

ENVIRONMENTAL AUDIT REPORT

of

Shri Shivaji Education Society's,
ARTS & COMMERCE COLLEGE, JARUD,
Dist: Amravati 444 908



Year: 2021-22

Prepared by:

ENGRESS SERVICES

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



MAHARASHTRA ENERGY DEVELOPMENT AGENCY

Maharashtra Energy Development Agency
(Government of Maharashtra Institution)
Aundh Road, Opposite Spicer College Road, Near Commissionerate of Animal Husbandary,
Aundh, Pune, Maharashtra 411067
Ph No: 020-35006450
Email: eee@maharaja.com, Web: www.maharaja.com

ECN/2022-23/CR-45/1709 10th May, 2022

**CERTIFICATE OF REGISTRATION
FOR CLASS 'A'**

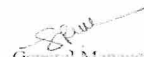
We hereby certify that, the firm having following particulars is registered with **MAHARASHTRA ENERGY DEVELOPMENT AGENCY (MEDA)** under given category as "Energy Planner & Energy Auditor" in Maharashtra for Energy Conservation Programme of MEDA.

Name and Address of the firm : M/s Engress Services
Yashdree, 26, Nirmal Bag Society,
Near Muktaganj English School,
Parvati, Pune - 411 009.

Registration Category : *Empanelled Consultant for Energy Conservation Programme for Class 'A'*

Registration Number : *MEDA/ECN/2022-23/Class A/EA-32.*

- Energy Conservation Programme intends to identify areas where wasteful use of energy occurs and to evaluate the scope for Energy Conservation and take concrete steps to achieve the evaluated energy savings.
- MEDA reserves the right to visit at any time without giving prior information to verify quarterly activities performed by the firm and canceling the registration, if the information is found incorrect.
- This empanelment is valid till **09th May, 2024** from the date of registration, to carry out energy audits under the Energy Conservation Programme
- The Director General, MEDA reserves the right to cancel the registration at any time without assigning any reasons thereof.


General Manager (EC)

 **GEM Certificate** 

ASSOCHAM hereby certifies that
Mr. A Y Mehendale

has successfully passed the
Green and Eco-friendly Movement Certified Professional Test (GEM CP)
with
"Excellent Performance"
on
06 June, 2022

*He/she is now eligible to execute the GEM Sustainability Certification Projects.
ASSOCHAM feels proud to award the GEM Certified Professional title to him/her.*

 **Pankaj R. Dharkar**
Chairman, GEM

GEM CP 22/788

 **Deepak Sood**
Secretary General, ASSOCHAM



ENGRESS SERVICES

Yashashree, 26, Nirmal Bag Society,
Near Muktangang English School, Parvati, Pune 411 009
Tel: 09890444795 Email: engress123@gmail.com

Ref: ES/ACCJ/21-22/03

Date: 10/6/2022

CERTIFICATE

This is to certify that we have conducted Environmental Audit at Shri Shivaji Education Society's Arts & Commerce College, Jarud, Dist: Amravati in the Year 2021-22.

The College has adopted following Environment Friendly Initiatives:

- Usage of Energy Efficient LED Light Fitting
- Maximum Usage of Day Lighting
- Installation of Roof Top Solar PV Plant of Capacity 3 kWp.
- Segregation of Waste at Source
- Implementation of Rain Water Management Project
- Tree Plantation in the campus
- Creation of Awareness on Resource Conservation by Display of Posters

We appreciate the support of Management, involvement of faculty members and students in the process of Energy Conservation & making the campus Environment Friendly.

For Engress Services,



A Y Mehendale,

Certified Energy Auditor, EA-8192

ASSOCHAM GEM Certified Professional: GEM: 22/788



INDEX

Sr. No	Particulars	Page No
I	Acknowledgement	5
II	Executive Summary	6
III	Abbreviations	8
1	Introduction	9
2	Study of Resource Consumption & CO ₂ Emission	12
3	Study of CO ₂ Emission Reduction	14
4	Study of Indoor Air Quality	15
5	Study of Indoor Comfort Condition Parameters	16
6	Study of Waste Management	17
7	Study of Rain water Management	18
8	Study of Environment Friendly Initiatives	19
	Annexure	
I	Various Standards in respect of Indoor Air Quality, Water, Noise & Indoor Comfort Condition	20



ACKNOWLEDGEMENT

We Engress Services, Pune, express our sincere gratitude to the management of Shri Shivaji Education Society's Arts & Commerce College, Jarud, Dist: Amravati, for awarding us the assignment of Environmental Audit of their Campus for the Academic Year: 21-22.

