Education Society Yavatmal's

# Loknayak Bapuji Aney Mahila Mahavidyalaya, Yavatmal

Affiliated to

## Sant Gadge Baba Amravati University, Amravati

# Self-Study Report
## (Cycle-3)

## Academic Years:
## 2018-19 to 2022-23

# Criterion: 7.1.3

**Quality audits on environment and energy regularly undertaken by the Institution. The institutional environment and energy initiatives are confirmed through the following**

**1.Green audit / Environment audit**
**2.Energy audit**
**3.Clean and green campus initiatives**
**4.Beyond the campus environmental promotion activities**

# Index

..संस्थापक..
स्व. श्री. माधव श्रीहरी अणे

एज्युकेशन सोसायटी, यवतमाळ (रजि.नं. एफ-६) द्वारा संचालित

# लोकनायक बापूजी अणे महिला महाविद्यालय, यवतमाळ

(संत गाडगेबाबा अमरावती विद्यापीठ संलग्न)
e-mail - aneymmv.ytl@rediffmail.com

वरिष्ठ महा. क्रमांक – ४१२
कनिष्ठ महा. क्रमांक – जे ०८.०१००४

कार्यालय : (०७२३२) २४४७८८
निवास : (०७२३२) २४१५२१

पत्र जा. क्र. अमम/ /२०
दिनांक : / /

## Declaration

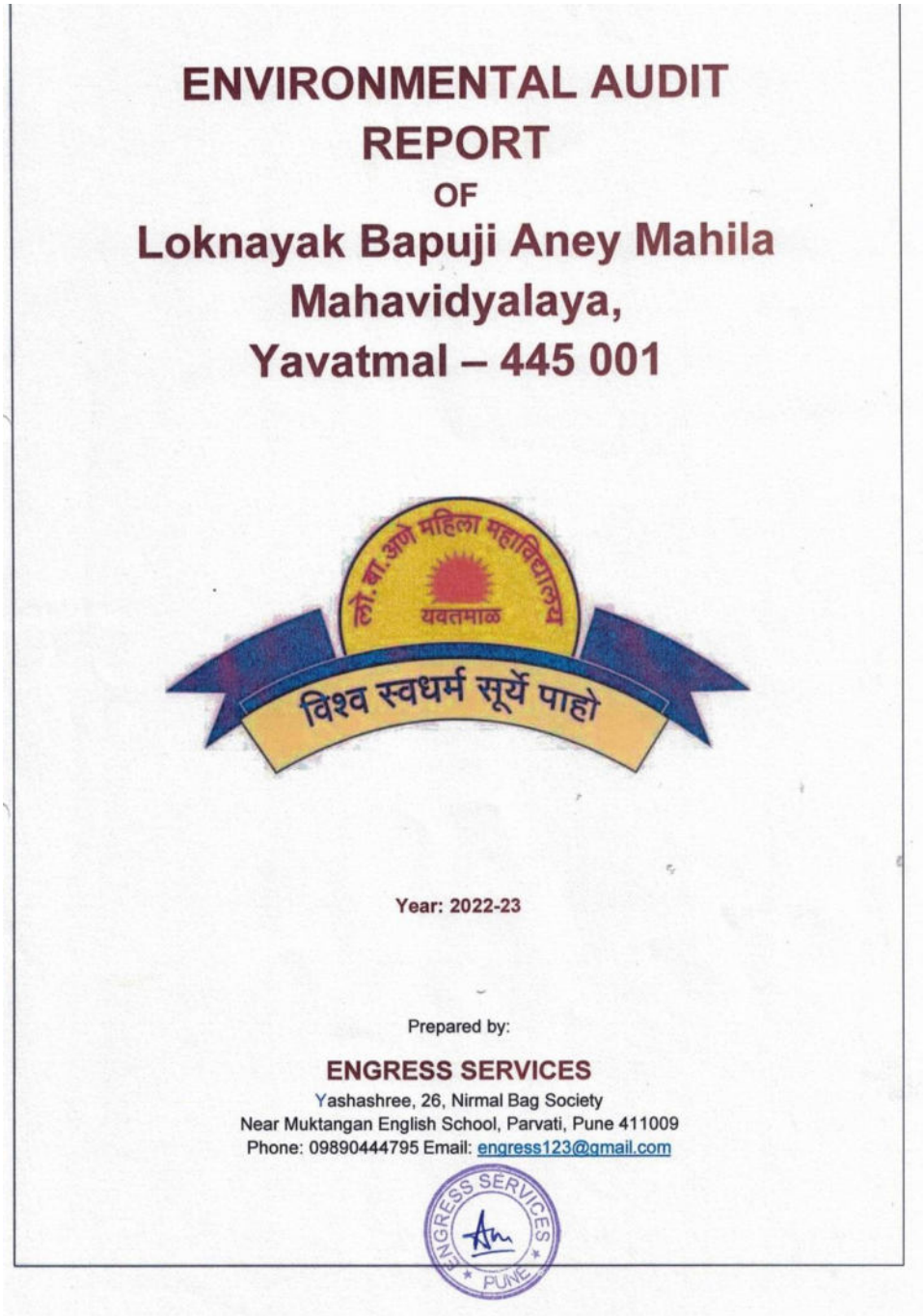
**This is to declare that the information, reports, true copies and numerical data etc. furnished in this file as supporting documents is verified by IQAC and found correct.**

**Hence this certificate.**

**Mr. Dnyaneshwar Gatkar**
**IQAC Coordinator**
**Loknayak Bapuji Aney**
**Mahila Mahavidyalaya,Yavatm**

**Dr. Durgesh Kunte**
**Principal**
**Loknayak Bapuji Aney**
**Mahila Mahavidyalaya,**
**Yavatmal**

# 2. Environment audit



ENVIRONMENTAL AUDIT REPORT

OF

Loknayak Bapuji Aney Mahila Mahavidyalaya,

Yavatmal – 445 001

लो. बा. अणे महिला महाविद्यालय यवतमाळ

विश्व स्वधर्म सूर्ये पाहो

Year: 2022-23

Prepared by:

ENGRESS SERVICES

Yashashree, 26, Nirmal Bag Society

Near Muktangan English School, Parvati, Pune 411009

Phone: 09890444795 Email: engress123@gmail.com

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# ENGRESS SERVICES

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MEDA Registration No: ECN/2022-23/CR-43/1709
ISO: 9001-2015 Certified (Cert No: 23EQKC13),
ISO: 14001-2015 Certified (Cert No: 23EEKW20)

## ENVIRONMENTAL AUDIT CERTIFICATE

Certificate No: ES/LB/22-23/09

Date: 21/04/2023

This is to certify that we have conducted Environmental Audit at Loknayak Bapuji Aney Mahila Mahavidyalaya,Yavatmal, in the Year 2022-23.

