

# ENERGY AUDIT REPORT

of

Rajgad Dnyanpeeth's,  
**SHRI CHHATRAPATI SHIVAJIRAJE COLLEGE OF ENGINEERING,**  
Dhangawadi, Tal: Bhore, Dist: Pune



Year: 2022-23

Prepared by

## ENGRESS SERVICES

Yashashree, 26, Nirmal Bag Society  
Near Mukhtangan English School, Parvati, Pune 411009  
Phone: 09890444795 Email: [engress123@gmail.com](mailto:engress123@gmail.com)



## ENGRESS SERVICES

Yashashree, 26, Nirmal Bag Society, Near Mukangan English School, Parvati, Pune 411 009

Tel: 09890444795 Email: [engress123@gmail.com](mailto:engress123@gmail.com)

MEDA Registration No: ECN/2022-23/CR-43/1709

ISO: 9001-2015 Certified (Cert No: 23EQKC13),

ISO: 14001-2015 Certified (Cert No: 23EEKW20)

## ENERGY AUDIT CERTIFICATE

Certificate No: ES/ RDSCSCOE/22-23/01

Date: 20/6/2023

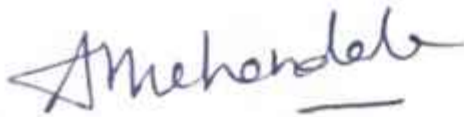
This is to certify that we have conducted Energy Audit at Rajgad Dnyanpeeth's Shri Chhatrapati Shivajiraje College of Engineering, Dhangawadi, Tal: Bhor, Dist: Pune in the year 2022-23.

The College has adopted Energy Efficient Practices:

- Usage of Energy Efficient LED Fittings
- Usage of Energy Efficient BEE STAR Rated equipment
- Installation of 10 kWp Capacity Roof Top Solar PV Plant
- Installation of Solar Thermal Water Heating System, at Hostel blocks
- In process installation of Sensor Based Lighting Operation

We appreciate the support of Management, involvement of faculty members and students in the process of making the campus Energy Efficient.

For Engress Services,



A Y Mehendale,  
B E-Mechanical, M Tech- Energy  
BEE Certified Energy Auditor, EA-8192





REGISTRATION CERTIFICATES



AUDITOR CERTIFICATE



MEDA Registration 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 Rajgad Dnyanpeeth's Shri Chhatrapati Shivajiraje College of Engineering, Dhangawadi, Tal: Bhore, Dist: Pune for awarding us the assignment of Energy Audit of their Dhangawadi Campus for the Year: 2022-23.

We are thankful to all staff members for helping us during the Field Study.





## EXECUTIVE SUMMARY

1. Rajgad Dnyanpeeth's Shri Chhatrapati Shivajiraje College of Engineering, Dhangawadi, Tal: Bhore, Dist: Pune 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	131	kW
2	Annual Energy Purchased	90551	kWh

### 3. Energy Performance Index:

No	Particulars	Value	Unit
1	Total Annual Energy Purchased	90551	kWh
2	Annual Energy Generated	12000	kWh
3	Annual Energy Consumed=1+2	102551	kWh
4	Total Built up Area of Institute	19535.72	m <sup>2</sup>
5	Energy Performance Index =(3) / (4)	5.24	kWh/m <sup>2</sup>

### 4. Study of Lighting Power Density & % Usage of LED Lighting:

No	Particulars	Value	Unit
1	Lighting Power Density	5	W/m <sup>2</sup>
2	% of Usage of LED Lighting to Total Lighting Load	34.58	%

### 5. Renewable Energy & Energy Efficiency Projects:

- Usage of Energy Efficient LED fittings
- Installation of 10 kWp Roof top Solar PV Plant
- Installation of Solar Thermal Water Heating System, at Hostel blocks.

### 6. Assumptions:

1. 1 kWh of Electrical Energy releases 0.9 Kg of CO<sub>2</sub> into atmosphere
2. Energy generated by Roof Top Solar PV Plant: 4 kWh/kWp per Day
3. Annual Solar Energy generation Days: 300 Nos

### 7. References:

- Audit Methodology: [www.mahaurja.com](http://www.mahaurja.com)
- Energy Conservation Building Code: ECBC-2017: [www.beeindia.gov.in](http://www.beeindia.gov.in)
- For CO<sub>2</sub> Emissions: [www.tatapower.com](http://www.tatapower.com)
- For Solar PV Energy generation: [www.solarrooftop.gov.in](http://www.solarrooftop.gov.in)



## ABBREVIATIONS

LED	: Light Emitting Diode
MSEDCL	: Maharashtra State Electricity Distribution Company Limited
kW	: kilo-Watt
kWh	: kilo-Watt Hour
kWp	: Kilo Watt peak
FTL	: Fluorescent Tube Light
MT	: Metric Ton
MVL	: Mercury Vapor Lamp
P C	: Personal Computer
A C	: Air conditioner





## CHAPTER-I INTRODUCTION

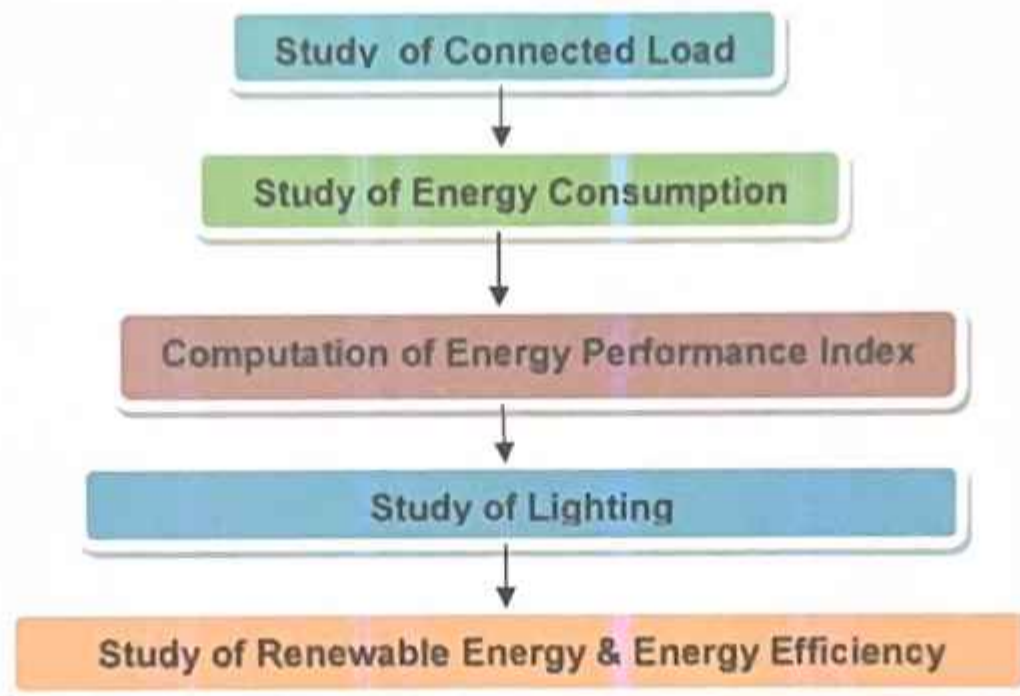
### 1.1 Introduction:

An Energy Audit is conducted at Rajgad Dnyanpeeth's Shri Chhatrapati Shivajiraje College of Engineering, Dhangawadi, Tal: Bhore, Dist: Pune

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](http://www.mahaurja.com))
- Tata Power: [www.tatapower.com](http://www.tatapower.com)

