SNDT Women's University

Shreemati Nathibai Damodar Thackersey Women's University

AQAR 2020-21

Criterion VII

Supporting documents

For

7.1.6- Quality audits on environment and energy are regularly undertaken by the institution

INDEX 7.1.6

Quality audits on environment and energy are regularly undertaken by the institution

Sr. No	Details of report	Page Number
01	Energy Audit Report 2020-21	04-24
02	Environmental Audit Report 2020-21	25-54
03	Green Audit Report	55-81

Policy Document on Environment and energy usage is available at :
https://docs.google.com/document/d/1uYetfBXkgaLHAXj8u6GiZr3IhnoT2aS-/edit?usp=sharing&ouid=100660592442491391876&rtpof=true&sd=true

7.1.6 Quality audits on environment and energy are regularly undertaken by the institution

7.1.6.1 The institution's initiatives to preserve and improve the environment and harness energy are confirmed through the following:

1. Green audit
2. Energy audit
3. Environment audit
4. Clean and green campus recognitions/awards
5. Beyond the campus environmental promotional activities

ENERGY AUDIT REPORT
of
SNDT WOMEN'S UNIVERSITY
MUMBAI

Year: 2020-21

Prepared by

Enrich Consultants

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

ENRICH CONSULTANTS * Pune *

MAHARASHTRA ENERGY DEVELOPMENT AGENCY

An ISO 9001 : 2000 Reg. no. : RQ 91 / 2462

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

ECN/2021-22/CR-14/1577 — 22nd April, 2021

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 Enrich Consultants** Yashashree, Plot No. 26, Nirmal Bag Society, Near Muktangan English School, Parvati, Pune - 411009.
Registration Category	:	*Empanelled Consultant for Energy Conservation Programme for Class 'A'*
Registration Number	:	*MEDA/ECN/2021-22/Class A/EA-03*

- 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 **21st April, 2023** 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)

ENRICH CONSULTANTS

Enrich Consultants

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

Ref: EC/SNDT/20-21/01 Date: 30/11/2021

CERTIFICATE

This is to certify that we have conducted Energy Audit at SNDT Women's University, Mumbai in the year 2020-21.

The University has adopted following Energy Efficient Practices:

- Usage of Energy Efficient LED Fittings.
- Installation of **500 kWp** Roof Top Solar PV Plant.
- Installation of **16000 LPD** Solar Thermal Water Heating System at Hostel blocks.
- Usage of BEE STAR Rated Equipment

We appreciate the support of Management, involvement of faculty members and students in making the campus Energy Efficient.

For Enrich Consultants,

A Y Mehendale,
Certified Energy Auditor
EA-8192

ENRICH CONSULTANTS * Pune *

INDEX

ENRICH CONSULTANTS Pune

7

ACKNOWLEDGEMENT

We Enrich Consultants, Pune, express our sincere gratitude to the management of SNDT Women's University, Mumbai for awarding us the assignment of Energy Audit of their Churchgate, Juhu & Pune Campuses for the Academic Year: 2020-21.

We are thankful to:

- Dr. Ujwala Chakradeo, Vice Chancellor
- Dr. Subhash Waghmare, Registrar (Additional Charge)
- Mr. Ashish Kamble, University Engineer
- Mr. Maske, Site Engineer

We are also thankful to concerned Faculty Members and Staff Members for helping us during the field study.

EXECUTIVE SUMMARY

1. SNDT Women's University, Mumbai has three campuses, namely at Churchgate, Juhu, in Mumbai and at Pune. The major form of Energy is the Electrical Energy, used for various equipment in the campuses.

2. Present Energy Consumption & CO_2 Emissions:

No	Parameter/ Value	Energy Consumed, kWh	CO_2 Emissions, MT
1	Total	302748	272.47
2	Maximum	51902	46.71
3	Minimum	19456	17.51
4	Average	25229	22.71

3. Various measures adopted for Energy Conservation:

The various projects already implemented by the University are

- Usage of LED Lights
- Installation of **500 kWp** Roof Top Solar PV Plant.
- Installation of **16000 LPD** Solar Thermal Water Heating System.

4. Usage of Alternate/Renewable Energy Source:

- The University has installed **500 kWp** Roof Top Solar PV Plant and **16000 LPD** Solar Thermal Water Heating System at the Hostel Blocks.
- Total Annual Electrical Energy Demand is **902748 kWh.**
- Annual Alternate Energy Usage is **600000 kWh.**
- The percentage of Alternate Energy to Annual Energy requirement is **66.46 %.**

5. Percentage of Lighting Power Requirement met by LED Lighting:

- The Annual Total Lighting Demand is **107010 kWh.**
- The annual LED Lighting Demand is **18720.5 kWh.**
- The % of LED to the total annual lighting power requirement works out to be **17.49 %**

6. Notes & Assumptions:

1. **1 kWh** of Electrical Energy releases **0.9 Kg of CO_2** into atmosphere.
2. **1 kWp** Roof Top Solar PV Plant generates **4 kWh** of Electrical Energy /Day
3. Daily working hours-**4 Nos** (For Lighting Calculations)
4. Annual working Days-**120 Nos** (For Lighting Calculations)

5. Annual Energy Generation Days: For Solar PV Plant: **300 Nos**

7. References:

1. For Computation of CO_2 Emissions: www.tatapower.com
2. For Energy Generated by Solar PV Plant: www.solarrooftop.gov.in

ABBREVIATIONS

AC	:	Air conditioner
SNDT	:	Shreemati Nathibai Damodar Thackersey
D/L	:	Down Lighter
FTL	:	Fluorescent Tube Light
LED	:	Light Emitting Diode
kWh	:	kilo-Watt Hour
kWp	:	Kilo Watt Peak
Qty	:	Quantity
W	:	Watt
kW	:	Kilo Watt
PC	:	Personal Computer
MT	:	Metric Ton

CHAPTER-I
INTRODUCTION

1.1 Objectives:

1. To study the Connected Load
2. To Study Present level of Energy Consumption
3. To compute the present CO_2 emissions
4. To study Usage of Renewable Energy
5. To study usage of LED Lighting

1.2 General Details of University:

Table No 1: General Details of University

No	Head	Particulars
1	Name	SNDT Women's University
2	Address	1, Nathibai Thackersey Road, Mumbai 400 020
3	Campuses Under Study	1) Churchgate Campus, Mumbai 2) Juhu Campus, Mumbai 3) Karve Road Campus, Pune
3	Year of Establishment	1916

CHAPTER-II
STUDY OF CONNECTED LOAD

In this chapter, we present the details of various Electrical loads as under

Table No 2: Details of Overall Connected Load of Churchgate Campus:

No	Equipment	Qty	Load, W/Unit	Load, kW
1	40 W-FTL	1414	40	56.56
2	20 WLED	101	20	2.02
3	Ceiling Fan	854	52	44.408
4	PC	348	150	52.2
5	Printer	101	150	15.15
6	Other Fans	128	52	6.656
7	AC-Old-1.5 TR	3	2025	6.075
8	AC-New-1.5 TR	13	1800	23.4
9	AC-2 TR	20	2700	54
10	LED-7W	19	7	0.133
11	LED 16 W	262	16	4.192
12	LED-50 W	2	50	0.1
13	LED-18 W	45	18	0.81
14	CFL	53	32	1.696
15	Water Pump	4	5595	22.38
16	Lift	1	5595	5.595
17	Other Equipment	50	150	7.5
18	Central A C	1	13500	13.5
19	**Total**			**316**

Chart No 1: Connected Load of Churchgate Campus:

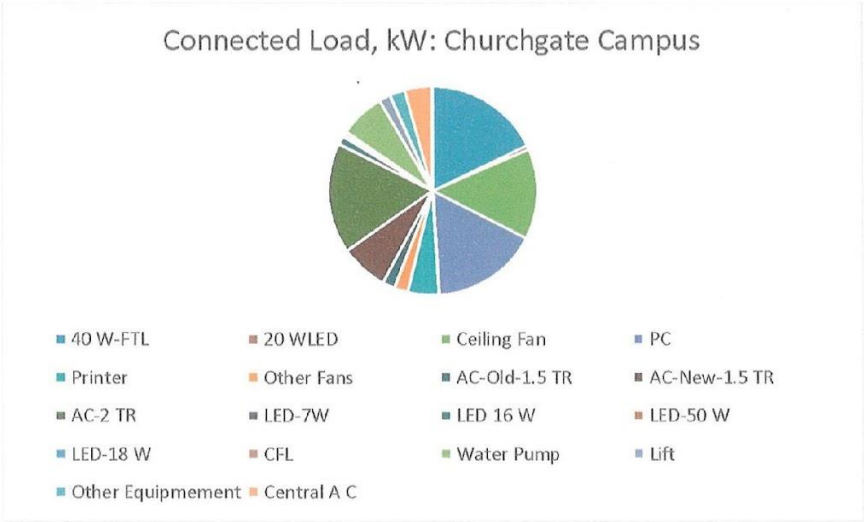


Table No 3: Details of Overall Connected Load of Juhu Campus:

No	Equipment	Qty	Load, W/Unit	Load, kW
1	FTL	2681	40	107.24
2	20W LED	466	20	9.32
3	2*20 W LED	19	40	0.76
4	LED D/L 16 W	51	16	0.82
5	LED-18W	78	18	1.404
6	22 W Led Sq. LED	23	22	0.51
7	Fan	1848	52	96.10
8	Other Fans	28	52	1.456
9	PC	854	150	128.1
10	Printer	55	150	8.25
11	AC-1.5 Ton	34	2025	68.85
12	AC-2 Ton	26	2700	70.2
13	AC- New	27	1800	48.6
14	Lift	1	5595	5.595
15	Water Pumps	1	11190	11.19
16	Other Equipment	50	150	7.5
17	**Total**			**566**

Chart No 2: Connected Load of Juhu Campus:

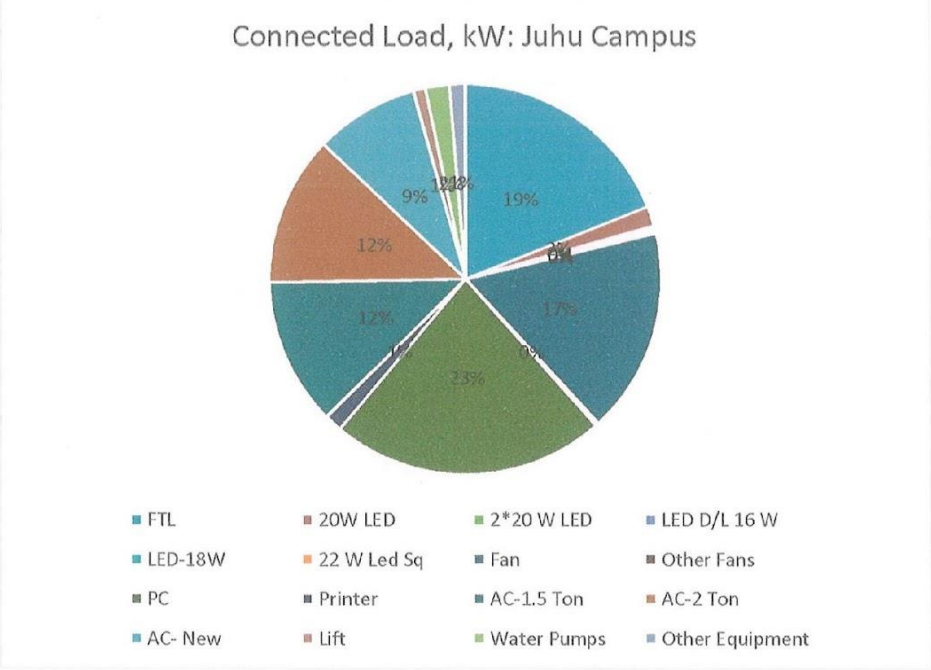


Table No 4: Details of Overall Connected Load of Pune Campus:

No	Equipment	Qty	Load, W/Unit	Load, kW
1	FTL	461	40	18.44
2	20 W LED	840	20	16.8
3	40 W LED D/L	30	40	1.2
4	16 W LED	50	16	0.8
5	7 W LED	20	7	0.14
6	Ceiling Fan	632	52	32.86
7	PC	127	150	19.05
8	Printer	86	150	12.9
9	Other Fans	18	52	0.94
10	AC- 1.5 TR New	5	1800	9
11	AC-1.5 TR- Old	6	2025	12.15
12	Water Pump	6	5595	33.57
13	Lift	2	5595	11.19
14	Other Equipment	50	150	7.5
15	**Total**			**177**

Chart No 3: Connected Load of Pune Campus:

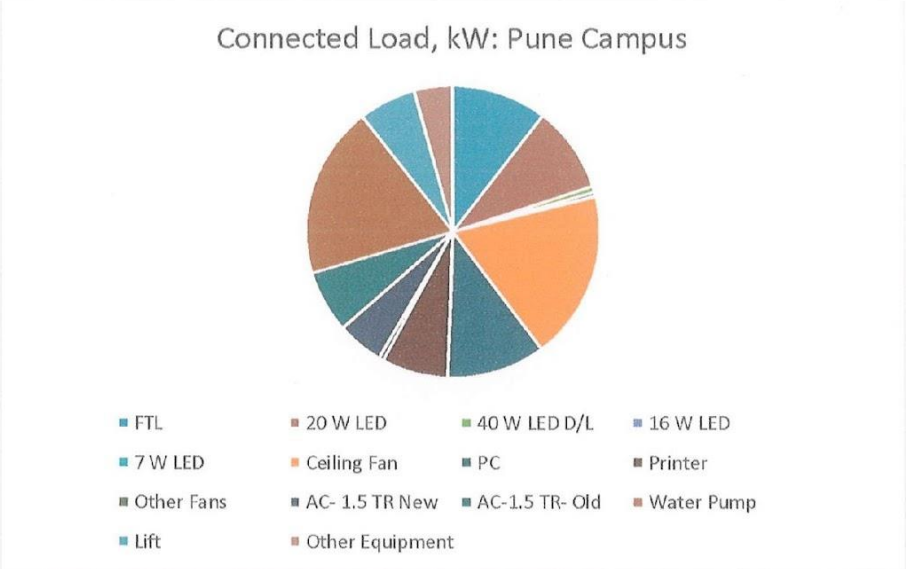
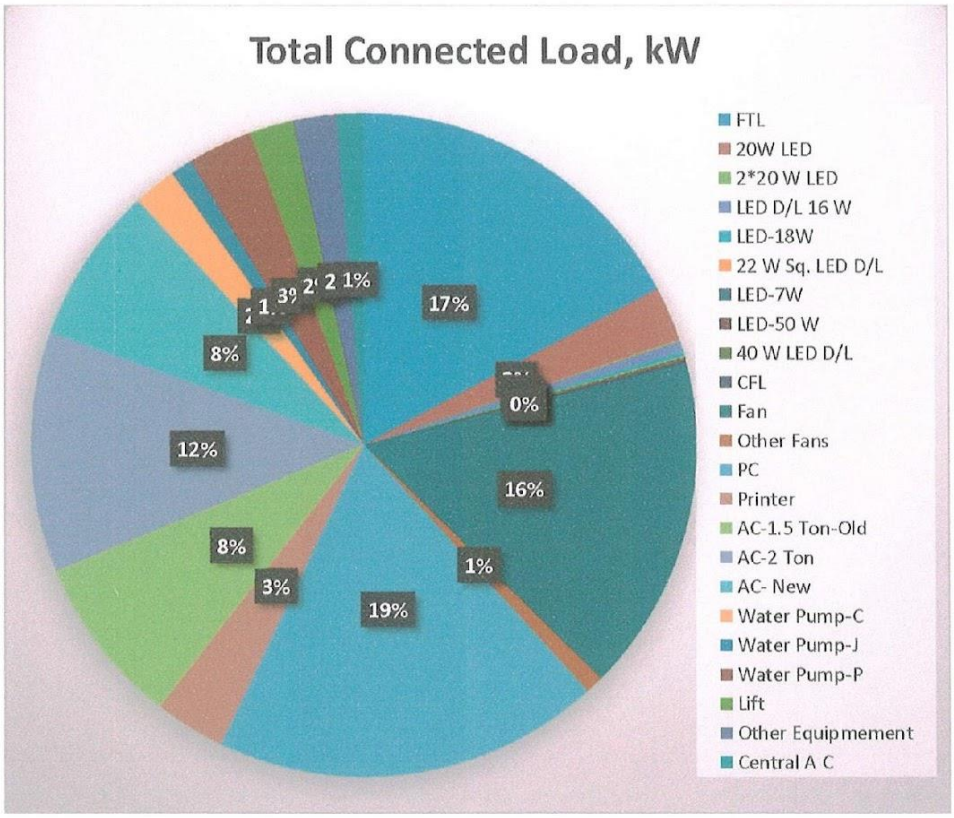


Table No 5: Details of Overall Connected Load of All Three Campuses:

No	Equipment	Qty	Load, W/Unit	Load, kW
1	FTL	4556	40	182.24
2	20W LED	1407	20	28.14
3	2*20 W LED	19	40	0.76
4	LED D/L 16 W	363	16	5.808
5	LED-18W	123	18	2.214

6	22 W Sq. LED D/L	23	22	0.506
7	LED-7W	39	7	0.273
8	LED 16 W	0	0	0
9	LED-50 W	2	50	0.1
10	40 W LED D/L	30	40	1.2
11	CFL	53	32	1.696
12	Fan	3334	52	173.368
13	Other Fans	174	52	9.048
14	PC	1329	150	199.35
15	Printer	242	150	36.3
16	AC-1.5 Ton-Old	43	2025	87.075
17	AC-2 Ton	46	2700	124.2
18	AC- New	45	1800	81
19	Water Pump-C	4	5595	22.38
20	Water Pump-J	1	11190	11.19
21	Water Pump-P	6	5595	33.57
22	Lift	4	5595	22.38
23	Other Equipment	150	150	22.5
24	Central A C	1	13500	13.5
25	**Grand Total**			**1059**

Chart No 4: Total Connected Load of All Three Campuses:



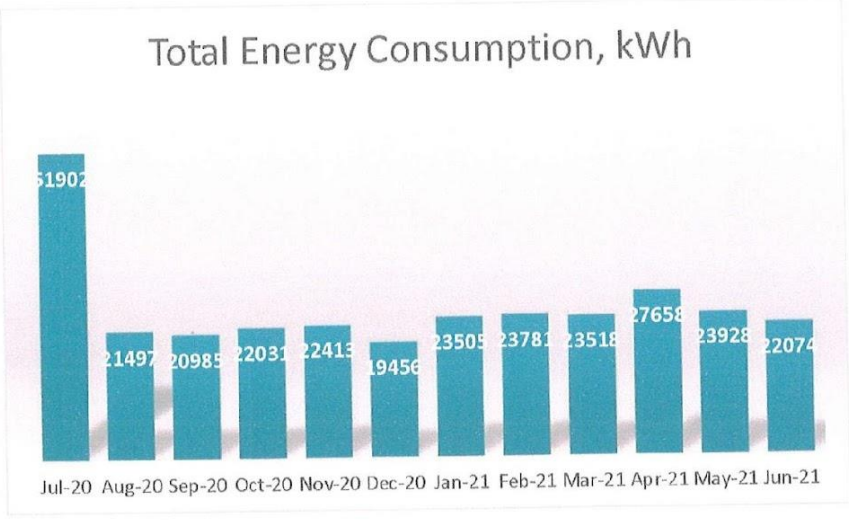
CHAPTER-III
STUDY OF PRESENT ENERGY CONSUMPTION

In this chapter, we present the consumption of Electrical Energy of all three campuses for the Academic Year: 2020-21.

Table No 6: Study of Consumption of Electrical Energy: 2020-21:

No	Month	Campus Wise Energy Consumed, kWh			Total Energy Consumption, kWh
		Churchgate	Juhu	Pune	
1	Jul-20	37227	3318	11357	51902
2	Aug-20	9122	4368	8007	21497
3	Sep-20	8111	3816	9058	20985
4	Oct-20	11161	3558	7312	22031
5	Nov-20	11069	4530	6814	22413
6	Dec-20	8972	5706	4778	19456
7	Jan-21	11247	5700	6558	23505
8	Feb-21	12308	4662	6811	23781
9	Mar-21	12192	4518	6808	23518
10	Apr-21	16711	3606	7341	27658
11	May-21	11994	3528	8406	23928
12	Jun-21	10684	3228	8162	22074
13	Total	160798	50538	91412	302748
14	Maximum	37227	5706	11357	51902
15	Minimum	8111	3228	4778	19456
16	Average	13399.83	4211.5	7617.67	25229

Chart No 5: Study of variation of Monthly Electrical Energy Consumption, kWh:



Key Observations:

Table No 7: Various Important Parameters:

No	Parameter/ Value	Energy Consumed, kWh
1	Total	302748
2	Maximum	51902
3	Minimum	19456
4	Average	25229

CHAPTER-IV
STUDY OF CARBON FOOTPRINTING

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 University for performing its day to day activities. The University uses Electrical Energy, LPG and Diesel for various Electrical gadgets & day to day activities.

