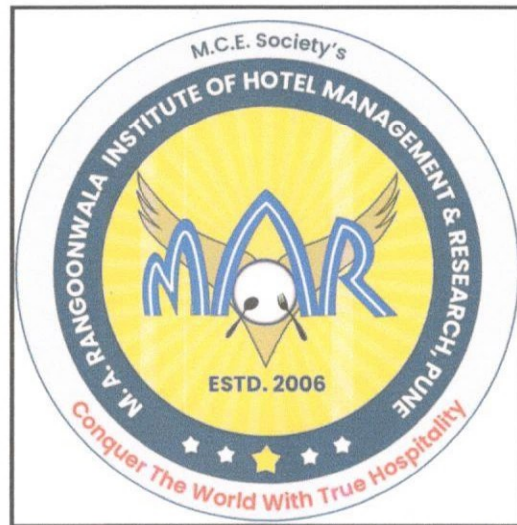


# ENVIRONMENTAL AUDIT REPORT

of

Maharashtra Cosmopolitan Education Society's,  
**M. A. RANGOONWALA INSTITUTE OF HOTEL  
MANAGEMENT & RESEARCH PUNE**

Azam Campus, K B Hidaytullah Road, Camp, Pune 411 001



Year: 2022-23

Prepared by:

## ENGRESS SERVICES

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



## ENGRESS SERVICES

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

## ENVIRONMENTAL AUDIT CERTIFICATE

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

Date: 14/7/2023

This is to certify that we have conducted Environmental Audit at Maharashtra Cosmopolitan Education Society's M. A. Rangoonwala Institute of Hotel Management & Research Pune, Camp, Pune 411 001, in the Year 2021-22.

The Institute has adopted following Eco Friendly Practices:

- Usage of Energy Efficient LED Fittings
- Usage of Energy Efficient BEE STAR Rated equipment
- Maximum usage of Day Lighting
- Installation of 50 kWp Roof Top Solar PV Plant
- Segregation of Waste at source
- Vermi Composting Pit for conversion of organic Waste
- Installation of Bio Gas Plant, for conversion of Leftover Food Waste
- Implementation of Rain Water Harvesting Project
- Internal Tree Plantation
- Creation of awareness on Plastic Free Campus by Display of Posters
- Tree Plantation Event in the Campus

