Shri. Shivaji Education Society, Amravati's

ARTS AND COMMERCE COLLEGE, JARUD

Website: www.artscollegejarud.org

Criterion7: Institutional Values and Best Practices

7.1.3 Quality audits on environment and energy

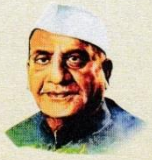
ARTS AND COMMERCE COLLEGE, JARUD

(run by Shri Shivaji Education Society, Amravati)

Tah. Warud, Dist. Amravati - 444 908

Website : artscollegejarud.org., E-mail : accjarud@gmail.com (College Code :137)

NAAC Accredited 'B' Grade



President
Shri Harshwardhan Deshmukh
Shri Shivaji Education Society, Amravati

Principal
Dr. G. R. Tadas
M.A.(Econamics),M.Phill,Ph.D.

Founder President
Dr.Panjabrao alias Bhausaheb Deshmukh
M.A., D.Phill.,L.L.B.Bar-at-Law

Date : 15/05/2023

Declaration

This is to declare that the information, Reports, true copies and numerical data etc. furnished in this file as supporting documents is verified by IQAC and found correct.

DR. A. B. KUKADE
Co-ordinator,
IQAC
Arts & Commerce College, Jarud

Principal
Arts & Commerce College
Jarud, Ta. Warud, Dist. Amravati

Contact No. : 9422857029 / 9421819966

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 Muktangan English School, Parvati, Pune 411009
Phone: 09890444795, Email: engress123@gmail.com

ENGRESS SERVICES PUNE

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: 020-33000450
Email: eee@mahaurja.com, Web: www.mahaurja.com

ECN/2022-23/CR-43/1709 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
Yashshree, 26, Nirmal Bag Society,
Near Muktangan 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)

ASSOCHAM

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 Muktangan 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

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 CO_2 on account of Electricity Consumption
- **Solid Waste:** Bio degradable Garden Waste
- **Liquid Waste:** Human liquid waste

3. Present Energy Consumption & CO_2 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 CO_2 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 CO_2 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, ^0C	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 CO_2 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 CO_2 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

1.1Important 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 & CO_2 Emissions
2. To Study CO_2 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

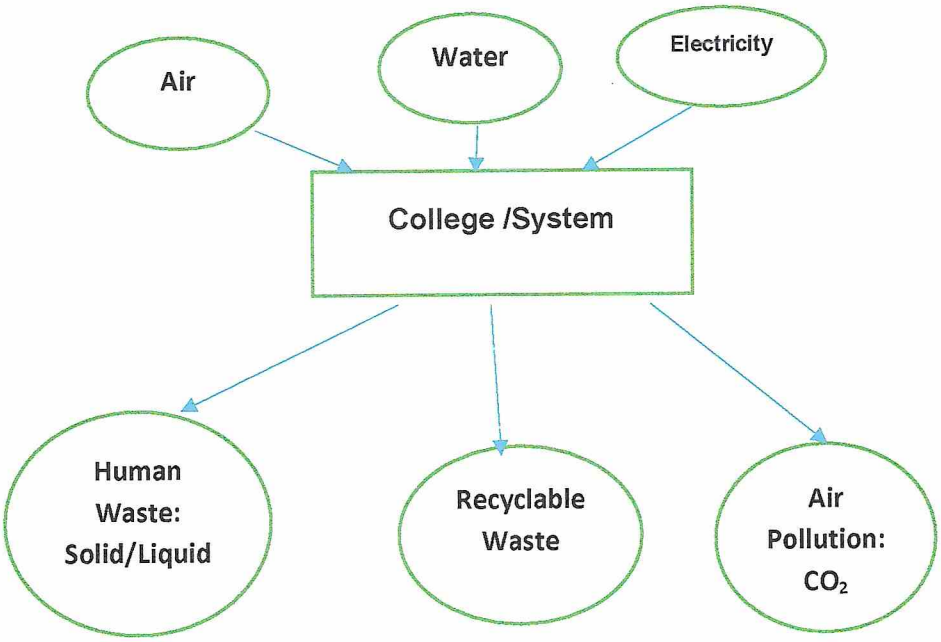
1.4 Google Earth Image:

CHAPTER-II
STUDY OF CONSUMPTION OF RECOURCES & CO_2 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 CO_2 on account of consumption of Electrical Energy. The basis of Calculation for CO_2 emissions due to Electrical Energy is as under

- 1 kWh of Electrical Energy releases **0.9 Kg of CO_2** into atmosphere

Table No 5: Study of Consumption of Electrical Energy & CO_2 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 CO_2 Emissions:

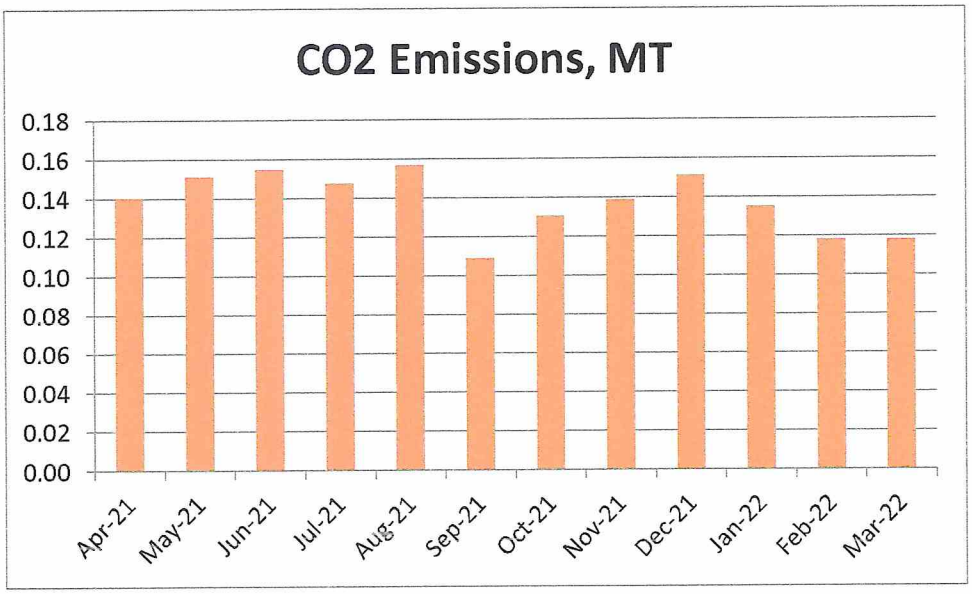


Table No 6: Important Parameters:

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 CO_2 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 CO_2 Emissions due to installation of Roof Top Solar PV Plant.

Table No 6: Computation of Annual Reduction in CO_2 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:

ENGRESS SERVICES * PUNE *

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, ^{0}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.

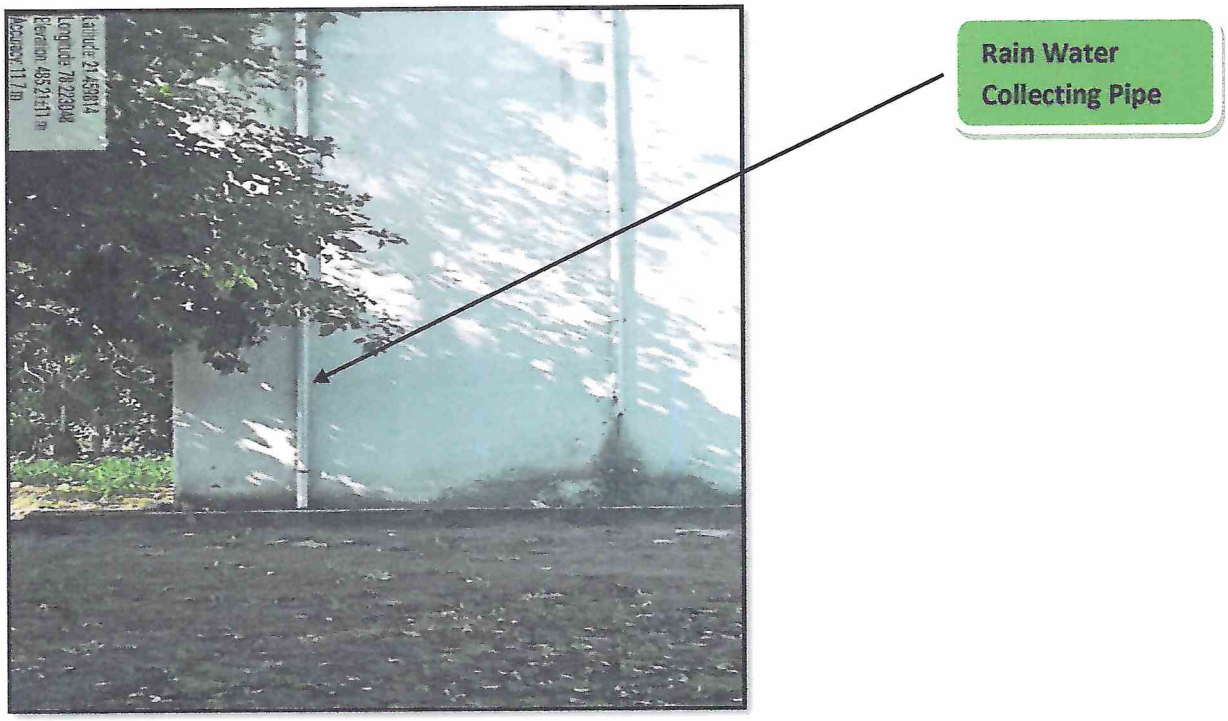
6.3 E Waste Management:

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:



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 33^0C
2	Humidity	Less Than 70%

GREEN AUDIT REPORT

of

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

Year: 2021-22

Prepared by:

ENGRESS SERVICES

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Maharashtra Energy Development Agency
(Government of Maharashtra Institution)
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Ph No: 020-35000450
Email: eee@mahaurja.com, Web: www.mahaurja.com

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Chairman, GEM

GEM CP 22/788

Deepak Sood
Secretary General, ASSOCHAM

ENGRESS SERVICES PUNE

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Tel: 09890444795 Email: engress123@gmail.com

Ref: ES/ACCJ/21-22/02

Date: 10/6/2022

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The College has adopted following Green Initiatives:

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- Maximum Usage of Day Lighting
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- Segregation of Waste at Source
- Implementation of Rain Water Management Project
- Maintenance of Good Internal Road
- Tree Plantation in the campus
- Provision of Ramp for Divyangajan
- Creation of Awareness about 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 Green.

For Engress Services,

A Y Mehendale,
Certified Energy Auditor, EA-8192
ASSOCHAM GEM Certified Professional: GEM: 22/788

ENGRESS SERVICES PUNE

INDEX

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- Maximum Usage of Day Lighting
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- Reduction in CO_2 Emissions in 21-22 is **3.24 MT.**

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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.

7. Green & Sustainable Initiatives:

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

8. Assumptions:

1. **1 kWh** of Electrical Energy releases **0.9 Kg of CO_2** 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.**

9. References:

- For CO_2 Emissions: www.tatapower.com
- For Roof Top Solar Energy generation: www.solarrooftop.gov.in

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 Objectives:

1. To study Present Energy Consumption
2. To Study CO_2 emissions
3. To study usage of Renewable Energy
4. Study of Waste Management
5. Study of Rain Water Harvesting
6. Study of Green & Sustainable Practices

1.2 General Details of College: Table No 1:

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

1.3 Google Earth Image:

CHAPTER-II
STUDY OF PRESENT ENERGY CONSUMPTION

In this chapter, we present the analysis of Electrical Energy & LPG Consumption.

Table No 2: Electrical Energy Consumption Analysis- 2021-22:

No	Month	Energy Purchased, kWh
1	Apr-21	156
2	May-21	168
3	Jun-21	172
4	Jul-21	164
5	Aug-21	174
6	Sep-21	121
7	Oct-21	145
8	Nov-21	154
9	Dec-21	168
10	Jan-22	150
11	Feb-22	131
12	Mar-22	131
13	Total	1834
14	Maximum	174
15	Minimum	121
16	Average	152.83

Chart No 1: Variation in Monthly Energy Purchased:

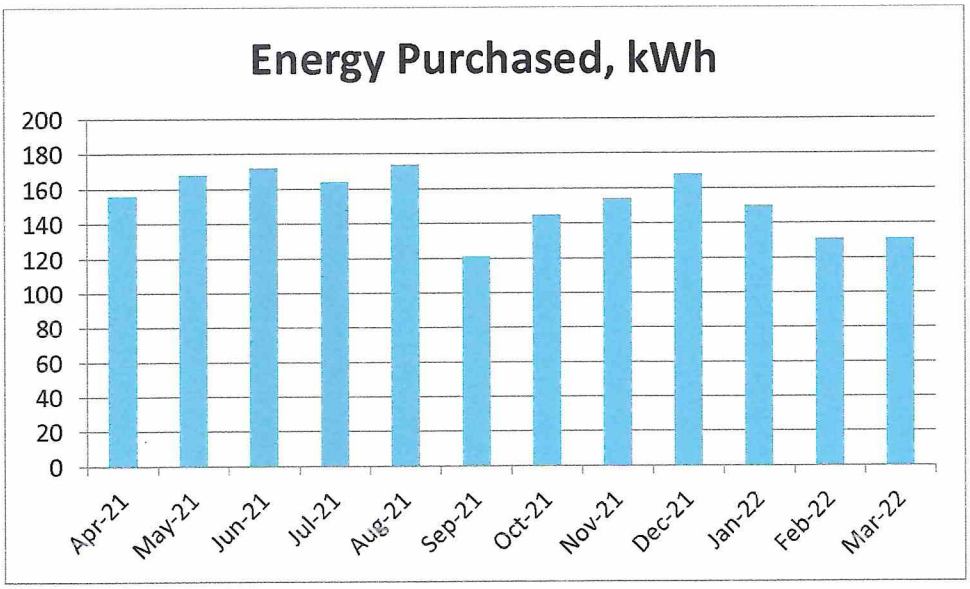


Table No 3: Variation in Important Parameters:

No	Parameter/ Value	Energy Purchased, kWh
1	Total	1834
2	Maximum	174
3	Minimum	121
4	Average	152.83

CHAPTER III
STUDY OF CARBON FOOTPRINTING

A Carbon Foot print is defined as the Total Greenhouse Gas emissions, emitted due to various activities.

In this we compute the emissions of Carbon-Di-Oxide, by usage of the various forms of Energy used by the College for performing its day to day activities

The College uses Electrical Energy as the Energy Source.

Basis for computation of CO_2 Emissions:

- **1 kWh** of Electrical Energy releases **0.9 Kg of CO_2** into atmosphere

Based on the above Data we compute the CO_2 emissions which are being released in to the atmosphere by the College due to its Day to Day operations

Table No 4: Month wise CO_2 Emissions:

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 CO_2Emissions:

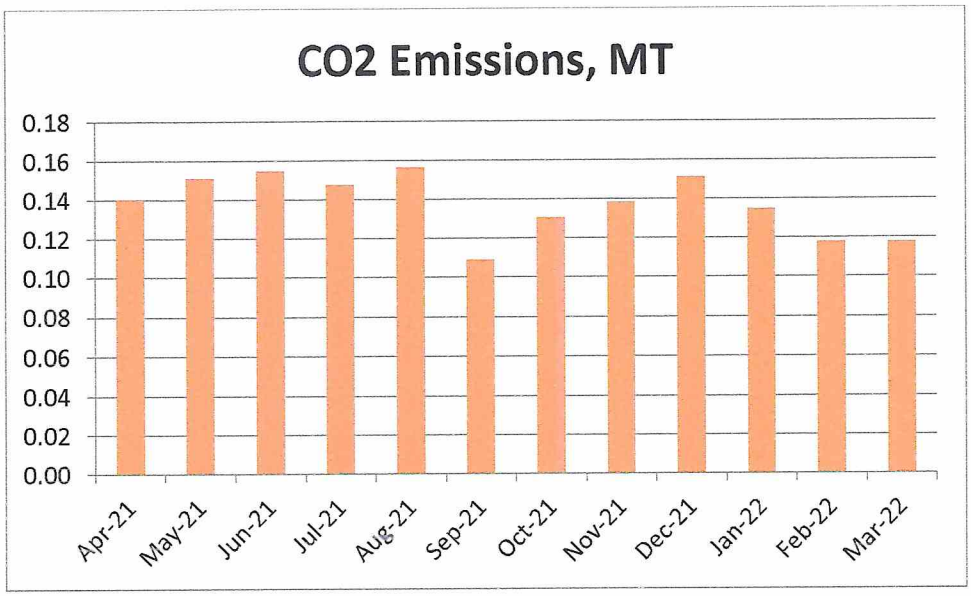


Table No 5: Important Parameters:

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

CHAPTER IV
STUDY OF USAGE OF RENEWABLE ENERGY

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

In the following Table, we compute the Annual Reduction in CO_2 Emissions due to installation of Roof Top Solar PV Plant.

Table No 6: Computation of Annual Reduction in CO_2 Emissions:

No	Particulars	Value	Unit
1	Installed Capacity of Roof Top Solar PV Plant Capacity	3	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 V
STUDY OF WASTE MANAGEMENT

5.1 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:

5.2 Organic Waste Management:

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

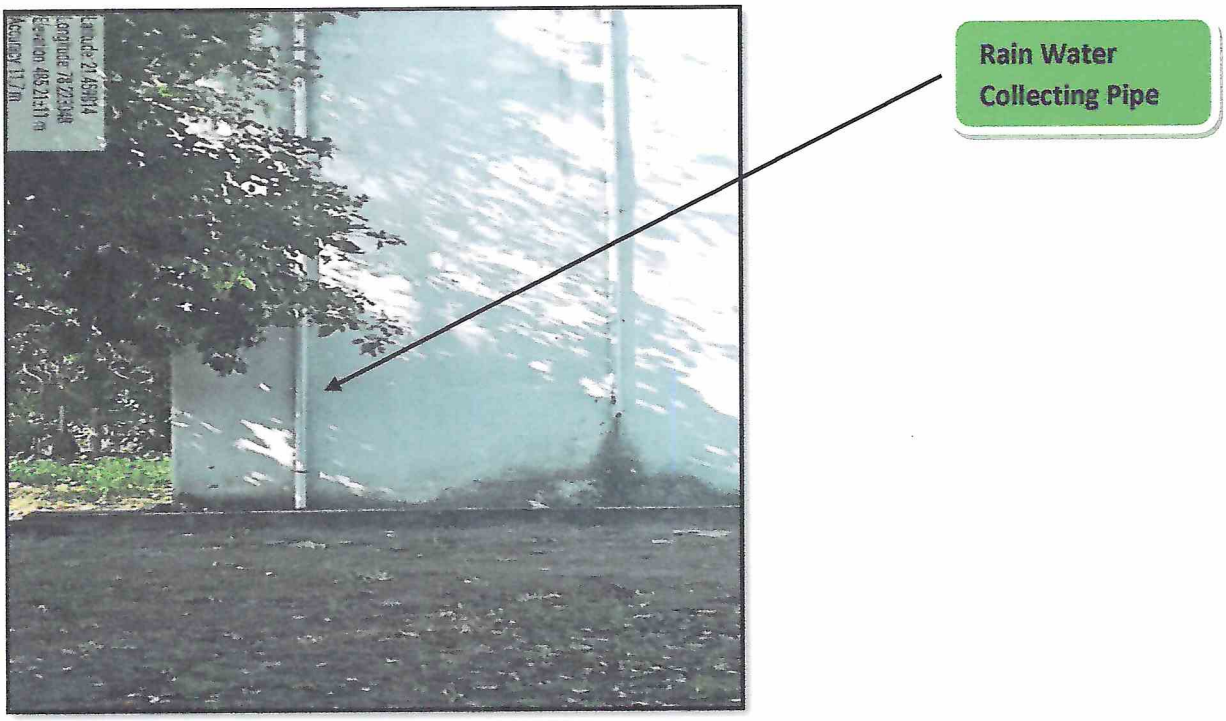
5.3 E Waste Management:

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

CHAPTER-VI
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:

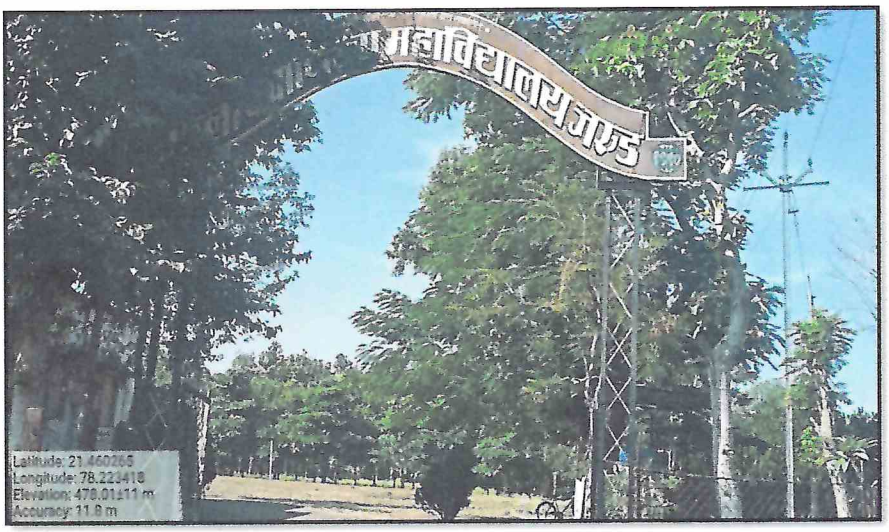


CHAPTER-VII
STUDY OF GREEN & SUSTAINABLE PRACTICES

7.1 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:



7.2 Internal Tree Plantation:

The College has well maintained Tree Plantation in the campus.

Photograph of Tree plantation:

7.3 Provision of Ramp:

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

Photograph of Ramp:

7.3 Creation of Awareness by Display of Posters:

In order to create Awareness about Resource Conservation, Display Posters are placed.