Basis for computation of CO_2 Emissions:

- 1 Unit kWh of Electrical Energy releases **0.9 Kg of CO_2** into atmosphere

Table No 8: Month wise CO_2 Emissions:

No	Month	Campus Wise Energy Consumed, kWh			Total Energy Consumption, kWh	CO_2 Emissions, MT
		Churchgate	Juhu	Pune		
1	Jul-20	37227	3318	11357	51902	46.71
2	Aug-20	9122	4368	8007	21497	19.35
3	Sep-20	8111	3816	9058	20985	18.89
4	Oct-20	11161	3558	7312	22031	19.83
5	Nov-20	11069	4530	6814	22413	20.17
6	Dec-20	8972	5706	4778	19456	17.51
7	Jan-21	11247	5700	6558	23505	21.15
8	Feb-21	12308	4662	6811	23781	21.40
9	Mar-21	12192	4518	6808	23518	21.17
10	Apr-21	16711	3606	7341	27658	24.89
11	May-21	11994	3528	8406	23928	21.54
12	Jun-21	10684	3228	8162	22074	19.87
13	Total	160798	50538	91412	302748	272.47
14	Maximum	37227	5706	11357	51902	46.71
15	Minimum	8111	3228	4778	19456	17.51
16	Average	13399.83	4211.5	7617.67	25229	22.71

Chart No 6: Representation of Month wise CO_2 Emissions:

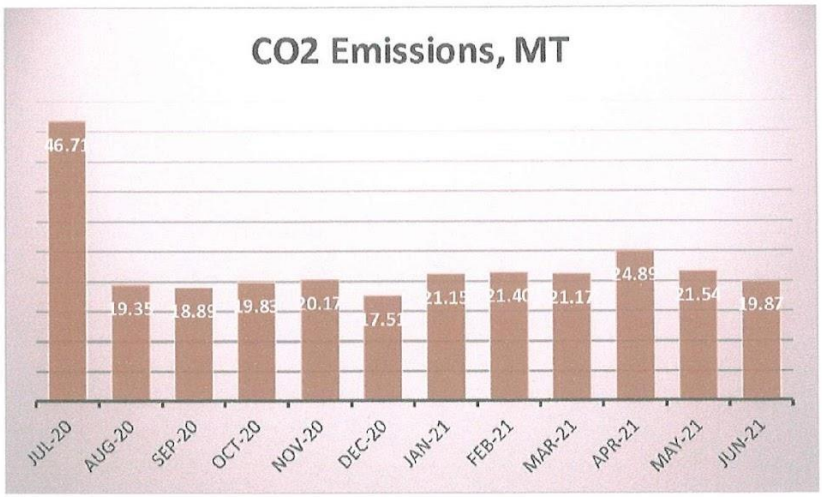


Table No 9: Various Important Parameters:

No	Parameter/ Value	Energy Consumed, kWh	CO_2 Emissions, MT
1	Total	302748	272.47
2	Maximum	51902	46.71
3	Minimum	19456	17.51
4	Average	25229	22.71

CHAPTER-V
STUDY OF USAGE OF ALTERNATE ENERGY

The University has installed Roof Top Solar PV Plant, on various buildings at Juhu Campus. The University has also installed Solar Thermal Water Heating System at Hostel blocks at Juhu campus and Pune campus respectively. In the following Table, we present the details of Building wise Solar PV Plants installed and Solar Thermal Water Heating Systems installed. In 20-21, due to lockdown, we do not take into account the Solar Thermal Water Heating System saving into account.

Table No 10: Details of Building wise Roof Top Solar PV Plant at Juhu Campus:

No	Name of Building/Location	Plant Capacity, kWp
1	Administrative Block	200
2	Usha Mittal Block	80
3	Library Building	80
4	Law & Pharmacy Building	90
5	Polytechnic Building	50
6	**Total**	**500**

Table No 11: Details of Solar Thermal Water Heating Systems installed:

No	Location	Capacity in LPD
1	Juhu Campus	8000
2	Pune Campus	8000
3	**Total**	**16000**

In the following Table, we present the percentage of usage of Renewable Energy to Annual Power requirement.

Table No 12: Computation of Usage of Alternate Energy to Annual Power requirement:

No	Particulars	Value	Unit
1	**Annual Energy Purchased for all three campuses**	**302748**	**kWh**
2	Installed Solar PV Plant Capacity	500	kWp
3	Average Energy generated per Day	4	kWh
4	Annual Generation Days	300	Nos
5	**Annual Electrical Energy generated by Solar PV Plant**	**600000**	**kWh**
6	**Total Annual Energy Requirement = (1) + (5)**	**902748**	**kWh**
7	**Total Alternate Energy Generated = (5)**	**600000**	**kWh**

8	% of Alternate Energy to Annual Energy Demand=(7)*100/(6)	66.46	%

Photograph of Roof Top Solar PV Plant:

ENRICH CONSULTANTS * Pune *

CHAPTER VI
STUDY OF USAGE OF LED LIGHTING

In the following Table, we present the percentage of annual Lighting load met by LED lights.

Table No 13: Computation of % of Annual LED Lighting Load:

No	Particulars	Value	Unit
1	No of FTL Fittings	4556	Nos
2	Load/Unit of FTL Fitting	40	W/Unit
3	Total Load of FTL Fittings	**182.24**	kW
4	No of 20 W LED Fittings	1407	Nos
5	Load/Unit of LED Fitting	20	W/Unit
6	Total Load of 20 W LED Fittings	**28.14**	kW
7	No of 2*20 W LED Fittings	19	Nos
8	Load/Unit of 2*20 W LED Fitting	40	W/Unit
9	Total Load of 2*20 W LED Fittings	**0.76**	kW
10	No of 16 W LED D/L Fittings	363	Nos
11	Load/Unit of 16 W LED D/L Fitting	16	W/Unit
12	Total Load of 16 W LED D/L Fittings	**5.808**	kW
13	No of 18 W LED Fittings	123	Nos
14	Load/Unit of 18 W LED Fitting	18	W/Unit
15	Total Load of 18 W LED Fittings	**2.214**	kW
16	No of 22 W Sq. LED Fittings	23	Nos
17	Load/Unit of 22 W Sq. LED Fitting	22	W/Unit
18	Total Load of 22 W Sq. LED Fittings	**0.506**	kW
19	No of 7 W LED Fittings	39	Nos
20	Load/Unit of 7 W LED Fitting	7	W/Unit
21	Total Oad of 7 W LED Fittings	**0.273**	kW
22	No of 50 W LED Fittings	2	Nos
23	Load/Unit of 50 W LED Fitting	50	W/Unit

24	Total Load of 50 W LED Fittings	**0.1**	kW
25	No of 40 W LED D/L Fittings	30	Nos
26	Load/Unit of 40 W LED D/L Fitting	40	W/Unit
27	Total Load of 40 W LED D/L Fittings	**1.2**	kW
28	No of CFL Fittings	53	Nos
29	Load/Unit of CFL Fitting	32	W/Unit
30	Total Load of CFL Fittings	**1.696**	kW
31	Total Lighting Load=3+6+9+12+15+18+21+24+27+30	**222.94**	kW
32	Total LED Lighting Load	**39.00**	kW
33	Average Daily Usage Period	4	Hrs/Day
34	Annual Working Days	120	Nos
35	Annual Total Lighting Load=31*33*34	107010	kWh
36	Annual LED Lighting Load=32*33*34	18720.5	kWh
37	**% of LED Lighting to Annual Lighting Load=36*100/35**	**17.49**	%

Note: Due to lockdown in the Year: 2020-21, we assume that the daily usage of Lighting is only for 4 hours, for a period of 120 days, for calculations purpose.

ENVIRONMENTAL AUDIT REPORT
of
SNDT WOMEN'S UNIVERSITY
MUMBAI

Year: 2020-21

Prepared by

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

ENRICH CONSULTANTS Pune

MAHARASHTRA ENERGY DEVELOPMENT AGENCY
An ISO 9001 : 2000 Reg. no. : RQ 91 / 2462

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

ECN/2021-22/CR-14/1577 — 22nd April, 2021

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 Enrich Consultants** Yashashree, Plot No. 26, Nirmal Bag Society, Near Muktangan English School, Parvati, Pune - 411009.
Registration Category	:	*Empanelled Consultant for Energy Conservation Programme for Class 'A'*
Registration Number	:	*MEDA/ECN/2021-22/Class A/EA-03*

- 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 **21st April, 2023** 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)

ENRICH CONSULTANTS * Pune *

Enrich Consultants

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

Ref: EC/SNDT/20-21/03 Date: 30/11/2021

CERTIFICATE

This is to certify that we have conducted Environmental Audit at SNDT Women's University, Mumbai in the year 2020-21.

The University has adopted following Environment Friendly Practices:

- Usage of Energy Efficient LED Fittings.
- Installation of **500 kWp** Roof Top Solar PV Plant.
- Installation of **16000 LPD** Solar Thermal Water Heating System at Hostel blocks.
- Segregation of Waste at source
- Implementation of Rain Water Harvesting Project

We appreciate the support of Management, involvement of faculty members and students in the process of making the Environment Friendly.

For Enrich Consultants,

A Y Mehendale,
Certified Energy Auditor
EA-8192

ENRICH CONSULTANTS * Pune *

INDEX

ACKNOWLEDGEMENT

We Enrich Consultants, Pune, express our sincere gratitude to the management of SNDT Women's University, Mumbai for awarding us the assignment of Environmental Audit of their Churchgate, Juhu & Pune Campuses for the Academic Year: 2020-21.

We are thankful to:

- Dr. Ujwala Chakradeo, Vice Chancellor
- Dr. Subhash Waghmare, Registrar (Additional Charge)
- Mr. Ashish Kamble, University Engineer
- Mr. Maske, Site Engineer

We are also thankful to concerned Faculty Members and Staff Members for helping us during the field study.