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



EXECUTIVE SUMMARY

1. **Shri Shivaji Education Society's Arts & Commerce College, Jarud, Dist: Amravati** consumes Energy in the form of **Electrical Energy** used for various Electrical Equipment, 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 Emission:

No	Parameter/ Value	Energy Purchased, kWh	CO ₂ Emissions, MT
1	Total	1834	1.65
2	Maximum	174	0.16
3	Minimum	121	0.11
4	Average	152.83	0.14

4. Various initiatives taken for Energy Conservation:

- Usage of Energy Efficient LED Lighting
- Maximum Usage of Day Lighting
- Installation of Roof Top Solar PV Plant of Capacity 3 kWp

5. Usage of Renewable Energy & Reduction in CO₂ Emission:

The College has installed Roof Top Solar PV Plant of Capacity **3 kWp**.

The Electrical Energy generated in 21-22 is **3600 kWh**.

Reduction in CO₂ Emissions in 21-22 is **3.24 MT**.

6. Indoor Air Quality Parameters:

No	Parameter/Value	AQI	PM-2.5	PM-10
1	Maximum	106	62	82
2	Minimum	100	60	76

7. Indoor Comfort Conditions:

No	Parameter/Value	Temperature, °C	Humidity, %	Lux Level	Noise Level, dB
1	Maximum	29.6	41	134	45
2	Minimum	29.1	39	105	40

8. Waste Management:

8.1 Segregation of Waste at Source:

The Waste is segregated at source and the recyclable waste, like paper waste is handed over to Authorized Agency for further action.

8.2 Organic Waste Management:

It is recommended to convert the Organic Waste in to Bio Compost in a Bio Composting Pit.

8.3 E Waste Management:

It is recommended to dispose of the E Waste through Authorized Agency

9. Rain Water Management:

The College has implemented the Rain Water Management Project. The College has installed Pipes from the terrace and the Rain water falling on the terrace is gathered and is stored in a well and is used for gardening.

10. Environment Friendly Initiatives:

- Good Internal Road
- Tree Plantation in the campus
- Provision of Ramp for Divyangajan
- Creation of Awareness about Resource Conservation by Display of Posters

11. Assumptions:

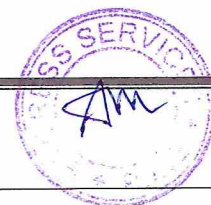
1. **1 kWh** of Electrical Energy releases **0.9 Kg** of **CO₂** into atmosphere
2. **1 kWp** Roof Top Solar PV Plant releases **4 kWh** of Electrical Energy per Day.
3. Annual Solar Energy Generation Days: **300 Nos.**

12. References:

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

ABBREVIATIONS

Kg	:	Kilo Gram
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

1.1 Important Definitions:

1.1.1 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 compiled 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.

1.1.4. Relevant Environmental Laws in India: Table No-1:

1927	The Indian Forest Act
1972	The Wildlife Protection Act
1974	The Water (Prevention and Control of Pollution) Act
1977	The Water (Prevention & Control of Pollution) Cess Act
1980	The Forest (Conservation) Act
1981	The Air (Prevention and Control of Pollution) Act
1986	The Environment Protection Act
1991	The Public Liability Insurance Act
2002	The Biological Diversity Act
2010	The National Green Tribunal Act

1.1.5. Some Important Environmental Rules in India: Table No-2:

1989	Hazardous Waste (Management and Handling) Rules
1989	Manufacture, Storage and Import of Hazardous Chemical Rules
2000	Municipal Solid Waste (Management and Handling) Rules
1998	The Biomedical Waste (Management and Handling) Rules
1999	The Environment (Siting for Industrial Projects) Rules
2000	Noise Pollution (Regulation and Control) Rules
2000	Ozone Depleting Substances (Regulation and Control) Rules
2011	E-waste (Management and Handling) Rules

2011	National Green Tribunal (Practices and Procedure) Rules
2011	Plastic Waste (Management and Handling) Rules

1.1.6 National Environmental Plans & Policy Documents: Table No-3:

1.	National Forest Policy, 1988
2.	National Water Policy, 2002
3.	National Environment Policy or NEP (2006)
4.	National Conservation Strategy and Policy Statement on Environment and Development, 1992
5.	Policy Statement for Abatement of Pollution (1992)
6.	National Action Plan on Climate Change
7.	Vision Statement on Environment and Human Health
8.	Technology Vision 2030 (The Energy Research Institute)
9.	Addressing Energy Security and Climate Change (MoEF and Bureau of Energy Efficiency)
10	The Road to Copenhagen; India's Position on Climate Change Issues (MoEF)