Photograph of Poster on Water Conservation:

ANNEXURE: I
DETAILS OF TREES IN THE CAMPUS

1. List of Trees:

No.	Common Name of Tree
1	Terminalia catappa
2	Tectona grandis
3	Ficus religiosa
4	Delonix regia
5	Azadirachata indica
6	Bixa Orellana
7	Dalbergia sissoo
8	Phyllantusemblica
9	Sapindusmukorossi
10	Ficus benghalensis
11	Arecaceae
12	Ficus recemosa
13	Saracaasoca
14	Tamarindus indica
15	Cassia fistula
16	Ficus benghalensis L
17	Vachellianilotica
18	Ziziphus mauritiana
19	Catharanthus roseus
20	Ehretialaevis
21	Mimusopselengi
22	Annona squamosal
23	Azadirachata indica
24	Bougainvillea
25	Catharanthus roseus
26	Borassus flabellifer
27	Arecaceae
28	Jasminum sambac
29	Saracaasoca
30	Lawsoniainermis
31	Mangifera indiaca L.
32	Thuja
33	Bougainvillea
34	Azadirachataindiaca

ENERGY 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 Muktangan 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: 020-35000450
Email: eee@mahaurja.com, Web: www.mahaurja.com

ECN/2022-23/CR-43/1709 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
Yashshree, 26, Nirmal Bag Society,
Near Muktangan 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)

ENGRESS SERVICES PUNE

ENGRESS SERVICES

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

Ref: ES/ACCJ/21-22/01

Date: 10/6/2022

CERTIFICATE

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

.The College has adopted following Energy Efficient Practices:

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

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,
Certified Energy Auditor
EA-8192

ENGRESS SERVICES * PUNE *

INDEX

ACKNOWLEDGEMENT

We Engress Services, Pune, express our sincere gratitude to the management of Shri Shivaji Education Arts & Commerce College, Jarud, Dist: Amravati, for awarding us the assignment of Energy Audit of their Campus for the 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. Present Energy Consumption & CO_2 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

3. Energy Conservation projects already installed:

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

4. Usage of Alternate Energy:

- The College has installed Roof Top Solar PV Plant of Capacity **3 kWp.**
- Energy purchased from MSEDCL is **1834 kWh.**
- Energy generated by Roof Top Solar PV Plant is **3600 kWh.**
- The Annual Energy Demand of the College is: **5434 kWh.**
- The percentage of Usage of Alternate Energy to Annual Energy Demand is **66 %.**

5. Usage of LED Lighting:

- The Total Lighting Load of the College is **0.59 kW.**
- The Total LED Lighting Load of the College is **0.25 kW.**
- The percentage of LED Lighting to Total Lighting Load is **42 %.**

6. Assumptions:

1. 1 kWh of Electrical Energy releases **0.9 Kg of CO_2** into atmosphere
2. **1 kWp** Roof Top Solar PV Plant generates **4 kWh** of Electrical Energy per Day.
3. Annual Solar Energy Generation Days: **300 Nos.**

7. References:

- For CO_2 Emissions: www.tatapower.com
- For Roof Top Solar PV Plant Energy generation: www.solarrooftop.gov.in

ABBREVIATIONS

LED	:	Light Emitting Diode
MSEDCL	:	Maharashtra State Electricity Distribution Company Limited
IQAC	:	Internal Quality Assurance Cell
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 Objectives:

1. To study Connected Load
2. To study Present Energy Consumption
3. To compute CO_2 emissions
4. To study usage of Alternate Energy
5. To study usage of LED Lighting