EXECUTIVE SUMMARY

1. SNDT Women's University, Mumbai has three campuses, namely at Churchgate, Juhu, in Mumbai and at Pune. The major form of Energy is the Electrical Energy, used for various equipment in the campuses.

2. Present Energy Usage & CO_2 Emissions:

No	Parameter/ Value	Energy Consumed, kWh	CO_2 Emissions, MT
1	Total	302748	272.47
2	Maximum	51902	46.71
3	Minimum	19456	17.51
4	Average	25229	22.71

3. Pollution caused by Day to Day Operation:

- **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

4. Usage of Renewable Energy & CO_2 Emission Reduction:

- The University has installed 500 kWp Roof Top Solar PV Plant and 16000 LPD Solar Thermal Water Heating System at the Hostel Blocks.
- Annual Alternate Energy Usage is **600000 kWh.**
- The reduction in CO_2 Emission due to usage of Alternate Energy is **540 MT**.

5. Indoor Air Quality Parameters:

No	Campus	Parameter/ Value	AQI	PM-2.5	PM-10
1	**Churchgate**	Maximum	120	115	130
		Minimum	46	4.5	5.6
2	**Juhu**	Maximum	240	102	111
		Minimum	100	60	68
3	**Pune**	Maximum	106	68	84
		Minimum	56	37	39

6. Indoor Comfort Condition Parameters:

No	Location	Parameter/ Value	Temperature, ^0C	Humidity, %	Lux Level, Lumen	Noise Level, dB
1	**Churchgate**	Maximum	27.6	92	275	80
		Minimum	23	65	50	54
2	**Juhu**	Maximum	285	84	945	72
		Minimum	25.5	53	30	45
3	**Pune**	Maximum	29	99	72	324
		Minimum	22.5	77	42	27

5. Waste Management:

5.1 Solid Waste Management:

The Waste is segregated at source and is further disposed of through Government Authorities.

5.2 E- Waste Management:

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

6. Rain Water Harvesting:

The University has implemented Rain Water Harvesting Project at Churchgate campus. The water collected is used to recharge the ring well.

7. Environment Friendly Initiatives:

- The University has made provision for Sanitary Waste Incinerator.

8. Notes & Assumptions:

1. **1 kWh** of Electrical Energy releases **0.9 Kg of CO_2** into atmosphere.
2. **1 kWp** Roof Top Solar PV Plant generates **4 kWh** of Electrical Energy /Day
3. Annual Energy Generation Days: For Solar PV Plant: **300 Nos**

9. References:

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

ABBREVIATIONS

LED	:	Light Emitting Diode
SNDT	:	Shreemati Nathibai Damodar Thackersey
CPCB	:	Central Pollution Control Board
ISHARE	:	The Indian Society of Heating & Refrigerating & Air Conditioning Engineers
AQI	:	Air Quality Index
PM2.5	:	Particulate Matter of Size 2.5 microns
PM 10	:	Particulate Matter of Size 10 microns
kWh	:	kilo-Watt Hour
kWp	:	Kilo Watt Peak
Qty	:	Quantity
MT	:	Metric Ton
LPD	:	Liters Per Day

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.

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

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

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 Consumption of various Resources & CO_2 Emissions
2. To Study Usage of Renewable Energy & CO_2 Emission Reduction
3. To Study Waste Management Practices
4. To Study Rain Water Harvesting
5. To study Eco Friendly & Sustainable Initiatives

1.2 Table No 4: General Details of University:

No	Head	Particulars
1	Name	SNDT Women's University
2	Address	1, Nathibai Thackersey Road, Mumbai 400 020
3	Campuses Under Study	1) Churchgate Campus, Mumbai 2) Juhu Campus, Mumbai 3) Pune Campus
3	Year of Establishment	1916

CHAPTER-II
STUDY OF CONSUMPTION OF VARIOUS RESOURCES & CO_2 EMISSION

2.1 The University 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 Representation of University as a System: Chart No:1

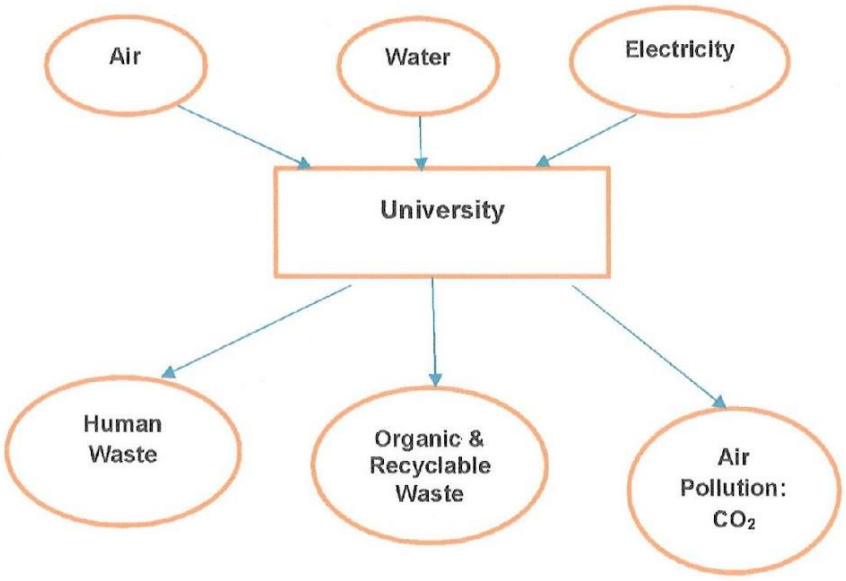


Chart No 1: Representation of University as a System & Environment

2.3 Computation of CO_2 Emissions: 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 University for performing its day to day activities. The University uses Electrical Energy, LPG and Diesel 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

Table No 5: Month wise CO_2 Emissions:

No	Month	Campus Wise Energy Consumed, kWh			Total Energy Consumption, kWh	CO_2 Emissions, MT
		Churchgate	Juhu	Pune		
1	Jul-20	37227	3318	11357	51902	46.71
2	Aug-20	9122	4368	8007	21497	19.35
3	Sep-20	8111	3816	9058	20985	18.89
4	Oct-20	11161	3558	7312	22031	19.83
5	Nov-20	11069	4530	6814	22413	20.17
6	Dec-20	8972	5706	4778	19456	17.51
7	Jan-21	11247	5700	6558	23505	21.15
8	Feb-21	12308	4662	6811	23781	21.40
9	Mar-21	12192	4518	6808	23518	21.17
10	Apr-21	16711	3606	7341	27658	24.89
11	May-21	11994	3528	8406	23928	21.54
12	Jun-21	10684	3228	8162	22074	19.87
13	Total	160798	50538	91412	302748	272.47
14	Maximum	37227	5706	11357	51902	46.71
15	Minimum	8111	3228	4778	19456	17.51
16	Average	13399.83	4211.5	7617.67	25229	22.71

Chart No 2: Representation of Month wise CO_2 Emissions:

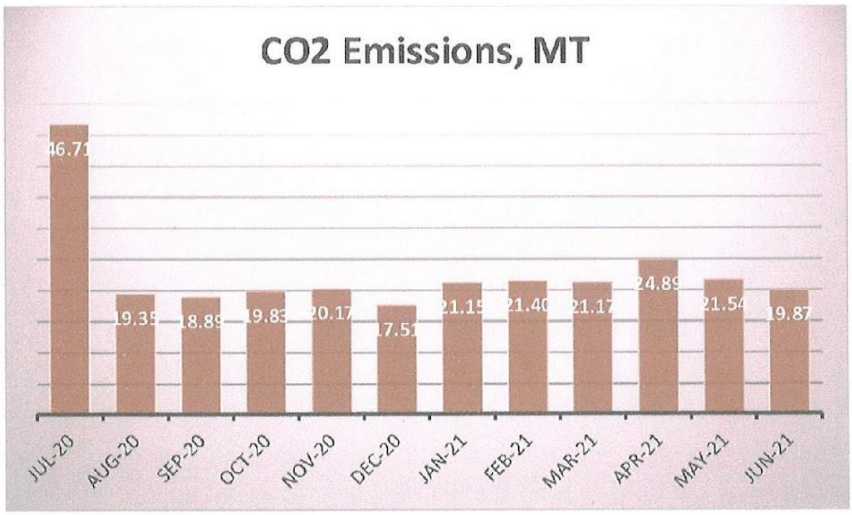


Table No 6: Various Important Parameters:

No	Parameter/ Value	Energy Consumed, kWh	CO_2 Emissions, MT
1	Total	302748	272.47
2	Maximum	51902	46.71
3	Minimum	19456	17.51
4	Average	25229	22.71

CHAPTER-III
STUDY OF CO_2 EMISSION REDUCTION

The University has installed Roof Top Solar PV Plant, on various buildings at Juhu Campus. The University has also installed Solar Thermal Water Heating System at Hostel blocks at Juhu campus and Pune campus respectively. In the following Table, we present the details of Building wise Solar PV Plants installed and Solar Thermal Water Heating Systems installed. In 20-21, due to lockdown, we do not take into account the Solar Thermal Water Heating System saving into account.

Table No 7: Details of Building wise Roof Top Solar PV Plant at Juhu Campus:

No	Name of Building/Location	Plant Capacity, kWp
1	Administrative Block	200
2	Usha Mittal Block	80
3	Library Building	80
4	Law & Pharmacy Building	90
5	Polytechnic Building	50
6	**Total**	**500**

Table No 8: Details of Solar Thermal Water Heating Systems installed:

No	Location	Capacity in LPD
1	Juhu Campus	8000
2	Pune Campus	8000
3	**Total**	**16000**

In the following Table, we present the percentage of usage of Renewable Energy to Annual Power requirement.