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,



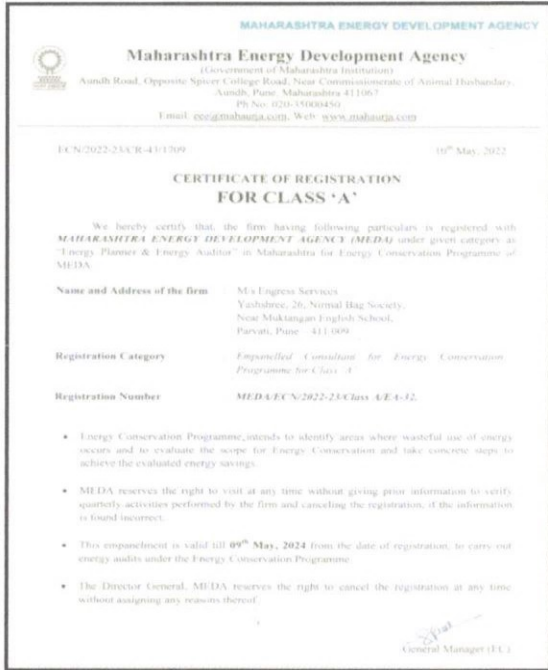
A Y Mehendale,

Certified Energy Auditor, EA-8192

ASSOCHAM GEM Certified Professional: GEM: 22/788



## REGISTRATION CERTIFICATES



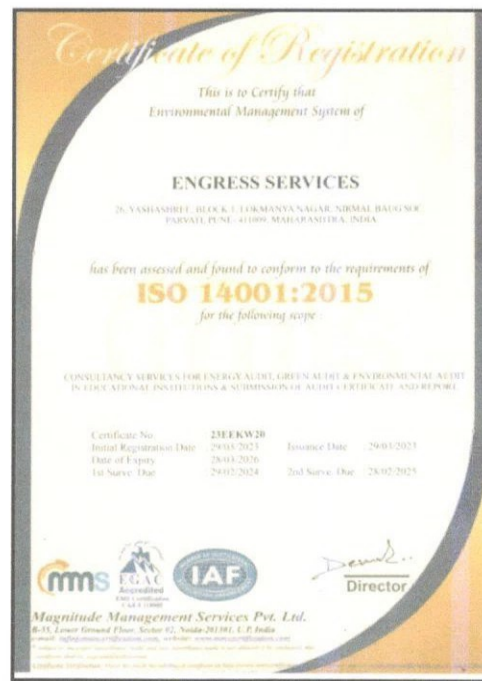
**MEDA REGISTRATION CERTIFICATE**



**ASSOCHAM GEM CP CERTIFICATE**



**ISO: 9001-2015 CERTIFICATE**



**ISO: 14001-2015 CERTIFICATE**



## 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 <sub>2</sub> Emission	11
3	Study of Usage of Renewable Energy	13
4	Study of Indoor Air Quality	14
5	Study of Indoor Comfort Condition Parameters	15
6	Study of Waste Management	16
7	Study of Rain water Harvesting	17
8	Study of Eco Friendly Initiatives	18
	<b>Annexure</b>	
I	Indoor Air Quality, Noise, & Indoor Comfort Standards	19

## **ACKNOWLEDGEMENT**

We Engress Services, Pune, express our sincere gratitude to the management of Maharashtra Cosmopolitan Education Society's M. A. Rangoonwala Institute of Hotel Management & Research Pune, Camp, Pune 411 001, for awarding us the assignment of Environmental Audit of their Pune Campus for the Year: 2022-23.

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



## EXECUTIVE SUMMARY

1. Maharashtra Cosmopolitan Education Society's M. A. Rangoonwala Institute of Hotel Management & Research Pune, Camp, Pune 411 001 consumes Energy in the form of Electrical Energy & LPG; used for various Equipment.

### 2. Pollution due to Institute Activities:

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

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

No	Particulars	Value	Unit
1	Annual Energy Purchased	29205	kWh
2	Annual CO <sub>2</sub> Emissions	29.85	MT

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

- The Institute has installed Roof Top Solar PV Plant of Capacity **50 kWp**.
- The Energy generated by Solar PV Plant in 22-23 is **60000 kWh**.
- Reduction in CO<sub>2</sub> Emissions in 22-23 is **54 MT**

### 5. Indoor Air Quality Parameters:

No	Parameter/Value	AQI	PM-2.5	PM-10
1	Maximum	49	30	25
2	Minimum	33	22	33

### 6. Indoor Comfort Conditions:

No	Parameter/Value	Temperature, °C	Humidity, %	Lux Level	Noise Level, dB
1	Maximum	27.2	71	132	45
2	Minimum	27.1	69	102	40

### 7. Waste Management:

No	Head	Particulars
1	Solid Waste	Segregation of Waste at source
2	Organic Waste	Installed Vermi Composting Pit
3	Food Waste	Installed Bio Gas Unit
4	E Waste Management	Disposed by the Society

## 8. Rain Water Harvesting:

The Institute has installed Pipes from the terrace and the Rain water falling on the terrace is run down through Pipes, filtered and is stored in a well & is further used for domestic purpose.

