

GREEN AUDIT REPORT

of

Sahyadri Bahujan Vidya Prasarak Samaj,

Loknete Balasaheb Thorat Arts, Commerce & Science College,

Talegaon Dighe, Taluka: Sangamner, District: Ahmednagar



Year: 2022-23

Prepared by:

ENGRESS SERVICES

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REGISTRATION CERTIFICATES



MEDA REGISTRATION CERTIFICATE

ASSOCHAM GEM CP CERTIFICATE



ISO: 9001-2015 CERTIFICATE

ISO: 14001-2015 CERTIFICATE



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ACKNOWLEDGEMENT

We Engress Services, Pune, express our sincere gratitude to the management of Sahyadri Bahujan Vidya Prasarak Samaj, Loknete Balasaheb Thorat Arts, Commerce & Science College, Talegaon Dighe, Taluka: Sangamner, District: Ahmednagar, for awarding us the assignment of Green Audit of their College Campus for the Year: 2022-23.

We are thankful to all staff members for helping us during the field study.



EXECUTIVE SUMMARY

1. Sahyadri Bahujan Vidya Prasarak Samaj, Loknete Balasaheb Thorat Arts, Commerce & Science College, Talegaon Dighe, consumes Energy in the form of Electrical Energy; used for various gadgets, Office & other facilities.

2. Present Energy Consumption & CO₂ Emissions:

No	Particulars	Value	Unit
1	Annual Energy Consumed	712	kWh
2	Annual CO ₂ Emissions	0.64	MT

3. Usage of Renewable Energy:

- The College has yet to install Solar PV Plant.

4. Waste Management:

No	Head	Particulars
1	Solid Waste	Segregation of Waste at source
2	Organic Waste	Provision of Bio Composting Pit
3	Liquid Waste	Provision of Septic Tank

6. Rain Water Management:

The rain water falling on the terrace is collected in a Storage Tank and used for domestic purpose, after filtration.

7. Green & Sustainable Initiatives:

- Maintenance of good Internal Road & Internal Tree Plantation
- Provision of Ramp for Divyangajan
- Display of Posters on Energy Conservation

8. Assumption:

1. 1 kWh of Electrical Energy releases 0.9 Kg of CO₂ into atmosphere

9. Reference:

- For CO₂ Emissions: www.tatapower.com



ABBREVIATIONS

BEE	Bureau of Energy Efficiency
kWh	Kilo Watt Hour
LPD	Liters Per Day
Kg	Kilo Gram
MT	Metric Ton
CO ₂	Carbon Di Oxide
Qty	Quantity

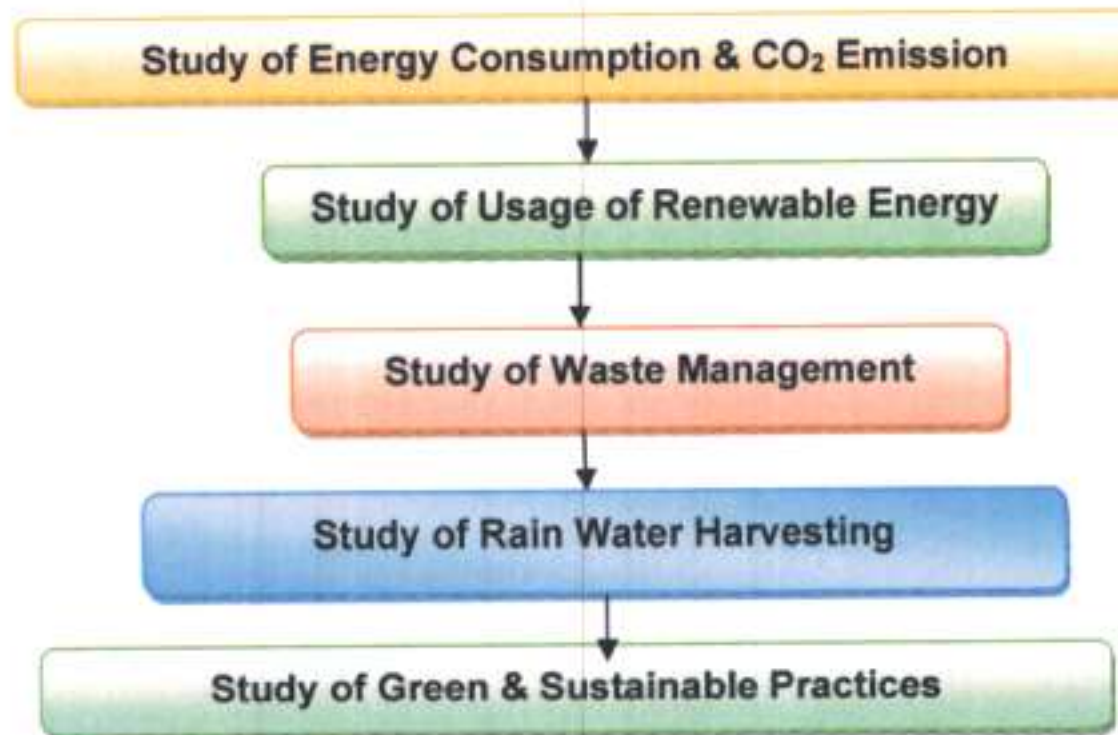


CHAPTER-I INTRODUCTION

1.1 Introduction:

A Green Audit is conducted at Sahyadri Bahujan Vidya Prasarak Samaj, Loknete Balasaheb Thorat Arts, Commerce & Science College, Talegaon Dighe,