### 1.2 Audit Procedural Steps:



### 1.3 Google Earth Image:



College  
Campus



## CHAPTER-II STUDY OF CONNECTED LOAD

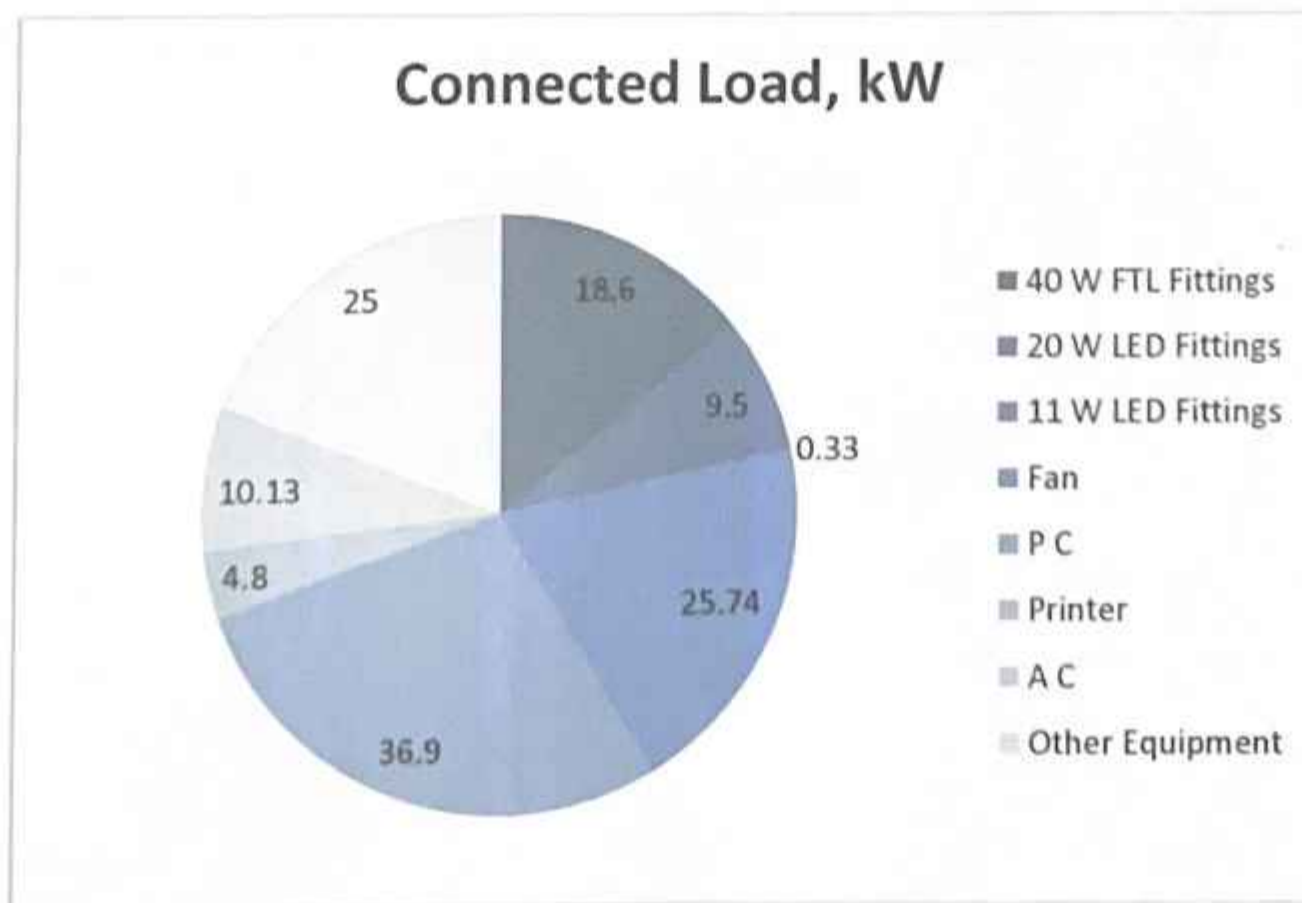
In this chapter, we present the details of various Electrical loads as under

Table No 2: Equipment wise connected Load:

No	Equipment	Qty	Load, W/Unit	Load, kW
1	40 W FTL Fittings	465	40	18.6
2	20 W LED Fittings	475	20	9.5
3	11 W LED Fittings	30	11	0.33
4	Fan	396	65	25.74
5	P C	369	100	36.9
6	Printer	32	150	4.8
7	A C	5	2025	10.13
8	Other Equipment	100	250	25
9	<b>Total</b>			<b>131</b>

We present the same in a PIE Chart as under:

Chart No-1: Details of Connected Load:



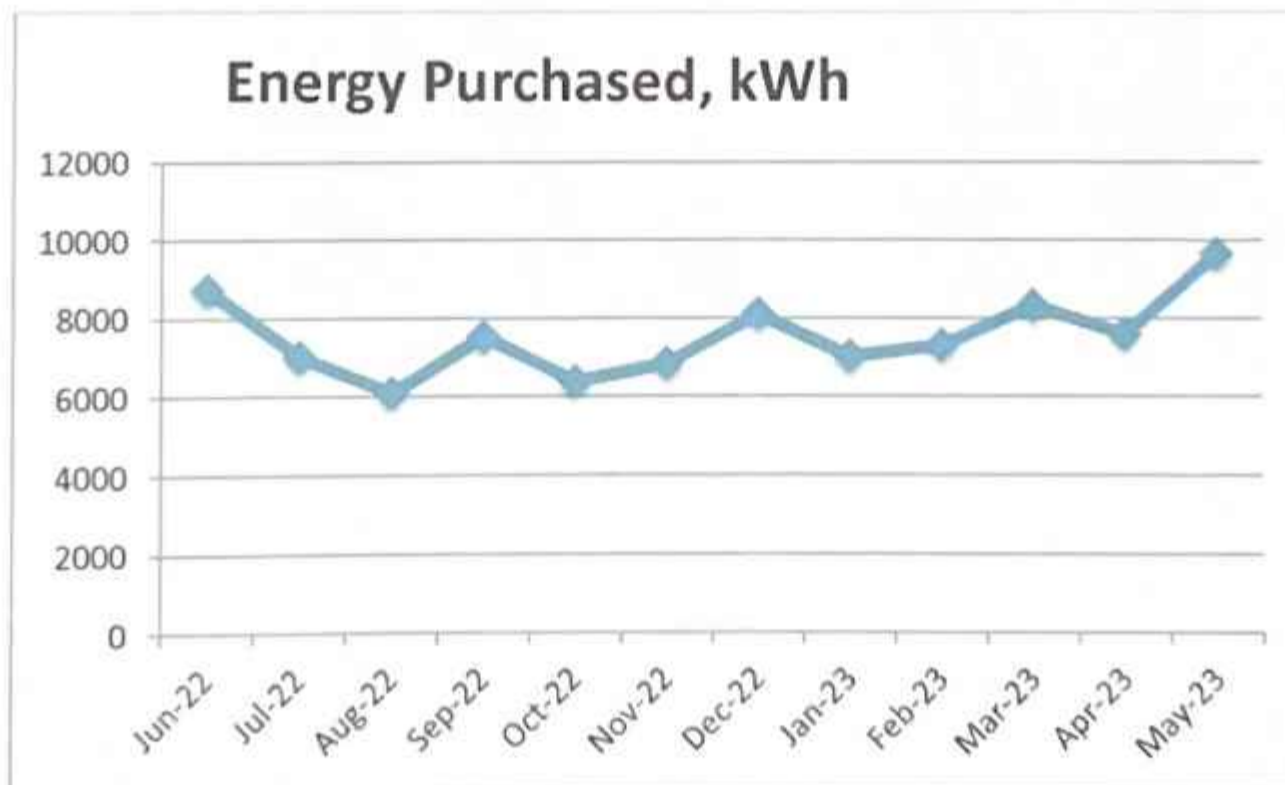
### CHAPTER-III STUDY OF PRESENT ENERGY CONSUMPTION