## 9. Environment Friendly Initiatives:

- Tree Plantation in the campus.
- Creation of awareness on Plastic Free Campus by Display of Posters

## 10. Assumptions:

1. Electrical Energy consumption is computed based on Capacity Utilization Factor
2. **1 kWh** of Electrical Energy releases **0.9 Kg of CO<sub>2</sub>** into atmosphere
3. **1 Kg of LPG** releases **2.68 Kg of CO<sub>2</sub>** into atmosphere
4. Energy generated by Roof Top Solar PV Plant: **4 kWh/kWp per Day**
5. Annual Solar Energy generation Days: **300 Nos**

## 11. References:

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

## **ABBREVIATIONS**

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



# CHAPTER-I

## INTRODUCTION

### 1. Important Definitions:

#### 1.1. Environment: Definition as per environment Protection Act: 1986

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

#### 1.2. 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:



1.5: Institute Location Image:



Institute  
Campus



## CHAPTER-II

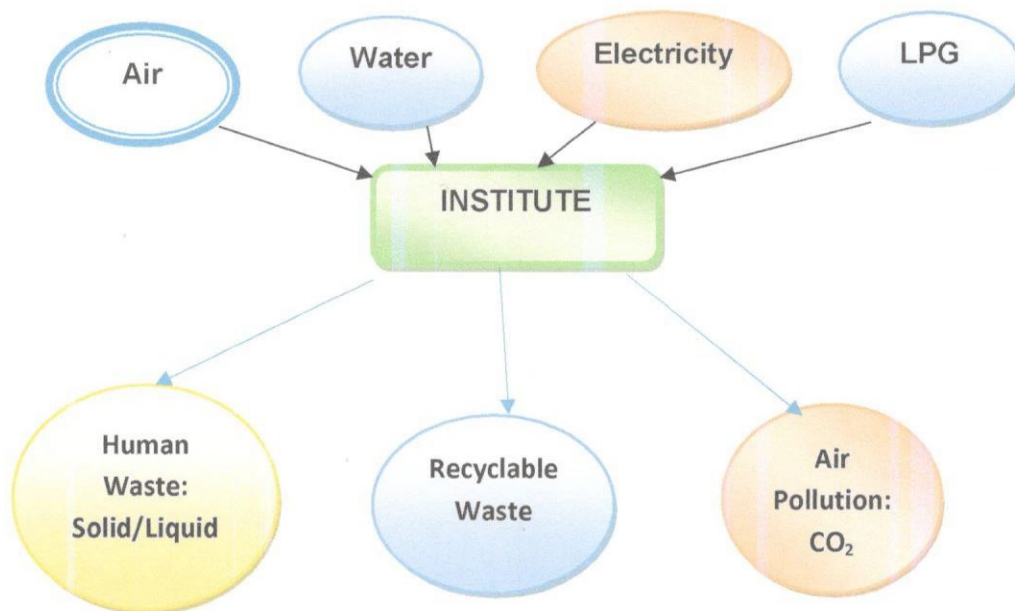
### STUDY OF RESOURCE CONSUMPTION & CO<sub>2</sub> EMISSION

The Institute consumes following basic/derived Resources:

1. Air
2. Water
3. Electrical Energy & LPG

We try to draw a schematic diagram for the Institute System & Environment as under.

**Chart No 1: Representation of Institute as System & Study of Resources & Waste**



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

- 1 kWh of Electrical Energy releases 0.9 Kg of CO<sub>2</sub> into atmosphere
- 1 Kg of LPG releases 2.68 Kg of CO<sub>2</sub> into atmosphere

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

No	Month	Energy Purchased, kWh	LPG Consumed, Kg	CO <sub>2</sub> Emissions, MT
1	Apr-22	2295	112	2.37
2	May-22	2336	116	2.41
3	Jun-22	2456	111	2.51
4	Jul-22	2635	111	2.67
5	Aug-22	2239	111	2.31
6	Sep-22	2965	126	3.01

7	Oct-22	2069	124	2.19
8	Nov-22	2375	103	2.41
9	Dec-22	2436	111	2.49
10	Jan-23	2175	115	2.27
11	Feb-23	2239	95	2.27
12	Mar-23	2985	95	2.94
13	Total	29205	1330	29.85
14	Maximum	2985	126	3.01
15	Minimum	2069	95	2.19
16	Average	2433.75	110.83	2.49