1.2 Audit Procedural Steps:



1.3 Google Earth Image:



CHAPTER-II STUDY OF ENERGY CONSUMPTION & CO₂ EMISSION

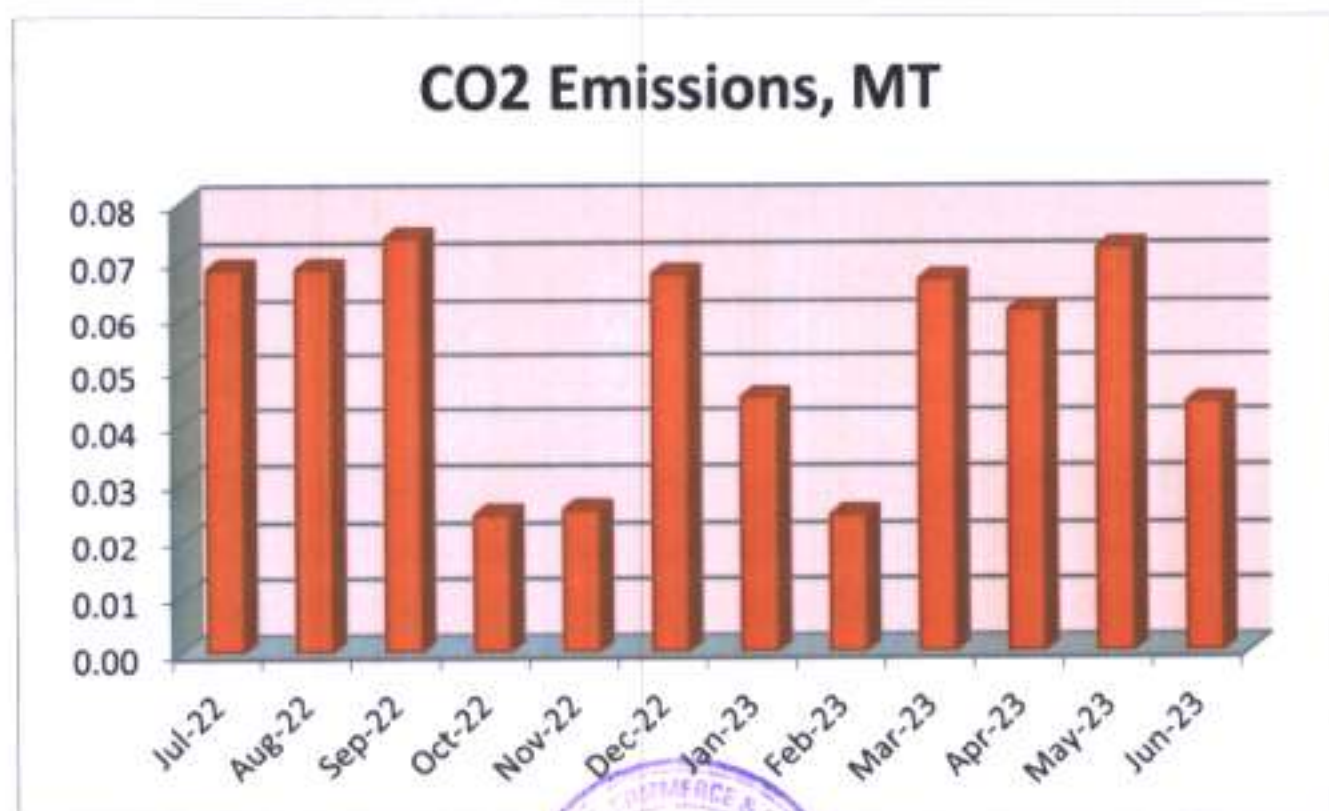
A Carbon Foot print is defined as the Total Greenhouse Gas emissions, emitted due to various activities. **Basis for computation of CO₂ Emissions:**

- 1 kWh of Electrical Energy releases 0.9 Kg of CO₂ into atmosphere

Table No 1: Month wise CO₂ Emissions:

No	Month	Energy Consumed, kWh	CO ₂ Emissions, MT
1	Jul-22	76	0.07
2	Aug-22	76	0.07
3	Sep-22	82	0.07
4	Oct-22	27	0.02
5	Nov-22	28	0.03
6	Dec-22	75	0.07
7	Jan-23	50	0.05
8	Feb-23	27	0.02
9	Mar-23	74	0.07
10	Apr-23	68	0.06
11	May-23	80	0.07
12	Jun-23	49	0.04
13	Total	712	0.64
14	Maximum	82	0.07
15	Minimum	27	0.02
16	Average	59.33	0.05

Chart No 1: Month wise CO₂ Emissions:



CHAPTER III STUDY OF USAGE OF RENEWABLE ENERGY

- The College has yet to install Solar PV Plant.



CHAPTER IV STUDY OF WASTE MANAGEMENT

4.1 Segregation of Waste at Source:

The Waste is segregated at source. Waste bins are located at various locations

Photograph of Separate Waste Collection Bin:



4.2 Organic Waste Management:

The College has a Bio composting Pit, for conversion of Organic Waste.

Photograph of Bio Composting Arrangement:



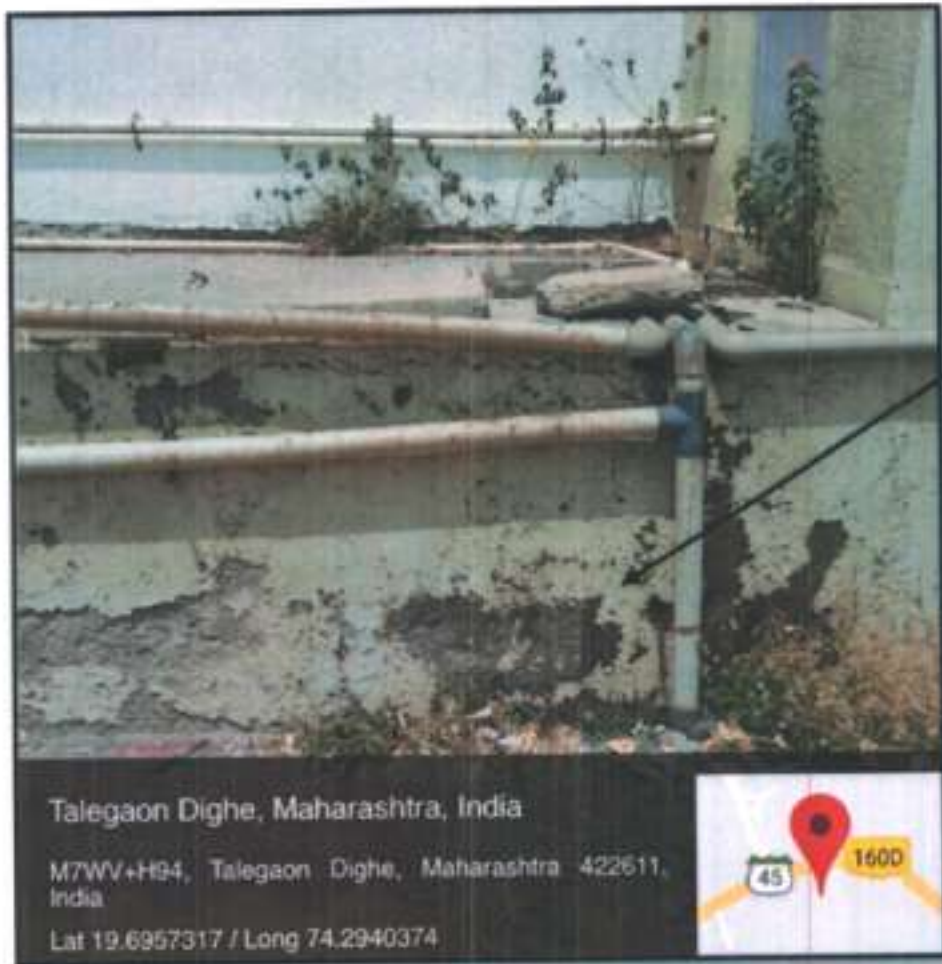
4.3 Liquid Waste Management:

The College has a Septic Tank, and is cleaned periodically.

