ENVIRONMENTAL AUDIT REPORT
of
Dr. AMBEDKAR INSTITUTE OF TECHNOLOGY,
Outer Ring Road, Mallathahalli,
Bengaluru 560 056

Year: 2021-22

Prepared by

ENGRESS SERVICES

Yashashree, 26, Nirmal Bag Society,
Near Muktangan English School, Parvati, Pune 411009
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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
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ECN/2021-22/CR-43/441 — 8th February, 2022

CERTIFICATE OF REGISTRATION
FOR CLASS 'B'

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 'B'*

Registration Number : ***MEDA/ECN/2021-22/Class B/EA-07.***

- 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 **7th February, 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.

08/02/22
General Manager (EC)

Engress Services

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Tel: 09890444795 Email: engress123@gmail.com

Ref: ES/DAIT/21-22/03 Date: 8/5/2022

CERTIFICATE

This is to certify that we have conducted Environmental Audit at Dr. Ambedkar Institute of Technology, Outer Ring Road, Mallathahalli, Bengaluru 560 056 in the Academic year 2021-22.

The Institute has adopted following Environment Friendly practices:

- Usage of Energy Efficient LED Fittings
- Usage of Energy Efficient BEE STAR Rated equipment
- Installation of **4000 LPD** Solar Thermal Water Heating System
- Provision of Bio composting Unit for Organic Waste Management
- Tree Plantation in the campus
- Provision of Sanitary Waste Incinerator for disposal of Sanitary Waste
- Creation of awareness by Display of posters on Resource conservation
- Encouragement for Usage of E Vehicles

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

INDEX

ACKNOWLEDGEMENT

We Engress Services, Pune, express our sincere gratitude to the management of Dr. Ambedkar Institute of Technology, Outer Ring Road, Mallathahalli, Bengaluru 560 056 for awarding us the assignment of Environmental Audit of their campus for the Academic Year: 2021-22.

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

EXECUTIVE SUMMARY

1. Dr. Ambedkar Institute of Technology, Outer Ring Road, Mallathahalli, Bengaluru consumes Energy in the form of **Electrical Energy and Diesel** used for various gadgets, Office & other facilities

2. Present Energy Consumption & CO_2 Emission:

No	Parameter	Energy consumed, kWh	Diesel Consumed, Liters	CO_2 Emissions, MT
1	Total			
2	Maximum			
3	Minimum			
4	Average			

3. Pollution caused due to Institute Activities:

- **Air pollution:** Mainly CO_2 on account of Electricity Consumption
- **Solid Waste:** Bio degradable Kitchen Waste, Garden Waste
- **Liquid Waste:** Human liquid waste

4. Usage of Renewable Energy & CO_2 Emission Reduction:

- The Institute has installed **4000 LPD** Solar Water Heating System.
- The Equivalent Electrical Energy generated by Solar System is **344448 kWh.**
- The Annual Reduction in CO_2 Emissions due to Solar System is **310 MT**

5. Indoor Air Quality Parameters:

No	Parameter/Value	AQI	PM-2.5	PM-10
1	Maximum	70	42	51
2	Minimum	53	31	32

6. Indoor Comfort Condition Parameters:

No	Parameter/Value	Temperature, ^0C	Humidity, %	Lux Level	Noise Level, dB
1	Maximum	27.9	78	396	66
2	Minimum	24.5	62	39	32

7. Waste Management:

7.1 Segregation of Waste at Source:

The waste is segregated at source. Separate Dry and Wet waste collection bins are provided at key locations in the campus. It is then further disposed.

7.2 Organic Waste Management:

The organic waste generated is composted in a Vermi Composting Unit and the bio compost produced is used for own garden in the premises.

7.3 Liquid Waste Management:

The Institute is in a process of Installation of Sewage Treatment Plant to treat the Liquid Waste. The treated water will be used for gardening purpose.

7.4 E- Waste Management:

E Waste is collected in a separate Bin and is disposed of through Authorized Vendors.