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

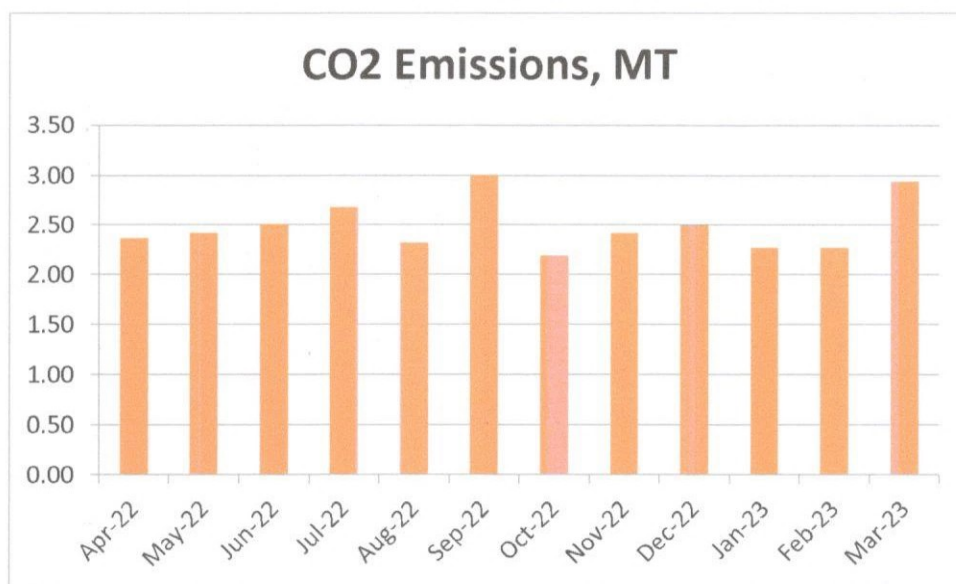


Table No 2: Important Parameters:

No	Parameter/ Value	Energy Purchased, kWh	LPG Consumed, Kg	CO <sub>2</sub> Emissions, MT
1	Total	29205	1330	29.85
2	Maximum	2985	126	3.01
3	Minimum	2069	95	2.19
4	Average	2433.75	110.83	2.49



## CHAPTER III

### STUDY OF USAGE OF RENEWABLE ENERGY

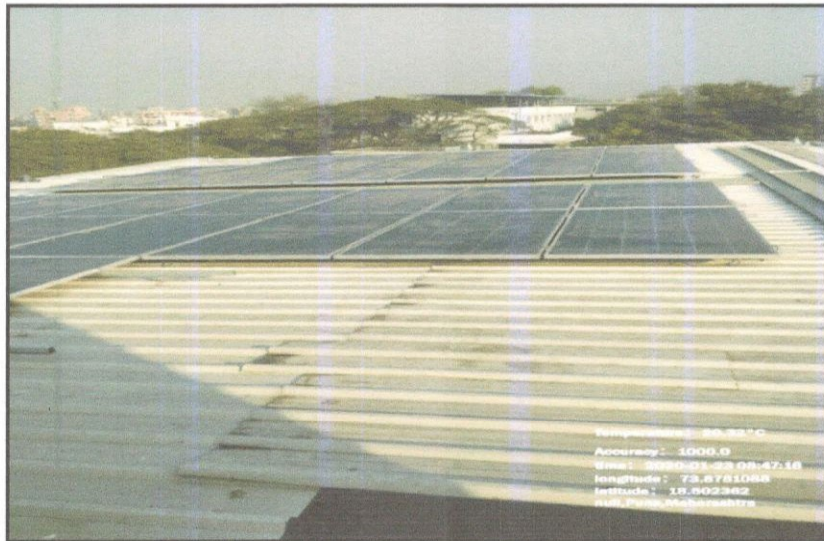
The Institute has installed Roof Top Solar PV Plant of Capacity **50 kWp**

In the following Table, we present the reduction in CO<sub>2</sub> emissions due to Solar Energy:

**Table No 3: Computation of Reduction in CO2 Emissions:**

No	Particulars	Value	Unit
1	Installed Capacity of Roof Top Solar PV Plant Capacity	50	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	60000	kWh
5	1 kWh of Electrical Energy saves	0.9	Kg/kWh
6	Qty of CO <sub>2</sub> Saved by Solar PV Plant $= (4) * (5) / 1000$	54	MT of CO <sub>2</sub>

**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.

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

#### 4.2 Air Quality Index:

An **Air Quality Index (AQI)** is a number used by government agencies to measure the **air pollution** levels and communicate it to the population. As the AQI increases, it means that a large percentage of the population will experience severe adverse health effects.