CHAPTER-V STUDY OF RAIN WATER MANAGEMENT

The Rain water falling on the terrace is collected through Pipes and is collected in the Main Water Storage Tank. This Water is further used for domestic purpose after filtration

Photograph of Rain Water Storage Tank:



Water Storage Tank

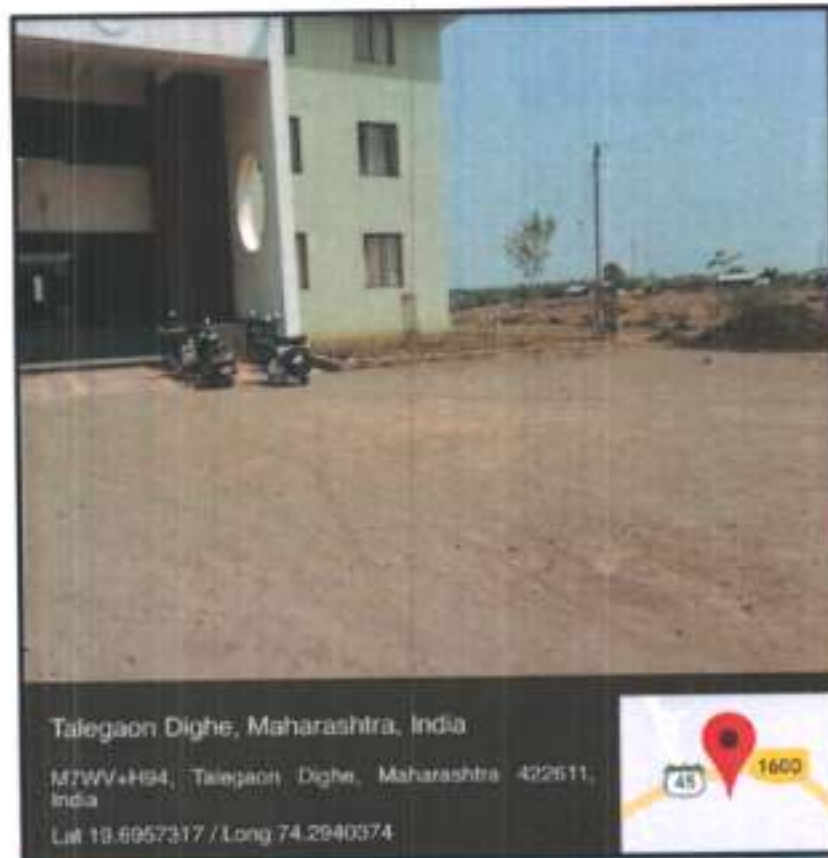


CHAPTER-VI STUDY OF GREEN & SUSTAINABLE PRACTICES

6.1 Pedestrian Friendly Roads:

The College has well maintained internal road to facilitate the easy movement of the students within the campus.

Photograph of Internal Road:



6.2 Internal Tree Plantation:

The College has well maintained landscaped garden in the campus.

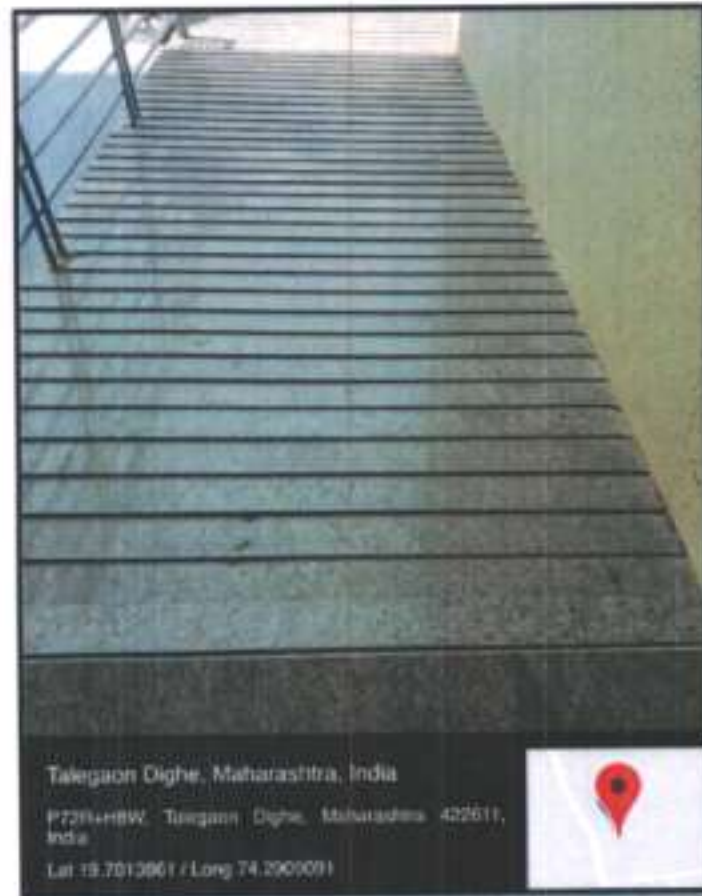
Photograph of Tree plantation:



6.3 Provision of Ramp:

For easy movement of Divyangajan, the College has made provision of Ramp at the main entrance.

Photograph of Ramp:



6.4 Creation of Awareness about Energy Conservation:

The College has displayed posters emphasizing on importance of Energy Conservation..

Photograph of Poster on Energy Conservation:



ENERGY AUDIT REPORT

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1. Sahyadri Bahujan Vidya Prasarak Samaj, Loknete Balasaheb Thorat Arts, Commerce & Science College, Talegaon Dighe, consumes Energy in the form of Electrical Energy; used for various gadgets, Office & other facilities.

2. Present Connected Load & Energy Consumption:

No	Particulars	Value	Unit
1	Total Connected Load	9.23	kW
2	Annual Energy Consumed	712	kWh

3. Energy Performance Index:

No	Particulars	Value	Unit
1	Total Annual Energy Consumed	712	kWh
2	Total Built up area of College		m ²
3	Energy Performance Index = (1) / (2)		kWh/m ²

4. Study of % Usage of LED Lighting:

No	Particulars	Value	Unit
1	% of Usage of LED Lighting to Total Lighting Load	100	%

5. Renewable Energy & Energy Efficiency Projects:

- The College has Solar PV Based Outdoor Lighting.
- Usage of Energy Efficient LED fittings

6. Assumption:

1. 1 kWh of Electrical Energy releases 0.9 Kg of CO₂ into atmosphere

7. References:

- Audit Methodology: www.mahaurja.com
- Energy Conservation Building Code: ECBC-2017: www.beeindia.gov.in
- For CO₂ Emissions: www.tatapower.com



ABBREVIATIONS

LED	:	Light Emitting Diode
MSEDCL	:	Maharashtra State Electricity Distribution Company Limited
BEE	:	Bureau of Energy Efficiency
FTL	:	Fluorescent Tube Light
CFL	:	Compact Fluorescent Light
PV	:	Photo Voltaic
Kg	:	Kilo Gram
kWh	:	kilo-Watt Hour
CO ₂	:	Carbon Di Oxide
MT	:	Metric Ton



