ENVIRONMENTAL AUDIT REPORT

Of

Deccan Education Society's,
BRIHAN MAHARASHTRA COLLEGE OF COMMERCE,
Shivajinagar, Pune 411 004

Year: 2021-22

Prepared by

ENGRESS SERVICES

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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,
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ECN/2022-23/CR-43/1709 — 10th May, 2022

CERTIFICATE OF REGISTRATION
FOR CLASS 'A'

We hereby certify that, the firm having following particulars is registered with ***MAHARASHTRA ENERGY DEVELOPMENT AGENCY (MEDA)*** under given category as "Energy Planner & Energy Auditor" in Maharashtra for Energy Conservation Programme of MEDA.

Name and Address of the firm : M/s Engress Services
Yashshree, 26, Nirmal Bag Society,
Near Muktangan English School,
Parvati, Pune – 411 009.

Registration Category : *Empanelled Consultant for Energy Conservation Programme for Class 'A'*

Registration Number : ***MEDA/ECN/2022-23/Class A/EA-32.***

- Energy Conservation Programme intends to identify areas where wasteful use of energy occurs and to evaluate the scope for Energy Conservation and take concrete steps to achieve the evaluated energy savings.
- MEDA reserves the right to visit at any time without giving prior information to verify quarterly activities performed by the firm and canceling the registration, if the information is found incorrect.
- This empanelment is valid till **09th May, 2024** from the date of registration, to carry out energy audits under the Energy Conservation Programme
- The Director General, MEDA reserves the right to cancel the registration at any time without assigning any reasons thereof.

General Manager (EC)

Engress Services

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

Ref: ES/DESBMCC/21-22/03 Date: 19/5/2021

CERTIFICATE

This is to certify that we have conducted Environmental Audit at Deccan Education Society's, Brihan Maharashtra College of Commerce, Shivajinagar, Pune-411 004 in the year 2021-22.

The College has adopted following **Energy Efficient & Green P**ractices:

- Usage of Energy Efficient LED Fittings
- Maximum Usage of Day Lighting
- Installation of **5500 LPD** Solar Thermal Water Heating System
- Segregation of Waste at source
- Installation of Bio Gas Plant
- In process installation of Sewage Treatment Plant
- In process installation of Rain Water Harvesting Project
- Tree Plantation and Maintenance of Good Internal Garden
- Provision of Sanitary Waste Incinerator
- Conducting Cleanliness Drive

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

For Engress Services,

A Y Mehendale,
Certified Energy Auditor
EA-8192

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ACKNOWLEDGEMENT

We at Engress Services, Pune, express our sincere gratitude to the management of Deccan Education Society's, Brihan Maharashtra College of Commerce, Pune, for awarding us the assignment of Environmental Audit of their campus for the Year: 2021-22.

We are thankful to various Head of Departments & other Staff members for helping us during the field measurements.

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EXECUTIVE SUMMARY

1. Deccan Education Society's, Brihan Maharashtra College of Commerce, Shivajinagar, Pune 411 004, consumes Energy in the form of **Electrical Energy** used for various gadgets, Office & other facilities.

2. Pollution caused due to College Activities:

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

3. Present Energy Consumption & CO_2 Emissions:

No	Parameter/ Value	Energy Purchased, kWh	CO_2 emissions, MT
1	Total	155535	139.98
2	Maximum	21451	19.31
3	Minimum	8117	7.31
4	Average	12961.25	11.67

4. Various projects already implemented for Environmental Conservation:

- Usage of Energy Efficient LED Fittings
- Usage of Energy efficient STAR Rated Equipment
- Installation of **5500 LPD** Solar Thermal Water Heating System

5. Usage of Renewable Energy& CO_2 Emission Reduction:

- The College has installed Solar Thermal Water Heating System of Capacity **5500 LPD**
- Electrical Energy saved by Solar Water Heating System in: 21-22 is **45205 kWh**.
- The reduction in CO_2 Emissions due to Solar PV Plant in 21-22 is **40.68 MT.**

6. Indoor Air Quality Parameters:

No	Parameter/Value	AQI	PM-2.5	PM-10
1	Maximum	28	17	26
2	Minimum	21	10	12

7. Indoor Comfort Condition Parameters:

No	Parameter/Value	Temperature, ^0C	Humidity, %	Lux Level	Noise Level, dB
1	Maximum	21	99	213	43.3
2	Minimum	19.8	98	85	36

8. Waste Management:

8.1 Segregation of Waste at Source:

The waste is segregated at the source. There are separate Waste Collection Bins at various locations, to collect Dry and Wet Waste separately.