The Institute has adopted following Energy Efficient & Green Practices:

- Usage of Energy Efficient LED Light Fitting
- Maximum Usage of Day Lighting
- Provision of Separate bins for Dry & Wet Waste
- The College has installed Septic Tank and is cleaned periodically.
- Implementation of Rain Water Harvesting Project
- Maintenance of good Internal Road
- Tree Plantation in the campus
- Creation of awareness by Display of Posters on Resource Conservation

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

**For Engress Services,**

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



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## REGISTRATION CERTIFICATES


Maharashtra Energy Development Agency

CERTIFICATE OF REGISTRATION
FOR CLASS 'A'

MEDA Registration Certificate


GEM Certificate

ASSOCHAM hereby certifies that

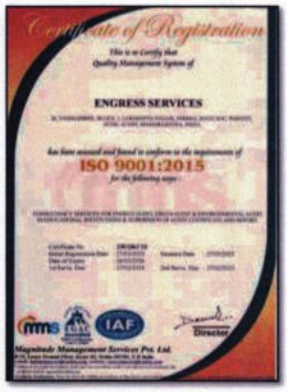
Mr. A Y Mehendale

has successfully passed the Green and Eco-friendly Monitored Certified Professional Test (GEM CP)

and

"Excellent Performance"

GEM Certified Professional Certificate


Certificate of Registration

This is to Certify that Quality Management System of

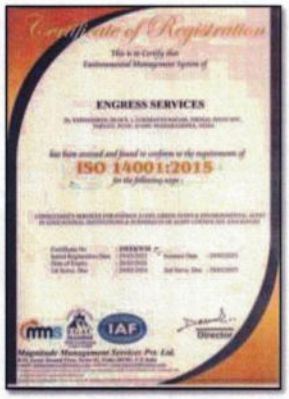
ENGRESS SERVICES

has been assessed and found to conform to the requirement of

ISO 9001:2015

for the following scope :

ISO: 9001-2015 Certificate


Certificate of Registration

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ISO 14001:2015

for the following scope :

ISO: 14001-2015 Certificate



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## INDEX





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## ACKNOWLEDGEMENT

We Engress Services, Pune, express our sincere gratitude to the management of Loknayak Bapuji Aney Mahila Mahavidyalaya,Yavatmal for awarding us the assignment of Environmental Audit of their Campus for the Year: 2022-23.

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



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## EXECUTIVE SUMMARY

**1. Loknayak Bapuji Aney Mahila Mahavidyalaya,Yavatmal** consumes Energy in the form of **Electrical Energy** used for various Electrical Equipment, office & other facilities.

**2. Pollution due to Institute 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 | Particulars | Value | Unit |
|---|---|---|---|
| 1 | Annual Energy Consumption | **725** | kWh |
| 2 | Annual $CO_2$ Emissions | **0.65** | MT |

**4. Various initiatives taken for Environmental Conservation:**

- Usage of Energy Efficient LED Lighting fittings.
- Maximum Usage of Day Lighting.
- Installation of **10 kWp** Solar PV Plant.

**5. Indoor Air Quality Parameters:**

| No | Parameter/Value | AQI | PM-2.5 | PM-10 |
|---|---|---|---|---|
| 1 | Maximum | 49 | 35 | 45 |
| 2 | Minimum | 37 | 19 | 26 |

**6. Indoor Comfort Conditions:**

| No | Parameter/Value | Temperature, °C | Humidity, % | Lux Level | Noise Level, dB |
|---|---|---|---|---|---|
| 1 | Maximum | 32.4 | 50.1 | 375 | 45 |
| 2 | Minimum | 31.8 | 49.8 | 94 | 39 |

**7. Waste Management:**

**7.1 Segregation of Waste at Source:**

The Waste is segregated at source in separate Waste Bins & is handed over for further action.



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### 7.2 Liquid Waste Management:

The College has installed Septic Tank and is cleaned periodically..

### 7.3 Sanitary Waste Management:

The Institute has installed Sanitary Waste Incinerator, to dispose of the Sanitary Waste.

### 7.4 E Waste Management:

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

### 8. Rain Water Harvesting:

The Institute has installed the Rainwater harvesting project; the rain water falling on the terrace is collected through pipes and is used for recharging the bore well.

### 9. Environment Friendly Initiatives:

- Display of Posters on Resource Conservation

### 10. Assumption:

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

### 11. References:

- For $CO_2$ Emissions: www.tatapower.com
- For Various Indoor Air Parameters: www.ishrae.com
- For AQI &Water Quality Standards: www.cpcb.com



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## 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 |



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# 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

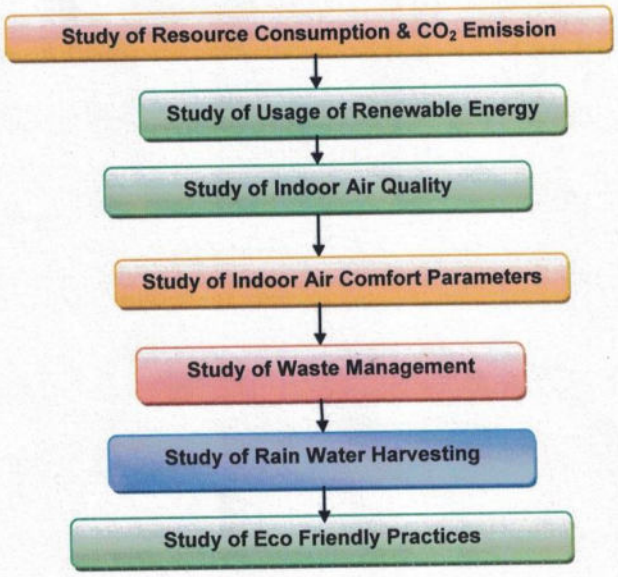
### 1.2. Environmental Audit: Definition:

An audit which aims at verification and validation to ensure that various environmental laws are 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*

**1.3. 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:

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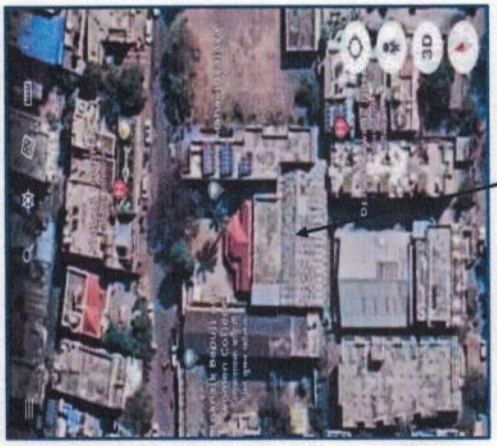
**1.5 Institute Location Image:**