8. Rain Water Management:

The rain water falling on the terrace is run through the pipes and channels and is used to increase the underground water table.

9. Green & Sustainable Practices:

- Maintenance of internal Lawn and Garden
- Tree Plantation in the campus
- Creation of awareness by Display of posters on Resource conservation
- Encouragement of Usage of E Vehicles

10. Notes & Assumptions:

1. **1 kWh** of Electrical Energy releases **0.9 Kg of CO_2** into atmosphere
2. **100 LPD** Solar Thermal System saves **1500 kWh** of Energy per Annum.

11. References:

1. For Indoor Air Quality: www.cpcb.com
2. For Indoor Comfort Parameters: www.ishrae.com
3. For Energy Generated by Solar PV Plant: www.solarrooftop.gov.in
4. For Computation of CO_2 Emissions: www.tatapower.com

ABBREVIATIONS

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

CHAPTER-I
INTRODUCTION

1.1 Important Definitions:

1.1.1 Environment: Definition as per environment Protection Act: 1986

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

1.1.2. Environmental Audit: Definition:

An audit which aims at verification and validation to ensure that various environmental laws are compiled with and adequate care has been taken towards environmental protection and preservation. *According to UNEP, 1990, "Environmental audit can be defined as a management tool comprising systematic, documented and periodic evaluation of how well environmental organization management and equipment are performing with an aim of helping to regularize the environment*

1.1.3. Environmental Pollutant: means any solid, liquid and gaseous substance present in the concentration as may be, or tend to be, injurious to Environment.

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

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

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

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 and CO_2 Emission
2. To study usage of Renewable Energy & CO_2 Emission Reduction
3. Study Indoor Air Quality Parameters
4. Study of Indoor Comfort Condition Parameters
5. To study Waste Management
6. To study Rain Water Harvesting
7. To study Environment Friendly initiatives

1.3 Google Earth Image:

1.4 Table No-4: General Details of Institute:

No	Head	Particulars
1	Name	Dr. Ambedkar Institute of Technology
2	Address	Outer Ring Road, Mallathahalli, Bengaluru

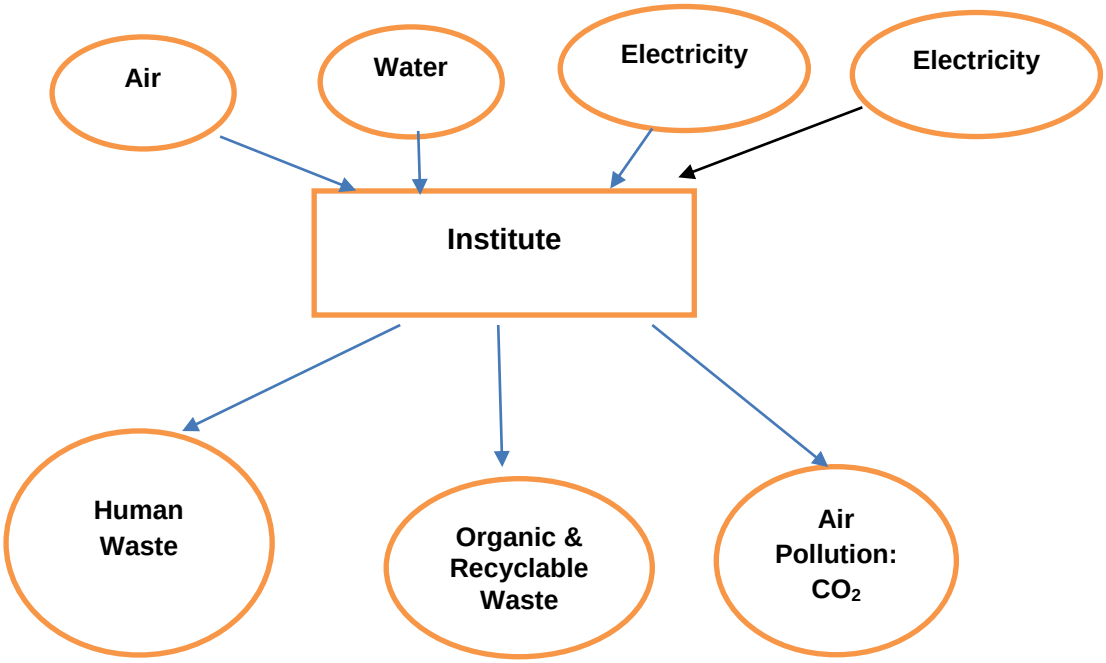
CHAPTER-II
STUDY OF CONSUMPTION OF RESOURCES & CO_2 EMISSION