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

Table No 3: Electrical Energy Consumption: 2022-23:

No	Month	Energy Purchased, kWh	CO <sub>2</sub> Emissions, MT
1	Jun-22	8736	7.86
2	Jul-22	7009	6.31
3	Aug-22	6090	5.48
4	Sep-22	7530	6.78
5	Oct-22	6375	5.74
6	Nov-22	6834	6.15
7	Dec-22	8098	7.29
8	Jan-23	7015	6.31
9	Feb-23	7316	6.58
10	Mar-23	8319	7.49
11	Apr-23	7582	6.82
12	May-23	9647	8.68
13	Total	90551	81.50
14	Maximum	9647	8.68
15	Minimum	6090	5.48
16	Average	7545.92	6.79

Chart No 2: To study the variation of Month wise Energy Purchased, kWh:



## 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:

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

Now we compute the EPI for the Institute as under:

**Table No 3: Computation of Energy Performance Index:**

No	Particulars	Value	Unit
1	Total Annual Energy Purchased	90551	kWh
2	Energy Generated by Solar PV Plant	12000	kWh
3	Total Energy Consumed= 1+2	102551	kWh
4	Total Built up area of Institute	19535.72	m <sup>2</sup>
5	Energy Performance Index =(3) / (4)	5.24	kWh/m <sup>2</sup>



## 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 ( $\text{lux/W/m}^2$ )

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 ( $\text{lm/W}$ )

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 Lighting Power Density of Class Room and the percentage usage of LED Lighting to total Lighting Load of the Institute.

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

Table No 4: Computation of Lighting Power Density: H. T. Room:

No	Particulars	Value	Unit
1	Qty of 40 W Fittings in H. T. Lab	5	Nos
2	Load of 40 W Fitting	40	W/unit
3	Total Load of 5 Nos, 40 W Fittings	200	W
4	Qty of 20 W LED Fittings in H. T. Lab	4	Nos

5	Load of 20 W LED Fitting	40	W/unit
6	Total Load of 4 Nos, 20 W LED Fittings	160	W
7	Total Lighting Load =3+6	360	W
8	Built up area of Class Room: GF-07	72	m <sup>2</sup>
9	Lighting Power Density = (7)/(8)	5	W/m <sup>2</sup>

Table No 5: Percentage Usage of LED Lighting to Total Lighting Load:

No	Particulars	Value	Unit
1	No of 40 W FTL Fittings	465	Nos
2	Load of 40 W FTL Fitting	40	W/unit
3	Total Load of 40 W FTL Fittings	18.6	kW
4	No of 20 W LED Fittings	475	Nos
5	Load of 20 W LED Fitting	20	W/unit
6	Total Load of 20 W LED Fittings	9.5	kW
7	No of 11 W LED Fittings	30	Nos
8	Load of 11 W LED Fitting	11	W/unit
9	Total Load of 11 W LED Fittings	0.33	kW
10	Total LED Lighting Load = 6+9	9.83	kW
11	Total Lighting Load = 3+6+9	28.43	kW
12	% of LED to Total Lighting Load=10*100/11	34.58	%



## CHAPTER-VI STUDY OF RENEWABLE ENERGY & ENERGY EFFICIENCY

### 6.1 Usage of Renewable Energy:

The Institute has installed Roof Top Solar PV Plant of Capacity 10 kWp

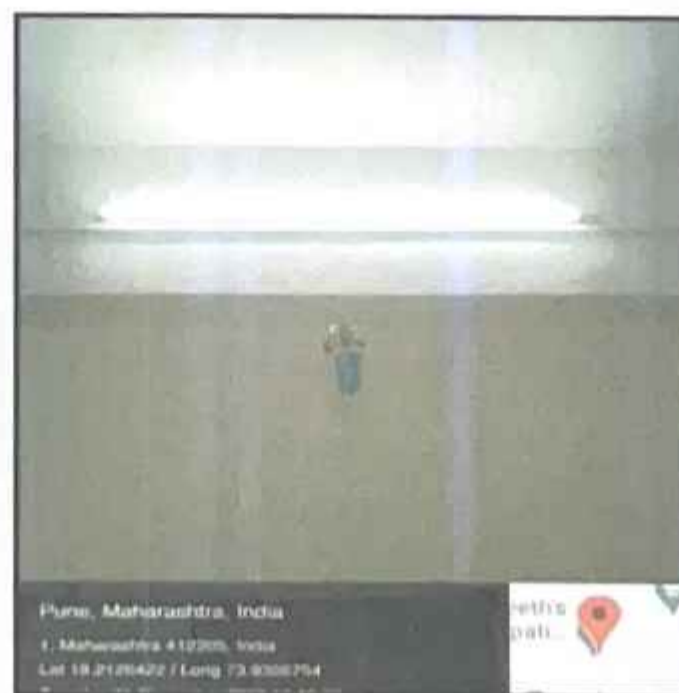
Photograph of Roof Top Solar PV Plant:



### 6.2 Energy Efficiency Measures adopted:

- The College has Energy Efficient LED Fittings.

Photograph of LED Lighting:





# ENVIRONMENTAL AUDIT REPORT

of

Rajgad Dnyanpeeth's,  
**SHRI CHHATRAPATI SHIVAJIRAJE COLLEGE OF ENGINEERING,**  
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Year: 2022-23

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## ENGRESS SERVICES

Yashashree, 26, Nirmal Bag Society, Near Muklangan English School,  
Parvati, Pune 411 009 Tel: 09890444795 Email: [engress123@gmail.com](mailto:engress123@gmail.com)

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ISO: 9001-2015 Certified (Cert No: 23EQKC13),

ISO: 14001-2015 Certified (Cert No: 23EEKW20)

## ENVIRONMENTAL AUDIT CERTIFICATE

Certificate No: ES/RDSCSCOE/ 22-23/03

Date: 20/6/2023

This is to certify that we have conducted Environmental Audit at Rajgad Dnyanpeeth's Shri Chhatrapati Shivajiraje College of Engineering, Dhangawadi, Tal: Bhor, Dist: Pune in the year 2022-23.

The College has adopted following Environmentally Friendly practices:

- Usage of Energy Efficient LED Fittings,
- Installation of 10 kWp Roof top Solar PV Plant
- Installation of Solar Thermal Water Heating System at Hostel Block
- Segregation of Waste at Source
- Installation of Biogas Plant for conversion of Leftover Food Waste
- Provision of Sanitary Waste Incinerator
- Provision of Septic Tank, for Disposal of Liquid Waste
- Installation of Rain water Management Project
- Good internal road
- Internal Tree plantation
- Creation of Awareness on Energy Conservation by Display of Posters

We appreciate the involvement of the students and faculty members and the cooperation extended by the management, in the process of Energy Conservation and making the campus Green and Environment Friendly.

For Engress Services,



A Y Mehendale,

B E- Mech, M Tech-Energy, Certified Energy Auditor, EA-8192

ASSOCHAM GEM Certified Professional: GEM: 22/788





REGISTRATION CERTIFICATES



MEDA REGISTRATION CERTIFICATE



ASSOCHAM GEM CP CERTIFICATE



ISO: 9001-2015 CERTIFICATE



ISO: 14001-2015 CERTIFICATE





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



## EXECUTIVE SUMMARY

1. Shri Chhatrapati Shivajiraje College of Engineering, Dhangawadi, Tal: Bhor, Dist: Pune consumes Energy in the form of Electrical Energy used for various gadgets, Office & other facilities.

