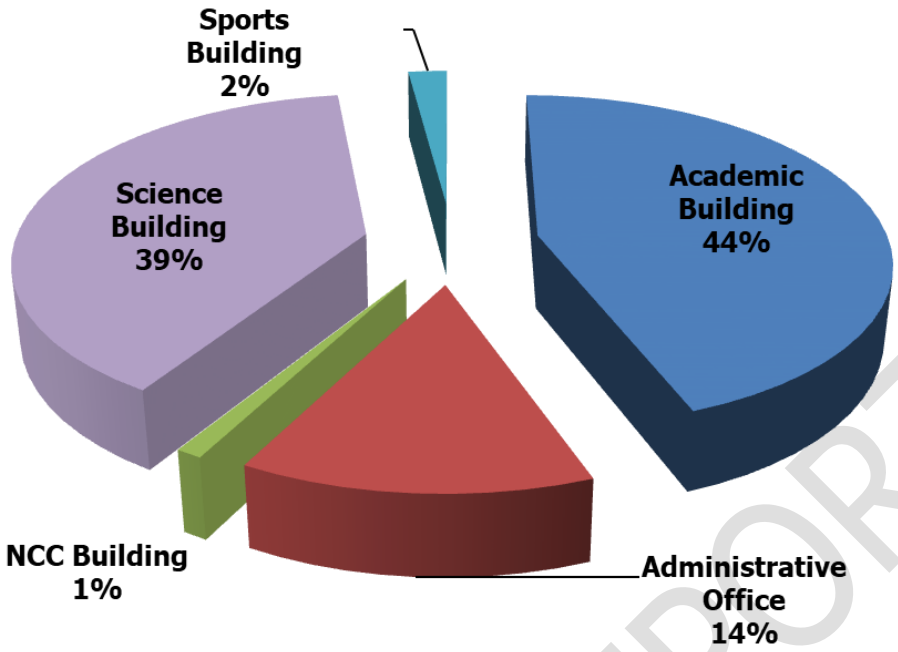

Figure 7: Energy consumed by Fans Building wise

The above analysis shows the Fans in the **Academic Building consumes the highest amount of energy of 6,413 kWh at 44%** while the ones in **Science Building consume 5,650 kWh at 39% the ones in Administrative Office area consume 1,950 kWh at 14% the ones in Sports Building consume 300 kWh at 2% and the ones in N.C.C. Building consume 150 kWh at 1%**

4.7.3 Site investigation observations

Some of the points noticed are as follows:

1. All fans are in working conditions
2. Daily monitoring and check is done by the maintenance staff and admin staff in an excellent manner.

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4.8 AC

4.8.1 Types of AC

There are **5 air-conditioners** in the entire premise. All of these are located in the Administrative Office. These consume around 9,650 kWh of power requirement.

4.8.2 Site investigation observations

Some of the points noticed are as follows:

1. Daily monitoring and check is done by the maintenance staff and admin staff in an excellent manner.
2. The Outdoor Unit is properly cleaned and maintained well.
3. The Outdoor Unit does not have any dust collection problem.
4. These are not required to be replaced.

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4.9 Equipment

4.9.1 Types of Equipment

There are a total of **8 types of equipment totalling to 29 in number** in the premise. The various types are mentioned in the table below.

S. No.	Name	Nos.
1	CCTV Camera	4
2	Cooler	1
3	Desktop Computer	18
4	Projector	1
5	Sound Box	1
6	Pump	1
7	RO Machine	2
8	Wifi router	1
Total		**29**