2.1 The Institute consumes following Natural/derived Resources:

1. Air
2. Water
3. Electrical Energy

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

2.2 Chart No 1: Representation of Institute as a System:



2.3 Computation of CO_2 Emissions: A Carbon Foot print is defined as the Total Greenhouse Gas Emissions, emitted due to various activities. The Institute uses Electrical Energy for various Electrical gadgets & day to day activities.

Basis for computation of CO_2 Emissions:

- **1 kWh** of Electrical Energy releases **0.9 Kg of CO_2** into atmosphere
- **1 Liter** diesel releases **2.68 of CO_2** into atmosphere

Table No 5: Month wise CO_2 Emissions:

Chart No 2: Representation of Month wise CO_2 emissions:

Table No 6: Key Parameters:

CHAPTER-III
STUDY OF REDUCTION IN CO_2 EMISSION

In this Chapter, we study the usage of Renewable Energy and compute the reduction in CO_2 Emissions. The Institute has installed Solar Water Heating System of Capacity 4000 LPD at the Hostel block.

100 LPD Solar Thermal Water Heating System saves **1500 kWh** of Electrical Energy in one Year.
In the following Table, we present the reduction in CO_2 Emissions.

Table No 6: Computation Annual Reduction in CO_2 Emissions:

No	Particulars	Value	Unit
1	Solar Water Heating System at Hostel Block	4000	LPD
2	Energy Saved by 100 LPD Solar Thermal System in 365 Days	1500	kWh
3	Energy saved by 1500 LPD System in 1 Year = 4000*1500/100	60000	kWh
4	Actual Usage Period in 21-22	200	Nos
5	Energy saved in 200 Days of operation in 21-22 = 200*60000/365	32877	kWh
6	Equivalent Electrical Energy saved by 2500 LPD System	**32877**	**kWh**
7	1 kWh of Electrical Energy is equal to	0.9	Kg of CO_2
8	Annual reduction in CO2 Emissions in 19-20= 6*7/1000	**30**	MT of CO_2

Photograph of Solar Thermal Water Heating System:

CHAPTER-IV
STUDY OF INDOOR AIR QUALITY PARAMETERS

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**.'

As per Section 2(a) of Air (Prevention and control of pollution) Act, 1981 '**air pollutant**' has been defined as **'any solid, liquid or gaseous substance [(including noise)] present in the atmosphere in such concentration as may be or tend to be injurious to human beings or other living creatures or plants or property or environment**

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 8: Indoor Air Quality Parameters:

No	Location	AQI	PM-2.5	PM-10
	First Floor			
1	Principal's office A block	60	37	38
2	IQAC Room A block	53	36	48

3	Main porch	63	34	43
4	Administrative office A block	61	37	40
5	A-109 Physics Lab	61	37	39
6	A-118 chemistry Lab	63	38	42
7	D-101 dept. Library	70	42	49
8	D-104 Computer Lab	70	40	49
9	D-107 UG Lab	56	34	42
10	C-108 CS Lab	65	40	50
11	C-220 EC dept.	66	42	49
12	C-320 LD- ECE Lab	66	42	51
13	C-410 Smart class room	56	36	42
14	B-301 Medical electronics library	56	31	32
15	B-307 Staff room	61	37	39
16	B-309 medical electronics lab	56	37	42
	Maximum	**70**	**42**	**51**
	Minimum	**53**	**31**	**32**

