

# 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

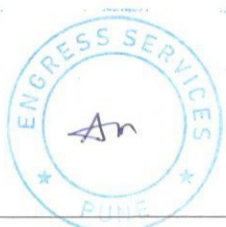


Year: 2021-22

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)



## REGISTRATION CERTIFICATES

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

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ECN/2022-23/CR-43/1709 10<sup>th</sup> 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 Muktagan 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 **09<sup>th</sup> 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)

## MEDA EMPANELMENT 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

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

  
**Deepak Sood**  
Secretary General, ASSOCHAM

GEM CP 22/788

## ASSOCHAM GEM CP CERTIFICATE



# ENGRESS SERVICES

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

Ref: ES/MARIHM/21-22/03

Date: 15/7/2022

## CERTIFICATE

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 Water Conservation 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



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## **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: 2021-22.

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 caused due to Institute Activities:

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

### 3. Present Energy, LPG Consumption & CO<sub>2</sub> Emissions:

No	Parameter /Value	Energy Purchased, kWh	LPG Consumed, Kg	CO <sub>2</sub> Emissions, MT
1	Total	25240	1330	26.28
2	Maximum	2365	139	2.43
3	Minimum	1896	95	1.97
4	Average	2103.33	110.83	2.19

### 4. Measures adopted for Environmental Conservation:

- Usage of Energy efficient LED fittings
- Usage of BEE STAR Rated Equipment
- Installation of **50 kWp** Roof Top Solar PV Plant

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

- The Institute has installed **50 kWp** Roof Top Solar PV Plant
- Energy generated by Solar PV Plant in 21-22 is **60000 kWh**
- Reduction in CO<sub>2</sub> Emissions by usage of Solar Energy in 21-22 is **54 MT**.

### 6. Indoor Air Quality:

No	Parameter/Value	AQI	PM-2.5	PM-10
1	Maximum	46	28	33
2	Minimum	40	25	30

### 7. Indoor Comfort Condition Parameters:

No	Parameter/Value	Temperature, °C	Humidity, %	Lux Level	Noise Level, dB
1	Maximum	28.4	68	165	44.6
2	Minimum	28.3	67	100	41.9

## 8. Waste Management:

### 8.1 Segregation of Waste at Source:

The waste is segregated at the source. There are Waste Collection Bins at various locations, to collect the Waste.

### 8.2 Organic Waste Management:

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

### 8.3 Bio Gas Unit:

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

### 8.4 E Waste Management:

The E Waste is disposed by the Society.

## 9. 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.

## 10. Environment Friendly Initiatives:

- Tree Plantation and Well maintained Garden.
- Creation of Awareness in respect of Water Conservation by displaying posters
- Tree Plantation Event in the Campus

## 11. 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**

## 12. References:

- For CO<sub>2</sub> Emission computation: [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

kWh	:	kilo-Watt Hour
Qty	:	Quantity
MT	:	Metric Ton
CO <sub>2</sub>	:	Carbon Di Oxide
LPD	:	Liters per Day
AQI	:	Air Quality Index
PM2.5	:	Particulate Matter of Size 2.5 microns
PM 10	:	Particulate Matter of Size 10 microns
CPCB	:	Central Pollution Control Board
ISHARE	:	The Indian Society of Heating & Refrigerating & Air Conditioning Engineers



## CHAPTER-I

### INTRODUCTION

#### 1.1. Important Definitions:

##### 1.1.1 Environment: Definition as per environment Protection Act: 1986

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

##### 1.1.2. Environmental Audit: Definition:

An audit which aims at verification and validation to ensure that various environmental laws are complied with and adequate care has been taken towards environmental protection and preservation

According to UNEP, 1990, "Environmental audit can be defined as a management tool comprising systematic, documented and periodic evaluation of how well environmental organization management and equipment are performing with an aim of helping to regularize the environment

1.1.3. 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 Audit Methodology:**

1. Study of present Resource Consumption & CO<sub>2</sub> Emissions
2. Study of CO<sub>2</sub> emission Reduction
3. Study of Indoor Air Quality
4. Study of Indoor Comfort Conditions
5. Study of Waste Management
6. Study of Rain Water Harvesting
7. Study of Environmental Friendly Initiatives.