1.2 Objectives:

1. To study Resource Consumption & CO₂ Emissions
2. To Study CO₂ Emission Reduction
3. To study Indoor Air Quality Parameters
4. To study Indoor Comfort Condition Parameters
5. To Study of Waste Management
6. To Study of Rain Water Management
7. To Study of Environment Friendly Initiatives

1.3 General Details of College: Table No 4:

No	Head	Particulars
1	Name of Institution	Shri Shivaji Education Society's Arts & Commerce College
2	Address	Jarud, Dist: Amravati 444 908
3	Affiliation	Sant Gadgebaba Amravati University



1.4 Google Earth Image:



College
Campus



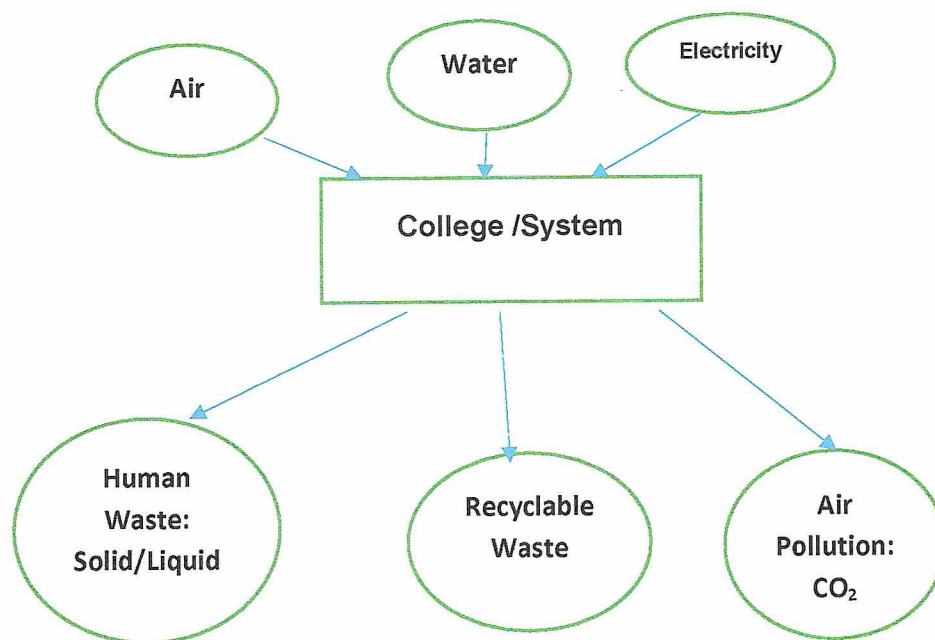
CHAPTER-II STUDY OF CONSUMPTION OF RECOURCES & CO₂ EMISSION

The Institute 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 5: Study of Consumption of Electrical Energy & CO₂ Emissions: 21-22:

No	Month	Energy Purchased, kWh	CO ₂ Emissions, MT
1	Apr-21	156	0.14
2	May-21	168	0.15
3	Jun-21	172	0.15
4	Jul-21	164	0.15
5	Aug-21	174	0.16
6	Sep-21	121	0.11

7	Oct-21	145	0.13
8	Nov-21	154	0.14
9	Dec-21	168	0.15
10	Jan-22	150	0.14
11	Feb-22	131	0.12
12	Mar-22	131	0.12
13	Total	1834	1.65
14	Maximum	174	0.16
15	Minimum	121	0.11
16	Average	152.83	0.14

Chart No 2: Month wise CO₂ Emissions:

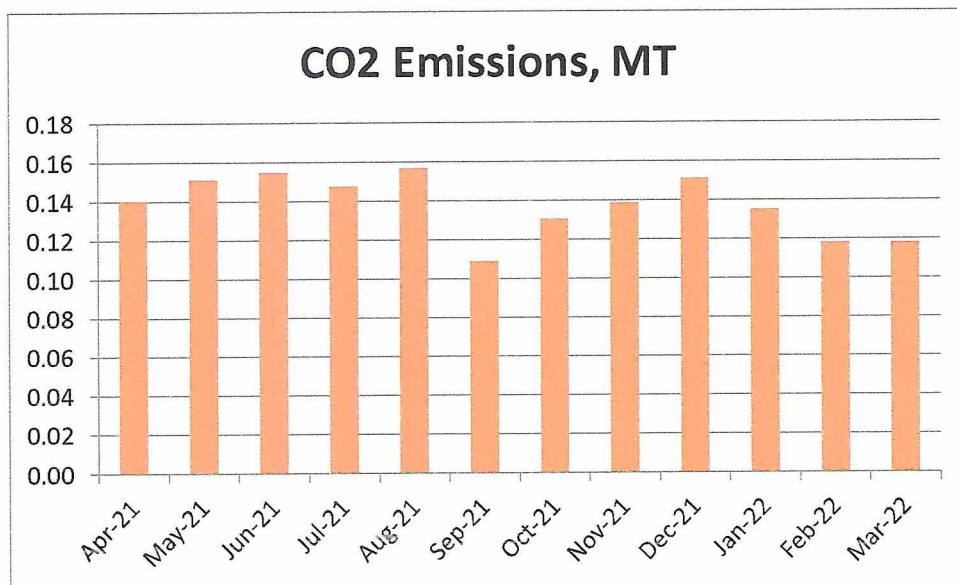


Table No 6: Important Parameters:

No	Parameter/ Value	Energy Consumed, kWh	CO ₂ Emissions, MT
1	Total	1834	1.65
2	Maximum	174	0.16
3	Minimum	121	0.11
4	Average	152.83	0.14



CHAPTER III STUDY OF CO₂ EMISSION REDUCTION

The College has installed Roof Top Solar PV Plant of Capacity 3 kWp.

In the following Table, we compute the Annual Reduction in CO₂ Emissions due to installation of Roof Top Solar PV Plant.

Table No 6: Computation of Annual Reduction in CO₂ Emissions:

No	Particulars	Value	Unit
1	Installed Capacity of Roof Top Solar PV Plant Capacity	1	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	3600	kWh
5	1 kWh of Electrical Energy saves	0.9	Kg/kWh
6	Qty of CO ₂ Saved by Solar PV Plant $= (4) * (5) / 1000$	3.24	MT of CO ₂

Photograph of 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.

Rapid urbanization and industrialization has added other elements/compounds to the pure air and thus caused the increase in pollution. In order to prevent, control and abate air pollution, the Air (Prevention and Control of Pollution) Act was enacted in 1981.

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.'

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. The measurement of the AQI requires an **air monitor** and an **air pollutant** concentration over a specified **averaging period**.

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 10micron

Table No 8: Indoor Air Quality Parameters:

No	Location	AQI	PM-2.5	PM-10
1	Principal Cabin	103	61	81
2	Office	100	60	76
3	Class Room	100	61	78
4	NSS Cell	106	62	82
5	Library	99	67	78
	Maximum	106	62	82
	Minimum	100	60	76

CHAPTER V

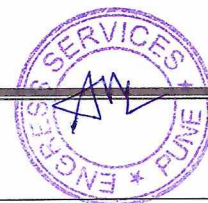
STUDY OF INDOOR COMFORT CONDITION PARAMETERS

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 9: Study of Indoor Comfort Condition Parameters:

No	Location	Temperature, °C	Humidity, %	Lux Level	Noise Level, dB
1	Principal Cabin	29.2	40	134	45
2	Office	29.1	41	119	44.6
3	Class Room	29.2	41	115	44.9
4	NSS Cell	29.1	41	105	42
5	Library	29.6	39	125	40
	Maximum	29.6	41	134	45
	Minimum	29.1	39	105	40



CHAPTER VI STUDY OF WASTE MANAGEMENT

6.1 Segregation of Waste at Source:

The Waste is segregated at source and the recyclable waste, like paper waste is handed over to Authorized Agency for further action.

Photograph of Waste Collection Bin:



6.2 Organic Waste Management:

It is recommended to convert Organic Waste into Bio compost in a Bio Composting Pit.

6.3 E Waste Management:

It is recommended to dispose of the E Waste through Authorized Agency.

CHAPTER-VII STUDY OF RAIN WATER MANAGEMENT

The College has implemented the Rain Water Management Project. The College has installed Pipes from the terrace and the Rain water falling on the terrace is gathered and is stored in a well and is used for gardening.

Photograph of Rain water Harvesting Pipe:



Rain Water
Collecting Pipe

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 Plastic Free Campus:

The College has displayed posters emphasizing on importance of Ban on Plastic.

Photograph of Poster on Plastic Free Campus:



**ANNEXURE-I:
VARIOUS AIR QUALITY, WATER 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 Water Quality Standards:

No	Designated Best Use	Criteria
1	Drinking Water Source without conventional Treatment but after disinfection	pH between 6.5 to 8.5 Dissolved Oxygen 6 mg/l or more
2	Drinking water source after conventional treatment and disinfection	pH between 6 to 9 Dissolved Oxygen 4 mg/l or more
3	Outdoor Bathing (Organized)	pH between 6.5 to 8.5 Dissolved Oxygen 5 mg/l or more
4	Controlled Waste Disposal	pH between 6 to 8.5

3. 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

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

No	Parameter	Value
1	Temperature	Less Than 33 ⁰ C
2	Humidity	Less Than 70%