CHAPTER-I INTRODUCTION

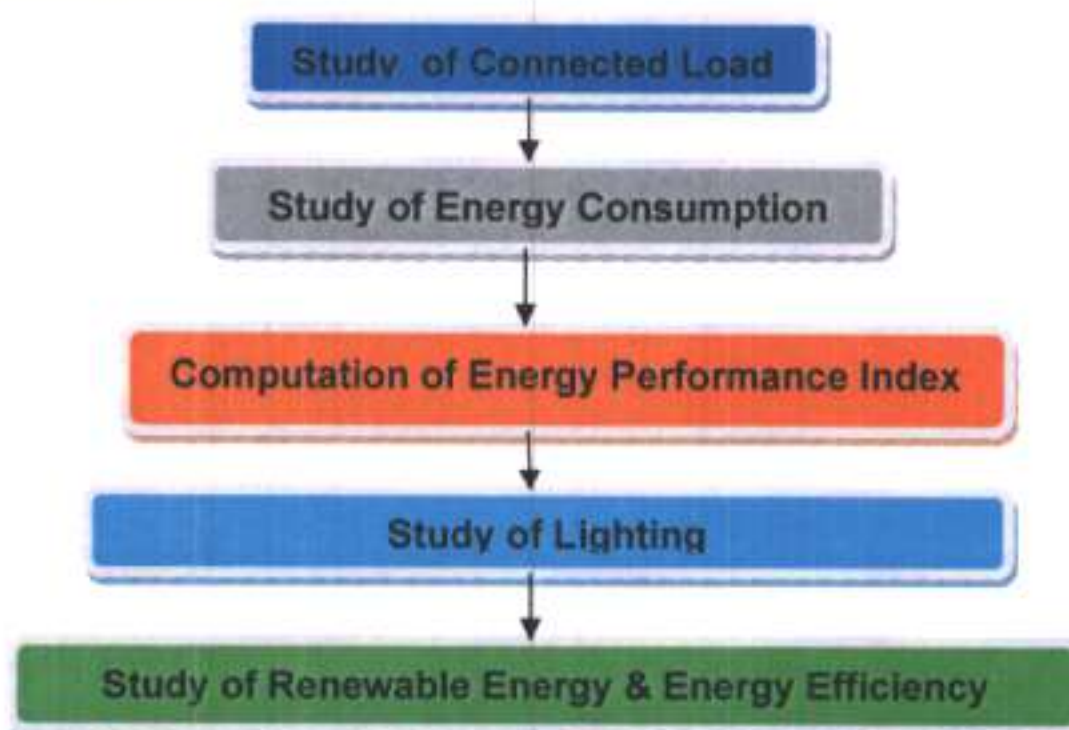
1.1 Introduction:

An Energy Audit is conducted at Sahyadri Bahujan Vidya Prasarak Samaj, Loknete Balasaheb Thorat Arts, Commerce & Science College, Talegaon Dighe.

The guidelines followed for conducting the Energy Audit are:

- BEE India's Energy Conservation Building Code: ECBC-2017
- Maharashtra Energy Development Agency (www.mahaurja.com)
- Tata Power: www.tatapower.com

1.2 Audit Procedural Steps:



1.3 College Location Image:



College
Campus



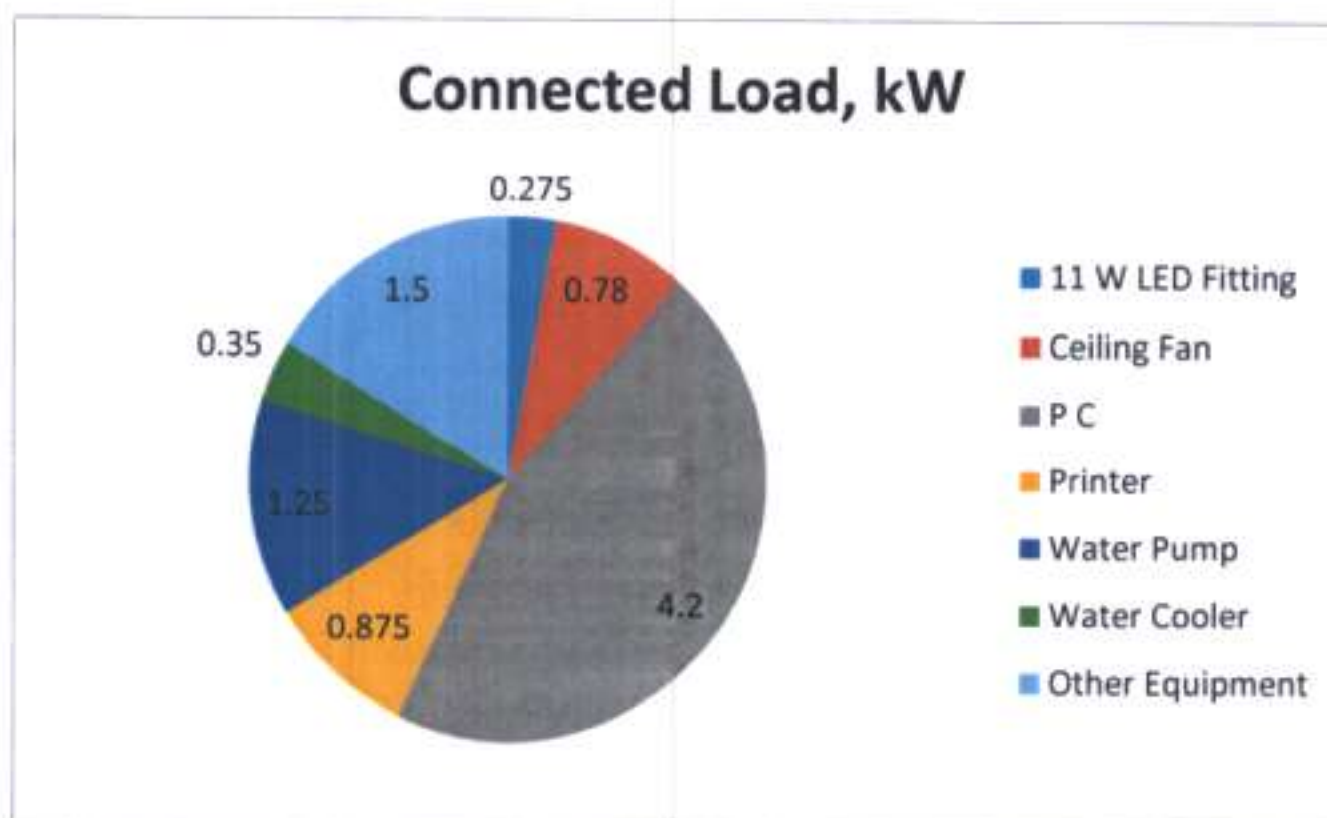
CHAPTER-II STUDY OF CONNECTED LOAD

In this Chapter we enlist the Electrical Load of the College.