1.2 Table No 1: General Details of the College:

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

1.3 Google Earth Image:

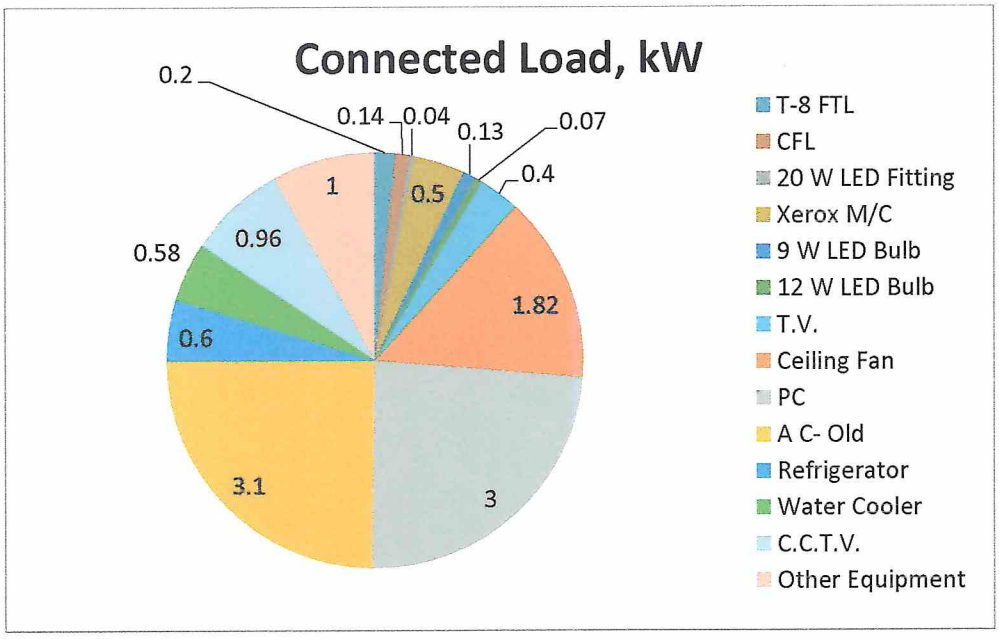
CHAPTER-II
STUDY OF CONNECTED LOAD

The major contributors to the connected load of the College are as under:

Table No 2: Study of Equipment wise Connected Load:

No	Equipment	Qty	Load, W/Unit	Load, kW
1	T-8 FTL	5	40	0.2
2	CFL	10	14	0.14
3	20 W LED Fitting	2	20	0.04
4	Xerox M/C	2	250	0.5
5	9 W LED Bulb	14	9	0.13
6	12 W LED Bulb	6	12	0.07
7	T.V.	2	200	0.4
8	Ceiling Fan	28	65	1.82
9	PC	20	150	3
10	A C- Old	2	1550	3.1
11	Refrigerator	2	300	0.6
12	Water Cooler	1	575	0.58
13	C.C.T.V.	8	120	0.96
14	Other Equipment	5	200	1
15	**Total**			**13**

Chart No 1: Study of Connected Load:



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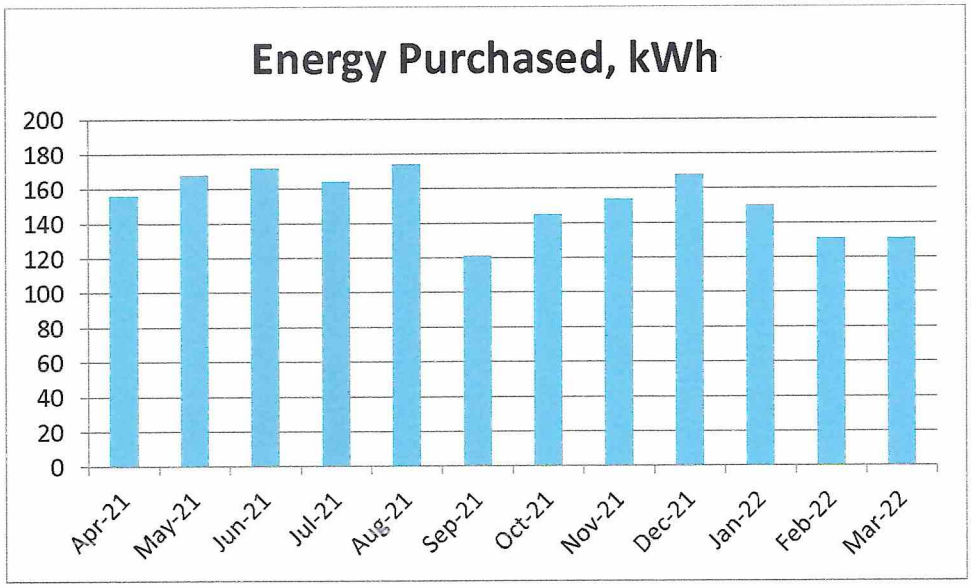

Table No 4: Variation in Important Parameters:

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STUDY OF CARBON FOOTPRINTING

A Carbon Foot print is defined as the Total Greenhouse Gas emissions, emitted due to various activities.

In this we compute the emissions of Carbon-Di-Oxide, by usage of the various forms of Energy used by the College for performing its day to day activities

The College uses Electrical Energy as the Energy Source.