**1.3 Google Earth Location Image:**



**Institute  
Campus**



**1.3 General Details of Institute: Table No: 4:**

No	Head	Particulars
1	Name	Maharashtra Cosmopolitan Education Society's, M. A. Rangoonwala Institute of Hotel Management & Research Pune
2	Address	K B Hidaytullah Road, Camp, Pune 411 001
3	Year of Establishment	2006





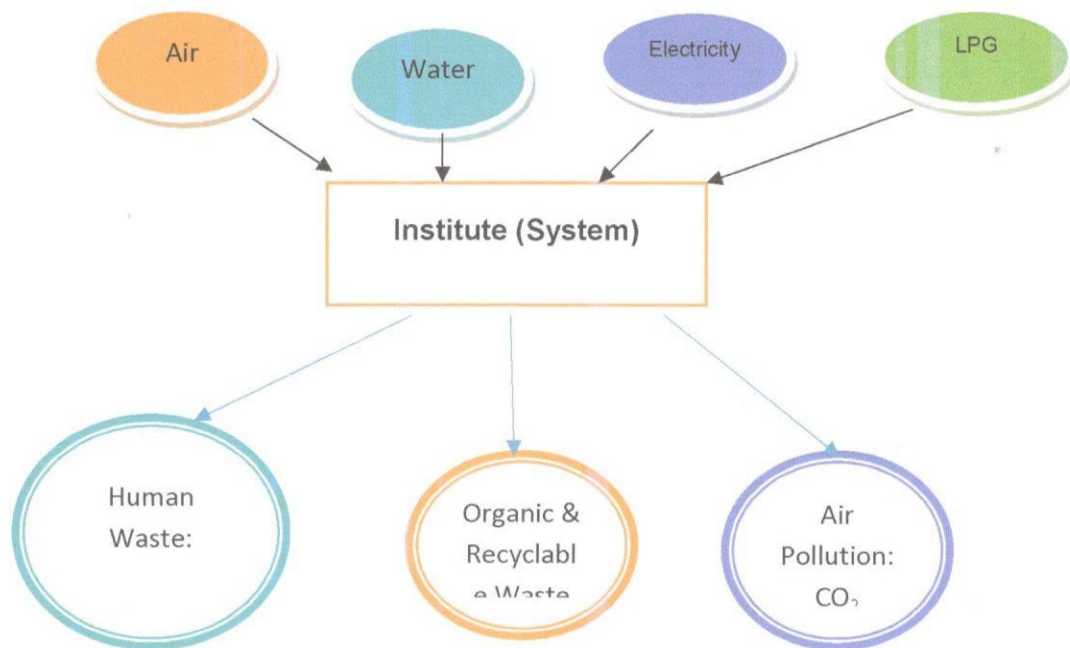
## CHAPTER-II STUDY OF RESOURCE CONSUMPTION & CO<sub>2</sub> EMISSION

The Institute consumes following Natural/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:**



A **Carbon Foot print** is defined as the Total Greenhouse Gas emissions, emitted due to various activities. Here we compute the emissions of Carbon-Di-Oxide, by usage 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 5: Study of Energy, LPG Consumption & CO<sub>2</sub> Emission: 2021-22:**

No	Month	Energy Purchased, kWh	LPG Consumed, Kg	CO <sub>2</sub> Emissions, MT
1	Apr-21	2190	114	2.28
2	May-21	2219	112	2.30
3	Jun-21	2115	113	2.21



4	Jul-21	2365	114	2.43
5	Aug-21	2164	116	2.26
6	Sep-21	2170	112	2.25
7	Oct-21	1936	116	2.05
8	Nov-21	2036	139	2.20
9	Dec-21	1996	106	2.08
10	Jan-22	1896	98	1.97
11	Feb-22	2036	95	2.09
12	Mar-22	2117	95	2.16
13	Total	25240	1330	26.28
14	Maximum	2365	139	2.43
15	Minimum	1896	95	1.97
16	Average	2103.33	110.83	2.19