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
	First Floor				
1	Principal's office	24.6	62	220	66
2	IQAC Room	24.5	78	120	32
3	Main porch	27.4	73	60	50
4	Administrative office	27	70	221	38
5	A-109 Physics Lab	26.9	73	95	35
6	A-118 chemistry Lab	26.8	73	160	42
7	D-101 dept. Library	27.2	71	120	37
8	D-104 Computer Lab	27.3	70	174	38
9	D-107 UG Lab	26.8	73	39	35
	Second floor				
10	C-108 CS lab	26.9	73	130	40
11	C-220 ECE dept.	27.8	70	63	46
12	C-320 LD-ECE Lab	27.9	69	138	37
13	C-410 Smart class room	27.4	72	257	42
14	B-301 Medical electronics lab	27.4	70	396	35
15	B-307 Staff room	27.5	70	278	41
16	B-309 medical electronics lab	27.6	70	140	40
	Maximum	**27.9**	**78**	**396**	**66**
	Minimum	**24.5**	**62**	**39**	**32**

CHAPTER-VI
STUDY OF WASTE MANAGEMENT

6.1 Segregation of Waste at Source:

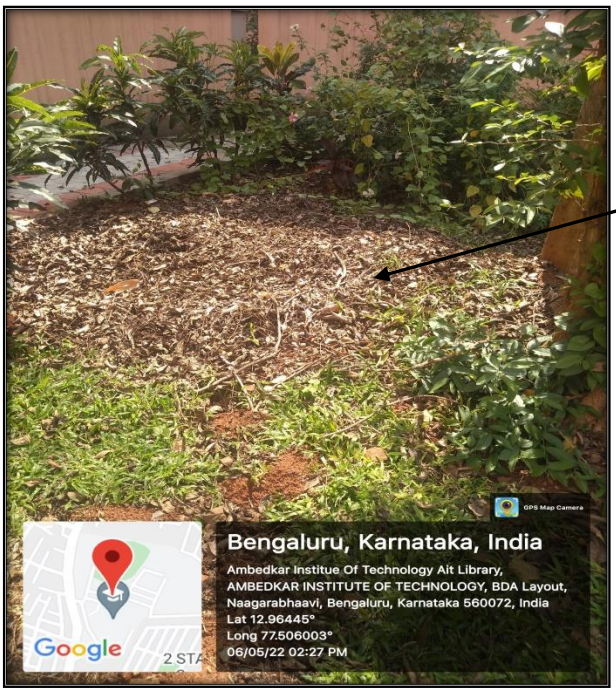
The waste is segregated at source. Separate Dry and Wet waste collection bins are provided at key locations in the campus. It is then further disposed.

Photograph of Waste Collection Bins:

6.2 Organic Waste Management:

The organic waste, like leafy waste generated is composted in a Bio Composting Unit and the compost produced is used for own garden.

Photograph of Bio Composting Unit:



6.3 Liquid Waste Management:

The Institute is in process of Installation of a Sewage Treatment Plant**,** to treat the Liquid Waste. The treated water will be used for gardening purpose.

Present Photograph of Sewage Treatment Plant Site:

6.4 E Waste Management:

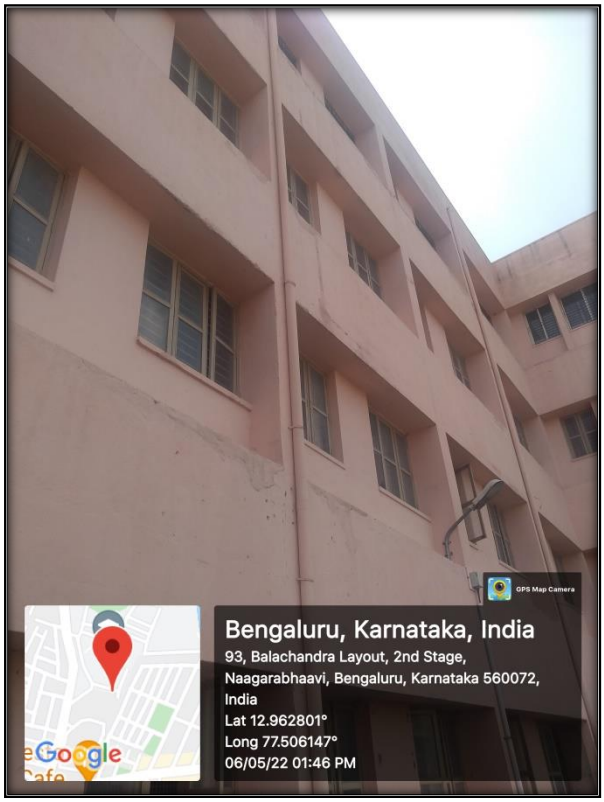
The E Waste is collected in a separate E Waste collection bin and is disposed of through Authorized Agency.

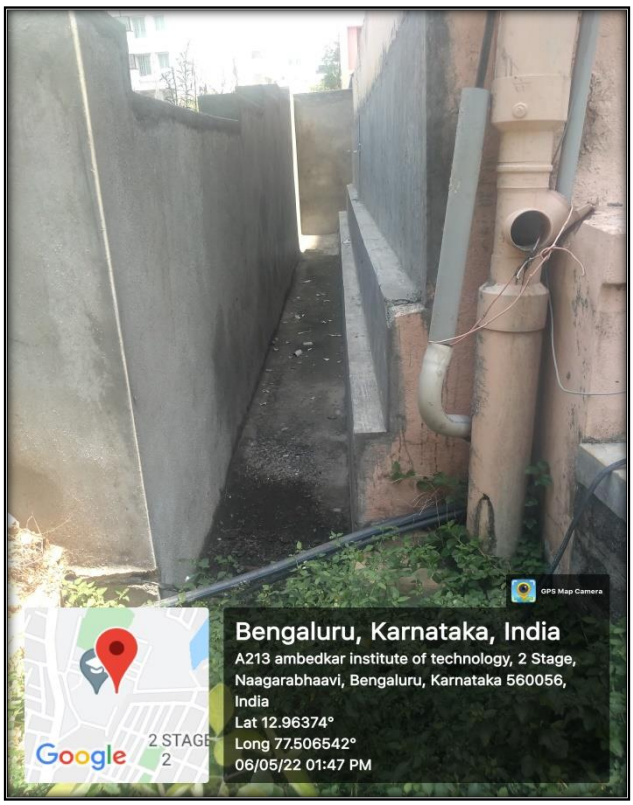
Photograph of E Waste Collection Bin:

CHAPTER-VII
STUDY OF RAIN WATER MANAGEMENT

The Institute has installed Pipes from the terrace and the Rain water falling on the terrace is gathered and used to increase the underground water table.

Photograph of Rain Water Collection Pipe and Channel Section:





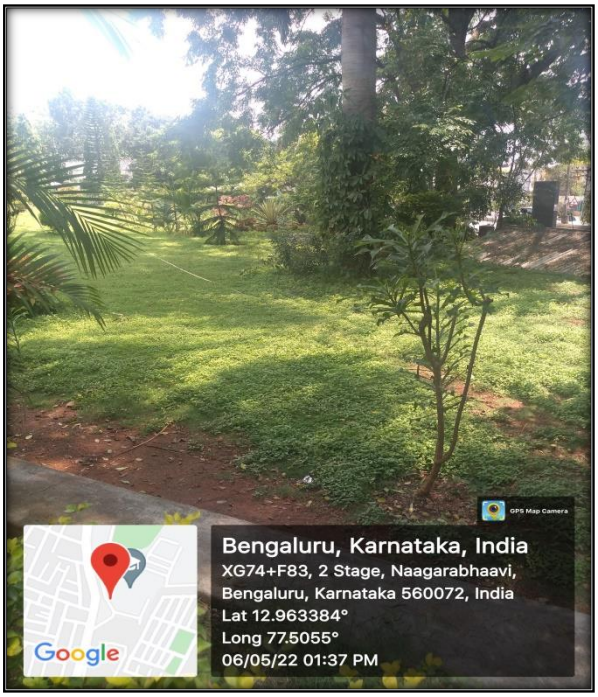
CHAPTER-VIII
STUDY OF ENVIRONMENT FRIENDLY INITIATIVES