We present herewith following important Parameters.

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

**Table No 4: Indoor Air Quality Parameters:**

No	Location	AQI	PM-2.5	PM-10
1	Account Section	36	22	26
2	CR-201	46	28	32
3	Stores	49	30	33
4	Placement Cell	40	24	31
5	Salt Restaurant	33	20	25
6	TRG Kitchen-BTK	40	24	27
	Maximum	<b>49</b>	<b>30</b>	<b>25</b>
	Minimum	<b>33</b>	<b>22</b>	<b>33</b>

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

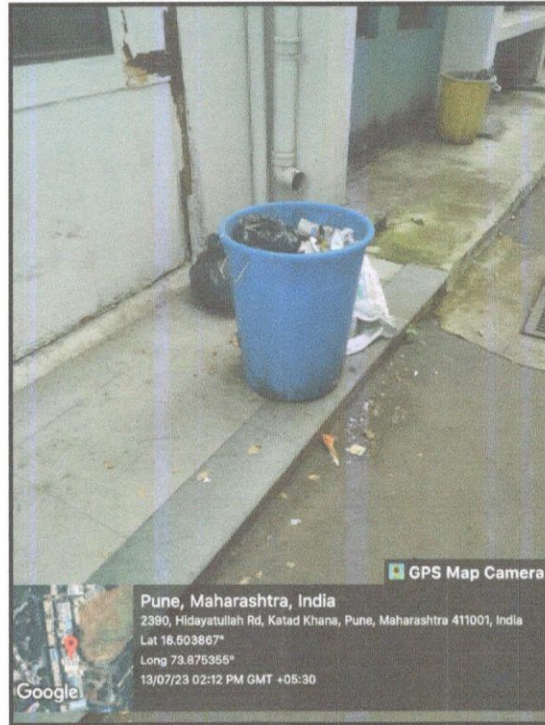
No	Location	Temperature, °C	Humidity, %	Lux Level	Noise Level, dB
1	Account Section	27.1	70	139	44.3
2	CR-201	27.2	69	105	42
3	Stores	27.1	69	102	41.9
4	Placement Cell	27.1	70	106	44.2
5	Salt Restaurant	27.2	71	112	43.9
6	TRG Kitchen-BTK	27.2	69	139	42
	Maximum	<b>27.2</b>	<b>71</b>	<b>132</b>	<b>45</b>
	Minimum	<b>27.1</b>	<b>69</b>	<b>102</b>	<b>40</b>

## CHAPTER VI STUDY OF WASTE MANAGEMENT

### 6.1 Segregation of Waste at Source:

The Institute has good housekeeping practices. The Waste is segregated at source. Waste collection Bins are placed at strategic locations.

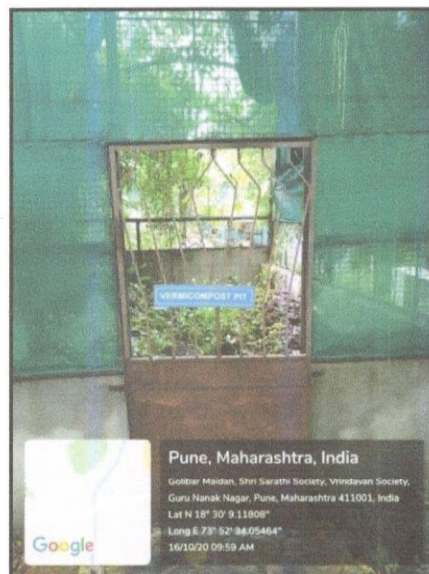
Photograph of Waste Collection Bins:



### 6.2 Organic Waste Management:

The Institute has installed a Vermi Composting Pit for conversion of Organic Waste.