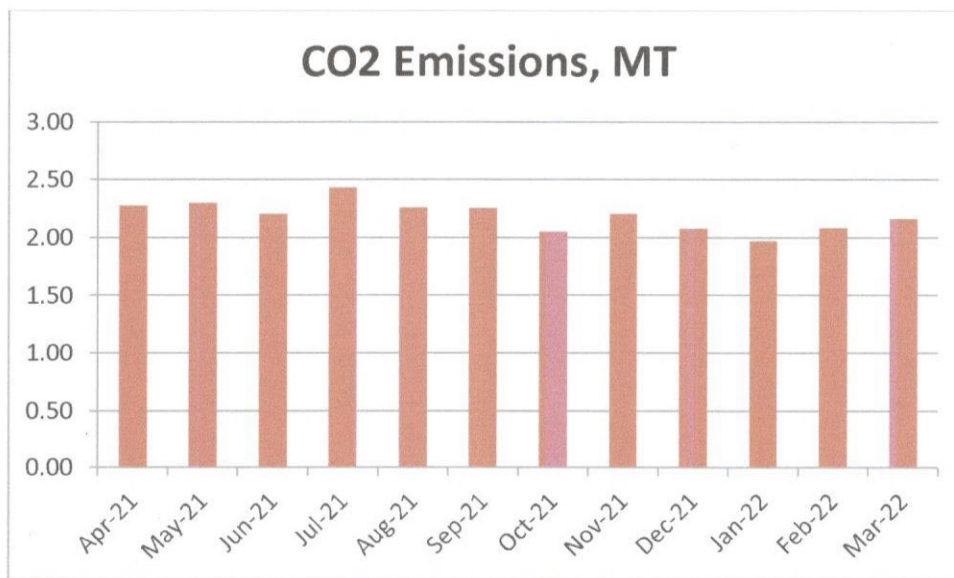
Chart No 2: Representation of Month wise CO<sub>2</sub> emissions:

Table No 6: Key Parameters:

No	Value	Energy Purchased, kWh	LPG Consumed, Kg	CO <sub>2</sub> emissions, MT
1	Total	25240	1330	26.28
2	Maximum	2365	139	2.43
3	Minimum	1896	95	1.97
4	Average	2103.33	110.83	2.19

## CHAPTER-III

### STUDY OF USAGE OF RENEWABLE ENERGY

The College has installed Roof Top Solar PV Plant of Capacity **50 kWp**  
We now calculate the reduction in CO<sub>2</sub> Emission due to Solar PV Plant.

**Table No 7: Computation of Reduction in CO<sub>2</sub> Emission:**

No	Particulars	Value	Unit
1	Installed Roof Top Solar PV Plant Capacity	50	kWp
2	Average Daily Energy Generated	4	kWh/kWp
3	Annual Generation Days	300	Nos
4	Annual Solar Energy Generated	<b>60000</b>	kWh
5	1 kWh of Electrical Energy is equivalent to	0.9	Kg of CO <sub>2</sub>
6	<b>Annual Reduction in CO<sub>2</sub> Emission = (4) * (5) /1000</b>	<b>54</b>	<b>MT</b>

**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 liveability.

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.

We present herewith following important Parameters.

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

**Table No 8: Indoor Air Quality Parameters:**

No	Location	AQI	PM-2.5	PM-10
1	Principal Cabin	40	25	33
2	Library	45	27	32
3	Class Room-101	41	25	30
4	Trg Kitchen	46	28	33
5	NAAC Office	45	27	32
	Maximum	<b>46</b>	<b>28</b>	<b>33</b>
	Minimum	<b>40</b>	<b>25</b>	<b>30</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 9: Study of Indoor Comfort Parameters:**

No	Location	Temperature, °C	Humidity, %	Lux Level	Noise Level, dB
1	Principal Cabin	28.3	68	165	44
2	Library	28.3	67	110	41.9
3	Class Room-101	28.4	67	100	42.3
4	Trg Kitchen	28.3	68	102	44.6
5	NAAC Office	28.3	68	114	43.8
	Maximum	<b>28.4</b>	<b>68</b>	<b>165</b>	<b>44.6</b>
	Minimum	<b>28.3</b>	<b>67</b>	<b>100</b>	<b>41.9</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.