Table 8: Types of equipment in the premise

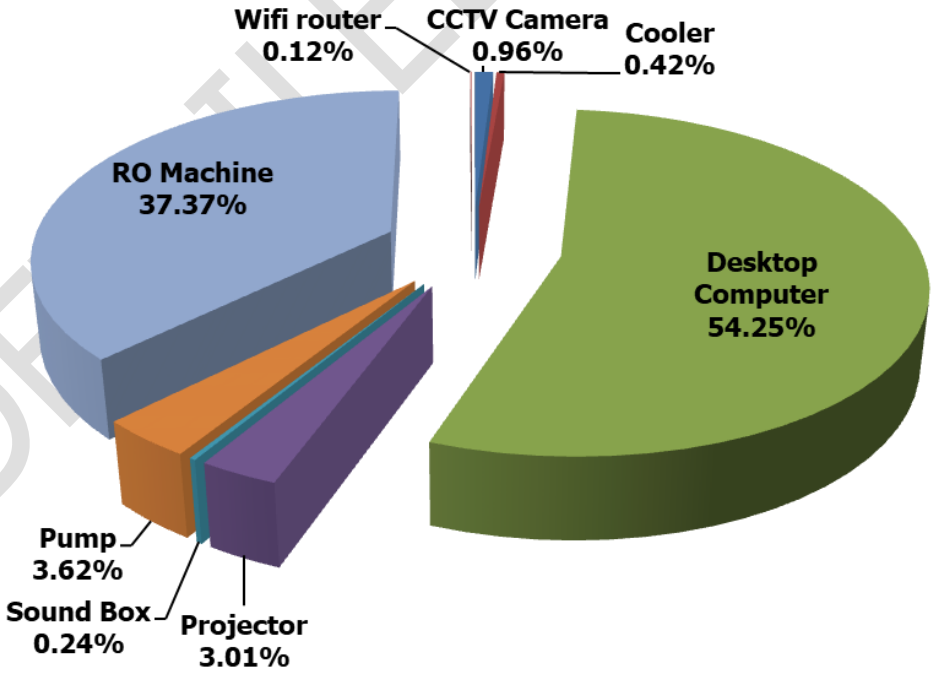

Figure 8: Summary of Energy consumed by Equipment

The above summary shows that **Desktop Computer consumes more energy at 54.25%** while **RO Machine at 37.37%** the **Pumps consume 3.62%** and the

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Projector consumes 3.01% these are maximum consumers as compared to other equipment. UPS and Inverter (when used for electrical consumption else it is a battery backup and does not require electricity as an equipment) are also one of the equipment but are excluded in this calculation.

4.9.2 Building and area wise consumption analysis

The energy consumption of Equipment is **12,443 kWh** of energy; the following graph shows the floor wise consumption. This section analysis constitutes all buildings as a single entity.

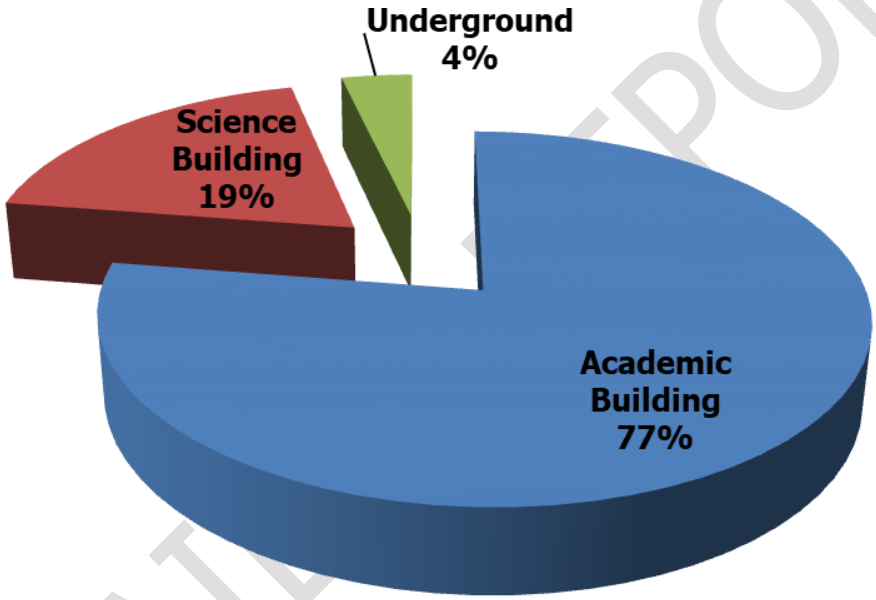

Figure 9: Energy consumed by Equipment Building wise

The above analysis shows the equipment in the **Academic Building consumes the highest amount of energy of 9,638 kWh at 77%** while the ones in **Science Building consume 2,355 kWh at 19% and the Underground area consumes 450 kWh at 4%**

4.9.3 Site investigation observations

Some of the points noticed are as follows:

1. All Equipments are in working conditions and Daily monitoring and check is done by the maintenance staff and admin staff in an excellent manner.
2. No defect was found in any equipment of electrical consumption.