8.2 Organic Waste Management:

For bio degradable waste, Bio Gas plant is installed at Girls Hostel Block.

8.3 Liquid Waste Management:

The College is in a process of installation of Sewage Treatment Plant to treat the Liquid Waste.

8.4 E Waste Management:

The E-Waste generated in the campus is disposed, through authorized vendor.

9. Rain Water Harvesting:

The College is in a process of installing the Rainwater Harvesting Project.

10. Environment Friendly Initiatives:

- There are about 700 plus Trees in the campus.
- Provision of Sanitary Waste Incinerator
- Conducting Cleanliness Drive

11. Notes & Assumptions:

1. **1 kWh** of Electrical Energy releases **0.9 Kg of CO_2** into atmosphere
2. Energy saved by 100 LPD Solar Thermal Water Heating System in an year is **1500 kWh**
3. Annual working Days: For Solar Thermal Water Heating System in 21-22:**200 Nos**

12. References:

- For CO_2 Emission computation: www.tatapower.com
- For Energy saved by Solar Water Heating System: www.mahaurja.com
- For Various Indoor Air Parameters: www.ishrae.com
- For AQI &Water Quality Standards: www.cpcb.com

ABBREVIATIONS

kWh	:	kilo-Watt Hour
DES	:	Deccan Education Society
LPD	:	Liters per Day
Qty	:	Quantity
MT	:	Metric Ton
CO_2	:	Carbon Di Oxide
kWp	:	Kilo Watt Peak
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

1.1Important Definitions:

1.1.1Environment: 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: 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. 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 College)
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)

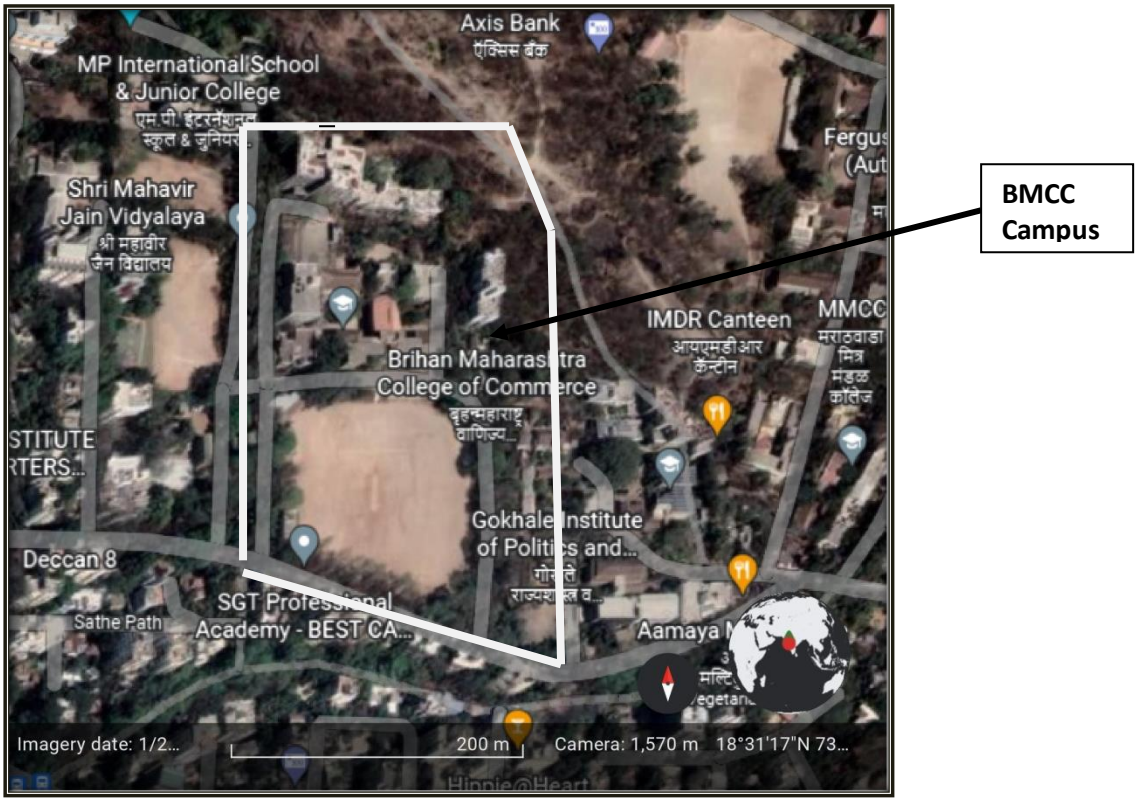
1.2 Audit Methodology:

1. Study of College as System
2. Study of present Resources Consumption & CO_2 Emissions
3. Study of CO_2 emission Reduction
4. Study of Indoor Air Quality
5. Study of Indoor Comfort Parameters
6. Study of Waste Management
7. Study of Rain Water Harvesting
8. Study of Environment Friendly Initiatives

1.3 Table No 4: General Details of College:

No	Head	Particulars
1	Name	Deccan Education Society's Brihan Maharashtra College of Commerce
2	Address	545, Shivajinagar, Pune 411004
3	Year of Establishment	1943
4	Affiliation	Savitribai Phule Pune University

1.4 Google Earth Image:



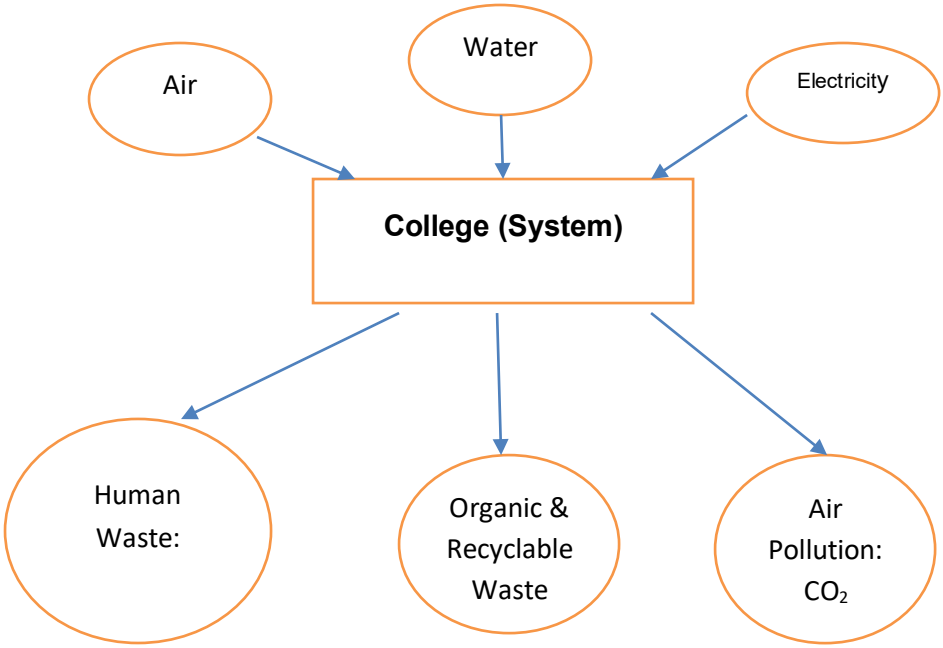
CHAPTER-II
STUDY OFRESOURCE CONSUMPTION & CO_2 EMISSION

The College consumes following Natural/derived Resources:

1. Air
2. Water
3. Electrical Energy

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

Chart No 1: Representation of College as System:



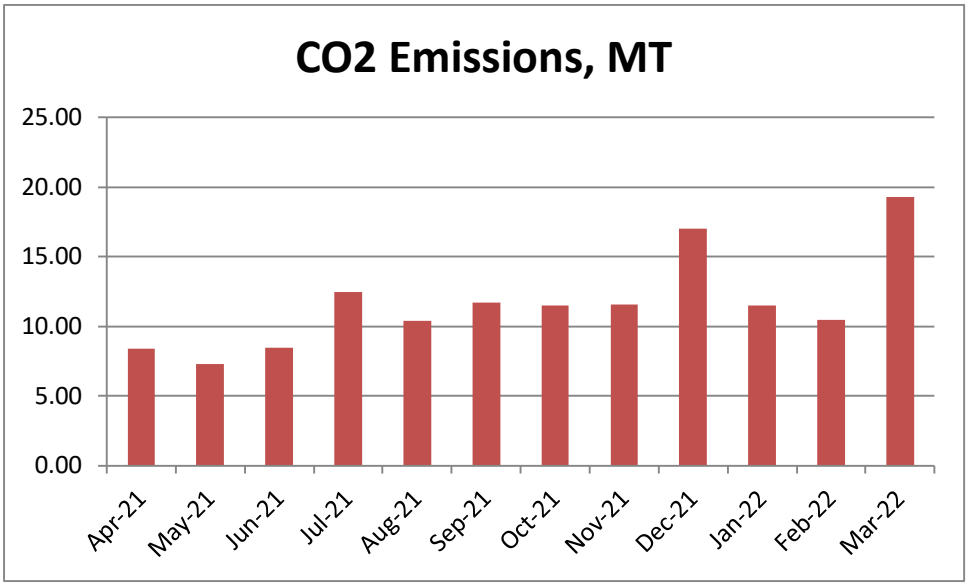
Now we compute the Generation of CO_2 on account of consumption of Electrical Energy as under.

Table No 5: Energy Consumption & CO_2 Emissions: 2021-22:

No	Month	Total Energy Consumed, kWh	CO_2 Emissions, MT
1	Apr-21	9291	8.36
2	May-21	8117	7.31
3	Jun-21	9396	8.46
4	Jul-21	13805	12.42
5	Aug-21	11527	10.37
6	Sep-21	12993	11.69

7	Oct-21	12752	11.48
8	Nov-21	12861	11.57
9	Dec-21	18934	17.04
10	Jan-22	12774	11.50
11	Feb-22	11634	10.47
12	Mar-22	21451	19.31
13	Total	155535	139.98
14	Maximum	21451	19.31
15	Minimum	8117	7.31
16	Average	12961.25	11.67

Chart No: 2: To study the variation of Monthly CO_2 Emission:



From the above analysis, we present following important parameters:

Table No 6: Variation in Important Parameters:

No	Parameter/ Value	Energy Purchased, kWh	CO_2 emissions, MT
1	Total	155535	139.98
2	Maximum	21451	19.31
3	Minimum	8117	7.31
4	Average	12961.25	11.67

CHAPTER-III
STUDY OF CO_2EMISSION REDUCTION

The College has installed **5500 LPD Solar Thermal Water heating system at Girls and Boys Hostel blocks.** (Total Installed Capacity). In the following Table we present the Annual Reduction in CO_2 Emissions due to Solar PV Plant.

Table No 7: Computation of Annual Reduction in CO_2 Emissions:

No	Particulars	Value	Unit
1	Installed Solar Thermal Water Heating Capacity	5500	LPD
2	Energy saved by 100 LPD System in 1 year	1500	kWh
3	Energy saved by 5500 LPD System=1*2/100	82500	kWh
4	System working days in 21-22	200	Nos
5	Energy saved by System in 21-22=82500*200/365	**45205**	kWh
6	1 kWh of Electrical Energy is equivalent to	**0.9**	Kg of CO_2
7	**Annual Reduction in CO@ emission in 21-22= 5*6/1000**	**40.68**	**MT**

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 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**.'