### 2. Pollution due to Institute Activities:

- Air pollution: Mainly CO<sub>2</sub> on account of Electricity Consumption
- Solid Waste: Bio degradable Garden Waste, Paper & Plastic Waste
- Liquid Waste: Human liquid waste

### 3. Present Energy Consumption & CO<sub>2</sub> Emission:

No	Particulars	Value	Unit
1	Annual Energy Purchased	90551	kWh
2	Annual CO <sub>2</sub> Emissions	81.50	MT

### 4. Usage of Renewable Energy & Reduction in CO<sub>2</sub> Emissions:

- The Institute has installed Roof Top Solar PV Plant of Capacity 10 kWp.
- The Energy generated by Solar PV Plant in 22-23 is 12000 kWh.
- Reduction in CO<sub>2</sub> Emissions in 22-23 is 10.8 MT

### 5. Indoor Air Quality Parameters:

No	Parameter/Value	AQI	PM-2.5	PM-10
1	Maximum	63	37	45
2	Minimum	58	34	38

### 6. Indoor Comfort Conditions:

No	Parameter/Value	Temperature, °C	Humidity, %	Lux Level	Noise Level, dB
1	Maximum	29.1	42	136	44.7
2	Minimum	28.9	40	98	41.9

### 7. Waste Management:

No	Head	Particulars
1	Solid Waste	Segregation of Waste at source
2	Food Waste	Installed Bio Gas Plant
3	Sanitary Waste	Installed Sanitary Waste Incinerator
4	Liquid Waste	Septic Tank installed & cleaned periodically
5	E Waste	Disposed of through Authorized Agency 'SWaCH'



### 8. Rain Water Management:

The College has installed Rainwater Management Project. The Rain Water is collected from the Terrace & from the hill slope, and is used to increase the underground water level.

### 9. Environment Friendly Initiatives:

- Tree Plantation in the campus.
- Creation of awareness on Energy Conservation Display of Posters

### 10. Assumptions:

1. 1 kWh of Electrical Energy releases 0.9 Kg of CO<sub>2</sub> into atmosphere
2. Energy generated by Roof Top Solar PV Plant: 4 kWh/kWp per Day
3. Annual Solar Energy generation Days: 300 Nos

### 11. References:

- For CO<sub>2</sub> Emissions: [www.tatapower.com](http://www.tatapower.com)
- For Solar PV Energy generation: [www.solarrooftop.gov.in](http://www.solarrooftop.gov.in)
- For Various Indoor Air Parameters: [www.ishrae.com](http://www.ishrae.com)
- For AQI & Water Quality Standards: [www.cpcb.com](http://www.cpcb.com)

## ABBREVIATIONS

CPCB	:	Central Pollution Control Board
ISHARE	:	The Indian Society of Heating & Refrigerating & Air Conditioning Engineers
AQI	:	Air Quality Index
PM2.5	:	Particulate Matter of Size 2.5 microns
PM 10	:	Particulate Matter of Size 10 microns
kWh	:	kilo-Watt Hour
kWp	:	Kilo Watt Peak
Qty	:	Quantity
W	:	Watt
kW	:	Kilo Watt
MT	:	Metric Ton
LPD	:	Litres Per Day



## 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

#### 1.2. 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"*

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

#### 1.4 Audit Procedural Steps:





### 1.3 Google Earth Image:



College  
Campus

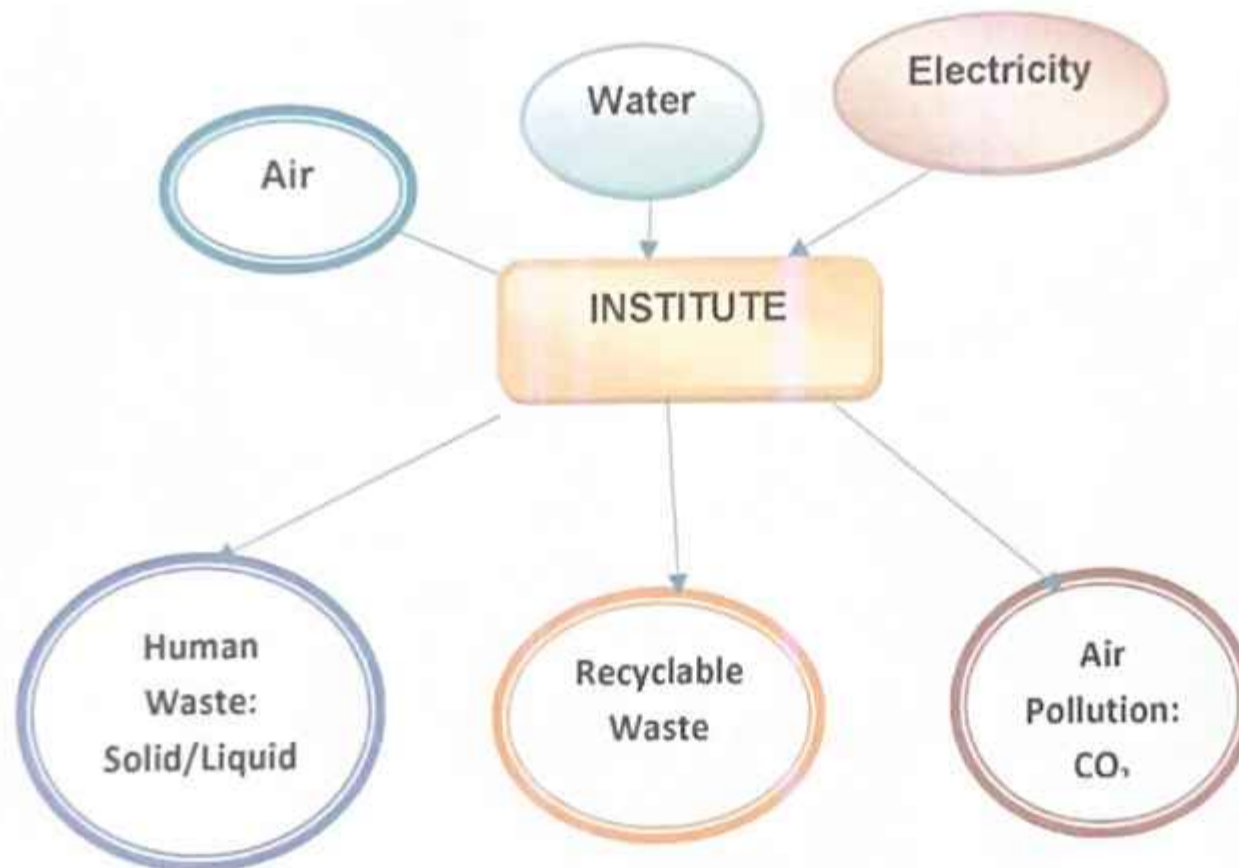


## CHAPTER-II STUDY OF RESOURCE CONSUMPTION & CO<sub>2</sub> EMISSION

The Institute consumes following basic/derived Resources:

1. Air
2. Water
3. Electrical Energy

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



Now we compute the Generation of CO<sub>2</sub> on account of consumption of Electrical Energy. The basis of Calculation for CO<sub>2</sub> emissions due to Electrical Energy is as under.