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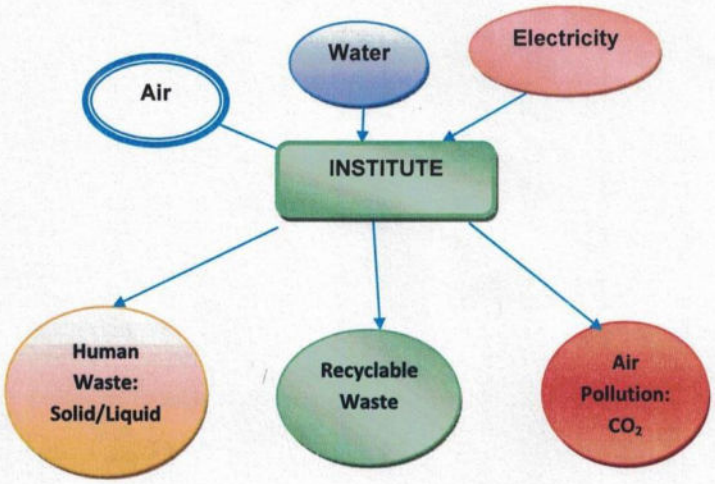
## CHAPTER-II
## STUDY OF RESOURCE CONSUMPTION & $CO_2$ EMISSION

The Institute consumes following basic/derived Resources:

1. Air
2. Water
3. Electrical Energy

We try to draw a schematic diagram for the Institute System & Environment as under.
**Chart No 1: Representation of Institute 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: 22-23:**

| No | Month | Energy Consumed, kWh | $CO_2$ Emissions, MT |
|---|---|---|---|
| 1 | Apr-22 | 0 | 0 |
| 2 | May-22 | 0 | 0 |
| 3 | Jun-22 | 0 | 0 |
| 4 | Jul-22 | 0 | 0 |
| 5 | Aug-22 | 0 | 0 |
| 6 | Sep-22 | 187 | 0.16 |
| 7 | Oct-22 | 122 | 0.10 |



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| | | | |
|---|---|---|---|
| 8 | Nov-22 | 416 | 0.37 |
| 9 | Dec-22 | 0 | 0 |
| 10 | Jan-23 | 0 | 0 |
| 11 | Feb-23 | 0 | 0 |
| 12 | Mar-23 | 0 | 0 |
| 13 | Total | 725 | 0.65 |
| 14 | Maximum | 416 | 0.37 |
| 15 | Minimum | 0 | 0 |
| 16 | Average | 60.416 | 0.054 |

**Chart No 2: Month wise $CO_2$ Emissions:**

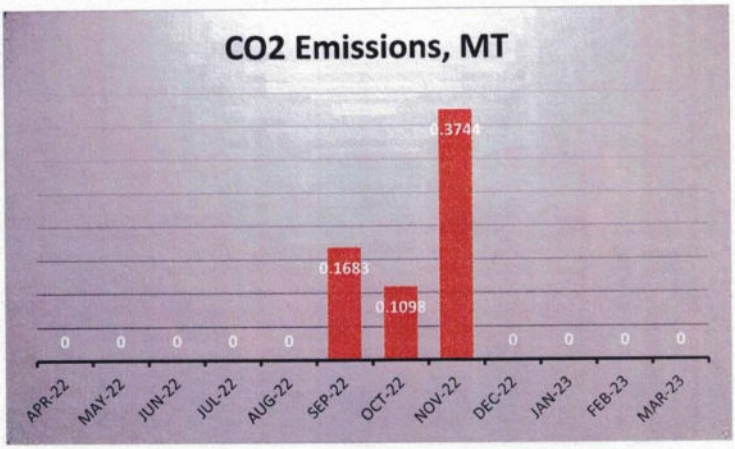


**Table No 6: Important Parameters:**

| No | Parameter/ Value | Energy Consumed, kWh | $CO_2$ Emissions, MT |
|---|---|---|---|
| 1 | Total | 725 | 0.65 |
| 2 | Maximum | 416 | 0.37 |
| 3 | Minimum | 0 | 0 |
| 4 | Average | 60.416 | 0.054 |



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

The College has installed Roof Top Solar PV Plant of Capacity **10 KWp.** In the following Table, we compute the percentage of reduction in Annual CO2 Emission.

**Table No 3: Computation of % Annual Energy Demand met by Alternate Energy:**

| No | Particulars | Value | Unit |
|---|---|---|---|
| 1 | Installed Roof Top Solar PV Plant Capacity | 10 | kWp |
| 2 | Average Daily Energy Generated | 4 | kWh/kWp |
| 3 | Annual Generation Days | 300 | Nos |
| 4 | Annual Solar Energy Generated | 12000 | kWh |
| 5 | 1 kWh of Electrical Energy Emits | 0.9 | Kg of $CO_2$ |
| 6 | Reduction in $CO_2$ emission by Solar PV Plant =(4)*(5) | 10.8 | MT/Annum |

**Photograph of Roof Top Solar PV Plant:**




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# 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. 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 10 micron

**Table No 7: Indoor Air Quality Parameters:**

| No | Locations | AQI | PM2.5 | PM10 |
|---|---|---|---|---|
| 1 | Principal Cabin | 40 | 28 | 32 |
| 2 | Admin Office | 39 | 26 | 35 |
| 3 | IQAC Room | 42 | 30 | 41 |
| 4 | Staff Room | 41 | 35 | 32 |
| 5 | Computer Lab | 42 | 29 | 36 |
| 6 | Seminar Hall | 49 | 33 | 45 |
| 7 | PhD Cell | 49 | 30 | 41 |
| 8 | Music Dept. | 38 | 19 | 26 |



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| | | | | |
|---|---|---|---|---|
| 9 | Room No.S-03 | 37 | 21 | 29 |
| 10 | Maximum | 49 | 35 | 45 |
| 11 | Minimum | 37 | 19 | 26 |