Table No 2: Study of Equipment wise Connected Load:

No	Equipment	Qty	Load, W/unit	Load, kW
1	11 W LED Fitting	25	11	0.275
2	Ceiling Fan	12	65	0.78
3	P C	28	150	4.2
4	Printer	5	175	0.875
5	Water Pump	1	1250	1.25
6	Water Cooler	1	350	0.35
7	Other Equipment	10	150	1.5
8	Total			9.23

Chart No 1: Study of Connected Load:



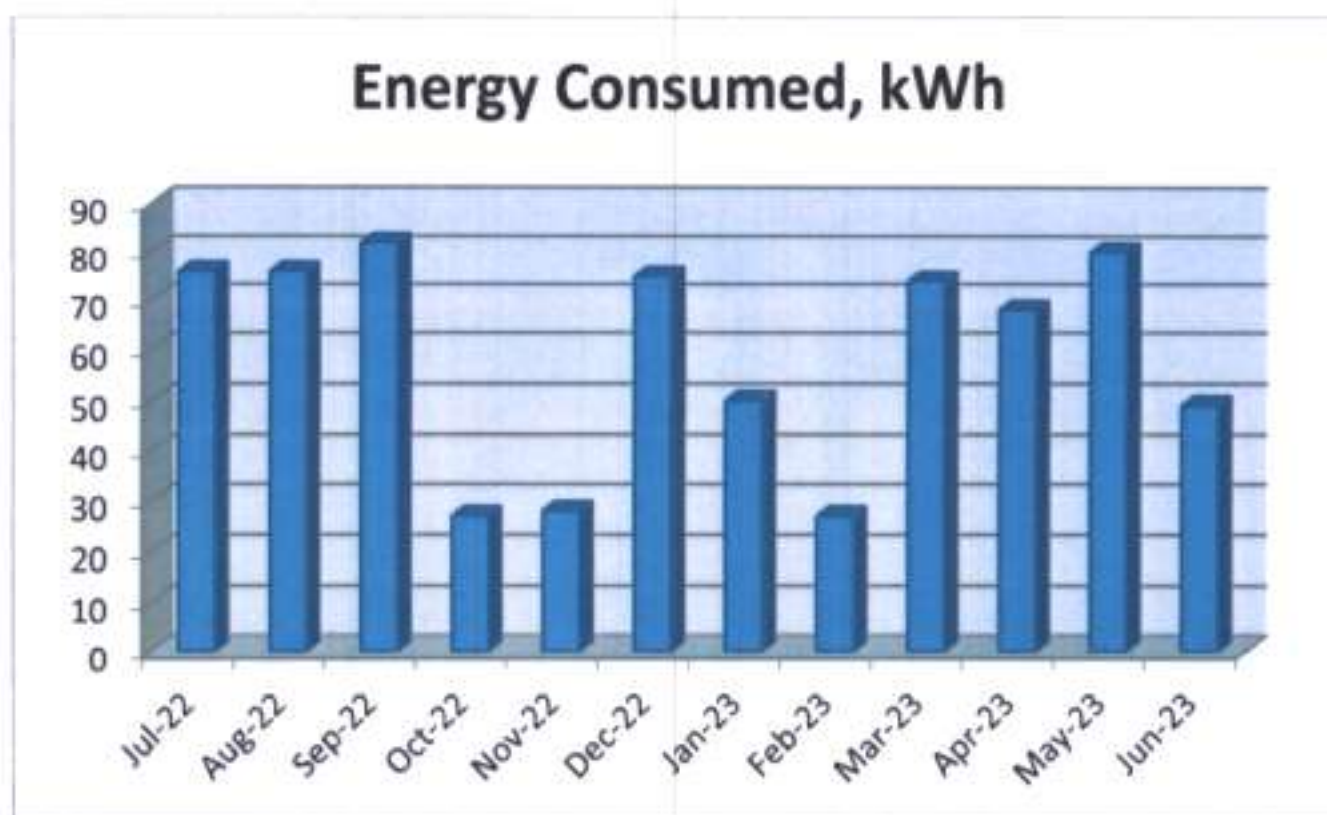
CHAPTER-III STUDY OF PRESENT ENERGY CONSUMPTION

In this chapter, we present the analysis of last year Electricity Bills

Table No 3: Electrical Bill Analysis- 2022-23:

No	Month	Energy Consumed, kWh	CO ₂ Emission, MT
1	Jul-22	76	0.07
2	Aug-22	76	0.07
3	Sep-22	82	0.07
4	Oct-22	27	0.02
5	Nov-22	28	0.03
6	Dec-22	75	0.07
7	Jan-23	50	0.05
8	Feb-23	27	0.02
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10	Apr-23	68	0.06
11	May-23	80	0.07
12	Jun-23	49	0.04
13	Total	712	0.64
14	Maximum	82	0.07
15	Minimum	27	0.02
16	Average	59.33	0.05

Chart No 2: Variation in Monthly Energy Consumption:



CHAPTER-IV STUDY OF ENERGY PERFORMANCE INDEX

Energy Performance Index: Energy Performance Index of a Building is its Annual Energy Consumption in Kilo Watt Hours per square meter of the Building

It is determined by:

$$\text{EPI} = \frac{\text{Annual Energy Consumption in kWh}}{\text{Total Built-up area in m}^2}$$

Now we compute the EPI for the College as under:

Table No 3: Computation of Energy Performance Index:

No	Particulars	Value	Unit
1	Total Annual Energy Consumed	712	kWh
2	Total Built up area of College		m ²
3	Energy Performance Index = (1) / (2)		kWh/m ²



CHAPTER V

STUDY OF LIGHTING

Terminology:

1. **Lumen** is a unit of light flow or luminous flux. The lumen rating of a lamp is a measure of the total light output of the lamp. The most common measurement of light output (or luminous flux) is the lumen. Light sources are labeled with an output rating in lumens.

2. **Lux** is the metric unit of measure for illuminance of a surface. One lux is equal to one lumen per square meter.

3. **Circuit Watts** is the total power drawn by lamps and ballasts in a lighting circuit under assessment.

4. **Installed Load Efficacy** is the average maintained illuminance provided on a horizontal working plane per circuit watt with general lighting of an interior. Unit: lux per watt per square metre (lux/W/m^2)

5. **Lamp Circuit Efficacy** is the amount of light (lumens) emitted by a lamp for each watt of power consumed by the lamp circuit, i.e. including control gear losses. This is a more meaningful measure for those lamps that require control gear. Unit: lumens per circuit watt (lm/W)

6. **Installed Power Density.** The installed power density per 100 lux is the power needed per square metre of floor area to achieve 100 lux of average maintained illuminance on a horizontal working plane with general lighting of an interior. Unit: watts per square metre per 100 lux ($\text{W/m}^2/100 \text{ lux}$) 100 Installed power density ($\text{W/m}^2/100 \text{ lux}$)

7. **Lighting Power Density:** It is defined as Total Lighting Load in a room divided by the Area of that Room in square meters.

In this Chapter we compute the percentage usage of LED Lighting to total Lighting Load of the College.

Now, we compute the usage of LED Lighting to Total Lighting Load, as under.

- The Total Lighting Load of the College is **0.275 kW**
- All the Fittings are LED Fittings.
- The % of LEDs to Total Lighting Load is **100%**



CHAPTER-VI

STUDY OF RENEWABLE ENERGY & ENERGY EFFICIENCY

6.1 Usage of Renewable Energy:

The College has yet to install Roof top Solar PV Plant.

6.2 Energy Efficiency Measures adopted:

- The College has Energy Efficient LED Fittings.
- Usage of BEE STAR Rated Equipment

Photographs of LED Lighting:



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1. Sahyadri Bahujan Vidya Prasarak Samaj, Loknete Balasaheb Thorat Arts, Commerce & Science College, Talegaon Dighe, consumes Energy in the form of Electrical Energy; used for various gadgets, Office & other facilities.