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4.10 Recommendations for a Sustainable Habitat

Over the time energy efficient appliances have been a boon not only to the energy saving parameters they adhere to but also the eco-friendly habits it helps to inculcate. The Institution such as Schools and Colleges are 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 are some of the suggestions which can be implemented for an energy efficient Institution. This would help in reduction of the current electrical consumption by a major percentage.

4.10.1 Non-LED Tubelights

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

The following graph shows a comparison of the current consumption and consumption of all the **Non-LED Tubelights on all floors** if replaced with LED lights.

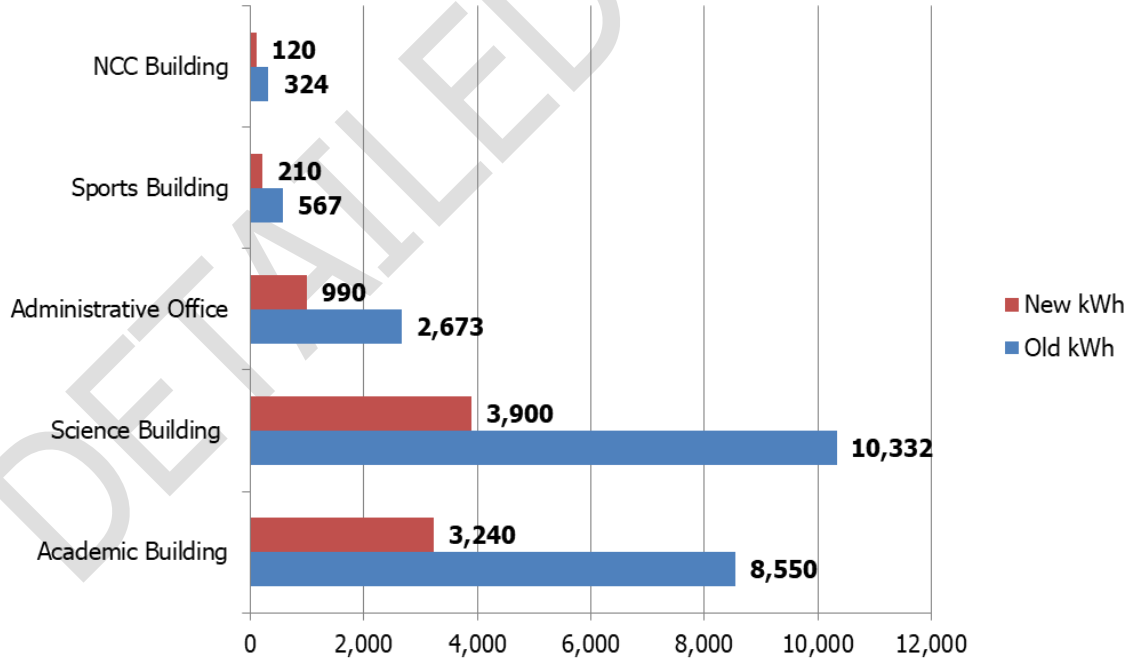

Figure 10: Analysis of current and new fans

The above analysis shows reduction of average of **63% reduction** in energy consumption if replaced with energy efficient appliance.

There are very less number of Mercury lamp that can be replaced with LED.

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4.10.2 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.

The following graph shows a comparison of the current consumption and consumption of all **ceiling fans on all floors** if replaced with star rated appliance.