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## 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 8: Study of Indoor Comfort Condition Parameters:**

| No | Locations | Temperature (°C) | Humidity (%) | Lux Level | Noise Level (dB) |
|---|---|---|---|---|---|
| 1 | Principal Cabin | 32.3 | 50 | 136 | 40 |
| 2 | Admin Office | 32.1 | 49.8 | 375 | 41.5 |
| 3 | IQAC Room | 32.4 | 50 | 94 | 40.5 |
| 4 | Staff Room | 32 | 50.1 | 165 | 41.5 |
| 5 | Computer Lab | 31.8 | 50 | 170 | 39 |
| 6 | Seminar Hall | 31.9 | 50 | 195 | 40 |
| 7 | PhD Cell | 32.1 | 50.1 | 170 | 40 |
| 8 | Music Dept. | 32.1 | 50 | 155 | 45 |
| 11 | Room No.S-03 | 32 | 49.9 | 190 | 40 |
| 12 | Maximum | 32.4 | 50.1 | 375 | 45 |
| 13 | Minimum | 31.8 | 49.8 | 94 | 39 |



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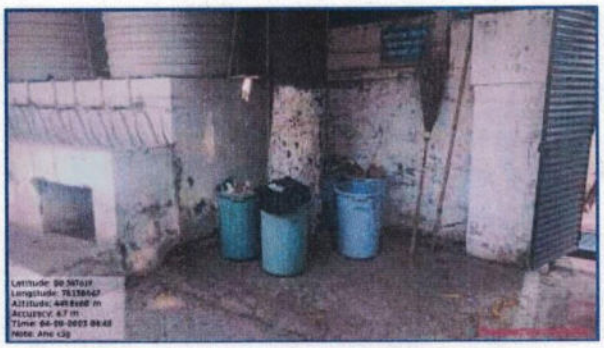
# CHAPTER VI
# STUDY OF WASTE MANAGEMENT

### 6.1 Segregation of Waste at Source:

The Waste is segregated at source in separate Waste Bins & is handed over for further action.

**Photograph of Waste Collection Bins:**



### 6.2 Liquid Waste Management:

The College has installed Septic tank and is cleaned periodically.

### 6.3 E-Waste Management:

The E-Waste is disposed of through Authorized Agency.

### 6.4 Sanitary Waste Incinerator:

The College has installed Sanitary Waste Incinerator for sanitary waste disposal.



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## CHAPTER VII
## STUDY OF RAIN WATER HARVESTING

The College has implemented the Rain Water Harvesting Project. The College has installed Pipes from the terrace and the Rain water falling on the terrace is gathered and is used to increase the underground water table.

**Photograph of Rain Water Harvesting Pipe:**





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## CHAPTER-VIII
## STUDY OF ECO FRIENDLY INITIATIVES

**8.1 Internal Tree Plantation:**

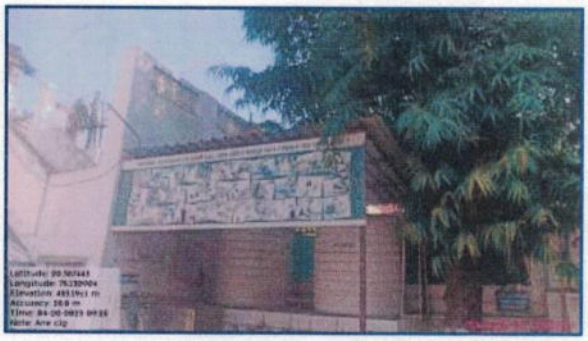
The College has planted trees in the campus and outside the campus.

**Photograph of Tree plantation:**

**8.2 Creation of Awareness about Water Conservation:**

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

**Photograph of Poster on Water Conservation:**





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## 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**<br>Dissolved Oxygen **6 mg/l or more** |
| 2 | Drinking water source after conventional treatment and disinfection | pH between **6 to 9**<br>Dissolved Oxygen **4 mg/l or more** |
| 3 | Outdoor Bathing (Organized) | pH between **6.5 to 8.5**<br>Dissolved Oxygen **5 mg/l or more** |
| 4 | Controlled Waste Disposal | pH between **6 to 8.5** |



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### 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% |



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Mahila Mahavidyalaya,
Yavatmal

# 2. Green Audit

## GREEN AUDIT REPORT
## OF
## Loknayak Bapuji Aney Mahila Mahavidyalaya,
## Yavatmal – 445 001


Year: 2022-23

Prepared by:

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


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# ENGRESS SERVICES

Yashashree, 26, Nirmal Bag Society, Near Muktangan English School,
Parvati, Pune 411 009 Tel: 09890444795 Email: 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/LB/22-23/08

Date: 21/04/2023

This is to certify that we have conducted Green Audit at Loknayak Bapuji Aney Mahila Mahavidyalaya,Yavatmal in the Year 2022-23.

The Institute has adopted following Energy Efficient & Green Practices:

- Usage of Energy Efficient LED Light Fitting
- Maximum Usage of Day Lighting
- Provision of Separate bins for Dry & Wet Waste
- The College has installed Septic Tank and is cleaned periodically.
- Implementation of Rain Water Harvesting Project
- Maintenance of good Internal Road
- Tree Plantation in the campus
- Creation of awareness by Display of Posters on Resource Conservation

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,**

ENGRESS SERVICES PUNE

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



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Dr. Durgesh Kunte
Principal
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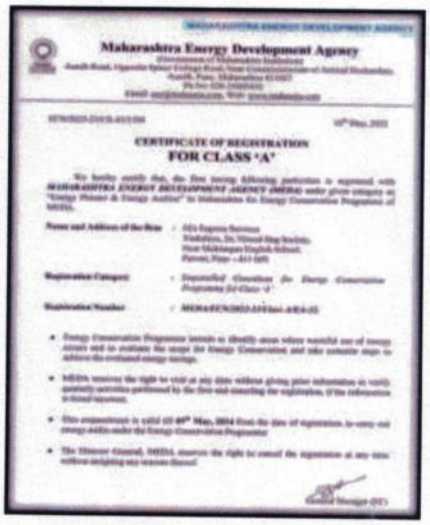
Mahila Mahavidyalaya,
Yavatmal

## REGISTRATION CERTIFICATES


Maharashtra Energy Development Agency

CERTIFICATE OF REGISTRATION
FOR CLASS 'A'

MEDA Registration Certificate


GEM Certificate

ASSOCHAM hereby certifies that

Mr. A Y Mehendale

has successfully passed the Green and Eco-friendly Movement Certified Professional Test (GEM CP)