2. Pollution due to College Activities:

- **Air pollution:** Mainly CO₂ on account of Electricity Consumption
- **Solid Waste:** Bio degradable Garden Waste
- **Liquid Waste:** Human liquid waste

3. Present Energy Consumption & CO₂ Emissions:

No	Particulars	Value	Unit
1	Annual Energy Consumed	712	kWh
2	Annual CO ₂ Emissions	0.64	MT

4. Usage of Renewable Energy:

- The College has yet to install Solar PV Plant.

5. Indoor Air Quality Parameters:

No	Parameter/Value	AQI	PM-2.5	PM-10
1	Maximum	67	41	49
2	Minimum	49	29	31

6. Indoor Comfort Conditions:

No	Parameter/Value	Temperature, °C	Humidity, %	Lux Level	Noise Level, dB
1	Maximum	30.5	74	127	45
2	Minimum	30.3	72	103	42

7. Waste Management:

No	Head	Particulars
1	Solid Waste	Segregation of Waste at source
2	Organic Waste	Provision of Bio Composting Pit
3	Liquid Waste	Provision of Septic Tank

8. Rain Water Management:

The rain water falling on the terrace is collected in a Storage Tank and used for domestic purpose, after filtration.

9. Eco Friendly Initiatives:

- Maintenance of Internal Garden
- Display of Posters on Energy Conservation

10. Assumption:

1. 1 kWh of Electrical Energy releases 0.9 Kg of CO₂ into atmosphere

11. References:

- For CO₂ Emissions: www.tatapower.com
- For Various Indoor Air Parameters: www.ishrae.com
- For AQI Quality Standards: www.cpcb.com



ABBREVIATIONS

Kg	: Kilo Gram
PJSS	: Poona Jesuit School Society
MSEDCL	: Maharashtra State Distribution Company Limited
MT	: Metric Ton
kWh	: kilo-Watt Hour
LPD	: Liters per Day
LED	: Light Emitting Diode
AQI	: Air Quality Index
PM-2.5	: Particulate Matter of Size 2.5 Micron
PM-10	: Particulate Matter of Size 10 Micron
CPCB	: Central Pollution Control Board
ISHRAE	: The Indian Society of Heating & Refrigerating & Air Conditioning Engineers



CHAPTER-I INTRODUCTION

1. Important Definitions:

1.1 Environment: Definition as per environment Protection Act: 1986

Environment includes water, air and land and the inter-relationship which exists among and between Water, Air, Land and Human beings, other living creatures, plants microorganism and property

1.1.2 Environmental Audit: Definition:

An audit which aims at verification and validation to ensure that various environmental laws are complied with and adequate care has been taken towards environmental protection and preservation

According to UNEP, 1990, "Environmental audit can be defined as a management tool comprising systematic, documented and periodic evaluation of how well environmental organization management and equipment are performing with an aim of helping to regularize the environment"

1.1.3 Environmental Pollutant: means any solid, liquid and gaseous substance present in the concentration as may be, or tend to be, injurious to Environment.

1.2 Audit Procedural Steps:



1.3 Google Earth Image:



College
Campus

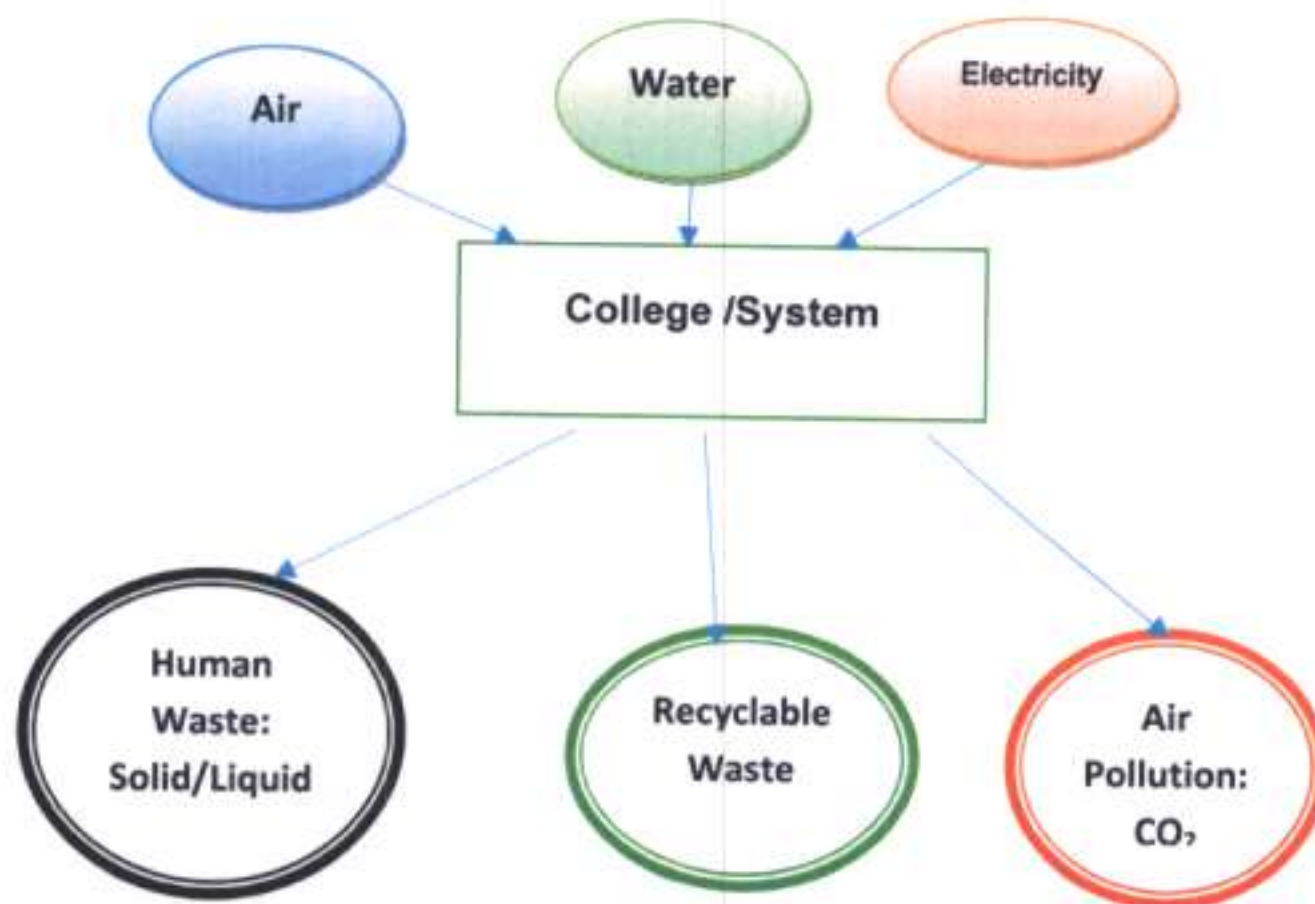


CHAPTER-II STUDY OF CONSUMPTION OF RECOURCES & CO₂ EMISSION

The College consumes following basic/derived Resources:

1. Air
2. Water
3. Electrical Energy

We try to draw a schematic diagram for the College System & Environment as under.
Chart No 1: Representation of College as System & Study of Resources & Waste



Now we compute the Generation of CO₂ on account of consumption of Electrical Energy.