Table No 9: Computation of Reduction in Annual CO_2 Emissions:

No	Particulars	Value	Unit
1	Installed Solar PV Plant Capacity	500	kWp
2	Average Energy generated per Day	4	kWh
3	Annual Generation Days	300	Nos
4	Annual Electrical Energy generated by Solar PV Plant	600000	kWh
5	1 kWh of Electrical Energy is equivalent to	0.9	Kg of CO_2
6	**Annual Reduction in CO2 Emissions= (4)*(5)/1000**	**540**	**MT**

Photograph of Roof Top Solar PV Plant:

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 10: Indoor Air Quality Parameters: Churchgate Campus:

No	Location	AQI	PM-2.5	PM-10
1	**Main Building**			
	Committee Hall	70	4.5	5.6

	Central A/c Dept	60	36	48
	Registrar Secretariat	56	33	34
	Registrar Office	46	28	40
	Dean-Science Faculty	71	42	50
2	**Annex Building**			
	3rd Floor			
	M. Lib .Sci. II classroom2	100	58	73
	M. Lib .Sci. I classroom1	120	115	130
	Computer Lab	89	11	120
	Room	86	63	81
	Lib. Staff room	120	62	78
	PG Office	100	67	84
		46		
3	**Patkar Hall**	90	56	72
	Maximum	120	115	130
	Minimum	46	4.5	5.6

Table No 11: Indoor Air Quality Parameters: Juhu Campus:

No	Location	AQI	PM2.5	PM10
1	**Composite Building**			
	Estate Department	190	94	111
	Office	189	84	110
2	**P. V. Polytechnic**			
	Office	173	82	91
	Principal Office	143	70	86
	Staff Room	190	86	93
	M-119	187	76	85
	M-107	189	85	92
	R-214	178	82	86
	R-222	185	80	84
	M-314	173	86	83
	M-305	172	85	82

3	**C. V. Shah College**			
	Ground Floor			
	Office	233	100	109
	Principal Office	160	78	88
	Pharmaceutical Lab	240	102	111
	1st Floor			
	Micro Lab	186	86	94
	Class Room	193	84	98
	2nd Floor			
	S. Y .B. Pharm	170	81	90
4	**CFBP Dept**			
	Ground			
	Office	183	86	93
	Food testing Lab	186	84	93
	1st -Education Technology			
	Admin Office	170	86	90
	Director TLC	160	78	90
	Class Room	150	75	86
	2nd -LAW School			
	Admin Office	163	79	90
	Principal Office	186	80	88
	Class Room	180	85	92
5	**SHPT College Of Science**			
	Gr. Floor-Lab	206	90	93
	Room	180	79	88
	1st-HOD cabin	150	79	88
	Office	166	81	88
	Staff Room	190	87	99
	2nd -Class Room	193	81	90
	Room	192	79	88
6	**Pariksha Bhavan**			
	Gr. floor-ac section	193	86	92

	Record & certificates	166	80	90
	1st-Exam Units	190	85	94
	Deputy Registrar	146	74	84
	2nd-Director Cabin	195	94	100
	Confidential Room	190	87	92
7	**Jankidevi Bajaj Institute**			
	Gr. Floor Office	160	80	92
	Class Room-3	143	72	85
	Faculty	145	76	89
	1st-Computer Lab	148	80	89
	Faculty	145	73	89
8	**SVT College**			
	Gr. floor-Office	130	68	84
	Vice Principal Office	153	75	85
	1st floor-English Dept	156	78	85
	Virtual Room	145	74	84
	2nd-Fashion Design Lab	148	80	86
	Physics Lab	160	67	82
9	**Usha Mittal Institute**			
	Gr. Floor Office	100	61	70
	Principal Office	203	90	96
	1st-E-Lab	153	76	87
	Communication Lab	140	72	85
	2nd-HOD IT	150	76	80
	Cloud Computing Lab	106	60	76
	3rd Floor-Library	150	75	68
	Class Room	153	81	92
	4th-Reading Room	143	74	87
	Drawing Hall	130	69	82
	5th-library	153	74	84
	Office	164	81	90
	Maximum	240	102	111
	Minimum	100	60	68

Table No 12: Indoor Air Quality Parameters: Pune Campus:

No	Location	AQI	PM2.5	PM10
1	Campus Admin Office	96	60	75
2	Main Entrance-library	93	55	68
3	Arts College-Principal Office	56	37	39
4	Computer Lab	75	45	56
5	Seminar Hall	85	54	63
6	Room 40	85	52	62
7	Home Science	106	68	84
8	R & M Dept	96	57	68
9	Tarapore Hall	83	50	62
10	MBA College	103	61	74
11	MBA -2nd Floor	96	58	73
12	Media College	80	49	69
13	Media College-2nd Floor	80	43	62
14	Education College	81	45	55
15	Education College-1st Floor	80	46	58
16	Education College-2ndFloor	71	44	45
17	PGSR-Ground Floor	83	51	75
18	PGSR-1st Floor	85	50	62
19	PGSR-2nd Floor	86	51	62
20	PGSR-3rd Floor	86	52	64
21	Maximum	106	68	84
22	Minimum	56	37	39

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 13: Study of Indoor Comfort Parameters: Churchgate Campus:

No	Location	Temperature, °C	Humidity, %	Lux Level	Noise Level, dB
1	**Main Building**				
	Committee Hall	25.5	89	138	75-78
	Central A/c Dept	25.9	65	150	58-65
	Registrar Secretariat	25.3	83	205	68-80
	Annex Building	23	89	214	54
2	**3rd Floor**	24.1	92	275	80
	M. Lib .Sci.IIclassroom2	25.1	90	230	75
	M. Lib. Sci. I classroom1	26.4	87	266	67
	Computer Lab	26.8	83	94	68
	Room	26.9	82	182	75
3	**Patkar Hall**	27.6	82	50	63
	Maximum	27.6	92	275	80
	Minimum	23	65	50	54

Table No 14: Study of Indoor Comfort Parameters: Juhu Campus:

No	Location	Temperature, °C	Humidity, %	Lux Level	Noise Level, dB
1	**Composite Building**				
	Estate Department	26.2	72	856	58
	Office	26.2	72	945	56

2	**P. V. Polytechnic**				
	Office	29.2	63	103	65
	Principal Office	29.8	54	63	59
	Staff Room	29.7	78	109	61
	M-119	29.6	74	110	59
	M-107	29.7	75	112	59
	R-214	29.6	71	109	61
	R-222	29.7	72	101	52
	M-314	29.7	72	115	54
	M-305	29.7	72	112	58
3	**C. V. Shah College**				
	Ground Floor				
	Office	25.5	76	70	65
	Principal Office	26	71	85	62
	Pharmaceutical Lab	26	73	113	62
	1st Floor				
	Micro Lab	26.2	84	249	68
	Class Room	26.2	83	180	45
	2nd Floor				
	S. Y .B. Pharm	26.7	79	112	45
4	**CFBP Dept**				
	Ground				
	Office	28.3	65	120	56
	Food testing Lab	29	62	175	62
	1st -Education Technology				
	Admin Office	29	62	150	68
	Director TLC	29.2	62	160	70
	Class Room	29	67	160	71
	2nd -LAW School				
	Admin Office	29	63	276	64
	Principal Office	29.2	80	130	65
	Class Room	29.2	65	280	70

5	**SHPT College Of Science**				
	Gr. Floor-Lab	29.2	64	894	45
	Room	29.3	64	150	45
	1st-HOD cabin	29	62	876	72
	Office	29.1	62	850	60
	Staff Room	29.1	61	623	54
	2nd -Class Room	29	61	160	72
	Room	29.2	63	160	64
6	**Pariksha Bhavan**				
	Gr. floor-ac section	29.1	67	160	60
	Record & certificates	28.8	66	324	62
	1st-Exam Units	29.3	64	266	64
	Deputy Registrar	29.3	56	171	60
	2nd-Director Cabin	29.3	60	100	54
	Confidential Room	29.3	63	210	62
7	**Jankidevi Bajaj Institute**				
	Gr. Floor Office	29.9	63	200	63
	Class Room-3	29.9	73	135	72
	Faculty	29.9	72	30	60
	1st-Computer Lab	29.8	75	230	50
	Faculty	29.8	71	180	67
8	**SVT College**				
	Gr. floor-Office	28.4	53	280	71
	Vice Principal Office	27.2	71	214	61
	1st floor-English Dept	27.8	71	260	61
	Virtual Room	28.2	72	214	58
	2nd-Fashion Design Lab	28.4	75	263	56
	Physics Lab	28.6	72	240	64
9	**Usha Mittal Institute**				
	Gr. Floor Office	28.2	70	130	66

	Principal Office	28.2	69	100	62
	1st-E-Lab	28.7	59	650	60-70
	Communication Lab	28.3	68	102	60
	2nd-HOD IT	28.4	64	164	51
	Cloud Computing Lab	28.9	64	300	71
	3rd Floor-Library	28.4	60	62	61
	Class Room	28.5	60	900	45
	4th-Reading Room	285	59	411	62
	Drawing Hall	28.8	76	116	54
	5th-library	28.5	58	220	62
	Office	28.4	63	200	59
	Maximum	285	84	945	72
	Minimum	25.5	53	30	45

Table No 15: Study of Indoor Comfort Parameters: Pune Campus:

No	Location	Temperature, °C	Humidity, %	Lux Level	Noise Level, dB
1	Campus Admin Office	22.5	99	63	40
2	Main Entrance-library	24.3	93	64	126
3	Arts College-Principal Office	26.4	88	65	53
4	Computer Lab	24	95	60	124
5	Seminar Hall	27	99	60	110
6	Room 40	27	87	56	125
7	Home Science	25.4	89	72	114
8	R & M Dept	27.3	81	58	69
9	Tarapore Hall	29	77	49	27
10	MBA College	24	97	61	155
11	MBA -2nd Floor	23.2	97	54	155
12	Media College	25.8	94	49	43
13	Media College-2nd Floor	25	92	66	136
14	Education College	28	84	59	75
15	Education College-1st Floor	28.3	98	49	96
16	Education College-2ndFloor	27.7	85	42	96
17	PGSR-Ground Floor	25.8	94	50	115

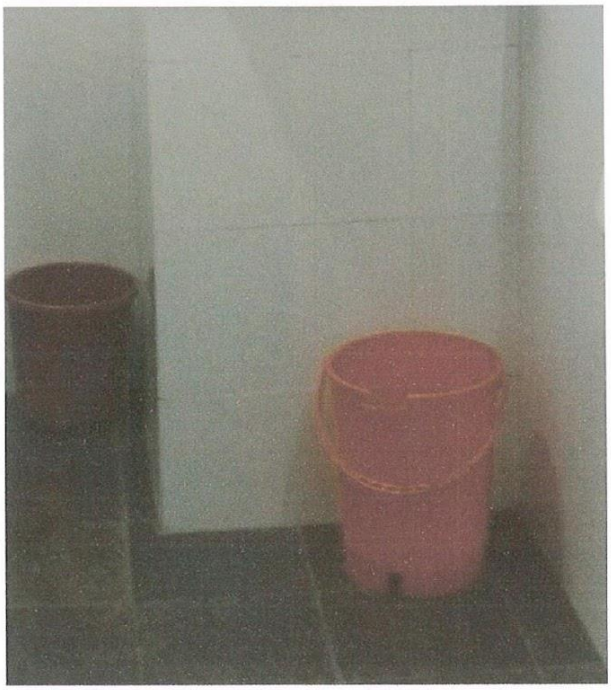
18	PGSR-1st Floor	25.8	95	47	206
19	PGSR-2nd Floor	24.7	97	54	324
20	PGSR-3rd Floor	24	99	46	84
21	Maximum	29	99	72	324
22	Minimum	22.5	77	42	27