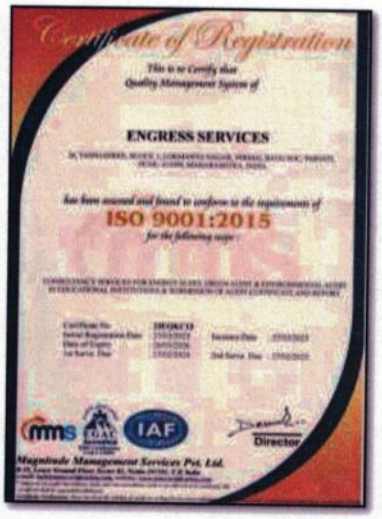
with

"Excellent Performance"

on

06 June, 2022

GEM Certified Professional Certificate


Certificate of Registration

This is to Certify that Quality Management System of

ENGRESS SERVICES

has been assessed and found to conform to the requirements of

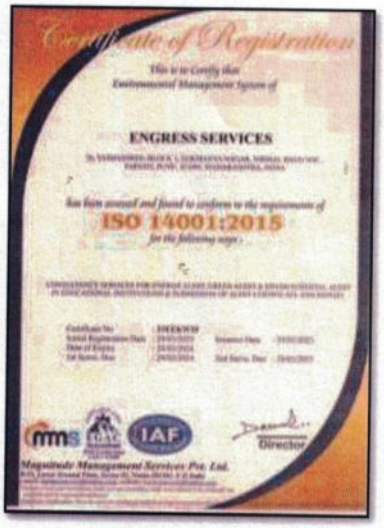
ISO 9001:2015

for the following scope :

Director

Magnitude Management Services Pvt. Ltd.

ISO: 9001-2015 Certificate


Certificate of Registration

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ENGRESS SERVICES

has been assessed and found to conform to the requirements of

ISO 14001:2015

for the following scope :

Director

Magnitude Management Services Pvt. Ltd.

ISO: 14001-2015 Certificate



ENGRESS SERVICES * PUNE *

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## INDEX





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## ACKNOWLEDGEMENT

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Yavatmal

## EXECUTIVE SUMMARY

**1. Loknayak Bapuji Aney Mahila Mahavidyalaya,Yavatmal** consumes Energy in the form of **Electrical Energy;** used for various Electrical Equipment, office & other facilities.

**2. Present Energy Consumption & $CO_2$ Emission:**

| No | Particulars | Value | Unit |
|---|---|---|---|
| 1 | Annual Energy Consumption | 725 | kWh |
| 2 | Annual $CO_2$ Emissions | 0.65 | MT |

**3. Renewable Energy & Energy Efficiency Projects:**

- Usage of Energy Efficient LED Lighting fittings.
- Maximum Usage of Day Lighting.
- Installation of **10 kWp** Solar PV Plant.

**4. Waste Management:**

**5.1 Segregation of Waste at Source:**

The Waste is segregated at source in separate Waste Bins & is handed over for further action.

**5.2 Liquid Waste Management:**

The College has installed Septic Tank and is cleaned periodically.

**5.3 Sanitary Waste Management:**

The Institute has installed Sanitary Waste Incinerator, to dispose of the Sanitary Waste.

**5.4 E Waste Management:**

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

**6. Rain Water Harvesting:**

The Institute has installed the Rainwater harvesting project; the rain water falling on the terrace is collected through pipes and is used for recharging the bore well.

**7. Green & Sustainable Practices:**

- Maintenance of good Internal Road
- Creation of awareness on Resource Conservation Display of Posters



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**8. Assumption:**

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

**9. Reference:**

- For $CO_2$ Emissions: www.tatapower.com



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## 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 |



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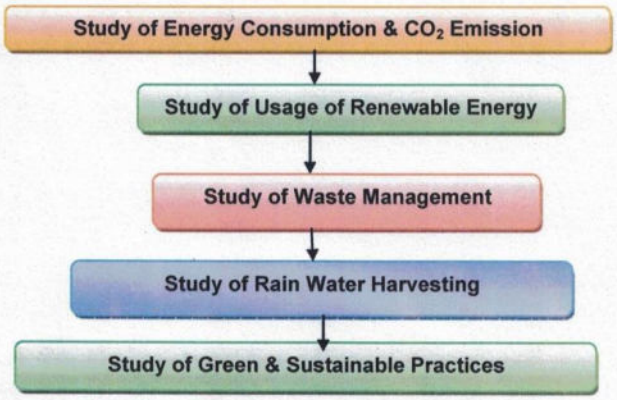
# CHAPTER-I
# INTRODUCTION

## 1.1 Introduction:

A Green Audit is conducted at Loknayak Bapuji Aney Mahila Mahavidyalaya,Yavatmal.

## 1.2 Audit Procedural Steps:




## 1.3 Institute Location Image:

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## CHAPTER-II
## STUDY OF ENERGY CONSUMPTION & $CO_2$ EMISSION

**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 Institute for performing its day to day activities.

The Institute uses Electrical Energy for various Electrical gadgets.

**Basis for computation of $CO_2$ Emissions:**

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

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

**Table No 1: Month wise $CO_2$ Emissions:**

| No | Month | Energy Consumed, kWh | CO2 Emissions, MT |
|---|---|---|---|
| 1 | Apr-22 | 0 | 0 |
| 2 | May-22 | 0 | 0 |
| 3 | Jun-22 | 0 | 0 |
| 4 | Jul-22 | 0 | 0 |
| 5 | Aug-22 | 0 | 0 |
| 6 | Sep-22 | 187 | 0.16 |
| 7 | Oct-22 | 122 | 0.10 |
| 8 | Nov-22 | 416 | 0.37 |
| 9 | Dec-22 | 0 | 0 |
| 10 | Jan-23 | 0 | 0 |
| 11 | Feb-23 | 0 | 0 |
| 12 | Mar-23 | 0 | 0 |
| 13 | Total | 725 | 0.65 |
| 14 | Maximum | 416 | 0.37 |
| 15 | Minimum | 0 | 0 |
| 16 | Average | 60.416 | 0.054 |



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Yavatmal

**Chart No 1: Month wise $CO_2$ Emissions:**

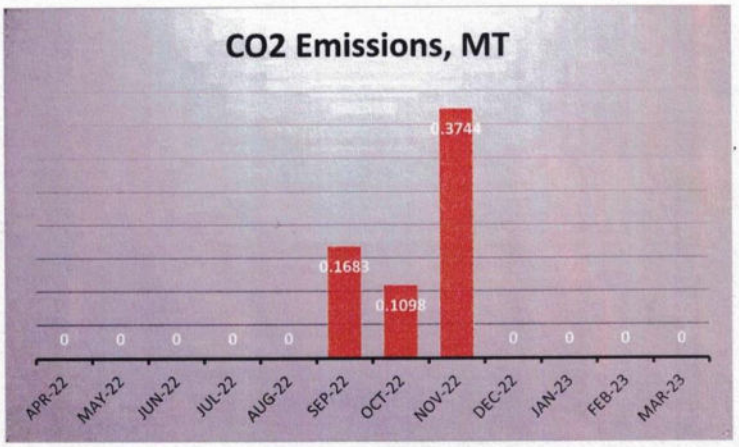


**Table No 2: Important Parameters:**

| No | Parameter/ Value | Energy Consumed, kWh | $CO_2$ Emissions, MT |
|---|---|---|---|
| 1 | Total | 725 | 0.65 |
| 2 | Maximum | 416 | 0.37 |
| 3 | Minimum | 0 | 0 |
| 4 | Average | 60.416 | 0.054 |



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

The College has installed Roof Top Solar PV Plant of Capacity **10 KWp.** In the following Table, we compute the percentage of reduction in Annual CO2 Emission.