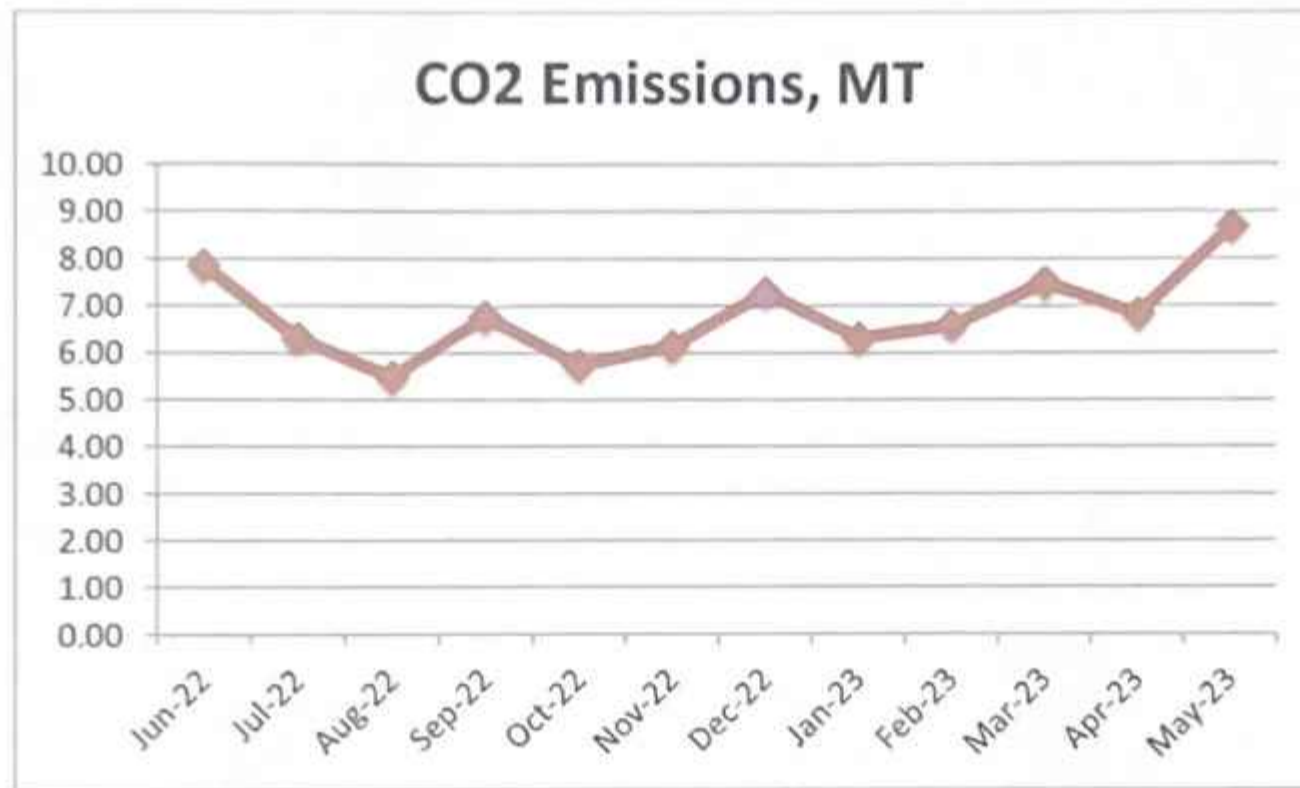
- 1 kWh of Electrical Energy releases 0.9 Kg of CO<sub>2</sub> into atmosphere

Table No 1: Study of Purchase of Energy & CO<sub>2</sub> Emissions: 22-23:

No	Month	Energy Purchased, kWh	CO <sub>2</sub> Emissions, MT
1	Jun-22	8736	7.86
2	Jul-22	7009	6.31
3	Aug-22	6090	5.48
4	Sep-22	7530	6.78
5	Oct-22	6375	5.74
6	Nov-22	6834	6.15
7	Dec-22	8098	7.29

8	Jan-23	7015	6.31
9	Feb-23	7316	6.58
10	Mar-23	8319	7.49
11	Apr-23	7582	6.82
12	May-23	9647	8.68
13	Total	90551	81.50
14	Maximum	9647	8.68
15	Minimum	6090	5.48
16	Average	7545.92	6.79

Chart No: 2: To study the variation of Monthly CO<sub>2</sub> Emission:





### CHAPTER-III STUDY OF USAGE OF RENEWABLE ENERGY

The College has installed Roof top Solar PV Plant of Capacity 10 kWp. For Hostel blocks, the Solar Thermal Hot water System is used. The capacity is 10000 LPD.

Table No 2: Computation of Reduction in CO<sub>2</sub> Emissions:

No	Particulars	Value	Unit
1	Installed Capacity of Roof Top Solar PV Plant Capacity	10	kWp
2	Energy Generated in per kWp	4	4 kWh/kWp
3	Annual Solar Energy generation Days	300	Nos
4	Energy Generated in the Year: 21-22	12000	kWh
5	1 kWh of Electrical Energy saves	0.9	Kg/kWh
6	Qty of CO <sub>2</sub> Saved by Solar PV Plant $= (4) * (5) / 1000$	10.8	MT of CO <sub>2</sub>

Photograph of 10 kWp Roof top 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.

### 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. As the AQI increases, it means that a large percentage of the population will experience severe adverse health effects.

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 3: Indoor Air Quality Parameters:**

No	Location	AQI	PM-2.5	PM-10
1	R-4	56	34	39
2	R-104	58	35	40
3	R-207	60	36	38
4	R-210	63	37	45
5	R-308	60	34	39
	Maximum	63	37	45
	Minimum	58	34	38



## 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 4: Study of Indoor Comfort Condition Parameters:

No	Location	Temperature, °C	Humidity, %	Lux Level	Noise Level, dB
1	R-4	28.9	41	110	41.9
2	R-104	28.9	41	136	42
3	R-207	29	40	98	42.9
4	R-210	29	42	105	44
5	R-308	29.1	42	121	44.7
	Maximum	29.1	42	136	44.7
	Minimum	28.9	40	98	41.9





## CHAPTER VI STUDY OF WASTE MANAGEMENT

In this Chapter, we study the Waste management Practices of the College.

### 6.1 Segregation of Waste at Source:

Separate Waste Collection Bins are placed at important locations. The Waste is segregated at source. The Collected Waste is further given for disposal.

Photograph of Waste Collections Bin:



### 6.2 Food Waste Management:

This College has installed Biogas plant to convert the Organic Waste into Bio Gas, which is used in the College mess.

Photograph of Biogas Plant:



### 6.3 Sanitary Waste Management:

The College has installed Sanitary Waste Incinerator to dispose of the Sanitary Waste.

Photograph of Sanitary Waste Incinerator:



### 6.4 Liquid Waste Management:

The College has installed Septic Tank and cleaned periodically.

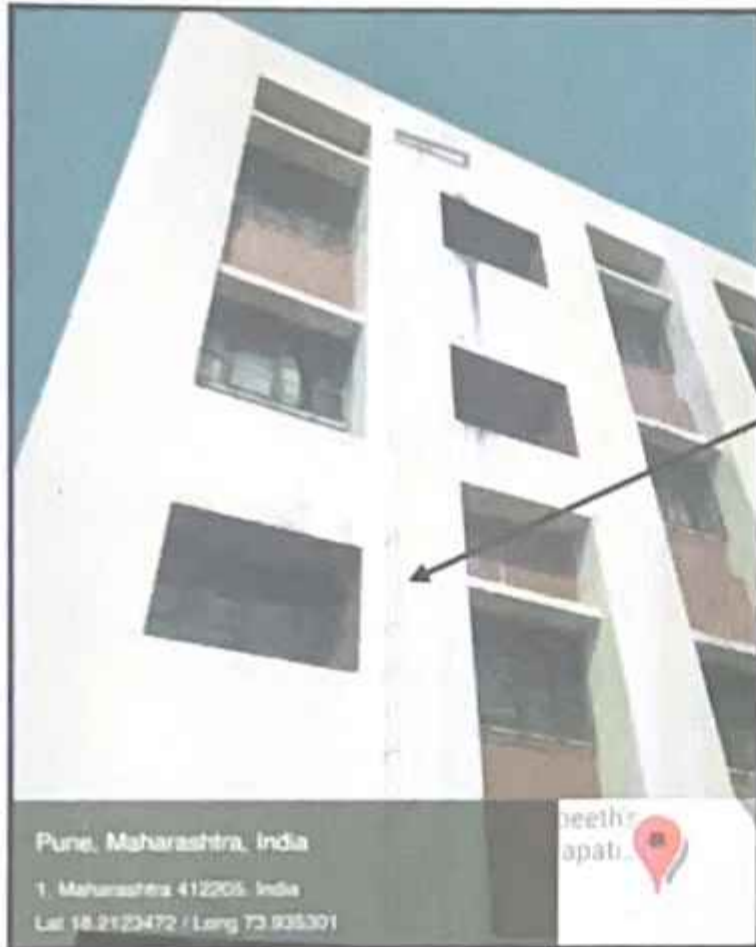
### 6.5 E-Waste Management:

The E Waste is handed over to Authorized Agency M/s 'SWaCH' Pune

## CHAPTER VII STUDY OF RAIN WATER MANAGEMENT

The College has installed Rainwater Management Project. The Rain Water is collected from the Terrace & from the hill slope, and is used to increase the Underground Water Table.

Photograph of Rain water Management Pipe:



Rain Water  
Collecting Pipe



## CHAPTER VIII STUDY OF ENVIRONMENT FRIENDLY INITIATIVES

### 8.1 Internal Tree Plantation:

The College has well maintained Garden in the campus. The details of Trees are furnished in the Annexure.

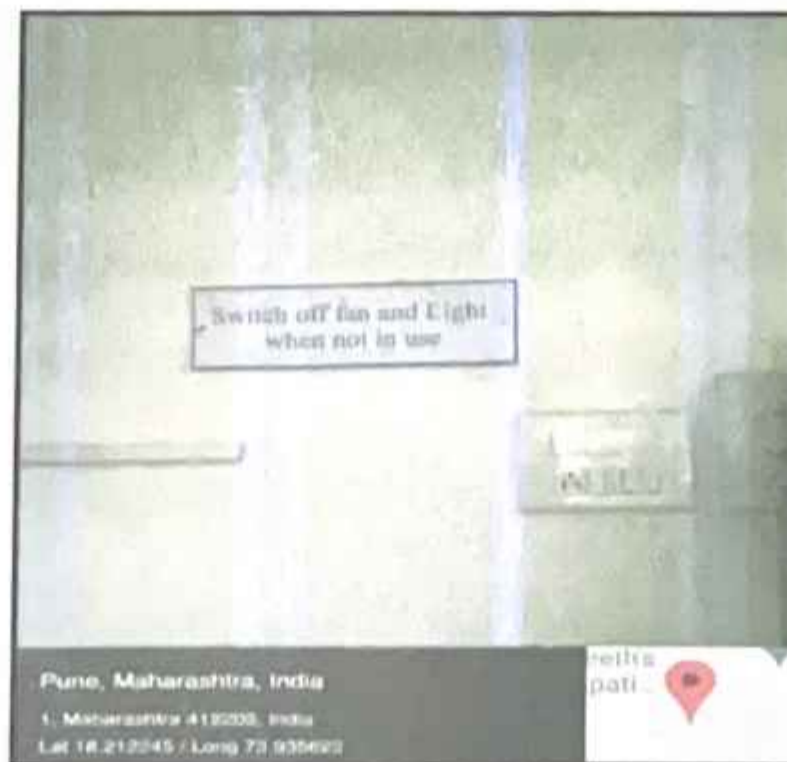
Photograph of Tree plantation in the campus:



### 8.2 Creation of Awareness about Energy Conservation:

The College has displayed posters on importance Energy Conservation.

Photograph of Poster on Importance of Energy Conservation:



## ANNEXURE: AIR QUALITY, NOISE & 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%

# GREEN AUDIT REPORT

of

Rajgad Dnyanpeeth's,  
**SHRI CHHATRAPATI SHIVAJIRAJE COLLEGE OF ENGINEERING,**  
Dhangawadi, Tal: Bhore, Dist: Pune



Year: 2022-23

Prepared by

## ENGRESS SERVICES

Yashashree, 26, Nirmal Bag Society  
Near Mukhtangan English School, Parvati, Pune 411009  
Phone: 09890444795 Email: [engress123@gmail.com](mailto:engress123@gmail.com)





## ENGRESS SERVICES

Yashashree, 26, Nirmal Bag Society, Near Mukhtangan English School,  
Parvati, Pune 411 009 Tel: 09890444795 Email: [engress123@gmail.com](mailto:engress123@gmail.com)  
MEDA Registration No: ECN/2022-23/CR-43/1709  
ISO: 9001-2015 Certified (Cert No: 23EQKC13),  
ISO: 14001-2015 Certified (Cert No: 23EEKW20)

## GREEN AUDIT CERTIFICATE

Certificate No: ES/RDSCSCOE/22-23/02

Date: 20/6/2023


This is to certify that we have conducted Green Audit at Rajgad Dnyanpeeth's Shri Chhatrapati Shivajiraje College of Engineering, Dhangawadi, Tal: Bhore, Dist: Pune in the year 2022-23.

The College has adopted following Energy Efficient and Green practices:

- Usage of Energy Efficient LED Fittings,
- Installation of 10 kWp Roof top Solar PV Plant
- Installation of Solar Thermal Water Heating System at Hostel Block
- Segregation of Waste at Source
- Installation of Biogas Plant for conversion of Leftover Food Waste
- Provision of Sanitary Waste Incinerator
- Provision of Septic Tank, for Disposal of Liquid Waste
- Installation of Rain water Management Project
- Good internal road
- Internal Tree plantation
- Provision of Ramp for Divyangajan
- Creation of Awareness on Energy Conservation by Display of Posters

We appreciate the involvement of the students and faculty members and the cooperation extended by the management, in the process of Energy Conservation & making the campus Green.

For Engress Services,



A Y Mehendale,

B E- Mech, M Tech-Energy, Certified Energy Auditor, EA-8192  
ASSOCHAM GEM Certified Professional: GEM: 22/788



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 Rajgad Dnyanpeeth's Shri Chhatrapati Shivajiraje College of Engineering, Dhangawadi, Tal: Bhor, Dist: Pune for awarding us the assignment of Green Audit of their Dhangawadi Campus for the Year: 2022-23.

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



## EXECUTIVE SUMMARY

1. Shri Chhatrapati Shivajiraje College of Engineering, Dhangawadi, Tal: Bhor, Dist: Pune consumes Energy in the form of Electrical Energy used for various gadgets, Office & other facilities.

### 2. Present Energy Consumption & CO<sub>2</sub> Emission:

No	Particulars	Value	Unit
1	Annual Energy Purchased	90551	kWh
2	Annual CO <sub>2</sub> Emissions	81.50	MT

### 3. Usage of Renewable Energy & Reduction in CO<sub>2</sub> Emissions:

- The Energy generated by 10 kWp Roof Top Solar PV Plant in 22-23 is 12000 kWh.
- Reduction in CO<sub>2</sub> Emissions in 22-23 is 10.8 MT

### 4. Waste Management:

No	Head	Particulars
1	Solid Waste	Segregation of Waste at source
2	Food Waste	Installed Bio Gas Plant
3	Sanitary Waste	Installed Sanitary Waste Incinerator
4	Liquid Waste	Septic Tank installed & cleaned periodically
5	E Waste	Disposed of through Authorized Agency 'SWaCH'

### 5. Rain Water Management:

The Rain Water from the Terrace & from the Hill slopes is collected and used to increase the Underground Water Table.