Photograph of Vermi Composting Pit:

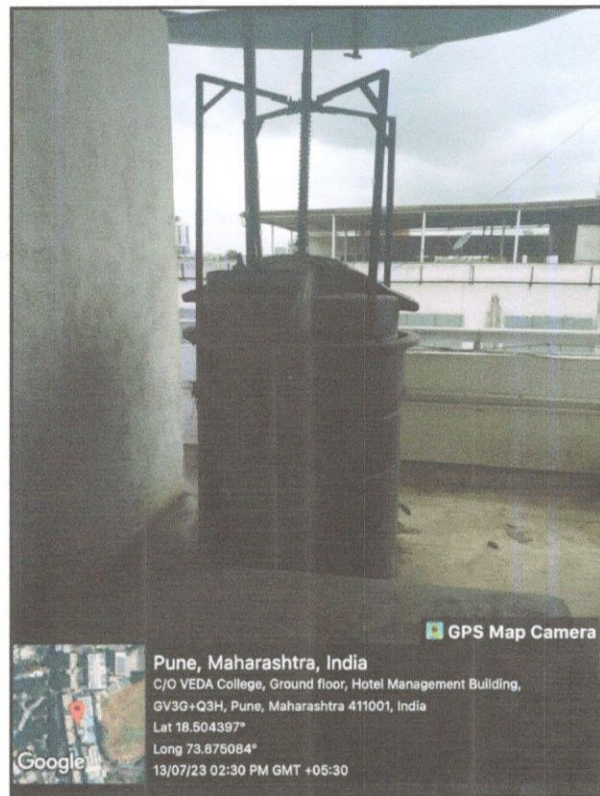




### 6.3 Bio Gas Unit:

The Institute has installed a Bio Gas Unit for conversion of Leftover Food Waste.

Photograph of Bio Gas Unit:



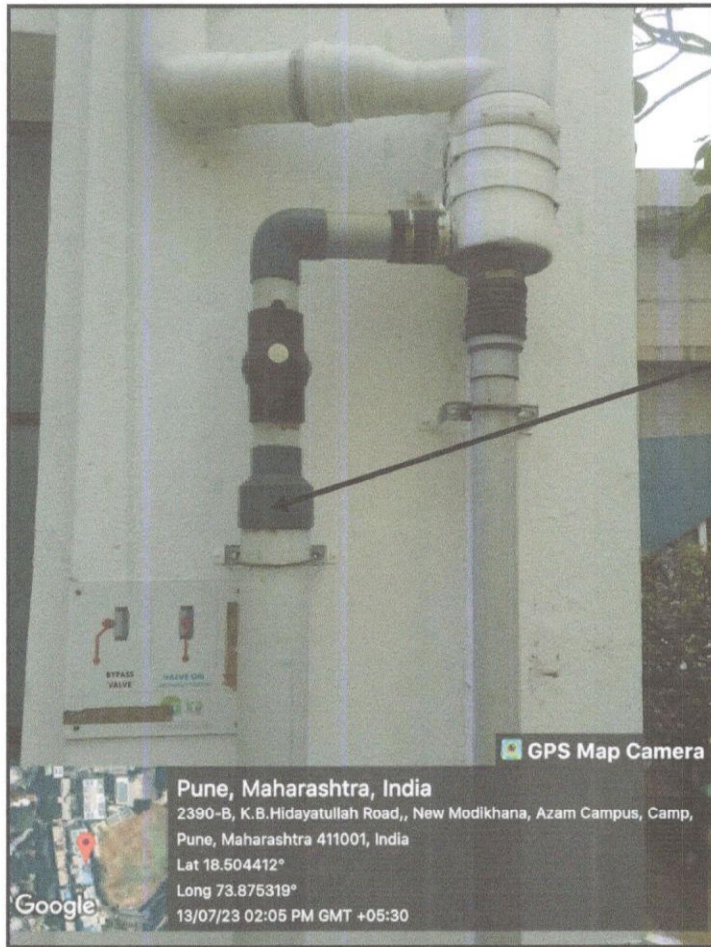
### 6.4 E Waste Management:

The E Waste is disposed by the Society.