**Table No 3: Computation of % Annual Energy Demand met by Alternate Energy:**

| No | Particulars | Value | Unit |
|---|---|---|---|
| 1 | Installed Roof Top Solar PV Plant Capacity | 10 | kWp |
| 2 | Average Daily Energy Generated | 4 | kWh/kWp |
| 3 | Annual Generation Days | 300 | Nos |
| 4 | Annual Solar Energy Generated | 12000 | kWh |
| 5 | 1 kWh of Electrical Energy Emits | 0.9 | Kg of $CO_2$ |
| 6 | Reduction in $CO_2$ emission by Solar PV Plant =(4)*(5) | 10.8 | MT/Annum |

**Photograph of Roof Top Solar PV Plant:**




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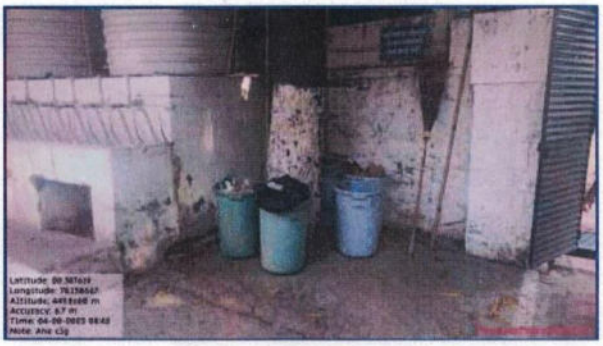
Yavatmal

# CHAPTER IV
# STUDY OF WASTE MANAGEMENT

### 4.1 Segregation of Waste at Source:

The Waste is segregated at source in separate Waste Bins & is handed over for further action.

**Photograph of Waste Collection Bins:**



### 4.2 Liquid Waste Management:

The College has installed Septic tank and is cleaned periodically.

### 4.3 E-Waste Management:

The E-Waste is disposed of through Authorized Agency.

### 4.4 Sanitary Waste Incinerator:

The College has installed Sanitary Waste Incinerator for sanitary waste disposal.



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Mahila Mahavidyalaya,
Yavatmal

## CHAPTER V
## STUDY OF RAIN WATER HARVESTING

The College has implemented the Rain Water Harvesting Project. The College has installed Pipes from the terrace and the Rain water falling on the terrace is gathered and is used to increase the underground water table.

**Photograph of Rain Water Harvesting Pipe:**





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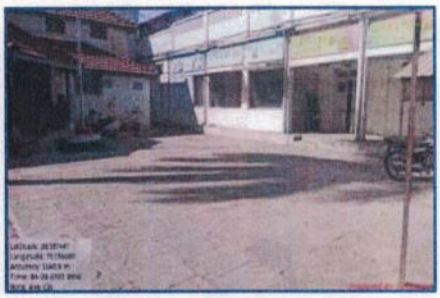
# CHAPTER VI
# STUDY OF GREEN & SUSTAINABLE PRACTICES

### 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 planted trees in the campus and outside the campus.

**Photograph of Tree plantation:**



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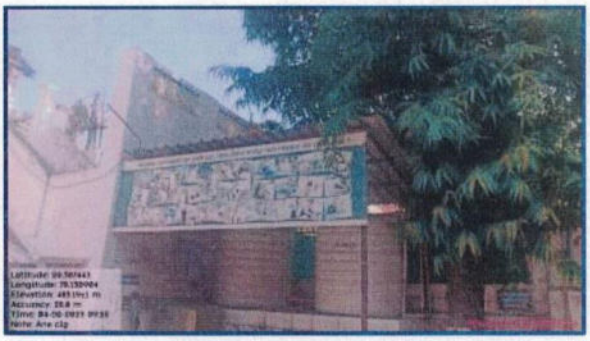
Mahila Mahavidyalaya,
Yavatmal

**6.3 Creation of Awareness about Water Conservation:**

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

**Photograph of Poster on Water Conservation:**





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Mahila Mahavidyalaya,
Yavatmal

# 3. Energy Audit

# ENERGY AUDIT REPORT

OF

## Loknayak Bapuji Aney Mahila Mahavidyalaya, Yavatmal – 445 001

Year: 2022-23

Prepared by:

**ENGRESS SERVICES**

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

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# ENGRESS SERVICES

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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/LB/22-23/07 Date: 21/04/2023

This is to certify that we have conducted an Energy Audit at Loknayak Bapuji Aney Mahila Mahavidyalaya, Yavatmal in the Year 2022-23.

.The Institute has adopted following Energy Efficient practices:

- Usage of Energy Efficient LED Fittings
- Maximum usage of Day Lighting
- Installation of 10 kWp Capacity 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,**
B E-Mechanical, M Tech- Energy
BEE Certified Energy Auditor, EA-8192

ENGRESS SERVICES * PUNE *



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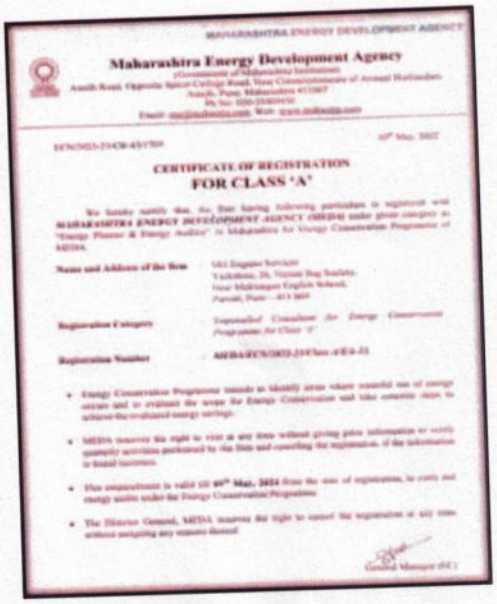
Energy Audit Report