### 6. Green & Sustainable Practices:

- Maintenance of good Internal Road
- Tree Plantation in the campus.
- Provision of Ramp for Divyangajan
- Creation of awareness on Energy Conservation Display of Posters

### 7. Assumptions:

1. 1 kWh of Electrical Energy releases 0.9 Kg of CO<sub>2</sub> into atmosphere
2. Energy generated by Roof Top Solar PV Plant: 4 kWh/kWp per Day
3. Annual Solar Energy generation Days: 300 Nos

### 8. References:

- For CO<sub>2</sub> Emissions: [www.tatapower.com](http://www.tatapower.com)
- For Solar PV Energy generation: [www.solarrooftop.gov.in](http://www.solarrooftop.gov.in)

## ABBREVIATIONS

LED	:	Light Emitting Diode
kW	:	kilo-Watt
kWh	:	kilo-Watt Hour
LPD	:	Liters per Day
kWp	:	Kilo Watt peak
MT	:	Metric Ton



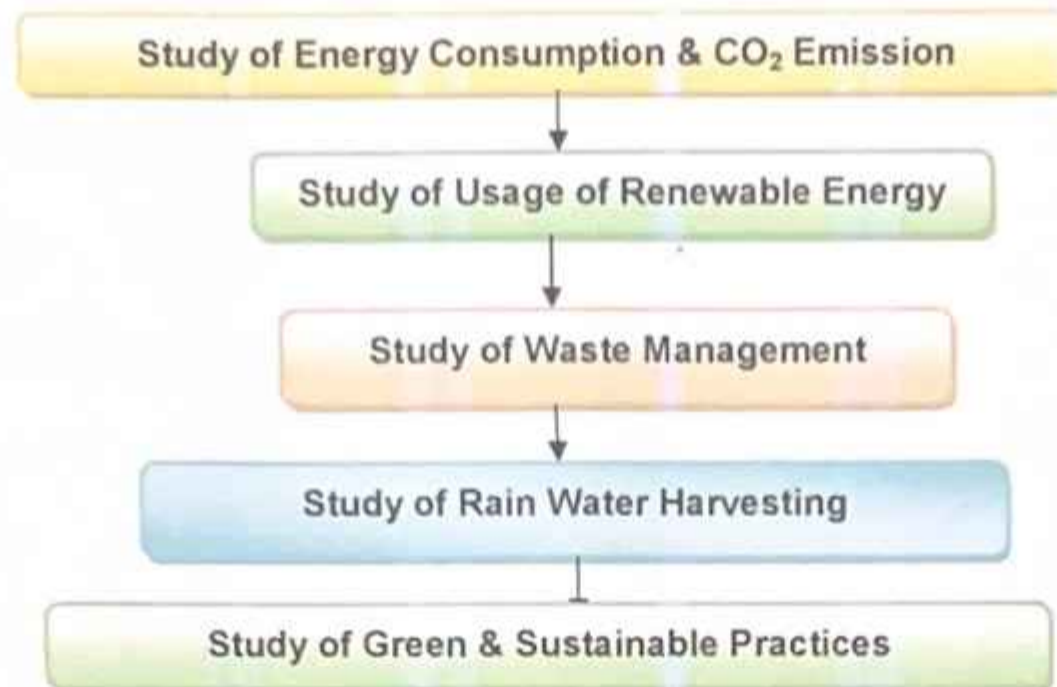


## CHAPTER-I INTRODUCTION

### 1.1 Introduction:

A Green Audit is conducted at Rajgad Dnyanpeeth's Shri Chhatrapati Shivajiraje College of Engineering, Dhangawadi, Tal: Bhor, Dist: Pune

### 1.2 Audit Procedural Steps:



### 1.3 Institute Location Image:



College  
Campus

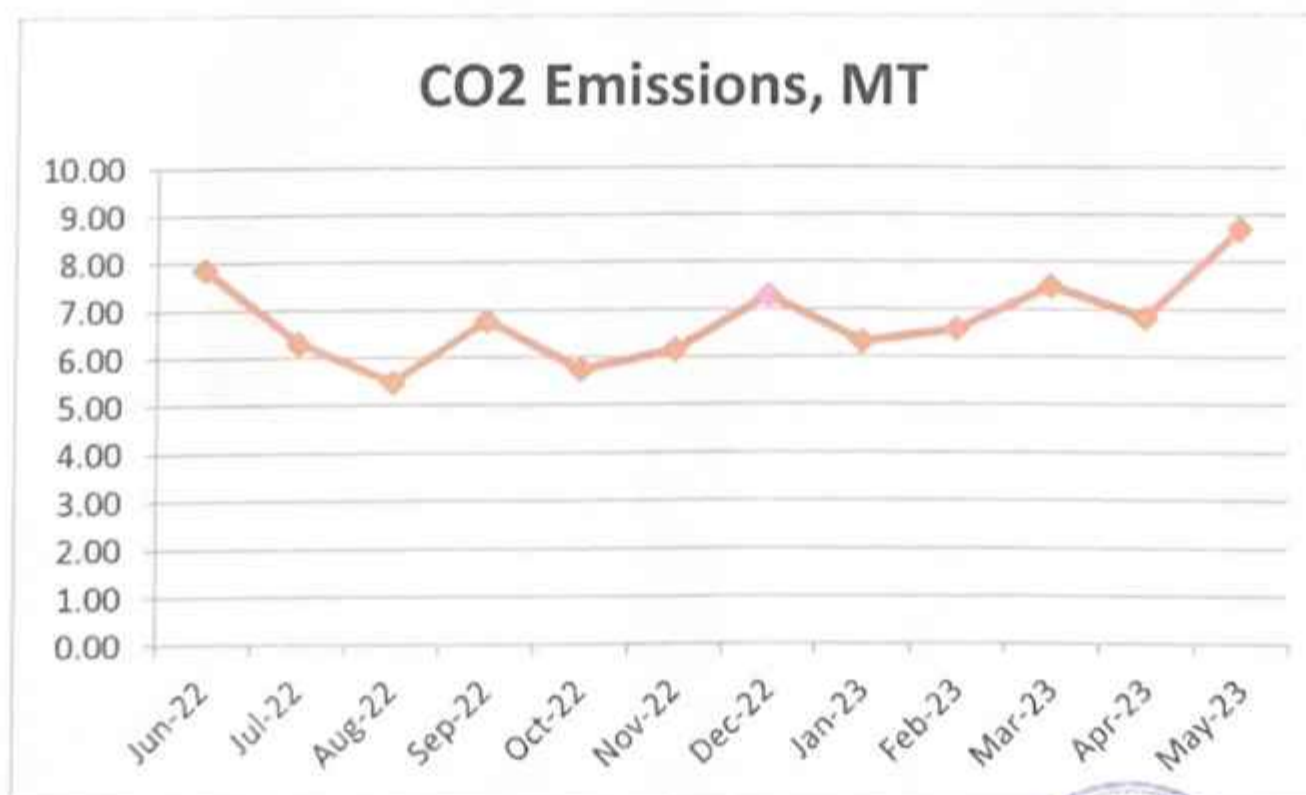
## CHAPTER-II STUDY OF ENERGY CONSUMPTION & CO<sub>2</sub> EMISSION

A Carbon Foot print is defined as the Total Greenhouse Gas emissions, emitted due to various activities. Basis for computation of CO<sub>2</sub> Emissions: 1 kWh of Electrical Energy releases 0.9 Kg of CO<sub>2</sub> into atmosphere.