## CHAPTER-VII STUDY OF RAIN WATER HARVESTING

The Institute has installed Pipes from the terrace and the Rain water falling on the terrace is run down through Pipes, filtered and is stored in a well & is further used for domestic purpose.

Photograph of Rain Water Carrying Pipe:



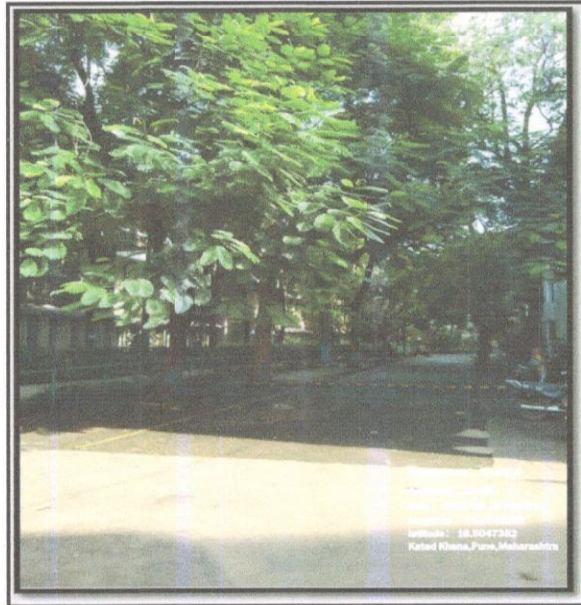
Rain Water Carrying Pipe & Sand Filter Unit

## CHAPTER-VIII STUDY OF ECO FRIENDLY INITIATIVES

### 8.1 Internal Tree Plantation:

The Institute has Tree Plantation in the campus.

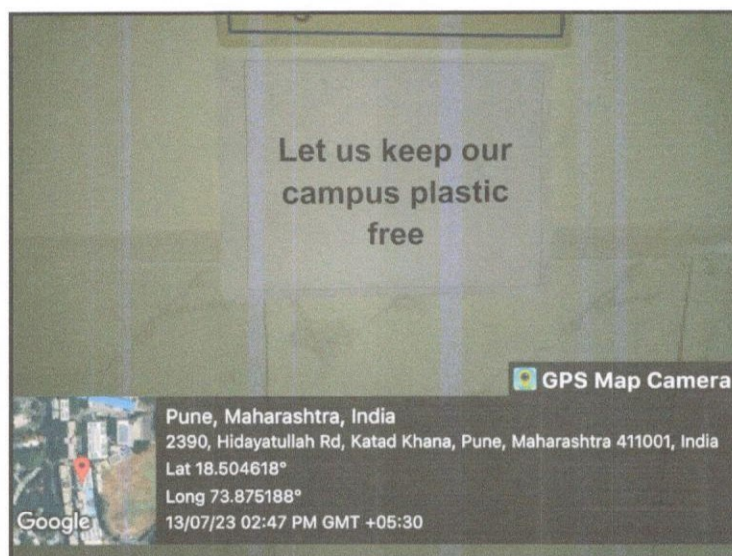
Photograph of Tree plantation:



### 8.2 Creation of Awareness about Plastic Ban:

The Institute has displayed posters emphasizing on importance of Plastic ban..

Photograph of Poster on Plastic Ban:



**ANNEXURE-I:****VARIOUS AIR QUALITY, NOISE & COMFORT STANDARDS:****1. Category Wise Air Quality Index Values & Concentration of PM 2.5 & PM10:**

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

**2. Recommended Noise Level Standards:**

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

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

No	Parameter	Value
1	Temperature	Less Than 33 <sup>0</sup> C
2	Humidity	Less Than 70%