CHAPTER VI
STUDY OF WASTE MANAGEMENT

6.1 Solid Waste Management:

The Waste is segregated at source. Waste collection bins are placed at various locations to collect the Waste. It is further disposed through Government Authorities

Photograph of Waste Collection Bin:



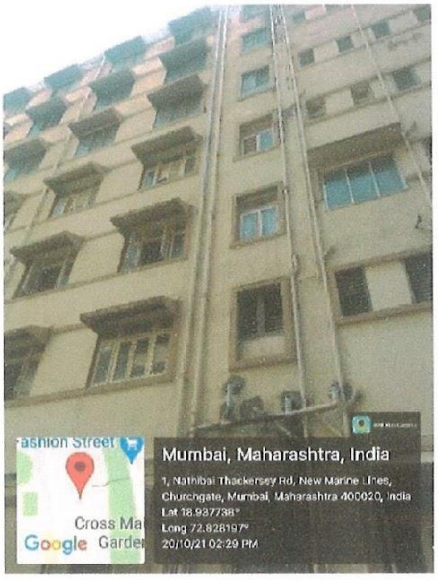
6.2 E-Waste Management:

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

CHAPTER-VII
RAIN WATER HARVESTING

The University has implemented Rain Water Harvesting Project at Churchgate campus. The water collected is used to recharge the ring well.

Photograph of Rain Water Harvesting Pipe at Churchgate campus:



CHAPTER-VIII
STUDY OF ENVIRONMENT FRIENDLY INITIATIVE

8.1 Sanitary Waste Incinerator: The University has installed as Sanitary Waste Incinerator.

Photograph of Sanitary Waste Incinerator:

ENRICH CONSULTANTS Pune

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** 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%

GREEN AUDIT REPORT
of
SNDT WOMEN'S UNIVERSITY
MUMBAI

Year: 2020-21

Prepared by

Enrich Consultants

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

ENRICH CONSULTANTS * Pune *

MAHARASHTRA ENERGY DEVELOPMENT AGENCY

An ISO 9001 : 2000 Reg. no. : RQ 91 / 2462

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

ECN/2021-22/CR-14/1577 22nd April, 2021

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 Enrich Consultants** Yashashree, Plot No. 26, Nirmal Bag Society, Near Muktangan English School, Parvati, Pune - 411009.
Registration Category	:	*Empanelled Consultant for Energy Conservation Programme for Class 'A'*
Registration Number	:	*MEDA/ECN/2021-22/Class A/EA-03*

- 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 **21st April, 2023** 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)

Enrich Consultants

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

Ref: EC/SNDT/20-21/02 Date: 30/11/2021

CERTIFICATE

This is to certify that we have conducted Green Audit at SNDT Women's University, Mumbai in the year 2020-21.

The University has adopted following Energy Efficient Practices:

- Usage of Energy Efficient LED Fittings.
- Installation of **500 kWp** Roof Top Solar PV Plant.
- Installation of **16000 LPD** Solar Thermal Water Heating System at Hostel blocks.
- Segregation of Waste at source
- Implementation of Rain Water Harvesting
- Well maintained Garden in the campus

We appreciate the support of Management, involvement of faculty members and students in the process of making the campus Green.

For Enrich Consultants,

A Y Mehendale,
Certified Energy Auditor
EA-8192

ENRICH CONSULTANTS * Pune *

INDEX

ACKNOWLEDGEMENT

We Enrich Consultants, Pune, express our sincere gratitude to the management of SNDT Women's University, Mumbai for awarding us the assignment of Green Audit of their Churchgate, Juhu & Pune Campuses for the Academic Year: 2020-21.

We are thankful to:

- Dr. Ujwala Chakradeo, Vice Chancellor
- Dr. Subhash Waghmare, Registrar (Additional Charge)
- Mr. Ashish Kamble, University Engineer
- Mr. Maske, Site Engineer

We are also thankful to concerned Faculty Members and Staff Members for helping us during the field study.

.

EXECUTIVE SUMMARY

1. SNDT Women's University, Mumbai has three campuses, namely at Churchgate, Juhu, in Mumbai and at Pune. The major form of Energy is the Electrical Energy, used for various equipment in the campuses.

2. Present Energy Usage & CO_2 Emissions:

No	Parameter/ Value	Energy Consumed, kWh	CO_2 Emissions, MT
1	Total	302748	272.47
2	Maximum	51902	46.71
3	Minimum	19456	17.51
4	Average	25229	22.71

3. Various measures adopted for Energy Conservation:

- Usage of Energy Efficient LED Lights
- Usage of BEE STAR Rated Equipment
- Installation of **500 kWp** Roof Top Solar PV Plant.
- Installation of **16000 LPD** Solar Thermal Water Heating System.

4. Usage of Renewable Energy Source & CO_2 Emission Reduction:

- The University has installed **500 kWp** Roof Top Solar PV Plant and **16000 LPD** Solar Thermal Water Heating System at the Hostel Blocks.
- Annual Energy generated by Roof Top Solar PV Plant is **600000 kWh.**
- The reduction in Annual CO2 Emissions is **540 MT.**

5. Waste Management:

5.1 Solid Waste Management:

The Waste is segregated at source and is further disposed of through Government Authorities.

5.2 E- Waste Management:

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

6. Rain Water Harvesting:

The University has implemented Rain Water Harvesting Project at Churchgate campus. The water collected is used to recharge the ring well.

7. Green, Innovative and Sustainable Practices:

- The University has well maintained internal roads for easy movement in the campus.
- The University has well maintained Garden in the premises.
- Ramps are provided for easy movement of Divyanga students. Also dedicated wash rooms are provided for those students
- The University has made provision for Sanitary Pad Dispenser as well as Sanitary Waste Incinerator.

8. Notes & Assumptions:

1. **1 kWh** of Electrical Energy releases **0.9 Kg of CO_2** into atmosphere.
2. **1 kWp** Roof Top Solar PV Plant generates **4 kWh** of Electrical Energy /Day
3. Annual Energy Generation Days: For Solar PV Plant: **300 Nos**

9. References:

1. For Computation of CO_2 Emissions: www.tatapower.com
2. For Energy Generated by Solar PV Plant: www.solarrooftop.gov.in

ABBREVIATIONS

SNDT	:	Shreemati Nathibai Damodar Thackersey
LPD		Liters Per Day
MT	:	Metric Ton
LED	:	Light Emitting Diode
kWh	:	kilo-Watt Hour
kWp	:	Kilo Watt Peak
Qty	:	Quantity
kW	:	Kilo Watt

CHAPTER-I
INTRODUCTION

1.1 Objectives:

1. To study Present Energy Usage
2. To Study CO_2 Emissions
3. To study usage of Renewable Energy
4. To study Waste Management practices
5. To study Rain Water Harvesting
6. To study Green & Innovative Practices
7. To study Biodiversity of Plants

1.2 General Details of University:

Table No 1: General Details:

No	Head	Particulars
1	Name	SNDT Women's University
2	Address	1, Nathibai Thackersey Road, Mumbai 400 020
3	Campuses Under Study	1) Churchgate Campus, Mumbai 2) Juhu Campus, Mumbai 3) Pune Campus
3	Year of Establishment	1916

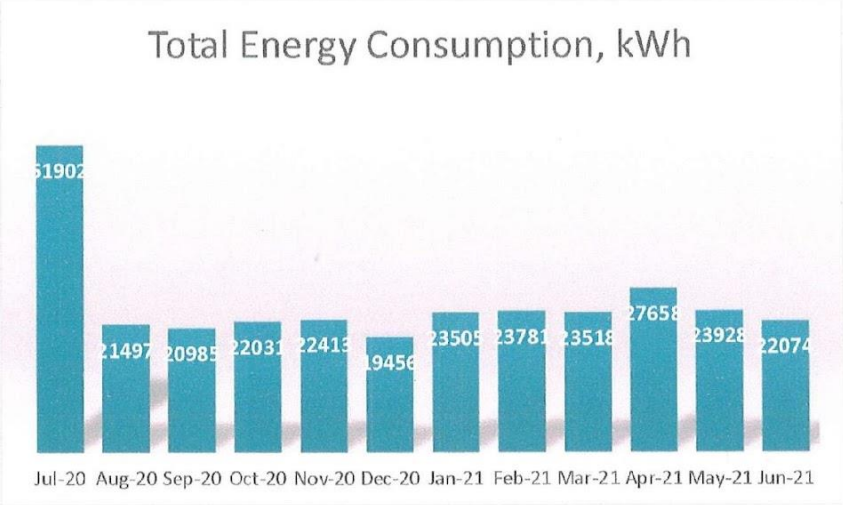
CHAPTER-II
STUDY OF PRESENT ENERGY CONSUMPTION

In this chapter, we present the consumption of Electrical Energy for the Academic Year: 2020-21.

Table No 2: Study of Consumption of Electrical Energy: 2020-21:

No	Month	Campus Wise Energy Consumed, kWh			Total Energy Consumption, kWh
		Churchgate	Juhu	Pune	
1	Jul-20	37227	3318	11357	51902
2	Aug-20	9122	4368	8007	21497
3	Sep-20	8111	3816	9058	20985
4	Oct-20	11161	3558	7312	22031
5	Nov-20	11069	4530	6814	22413
6	Dec-20	8972	5706	4778	19456
7	Jan-21	11247	5700	6558	23505
8	Feb-21	12308	4662	6811	23781
9	Mar-21	12192	4518	6808	23518
10	Apr-21	16711	3606	7341	27658
11	May-21	11994	3528	8406	23928
12	Jun-21	10684	3228	8162	22074
13	Total	160798	50538	91412	302748
14	Maximum	37227	5706	11357	51902
15	Minimum	8111	3228	4778	19456
16	Average	13399.83	4211.5	7617.67	25229

Chart No 1: Study of variation of Monthly Electrical Energy Consumption, kWh:



Key Observations:

Table No 3: Various Important Parameters:

No	Parameter/ Value	Energy Consumed, kWh
1	Total	302748
2	Maximum	51902
3	Minimum	19456
4	Average	25229

CHAPTER-III
STUDY OF CO_2 EMISSIONS

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 University for performing its day to day activities. The University uses Electrical Energy, LPG and Diesel for various Electrical gadgets & day to day activities.