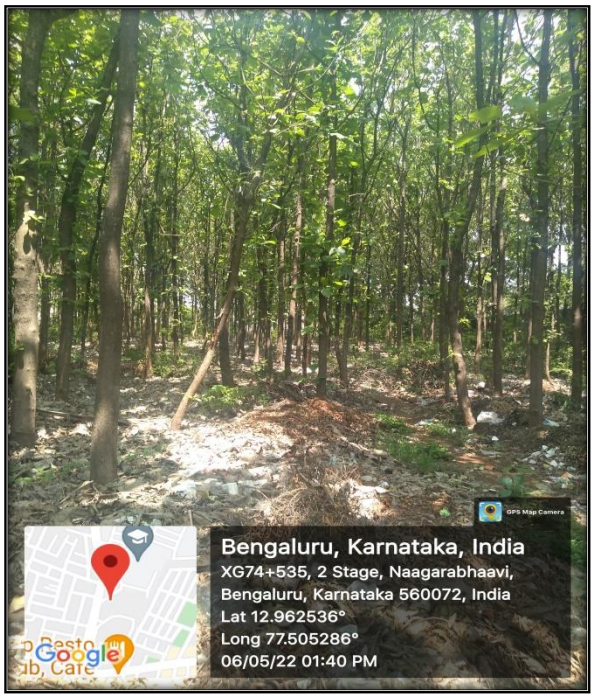
8.1 Internal Tree Plantation:

The Institute has well maintained landscaped garden in the campus.

Photograph of Tree plantation:

Photograph of Lawn and Tree Plantation:





8.2 Creation of Awareness by Display of Posters:

The Institute has displayed posters by display of Posters on Resource Conservation.

Photograph of Posters on Resource Conservation:

8.3 Encouragement for Usage of E Vehicle:

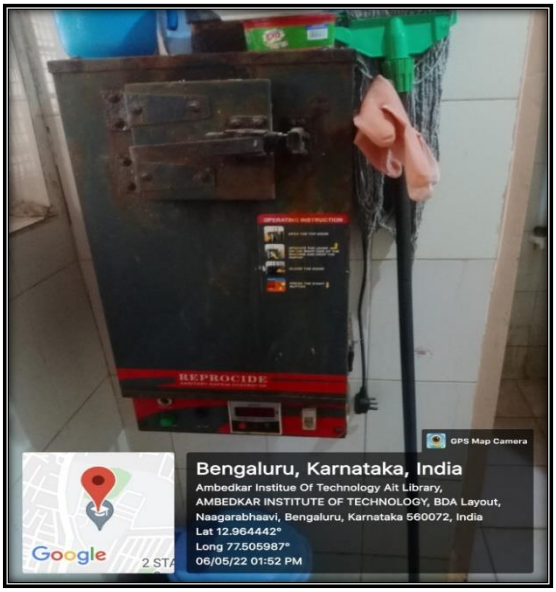
The Institute is encouraging the usage of E Vehicles by Stake holders. Some faculties are using the E Vehicles.

Photograph of E Vehicles:

8.4 Provision of Sanitary Waste Incinerator:

For disposal of Sanitary Waste, a Sanitary Waste Incinerator is installed in the campus.

Photograph of Sanitary Waste Incinerator:



ANNEXURE: VARIOUS AIR QUALITY, WATER QUALITY, NOISE & INDOOR COMFORT STANDARDS:

1. Category Wise Air Quality Index Values & Concentration of PM 2.5 & PM10:

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

2. Recommended Water Quality Standards:

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

3. Recommended Noise Level Standards:

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

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

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