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 10micron

Table No 8: Indoor Air Quality Parameters:

No	Location	AQI	PM2.5	PM 10
1	**Main Building**			
	Ground Floor			
1	Principal Office	26	15	26

2	Vice Principal Office	21	12	14
3	Supervisor Office	23	14	19
4	Class Room-4	23	13	14
5	Class Room-3	24	15	16
6	Admin Section	25	16	19
7	Tata Hall	26	16	20
	Basement			
1	Faculty Room	26	12	16
2	Wash Room	23	14	17
3	Pantry	25	16	20
4	Record Room	26	16	18
	First Floor			
1	Class Room	23	12	13
2	Class Room	26	16	18
3	Class Room	25	15	18
4	Department of Banking	23	14	19
5	Class Room	26	16	23
6	Class Room	28	17	21
7	Class Room	25	16	22
2	**Library**			
1	Ground Floor	23	15	20
2	First Floor	26	16	24
3	**BBA Building**			
	Ground Floor			
1	Porch	23	14	13
2	Admin Office	24	14	20
3	Hasamnis Madam Office	22	10	12
4	Upadhye Madam Office	23	14	19
5	Room	26	13	16
6	Pantry	23	14	19
7	Meeting Room	25	17	19
8	Faculty Room	28	17	21
9	Class Room: 2, 3, 4	26	17	23

	First Floor			
1	Class Room	23	15	19
2	Computer Lab	26	17	23
3	Class Rooms- 5 Nos	23	14	13
4	Corridor	28	16	20
	Second Floor			
1	Computer Lab-2	23	15	20
2	Class Room	26	16	24
	Third Floor			
1	Class Rooms- 7 Nos	28	17	21
4	**Junior College Building**			
	Ground Floor			
1	Placement Office	24	14	20
2	Class Rooms-3 Nos	22	10	12
	First Floor			
1	Class Rooms-4 Nos	23	14	19
5	**Girls Common Room**	25	16	20
6	**Girls Hostel Block**	26	16	18
7	**Boys Hostel Block**	25	16	20
8	**BMTRI Centre**			
	Ground Floor			
1	OQAC Office	23	14	13
2	Accounting Lab	24	14	20
3	Accounts Department	22	10	12
4	Heritage	23	14	19
5	NCC	26	13	16
6	Commerce Lab	23	14	19
7	Research Centre	25	17	19
8	Corridor	28	17	21
	First Floor			
1	A V Hall	26	17	23

2	English Department	25	16	20
3	BCA Lab	22	10	12
4	Lab	23	14	19
9	Pittie Hall	23	14	13
10	Gymkhana Office	28	17	21
	Maximum	**28**	**17**	**26**
	Minimum	**21**	**10**	**12**

CHAPTER VI
STUDY OF INDOOR COMFORT CONDITION

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, ^{0}C	Humidity, %	Lux Level	Noise Level, dB
1	**Main Building**				
	Ground Floor				
1	Principal Office	20	99	113	41.1
2	Vice Principal Office	19.9	98	102	40
3	Supervisor Office	20	98	120	43.3
4	Class Room-4	19.9	99	96	36
5	Class Room-3	20	98	85	37
6	Admin Section	20	99	87	36.9
7	Tata Hall	20	99	94	39
	Basement				
1	Faculty Room	20.1	98	104	41.3
2	Wash Room	20.1	99	110	41
3	Pantry	20	99	105	42
4	Record Room	20	99	112	41.6
	First Floor				
1	Class Room	20.1	99	102	41.3
2	Class Room	20	98	131	43
3	Class Room	19.8	99	96	41.2
4	Department of Banking	20	99	102	41
5	Class Room	20.1	99	112	42.1
6	Class Room	20	99	140	42

7	Class Room	20	99	130	43.1
2	**Library**				
1	Ground Floor	20	99	103	41
2	First Floor	19.9	98	112	43.1
3	**BBA Building**				
	Ground Floor				
1	Porch	20	99	136	42
2	Admin Office	21	98	105	41
3	Hasamnis Madam Office	20.1	98	213	40
4	Upadhye Madam Office	20.3	99	126	41
5	Room	20.3	99	103	42
6	Pantry	20.3	98	112	41
7	Meeting Room	20.1	99	116	42
8	Faculty Room	20.1	98	149	41
9	Class Room: 2, 3, 4	20.3	99	104	43.3
	First Floor				
1	Class Room	20.3	99	106	42
2	Computer Lab	20	99	113	41.1
3	Class Rooms- 5 Nos	19.9	98	102	40
4	Corridor	20	98	120	43.3
	Second Floor				
1	Computer Lab-2	20	98	85	37
2	Fclass Room	20	99	87	36.9
	Third Floor				
1	Class Rooms- 7 Nos	19.9	99	96	36
4	**Junior College Building**				
	Ground Floor				
1	Placement Office	19.9	99	96	36
2	Class Rooms-3 Nos	20.2	99	93	39.4
	First Floor				
1	Class Rooms-4 Nos	20	99	94	39