Basis for computation of CO_2 Emissions:

- 1 Unit kWh of Electrical Energy releases **0.9 Kg of CO_2** into atmosphere

Table No 4: Month wise CO_2 Emissions:

No	Month	Campus Wise Energy Consumed, kWh			Total Energy Consumption, kWh	CO_2 Emissions, MT
		Churchgate	Juhu	Pune		
1	Jul-20	37227	3318	11357	51902	46.71
2	Aug-20	9122	4368	8007	21497	19.35
3	Sep-20	8111	3816	9058	20985	18.89
4	Oct-20	11161	3558	7312	22031	19.83
5	Nov-20	11069	4530	6814	22413	20.17
6	Dec-20	8972	5706	4778	19456	17.51
7	Jan-21	11247	5700	6558	23505	21.15
8	Feb-21	12308	4662	6811	23781	21.40
9	Mar-21	12192	4518	6808	23518	21.17
10	Apr-21	16711	3606	7341	27658	24.89
11	May-21	11994	3528	8406	23928	21.54
12	Jun-21	10684	3228	8162	22074	19.87
13	Total	160798	50538	91412	302748	272.47
14	Maximum	37227	5706	11357	51902	46.71
15	Minimum	8111	3228	4778	19456	17.51
16	Average	13399.83	4211.5	7617.67	25229	22.71

Chart No 2: Representation of Month wise CO_2 Emissions:

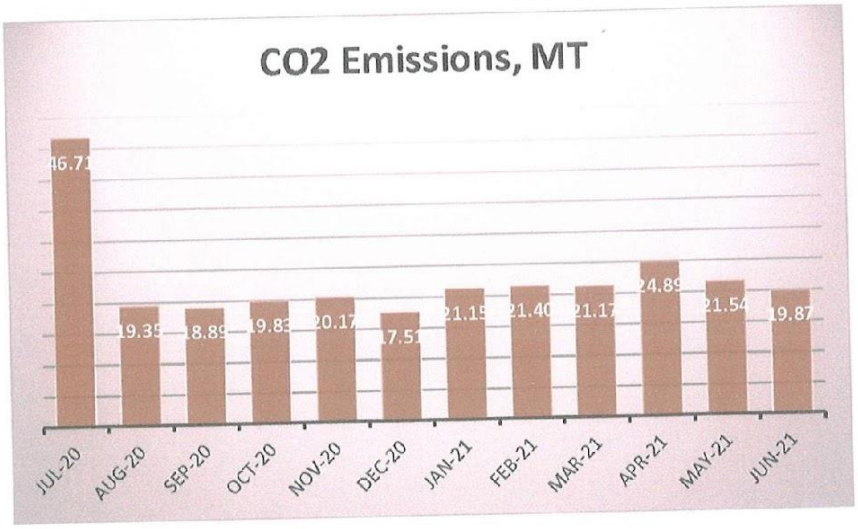


Table No 5: Various Important Parameters:

No	Parameter/ Value	Energy Consumed, kWh	CO_2 Emissions, MT
1	Total	302748	272.47
2	Maximum	51902	46.71
3	Minimum	19456	17.51
4	Average	25229	22.71

CHAPTER-IV
STUDY OF USAGE OF RENEWABLE ENERGY

The University has installed Roof Top Solar PV Plant, on various buildings at Juhu Campus. The University has also installed Solar Thermal Water Heating System at Hostel blocks at Juhu campus and Pune campus respectively. In the following Table, we present the details of Building wise Solar PV Plants installed and Solar Thermal Water Heating Systems installed. In 20-21, due to lockdown, we do not take into account the Solar Thermal Water Heating System saving into account.

Table No 6: Details of Building wise Roof Top Solar PV Plant at Juhu Campus:

No	Name of Building/Location	Plant Capacity, kWp
1	Administrative Block	200
2	Usha Mittal Block	80
3	Library Building	80
4	Law & Pharmacy Building	90
5	Polytechnic Building	50
6	**Total**	**500**

Table No 7: Details of Solar Thermal Water Heating Systems installed:

No	Location	Capacity in LPD
1	Juhu Campus	8000
2	Pune Campus	8000
3	**Total**	**16000**

In the following Table, we present the percentage of usage of Renewable Energy to Annual Power requirement.

Table No 8: Computation of Reduction in Annual CO_2 Emissions:

No	Particulars	Value	Unit
1	Installed Solar PV Plant Capacity	500	kWp
2	Average Energy generated per Day	4	kWh
3	Annual Generation Days	300	Nos
4	Annual Electrical Energy generated by Solar PV Plant	600000	kWh
5	1 kWh of Electrical Energy is equivalent to	0.9	Kg of CO_2
6	**Annual Reduction in CO2 Emissions= (4)*(5)/1000**	**540**	**MT**

Photograph of Roof Top Solar PV Plant:

CHAPTER-V
STUDY OF WASTE MANAGEMENT

5.1 Solid Waste Management:

The Waste is segregated at source. Waste collections bins are placed at various locations to collect the Waste. It is further disposed through Government Authorities

Photograph of Waste Collection Bin:

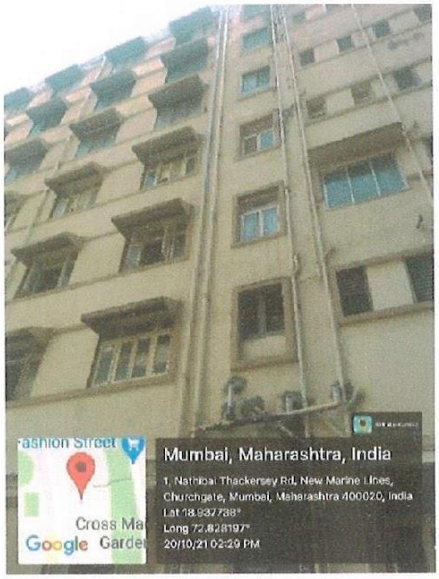
5.2 E-Waste Management:

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

CHAPTER-VI
RAIN WATER HARVESTING

The University has implemented Rain Water Harvesting Project at Churchgate campus. The water collected is used to recharge the ring well.

Photograph of Rain Water Harvesting Pipe at Churchgate campus:

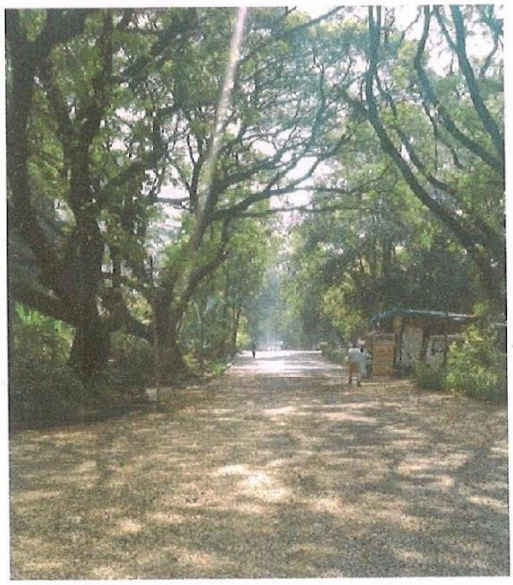


CHAPTER-VII
STUDY OF GREEN & INNOVATIVE PRACTICES

7.1 Internal Roads:

For easy movement of commuters, in the campus, the University has maintained good internal roads, within the campus. For pedestrians, separate foot paths are constructed.

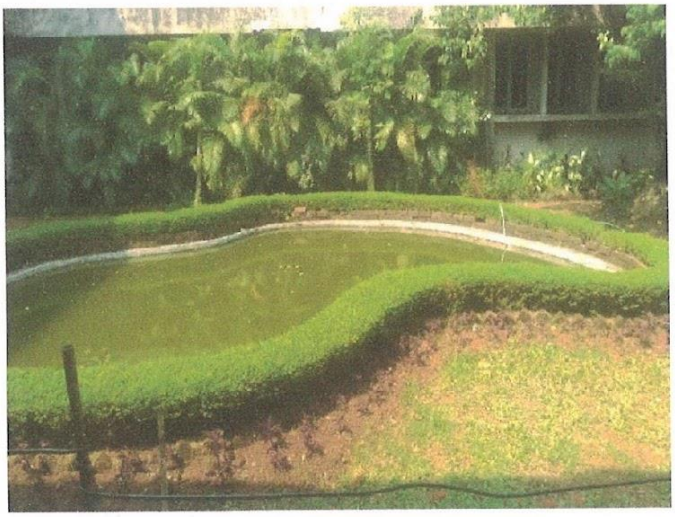
Photograph of Internal Road at Juhu Campus:



7.2 Internal Lawn:

The University is maintaining Clean Campus, inside the Buildings as well as outer areas.

Photograph of Internal Pond & Garden at Juhu Campus:



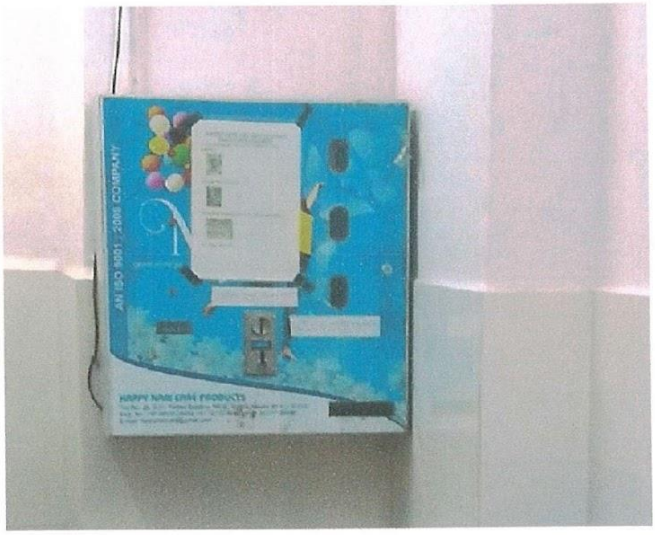
7.3 Provision of Ramp for Divyanga Students:

The University has made provision of Ramp, for easy movement of Divyanga students. Also dedicated washrooms are provided for Divyanga students.