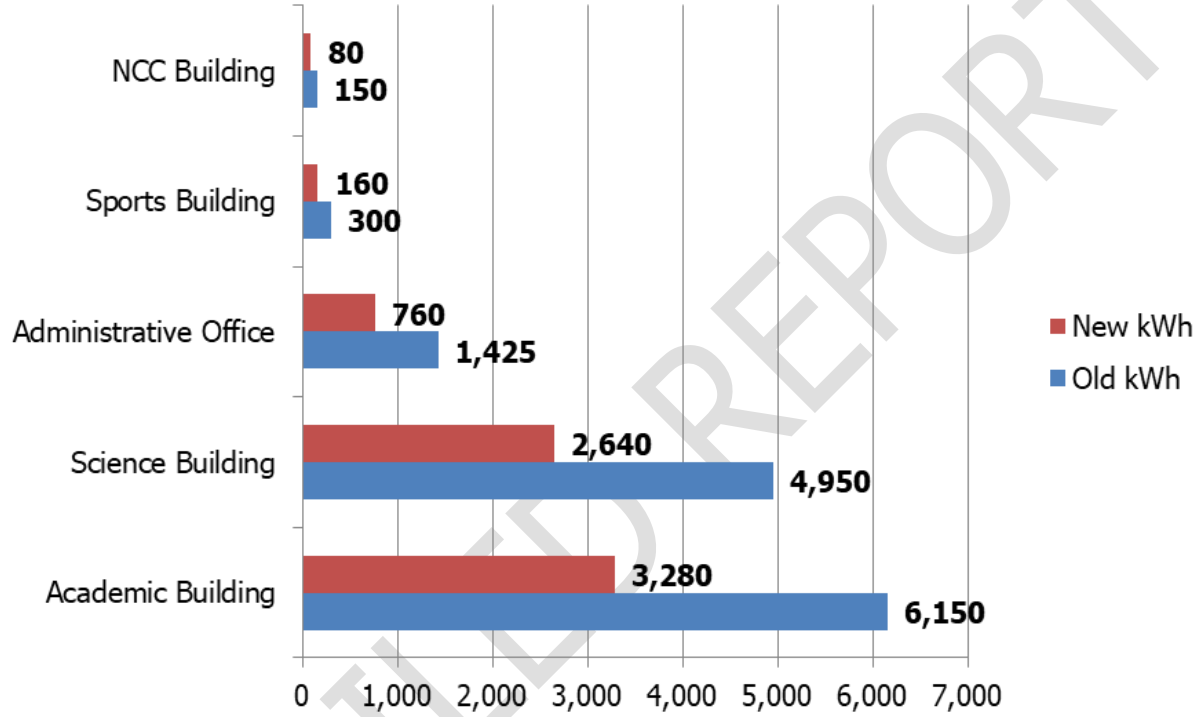

Figure 11: Analysis of current and new fans

The above analysis shows reduction of average of **47% reduction** in energy consumption if replaced with energy efficient appliance.

It will be suggested to either replace these now if College can have certain plans else the replacement can be done when fans get damaged or are not in working condition.

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4.10.3 AC

The current Air conditioners have become old. Most of these are not star rated and are consuming more energy. These should be replaced with energy efficient and star rated air conditioners wherein 1.5 ton consumes 1495W.

The following graph shows a comparison of the current consumption and consumption of all the **air conditioners on ground floor** if replaced with star rated appliance.