5	**Girls Common Room**	20	99	94	39
6	**Girls Hostel Block**	20.2	99	93	39.4
7	**Boys Hostel Block**	20.1	98	96	39.4
8	**BMTRI Centre**				
	Ground Floor				
1	OQAC Office	19.9	99	96	36
2	Accounting Lab	20.3	99	103	42
3	Accounts Department	20.3	98	112	41
4	Heritage	20.1	99	116	42
5	NCC	20.1	98	149	41
6	Commerce Lab	20	99	94	39
7	Research Centre	20.2	99	93	39.4
8	Corridor				
	First Floor				
1	A V Hall	20.3	99	103	42
2	English Department	20.3	98	112	41
3	BCA Lab	20.1	99	116	42
4	Lab	20.1	98	149	41
9	Pittie Hall	20.3	98	112	41
10	Gymkhana Office	20.3	99	103	42
	Maximum	**21**	**99**	**213**	**43.3**
	Minimum	**19.8**	**98**	**85**	**36**

CHAPTER VI
STUDY OF WASTE MANAGEMENT

5.1 Segregation of Waste at Source:

The waste is segregated at the source. There are separate Waste Collection Bins at various locations, to collect Dry and Wet Waste separately.

Photograph of Waste Collection Bins:

5.2 Organic Waste Management:

To convert the Bio degradable Waste, the College has installed a **Bio Gas Plant** at the Girls hostel block.

Photograph of Bio Gas Plant:

5.3 Liquid Waste Management:

The College is in a process of installation of Sewage Treatment Plant to treat the Waste Water.

5.4 E Waste Management:

The E-Waste generated in the campus is disposed, through authorized vendor.

CHAPTER-VII
RAIN WATER HARVESTING

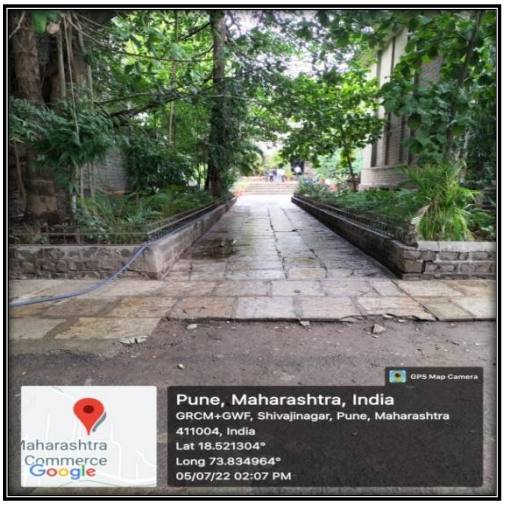
The College is in a process of installing the Rainwater Harvesting Project.

CHAPTER-VIII
STUDY OF ENVIRONMENT FRIENDLYPRACTICES

8.1 Tree Plantation:

The College has beautiful maintained lawn and trees in the campus. On all sides of the campus trees are planted. There are about 700 Plus trees in the campus.

Photograph of Tree Plantation:



8.2 Provision of Sanitary Waste Incinerator:

The College has installed a Sanitary Waste Incinerator.

Photograph of Sanitary Waste Incinerator:

8.3 Cleanliness Drive:

In order to make students understand, the importance of Cleanliness of our society, Cleanliness Drive was arranged.

Photograph of Cleanliness Drive:

ANNEXURE-1: VARIOUS AIR QUALITY, WATER QUALITY, NOISE & INDOOR COMFORT STANDARDS:

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

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

2. Recommended Water Quality Standards:

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

3. Recommended Noise Level Standards:

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

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

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