The basis of Calculation for CO₂ emissions due to Electrical Energy is as under

- 1 kWh of Electrical Energy releases 0.9 Kg of CO₂ into atmosphere

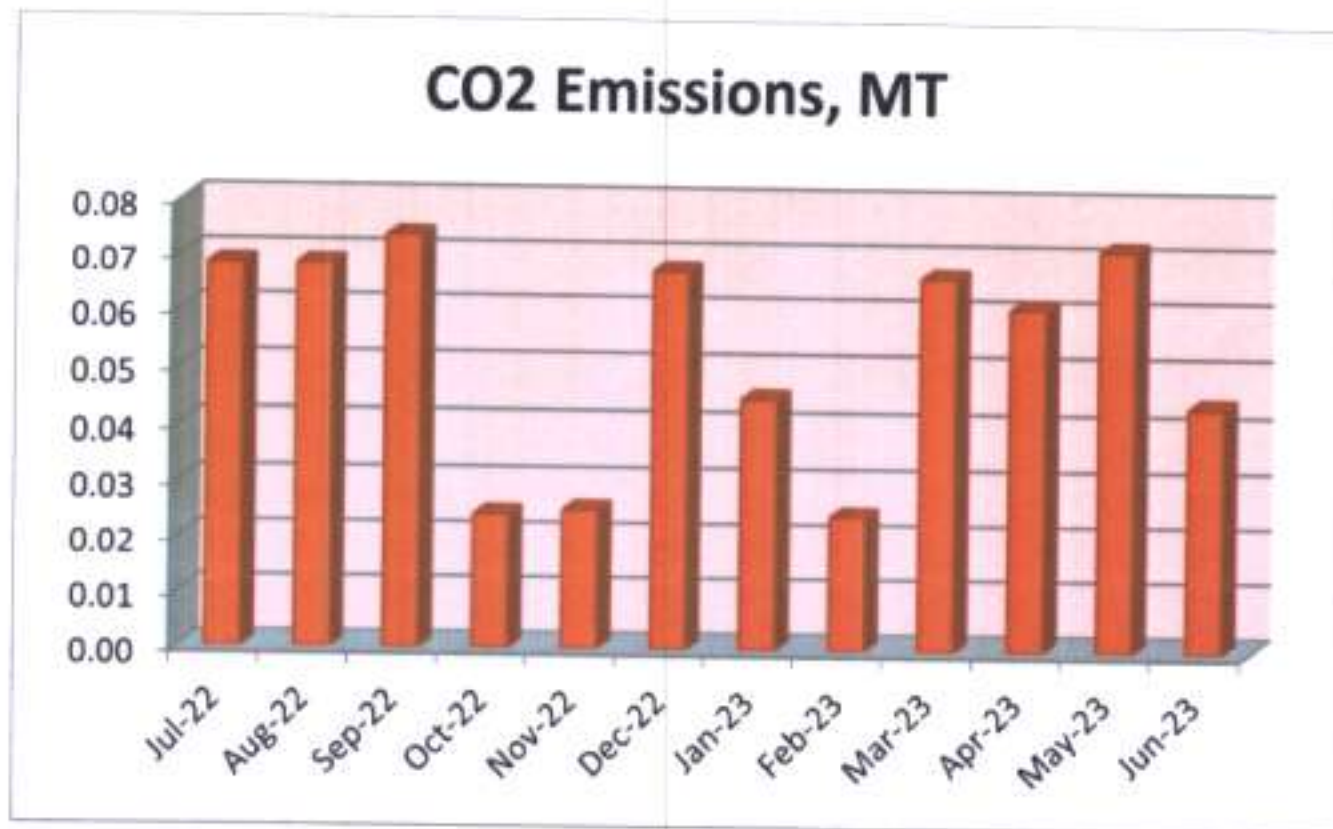
Table No 1: Study of Consumption of Electrical Energy & CO₂ Emissions: 22-23:

No	Month	Energy Consumed, kWh	CO ₂ Emission, MT
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2	Aug-22	76	0.07
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4	Oct-22	27	0.02
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8	Feb-23	27	0.02
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12	Jun-23	49	0.04
13	Total	712	0.64
14	Maximum	82	0.07
15	Minimum	27	0.02
16	Average	59.33	0.05

Chart No 2: Month wise CO₂Emissions:



CHAPTER III

STUDY OF USAGE OF RENEWABLE ENERGY

- The College has yet to install Solar PV Plant.



CHAPTER IV STUDY OF INDOOR AIR QUALITY

4.1 Importance of Air Quality:

Air: The common name given to the atmospheric gases used in breathing and photosynthesis.

By volume, Dry Air contains 78.09% Nitrogen, 20.95% Oxygen, 0.93% Argon, 0.039% carbon dioxide, and small amounts of other gases.

On average, a person inhales about **14,000 liters** of air every day. Therefore, poor air quality may affect the quality of life now and for future generations by affecting the health, the environment, the economy and the city's livability.

Air quality is a measure of the suitability of air for breathing by people, plants and animals.

According to Section 2(b) of Air (Prevention and control of pollution) Act, 1981 'air pollution' has been defined as 'the presence in the atmosphere of any air pollutant.'

As per Section 2(a) of Air (Prevention and control of pollution) Act, 1981 'air pollutant' has been defined as 'any solid, liquid or gaseous substance [(including noise)] present in the atmosphere in such concentration as may be or tend to be injurious to human beings or other living creatures or plants or property or environment

4.2 Air Quality Index:

An **Air Quality Index (AQI)** is a number used by government agencies to measure the **air pollution** levels and communicate it to the population.

We present herewith following important Parameters.

1. AQI- Air Quality Index
2. PM-2.5- Particulate Matter of Size 2.5 micron
3. PM-10- Particulate Matter of Size 10 micron

Table No 2: Indoor Air Quality Parameters:

No	Location	AQI	PM-2.5	PM-10
1	Principal Cabin	67	41	49
2	Meeting Hall	50	30	32
3	Library	66	39	46
4	Physics Lab	49	29	31
5	Classroom	60	36	42
	Maximum	67	41	49
	Minimum	49	29	31

CHAPTER V STUDY OF INDOOR COMFORT CONDITION PARAMETERS

In this Chapter, we present the various Indoor Comfort Parameters measured during the Audit.

The Parameters include:

1. Temperature
2. Humidity
3. Lux Level
4. Noise Level.

Table No 3: Study of Indoor Comfort Condition Parameters:

No	Location	Temperature, °C	Humidity, %	Lux Level	Noise Level, dB
1	Principal Cabin	30.5	74	113	42.6
2	Meeting Hall	30.4	72	127	42
3	Library	30.5	74	123	44.3
4	Physics Lab	30.3	74	103	45
5	Classroom	30.4	73	119	44
	Maximum	30.5	74	127	45
	Minimum	30.3	72	103	42



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The Waste is segregated at source. Waste bins are located at various locations

Photograph of Separate Waste Collection Bin:



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The College has a Bio composting Pit, for conversion of Organic Waste.