Table No 1: Month wise Energy Consumption & CO<sub>2</sub> Emissions:

No	Month	Energy Purchased, kWh	CO <sub>2</sub> Emissions, MT
1	Jun-22	8736	7.86
2	Jul-22	7009	6.31
3	Aug-22	6090	5.48
4	Sep-22	7530	6.78
5	Oct-22	6375	5.74
6	Nov-22	6834	6.15
7	Dec-22	8098	7.29
8	Jan-23	7015	6.31
9	Feb-23	7316	6.58
10	Mar-23	8319	7.49
11	Apr-23	7582	6.82
12	May-23	9647	8.68
13	Total	90551	81.50
14	Maximum	9647	8.68
15	Minimum	6090	5.48
16	Average	7545.92	6.79

Chart No 1: Chart No 1: Month wise CO<sub>2</sub> Emissions:





### CHAPTER-III STUDY OF USAGE OF RENEWABLE ENERGY

The College has installed Roof top Solar PV Plant of Capacity 10 kWp. For Hostel blocks, the Solar Thermal Hot water System is used. The capacity is 10000LPD.

Table No 2: Computation of CO<sub>2</sub> Emission reduction by Solar PV Plant:

No	Particulars	Value	Unit
1	Installed Capacity of Roof Top Solar PV Plant Capacity	10	kWp
2	Energy Generated in per kWp	4	4 kWh/kWp
3	Annual Solar Energy generation Days	300	Nos
4	Energy Generated in the Year: 21-22	12000	kWh
5	1 kWh of Electrical Energy saves	0.9	Kg/kWh
6	Qty of CO <sub>2</sub> Saved by Solar PV Plant $= (4) * (5) / 1000$	10.8	MT of CO <sub>2</sub>

Photograph of 10 kWp Roof top Solar PV Plant:





## CHAPTER V STUDY OF WASTE MANAGEMENT

### 5.1 Segregation of Waste at Source:

Separate Waste Collection Bins are placed at important locations. The Waste is segregated at source. The Collected Waste is further given for disposal.

#### Photograph of Waste Collections Bin:



### 5.2 Food Waste Management:

This College has installed Biogas plant to convert the Organic Waste into Bio Gas, which is used in the College mess.

#### Photograph of Biogas Plant:



### 5.3 Sanitary Waste Management:

The College has installed Sanitary Waste Incinerator to dispose of the Sanitary Waste.

Photograph of Sanitary Waste Incinerator:



### 5.4 Liquid Waste Management:

The College has installed Septic Tank and cleaned periodically.

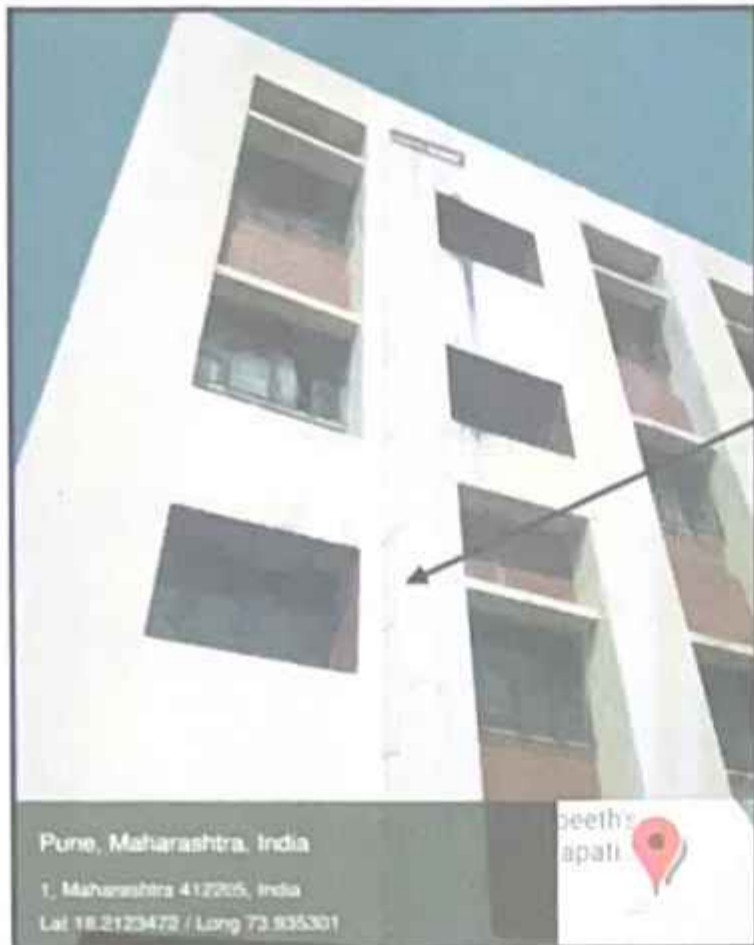
### 5.5 E-Waste Management:

The E Waste is handed over to Authorized Agency M/s 'SWaCH' Pune

## CHAPTER VI STUDY OF RAIN WATER MANAGEMENT

The College has installed Rainwater Management Project. The Rain Water is collected from the Terrace & from the hill slope, and is used to increase the Underground Water Table.

Photograph of Rain water Management Pipe:



Rain Water  
Collecting Pipe



## CHAPTER VII STUDY OF GREEN & SUSTAINABLE PRACTICES

### 7.1 Pedestrian Friendly Road:

The College has well defined pedestrian foot paths as to facilitate the easy movement of the students within the campus.

Photograph of internal road in the campus:



### 7.2 Tree Plantation & Internal Garden:

The College has well maintained Garden in the campus. The details of Trees are furnished in the Annexure.

Photograph of Tree plantation in the campus:



### 7.3 Ramp for Divyangajan:

The College has made provision of Ramp for easy movement of Divyangajan.

#### Photograph of Ramp:



### 7.4 Creation of Awareness about Energy Conservation:

The College has displayed posters on importance Energy Conservation.

#### Photograph of Poster on Importance of Energy Conservation:





## ANNEXURE

### LIST OF TREES IN THE CAMPUS

#### List of Trees & Plants:

No	Common Name	Quantity	No	Common Name	Quantity
1	Nim	5	34	Tikoma	1
2	Karanj	1	35	Umbar	1
3	Umbar	1	36	Rui	1
4	Tantanee	1	37	Shisav	28
5	Chandan	1	38	Subhabul	1
6	Rui	1	39	Mango	7
7	Sag	2	40	Bhabul	2
8	Gulmohar	3	41	Vad	5
9	Shisav	4	42	Gulmohar	27
10	Supari	4	43	Jambhul	1
11	Vad	2	44	Sag	1
12	Mango	3	45	Pangara	1
13	Bottol Palm	23	46	Nim	1
14	Rose	2	47	Karanj	3
15	Jasmine	3	48	Duranda	409
16	Mango	2	49	Rui	2
17	Tikoma	1	50	Naral	3
18	Shisav	27	51	Junikeras	1
19	Karanj	3	52	Rose	4
20	Gulmohar	1	53	Jasmine	3
21	Kashiya	4	54	Aboli	1
22	Shisav	50	55	X - Mas Tree	1
23	Nilgiri	23	56	Duranda	14
24	Karanj	3	57	HemiliyaPentas	114
25	Savar	3	58	Areca Palm	4
26	Bor	1	59	X - Mas Tree	1
27	Pangara	1	60	Duranda	17
28	Jambhul	3	61	HemiliyaPentas	135
29	Bakul	1	62	Areca Palm	4
30	Silver Oke	1	63	X - Mas Tree	1
31	Mango	1	64	Duranda	92
32	Gulmohar	1	65	HemiliyaPentas	40
33	Subhabul	1	66	Areca Palm	3