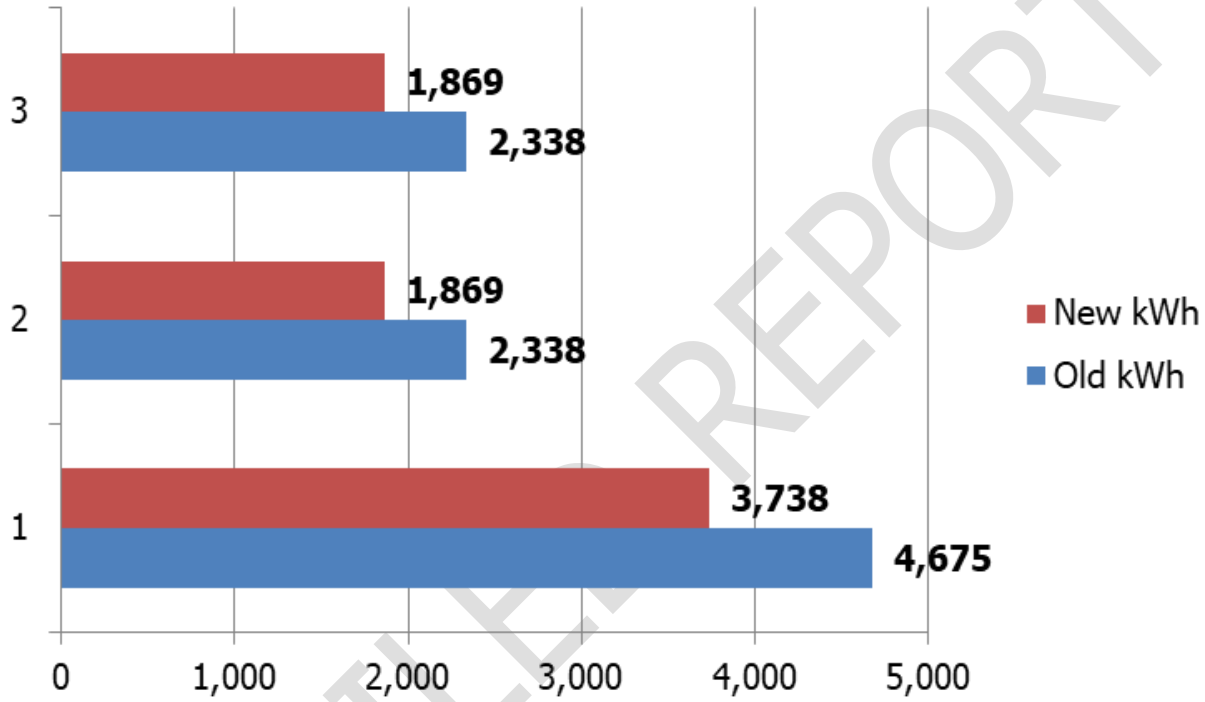

Figure 12: Analysis of current and new air conditioners

The above analysis shows reduction of average of **20% reduction** in energy consumption if replaced with energy efficient appliance, there is hardly much change in kWh consumption but it is better to be replaced.

It will be suggested to either replace these now if College can have certain plans else the replacement can be done when AC gets damaged or is not in working condition.

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4.10.4 Equipment

Among all equipment it suggested to replace the desktop computers with laptops as this would be energy efficient. A normal desktop computer consumes on an average 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 which lasts up to 4 hours.

The following table shows a comparison of the current consumption and consumption of the **desktop computers** if replaced with laptops.