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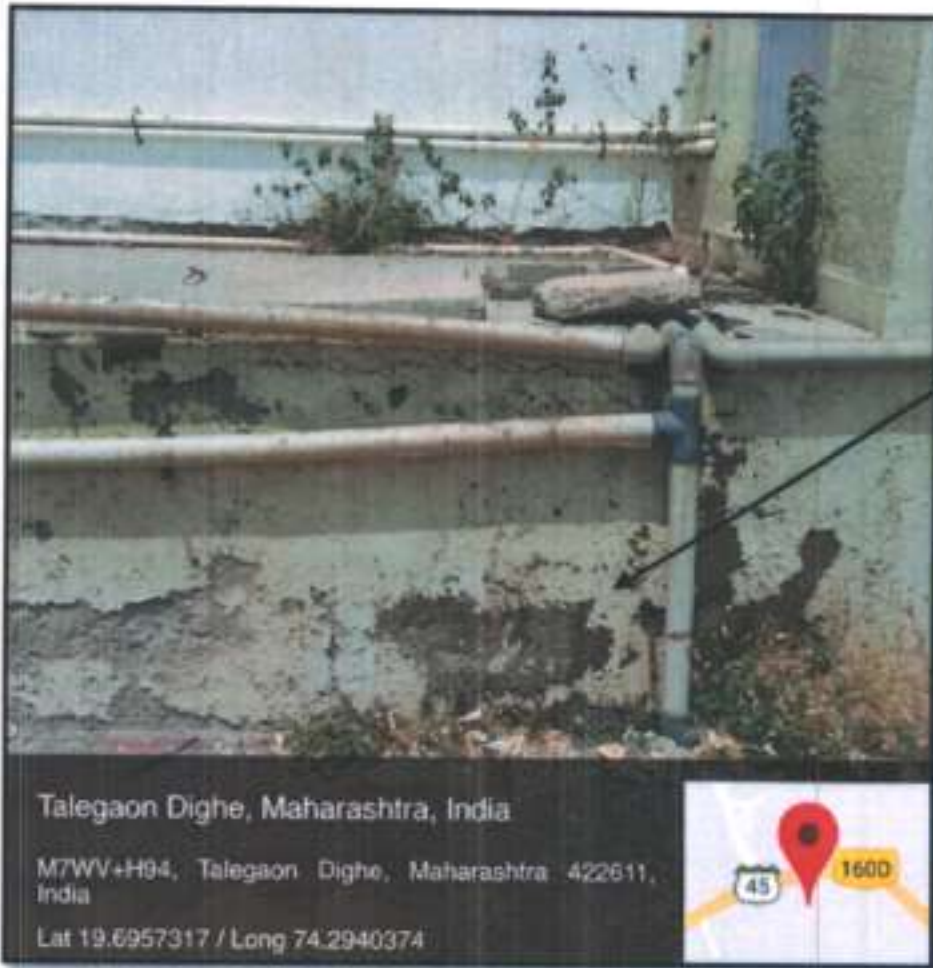
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Photograph of Rain Water Storage Tank:



Water Storage Tank



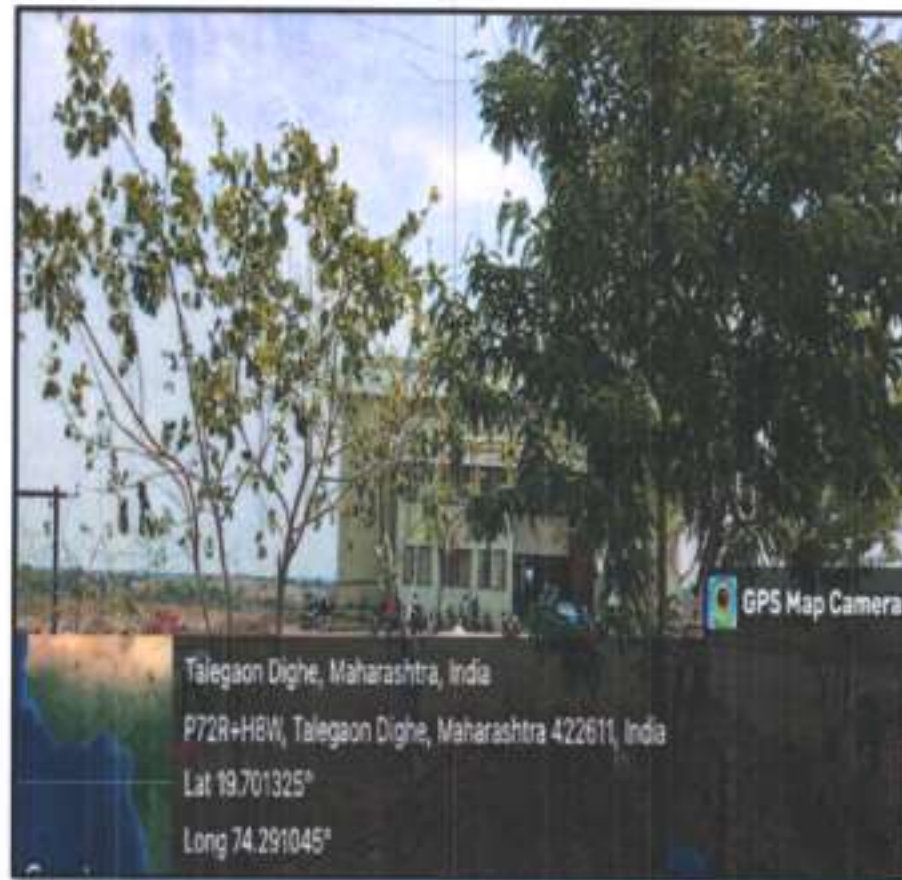
CHAPTER-VIII

STUDY OF ENVIRONMENT FRIENDLY INITIATIVES

8.1 Internal Tree Plantation:

The College has well maintained landscaped garden in the campus.

Photograph of Tree plantation



8.2 Creation of Awareness about Energy Conservation:

The College has displayed posters emphasizing on importance of Energy Conservation..

Photograph of Poster on Energy Conservation:



ANNEXURE-I:

AIR QUALITY, NOISE & INDOOR COMFORT STANDARDS:

1. Category Wise Air Quality Index Values & Concentration of PM 2.5 & PM10:

No	Category	AQI Value	Concentration Range, PM 2.5	Concentration Range, PM 10
1	Good	0 to 50	0 to 30	0 to 50
2	Satisfactory	51 to 100	31 to 60	51 to 100
3	Moderately Polluted	101 to 200	61 to 90	101 to 250
4	Poor	201 to 300	91 to 120	251 to 350
5	Very Poor	301 to 400	121 to 250	351 to 430
6	Severe	401 to 500	250 +	430 +

2. Recommended Noise Level Standards:

No	Location	Noise Level dB
1	Auditoriums	20-25
2	Outdoor Playground	55
3	Occupied Class Room	40-45
4	Un occupied Class Room	35
5	Apartment, Homes	35-40
6	Offices	45-50
7	Libraries	35-40
8	Restaurants	50-55

3. Thermal Comfort Conditions: For Non-conditioned Buildings:

No	Parameter	Value
1	Temperature	Less Than 33°C
2	Humidity	Less Than 70%