## Registration Certificates



Maharashtra Energy Development Agency

CERTIFICATE OF REGISTRATION
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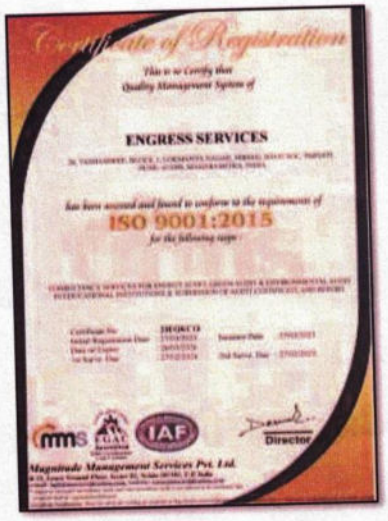
MEDA Registration Certificate



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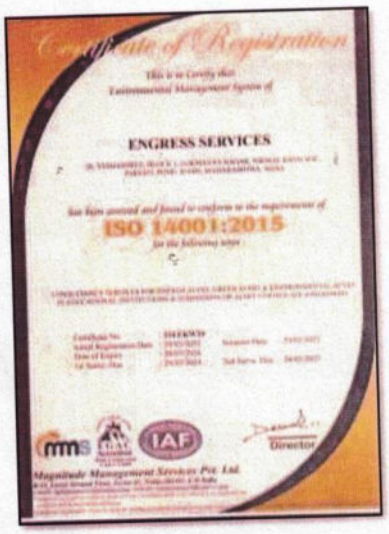

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ENGRESS SERVICES PUNE

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# INDEX





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## EXECUTIVE SUMMARY

**1. Loknayak Bapuji Aney Mahila Mahavidyalaya,Yavatmal** consumes Energy in the form of **Electrical Energy;** used for various Electrical Equipment, office & other facilities.

**2. Present Connected Load & Annual Energy Consumption:**

| No | Particulars | Value | Unit |
|---|---|---|---|
| 1 | Total Connected Load | 32 | kW |
| 2 | Annual Energy Consumption | 725 | kWh |
| 3 | Annual $CO_2$ Emissions | 0.65 | MT |

**3. Energy Performance Index:**

| No | Particulars | Value | Unit |
|---|---|---|---|
| 1 | Total Annual Energy Consumed | 725 | kWh |
| 2 | Total Built up area of Institute | 2917.22 | $m^2$ |
| 3 | Energy Performance Index =(1) / (2) | **4.02** | $kWh/m^2$ |

**4. Study of Lighting Power Density & % of LED Lighting:**

| No | Particulars | Value | Unit |
|---|---|---|---|
| 1 | Lighting Power density | 0.62 | $W/m^2$ |
| 2 | % of Usage of LED Lighting to Total Lighting Load | 100 | % |

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

- Usage of Energy Efficient LED fittings
- Maximum Usage of Day Lighting
- Installation of 10 kWp Solar PV Plant

**6. Assumption:**

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

**7. References:**

- Audit Methodology: www.mahaurja.com
- Energy Conservation Building Code: ECBC-2017: www.beeindia.gov.in
- For $CO_2$ Emissions: www.tatapower.com



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## ABBREVIATIONS

| | | |
|---|---|---|
| LED | : | Light Emitting Diode |
| MSEDCL | : | Maharashtra State Electricity Distribution Company Limited |
| BEE | : | Bureau of Energy Efficiency |
| ECBC | : | Energy Conservation Building Code |
| MEDA | : | Maharashtra Energy Development Agency |
| PV | : | Photo Voltaic |
| Kg | : | Kilo Gram |
| kWh | : | kilo-Watt Hour |
| $CO_2$ | : | Carbon Di Oxide |
| MT | : | Metric Ton |



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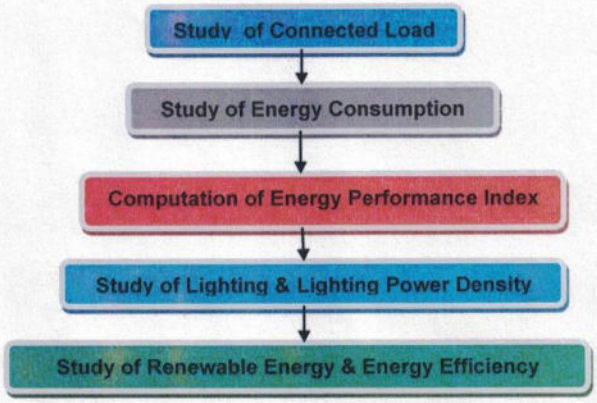
# CHAPTER-I
# INTRODUCTION

## 1.1 Introduction:

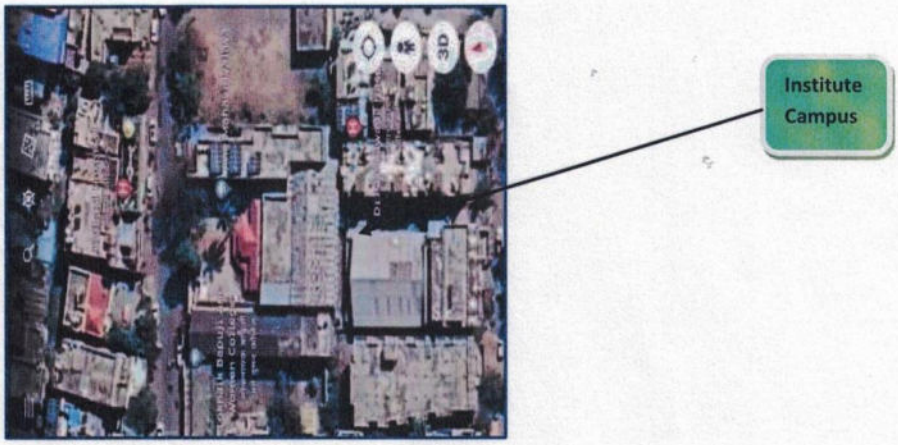
An Energy Audit is conducted at Loknayak Bapuji Aney Mahila Mahavidyalaya Yavatmal. The guidelines followed for conducting the Energy Audit are:

- 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 Institute Location Image:



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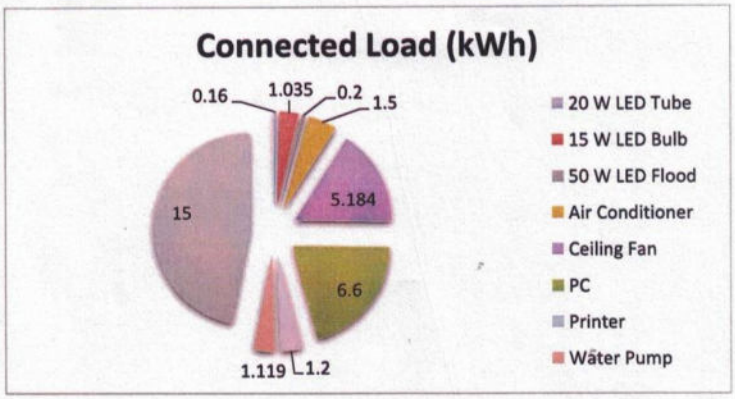
## CHAPTER-II
## STUDY OF CONNECTED LOAD

The major contributors to the connected load of the Institute include:

**Table No 1: Study of Equipment wise Connected Load:**

| No | Equipment | Qty | Load, W/Unit | Load, kW |
|---|---|---|---|---|
| 1 | 20 W LED Tube | 8 | 20 | 0.16 |
| 2 | 15 W LED Bulb | 69 | 15 | 1.035 |
| 3 | 50 W LED Flood | 4 | 50 | 0.2 |
| 4 | Air Conditioner | 1 | 1500 | 1.5 |
| 5 | Ceiling Fan | 96 | 54 | 5.184 |
| 6 | PC | 44 | 150 | 6.6 |
| 7 | Printer | 8 | 150 | 1.2 |
| 8 | Water Pump | 1 | 1119 | 1.119 |
| 9 | Other Equipment | 100 | 150 | 15 |
| 12 | **Total** | | | **31.998** |

**Chart No 1: Study of Connected Load:**



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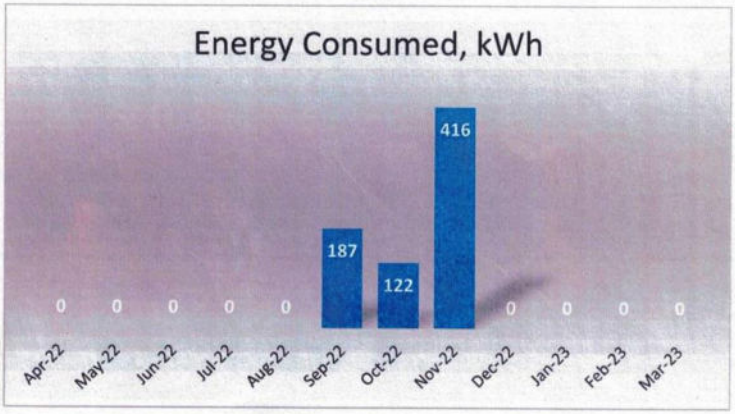
# CHAPTER-III
# STUDY OF PRESENT ENERGY CONSUMPTION

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

**Table No 2: Electrical Bill Analysis- 2022-23:**

| No | Month | Energy Consumed, kWh | CO2 Emissions, MT |
|---|---|---|---|
| 1 | Apr-22 | 0 | 0 |
| 2 | May-22 | 0 | 0 |
| 3 | Jun-22 | 0 | 0 |
| 4 | Jul-22 | 0 | 0 |
| 5 | Aug-22 | 0 | 0 |
| 6 | Sep-22 | 187 | 0.16 |
| 7 | Oct-22 | 122 | 0.10 |
| 8 | Nov-22 | 416 | 0.37 |
| 9 | Dec-22 | 0 | 0 |
| 10 | Jan-23 | 0 | 0 |
| 11 | Feb-23 | 0 | 0 |
| 12 | Mar-23 | 0 | 0 |
| 13 | Total | 725 | 0.65 |
| 14 | Maximum | 416 | 0.37 |
| 15 | Minimum | 0 | 0 |
| 16 | Average | 60.416 | 0.054 |

**Chart No 2: Variation in Monthly Energy Consumption:**



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## 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:

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

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 Consumed | 725 | kWh |
| 2 | Total Built up area of Institute | 2917.22 | $m^2$ |
| 3 | Energy Performance Index =(1) / (2) | **4.023** | $kWh/m^2$ |



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# 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/m²)

**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 (W/m²/100 lux) 100 Installed power density (W/m²/100 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: Lighting Power Density of a Class Room. We also compute the percentage usage of LED Lighting to total Lighting Load of the Institute.

**Table No 4: Computation of Lighting Power Density:**

| No | Particulars | Value | Unit |
|---|---|---|---|
| 1 | No of 20 W LED Tube Lights in Class Room | 4 | Nos |
| 2 | Demand of 20 W LED Tube Light | 20 | W/Unit |
| 3 | Total Lighting Load in the Class Room= **(1) * (2)** | **80** | W |
| 4 | Area of Class Room | 49.88 | $m^2$ |
| 5 | Lighting Power Density = **(3)/ (4)** | **0.62** | $W/m^2$ |



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

**Table No 5: Percentage Usage of LED Lighting to Annual Lighting Load:**

| No | Particulars | Value | Unit |
|---|---|---|---|
| 1 | No of 20 W LED Tube Lights | 8 | Nos |
| 2 | Demand of 20 W LED Tube Light | 20 | W/Unit |
| 3 | Total Electrical Load of 20 W LED Fittings | 0.16 | kW |
| | | | |
| 4 | No of 15 W LED Tube Lights | 69 | Nos |
| 5 | Demand of 15 W LED Tube Light | 15 | W/Unit |
| 6 | Total Electrical Load of 15 W LED Fittings | 1.035 | kW |
| | | | |
| | | | |
| 7 | No of 50 W LED Tube Lights | 4 | Nos |
| 8 | Demand of 50 W LED Tube Light | 50 | W/Unit |
| 9 | Total Electrical Load of 50 W LED Fittings | 0.2 | kW |
| | | | |
| 10 | Total Lighting Load=3+6+9 | 1.395 | kW |
| 11 | Total LED Lighting Load= 3+6+9 | 1.395 | kW |
| | | | |
| | | | |
| 12 | % of Annual LED Lighting to Total Lighting Load= 10*100/11 | 100.00 | % |



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

## 6.1 Usage of Renewable Energy:

The College has installed Roof Top Solar PV Plant of Capacity **10 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 | 725 | kWh |
| 2 | Installed Roof Top Solar PV Plant Capacity | 10 | kWp |
| 3 | Average Daily Energy Generated | 4 | kWh/kWp |
| 4 | Annual Generation Days | 300 | Nos |
| 5 | Annual Solar Energy Generated | 12000 | kWh |
| 6 | Total Energy Demand = (1) + (5) | 12725 | kWh |
| 7 | % of Usage of Alternate Energy to Total Annual Energy Demand= (5)*100/ (6) | 94.30 | % |

**Photograph of Roof Top Solar PV Plant:**




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