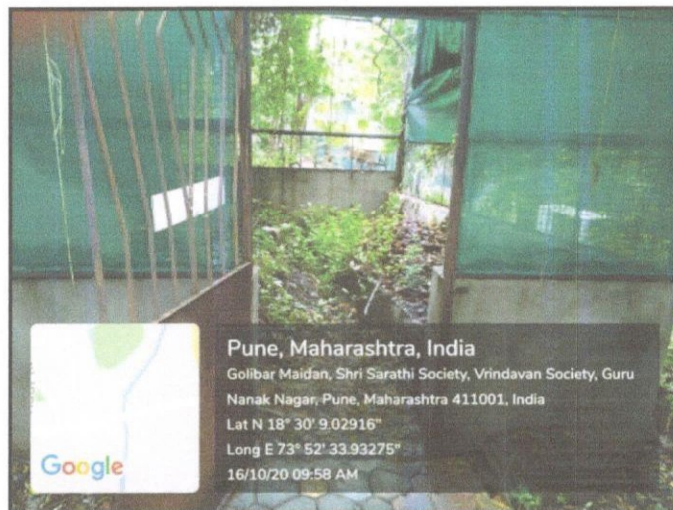
#### Photograph of Waste Collection Bin:



### 6.2 Organic Waste Management:

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

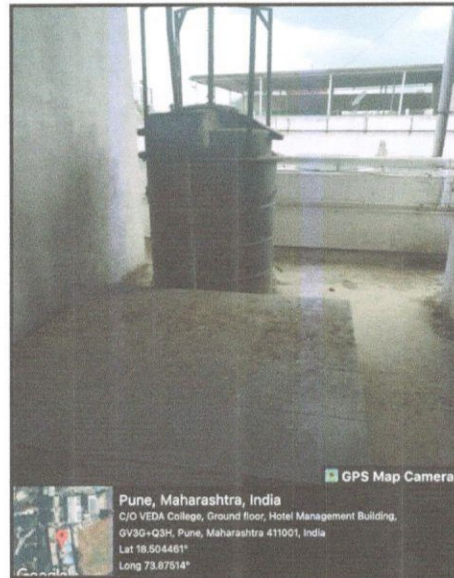
#### Photograph of Vermi Composting Pit:



### 6.3 Bio Gas Unit:

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

#### Photograph of Bio Gas Unit:



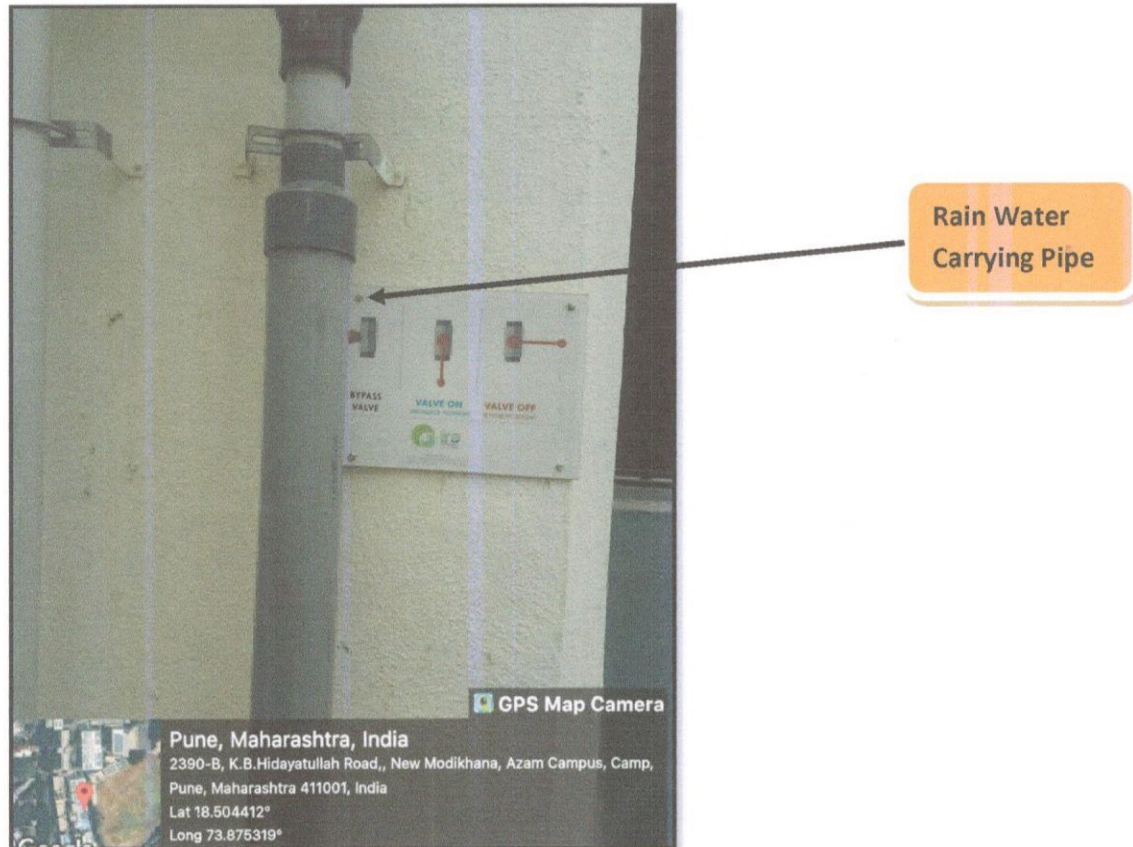
### 6.4 E Waste Management:

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:





## CHAPTER-VIII STUDY OF ENVIRONMENT FRIENDLY PRACTICES

### 8.1 Tree Plantation in the Campus:

The Institute has landscaped Lawn and well maintained Tree Plantation in the campus.

#### Photograph of Tree Plantation:



### 8.2 Creation of Awareness about Water Conservation:

The Institute has displayed Posters on Importance of Water Conservation.

#### Photograph of Poster on importance of Water Conservation:

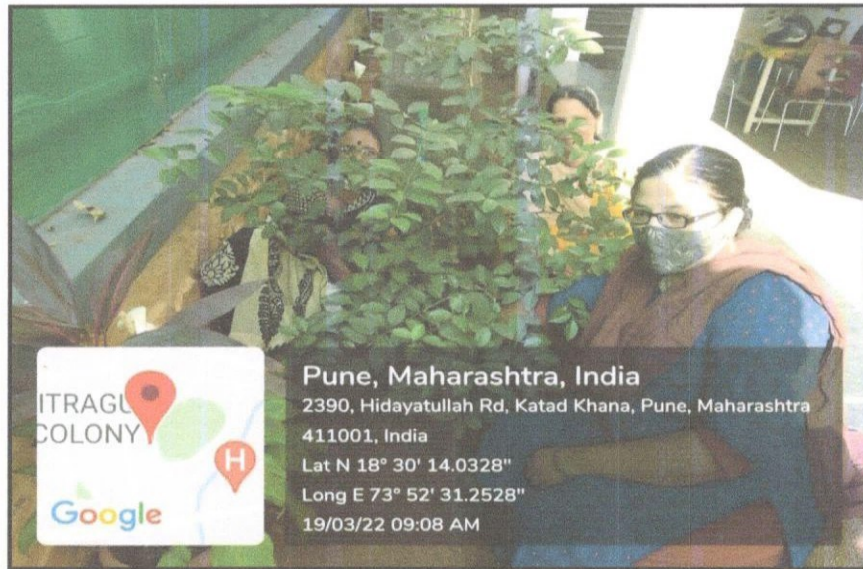




### 8.3 Tree Plantation in the Campus:

On 19<sup>th</sup> March 2022, the Institute organized Tree Plantation Event in the Campus.

**Photograph of Tree Plantation Program:**



## **ANNEXURE-I: INDOOR AIR QUALITY, NOISE & INDOOR COMFORT PARAMETER 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

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

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