Basis for computation of CO_2 Emission:

- **1 kWh** of Electrical Energy releases **0.9 Kg of CO_2** into atmosphere

Based on the above Data we compute the CO_2 emissions which are being released in to the atmosphere by the College due to its Day to Day operations

Table No 5: Month wise CO_2 Emissions:

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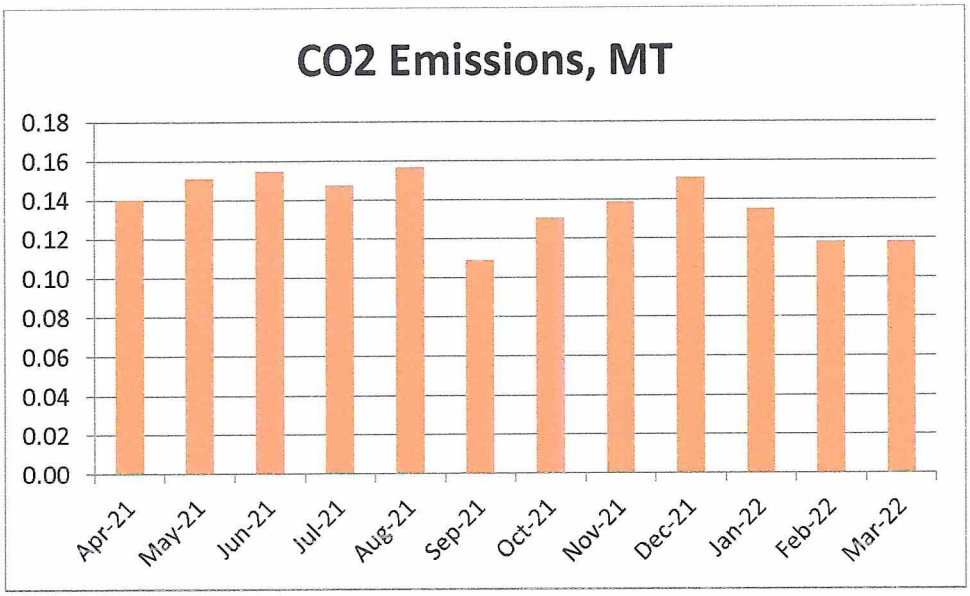

Table No 6: Important Parameters:

No	Parameter/ Value	Energy Purchased, kWh	CO_2 Emissions, MT
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3	Minimum	121	0.11
4	Average	152.83	0.14

CHAPTER-V
STUDY OF USAGE OF ALTERNATE ENERGY

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

In the following Table, we compute the percentage of Usage of Alternate Energy to Annual Energy Demand of the College.

Table No 7: Computation of % Annual Energy Demand met by Alternate Energy:

No	Particulars	Value	Unit
1	Energy Purchased from MSEDCL	**1834**	kWh
2	Installed Roof Top Solar PV Plant Capacity	3	kWp
3	Average Daily Energy Generated per kWp	4	kWh
4	Annual Generation Days	300	Nos
5	Annual Solar Energy Generated	**3600**	kWh
6	Total Energy Demand = (1) + (5)	**5434**	kWh
7	**% of Alternate Energy to Annual Energy Demand=5*100/6**	**66**	**%**

Photograph of Roof Top Solar PV Plant:

CHAPTER VI
STUDY OF USAGE OF LED LIGHTING

In this chapter, we compute the percentage of usage of LED Lighting to Total Lighting Load.

Table No 8: Usage of LED Lighting to Total Lighting Load:

No	Particulars	Value	Unit
1	No of T-8 FTL fittings	5	Nos
2	Load/per Fitting	40	W/Unit
3	Total Load of T-8 FTL Fittings	**0.2**	kW
4	No of CFL fittings	10	Nos
5	Load/per Fitting	14	W/Unit
6	Total Load of CFL Fittings	**0.14**	kW
7	No of 20 W LED fittings	2	Nos
8	Load/per Fitting	20	W/Unit
9	Total Load of 20 W LED Fittings	**0.04**	kW
10	No of 9 W LED fittings	9	Nos
11	Load/per Fitting	9	W/Unit
12	Total Load of 9 W LED Fittings	**0.081**	kW
13	No of 12 W LED Bulb	6	Nos
14	Load/per Fitting	12	W/Unit
15	Total Load of LED Bulbs	**0.072**	kW
16	No of 07 W LED D/L fittings	5	Nos
17	Load/per Fitting	7	W/Unit
18	Total Load of 16 W LED D/L Fittings	**0.035**	kW
19	No of 40 W Square LED fittings	2	Nos
20	Load/per Fitting	10	W/Unit
21	Total Load of 40 W Square LED Fittings	**0.02**	kW
22	Total LED Lighting Load = **9+12+15+18+21**	**0.25**	kW
23	Total Lighting Load = **3+6+9+12+15+18+21**	**0.59**	kW
24	**% of Total Lighting Load met by LEDs=22*100/23**	**42**	%