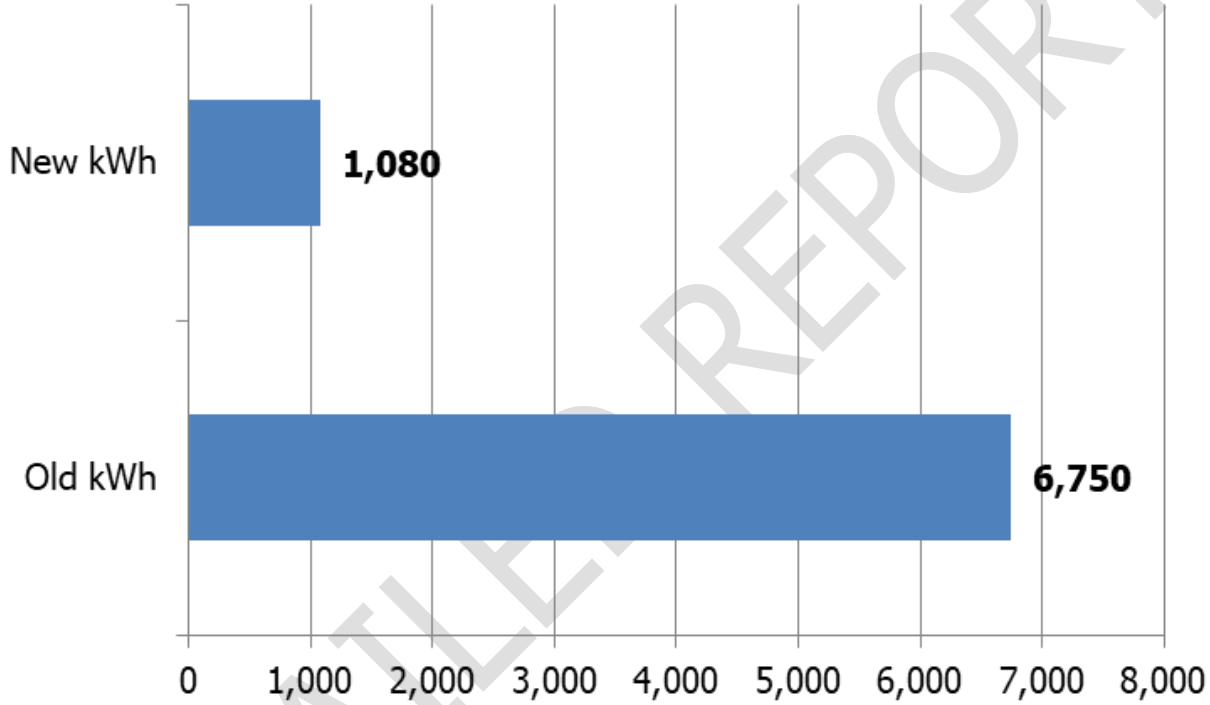

Figure 13: Analysis of current computers and new laptops

The above analysis shows reduction of average of **84% reduction** in energy consumption if replaced with energy efficient appliance.

It will be suggested to either replace these now if College can have certain plans else the replacement can be done when the devices get damaged or are not in working condition.

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5. Towards a Healthy & Sustainable Institution

Based on the analysis of the study of premises in addition to the recommendations provided in each section of Ecological, Water, Waste and Energy Audit the College can adopt the following strategies towards a Healthy and Sustainable Institution practices.

a) **Kitchen garden -** There can be provision of kitchen garden practices in a designated area of the open space this would enhance the biodiversity and be useful in training students and staff about the healthy practices and vegetables grown which would be used in Canteen. It helps in capacity building. The smaller steps taken have huge impacts when each student would adopt these practices in their homes or societies and grow kitchen garden, terrace garden there will be a long term benefit for the environment as a whole.

b) **Cutlery in the Canteen –** The regular plastic and steel plates, spoons used in Canteen can be replaced with eco-friendly and organic leaves, paper straw, disposable plates, edible spoons and tables made out of sugarcane waste or bamboo. This will be first of its kind initiative to be adopted and practiced thus also inculcating the healthy practices in students.

c) **Waste vio –** College can tie up with an organisation and students can be encouraged to collect dry waste and electronic waste such as newspapers, old computers and others and hand over to organisation on a weekly or monthly basis thereby making a waste reduction approach in the community. This has benefits such as awareness, eco-friendly habits in becoming a responsible citizen.

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

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5.2 Survey Results

An online survey was conducted to analyse 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 key responses are listed below. Whereas many responses **stated there were no changes requires because the present practices are excellent.**

- Everything is better in our college so don't change any thing.
- Nothing

Some of the suggestions by the Students and staff are listed below:

- According to me we should plant trees.
- Water harvesting should be improved.
- Beautiful Flowering garden and botanical garden should be made available in the college premises.
- Every students and teachers should participate equally and apart from campus should take care of local surrounding.
- To focus on maintenance
- All staff member should plant one plant every year.

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

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6. References

1. Uniform Plumbing Code – India, 2008
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3. IGBC Green Landscape Rating system, March 2013
4. BOMA Canada Waste Auditing Guide, Best Environmental Standards, BOMA BEST - Canada
5. Climate data https://en.climate-data.org/asia/india/maharashtra/chandrapur-24355/
6. Used only for understanding Universal design - Universal accessibility Guidelines for Pedestrian, Non-motorizes vehicle and Public Transport Infrastructure – Report guidelines by Samarthyam (National centre for Accessible Environments) – an initiative supported by Shakti Sustainable Energy Foundation.

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