Photograph of Ramp:

7.4 Sanitary Waste Incinerator: The University has installed sanitary pad Dispenser.

Photograph of Sanitary Pad Dispenser:



7.5 Sanitary Waste Incinerator: The University has installed as Sanitary Waste Incinerator.

Photograph of Sanitary Waste Incinerator:

CHAPTER-VIII
STUDY OF BIODIVERSITY OF PLANTS

8.1 Plants define the habitat of a site, providing structure, shelter and food as well as contributing to the overall Biodiversity.
They include: Flowering Plants (Trees, Shrubs, Grasses and Herbaceous Plants).

8.2 List of Plants:

No.	Botanical Name	Name	Family	Habit	Benefits
1	*Aloe vera*	Korphad	Asphodelaceae	Herb	O/M
2	*Artocarpus heterophyllus*	Jackfruit	Moraceae	Tree	F
3	*Azadirachta indica*	Neem	Meliaceae	Tree	S/M
4	*Bambusa tulda*	Bamboo	Poaceae	Shrub	O/Fl
5	*Bauhinia variegata*	Kanchan	Fabaceae	Tree	S/M
6	*Bougainvillea spectabilis*	Paperflower	Nyctaginaceae	Shrub	O
7	*Butea monosperma*	Palas	Fabaceae	Tree	O/Fl
8	*Calliandra haematocephala*	Red Powder-puff	Fabaceae	Shrub	O
9	*Canna indica*	Saka Siri	Cannaceae	Herb	O
10	*Carica papaya*	Papaya	Caricaceae	Shrub	F
11	*Catharanthus roseus*	Sadaphuli	Apocynaceae	Shrub	O
12	*Citrus limetta*	Mosambi	Rutaceae	Tree	F
13	*Clitoria Ternatea*	Gokarana	Fabaceae	Climber	O
14	*Codiaeum Variegatum*	Crotan	Euphorbiaceae	Shrub	O
15	*Colocasia esculanta*	Taro Plant	Araceae	Herb	O
16	*Cosmos sulphureus*	Yellow cosmos	Asteraceae	Herb	O
17	*Crossandra infundibuliformis*	Aboli	Acanthaceae	Shrub	O/Fl
18	*Croton tiglium*	Jaipal	Euphorbiaceae	Herb	O
19	*Cynodon dactylon*	Scutch Grass	Poaceae	Herb	W/O/M
20	*Delonix regia*	Gulmohr	Fabaceae	Tree	O/S
21	*Duranta erecta*	Gold Duranta	Verbenaceae	Shrub	O
22	*Duranta erecta*	Silver Duranta	Verbenaceae	Shrub	O
23	*Dypsis lutescens*	Golden Cane Palm	Arecaceae	Shrub	O
24	*Eucalyptus globulus*	Nilgiri	Myrtaceae	Tree	S/M/F
25	*Ficus elastica*	Rubber Tree	Moraceae	Tree	S
26	*Ficus racemosa*	Cluster fig	Moraceae	Tree	S/N/F
27	*Ficus religiosa*	Sacred fig	Moraceae	Tree	S/N

28	*Hibiscus rosa-sinensis*	Jaswand	Malvaceae	Shrub	O/Fl
29	*Hyophorbe lagenicaulis*	Bottle palm	Aracaceae	Tree	O
30	*Impateins walleriana*	Balsam	Balsaminaceae	Shrub	O
31	*Ipomoea quamoclit*	Ganesh vel	Convolvulaceae	Climber	O
32	*Ixora coccinea*	Jungle flame	Rubiaceae	Shrub	O/Fl
33	*Jacaranda mimosifolia*	Neel gulmohr	Bignoniaceae	Tree	O
34	*Jasminum sambac*	Arabian jasmine	Oleaceae	Herb	Fl/O
35	*Jatropha podagrica*	Gout Stalk,	Euphorbiaceae	Herb	O
36	*Lantana camra*	Ghaneri	Verbenaceae	Shrub	O/Fl
37	*Lantana montevidensis*	Trailing Lantana	Verbenaceae	Herb	O
38	*Leucaena leucocephala*	Subabul	Fabaceae	Tree	O/Fl
39	*Magnolia alba*	White Champak	Magnoliaceae	Tree	O/Fl
40	*Magnolia champaca*	Champak	Magnoliaceae	Tree	O/Fl
41	*Mangifera indica*	Mango	Anacardiaceae	Tree	S/N
42	*Mesua ferrea*	Nag Chafa	Calophyllaceae	Tree	O/Fl
43	*Millingtonia hortensis*	Indian cork tree	Bignoniaceae	Tree	O/S/Fl
44	*Mirabilis jalpa*	four o'clock flower	Nyctaginaceae	Herb	O
45	*Muntingia calabura*	Jam Cherry	Malvaceae	Shrub	Fl/F
46	*Musa acuminata*	Banana	Musaceae	Herb	F
47	*Parthenium hysterophorus*	Congress grass	Asteraceae	Herb	W
48	*Phoenix dactylifera*	Date plant	Arecaceae	Tree	F
49	*Phyllanthus emblica*	Amla	Phyllanthaceae	Tree	F
50	*Platycladus orientalis*	Morpankhi	Cupressaceae	Tree	O
51	*Plumbago zeylanica*	Wild Leadwort	Plumbaginaceae	Herb	O
52	*Psidium guajava*	Guava	Myrtaceae	Tree	F
53	*Santalum album*	Chandan	Santalaceae	Tree	M
54	*Saraca asoca*	Ashoka	Fabaceae	Tree	O
55	*Syzygium cumini*	Jamun	Myrtaceae	Tree	F
56	*Tamarindus indica*	Tamarind	Fabaceae	Tree	S/F
57	*Terminalia catappa*	Badam	Combretaceae	Tree	F
58	*Turnera ulmifolia*	Yellow Alder	Passifloraceae	Herb	O

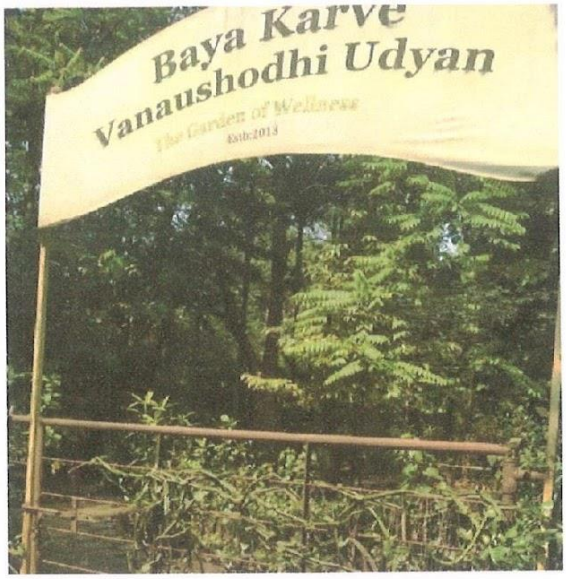
Benefits – O - Ornamental, N = Nesting, S = Shade, F = Flower and Fruit bearing, Fl = Nectar containing Flowers, M = Medicinal.

The total no. of **58 species** belongs to **51 genera** & **32 families** are recorded.

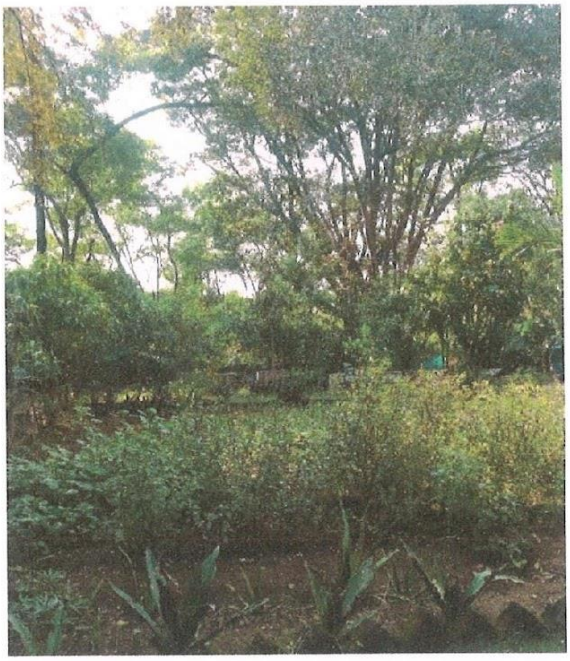
8.3 Population of Trees

Botanical Name	Name	Family	Total
Artocarpus heterophyllus	Jackfruit	Moraceae	9
Azadirachta indica	Neem	Meliaceae	23
Bambusa tulda	Bamboo	Poaceae	4
Bauhinia variegata	Kanchan	Fabaceae	5
Citrus limetta	Mosambi	Rutaceae	7
Delonix regia	Gulmohr	Fabaceae	14
Eucalyptus globulus	Nilgiri	Myrtaceae	3
Ficus elastica	Rubber Tree	Moraceae	7
Ficus racemosa	Cluster fig	Moraceae	2
Ficus religiosa	Sacred fig	Moraceae	5
Hyophorbe lagenicaulis	Bottle palm	Aracaceae	7
Jacaranda mimosifolia	Neel gulmohr	Bignoniaceae	2
Leucaena leucocephala	Subabul	Fabaceae	32
Magnolia alba	White Champak	Magnoliaceae	7
Magnolia champaca	Champak	Magnoliaceae	4
Mangifera indica	Mango	Anacardiaceae	5
Mesua ferrea	Nag Chafa	Calophyllaceae	1
Millingtonia hortensis	Indian cork tree	Bignoniaceae	6
Phoenix dactylifera	Date plant	Arecaceae	1
Phyllanthus emblica	Amla	Phyllanthaceae	6
Platycladus orientalis	Morpankhi	Cupressaceae	12
Psidium guajava	Guava	Myrtaceae	1
Santalum album	Chandan	Santalaceae	1
Saraca asoca	Ashoka	Fabaceae	17
Syzygium cumini	Jamun	Myrtaceae	3
Tamarindus indica	Tamarind	Fabaceae	27
Terminalia catappa	Badam	Combretaceae	6
Total			217

8.4 Photographs of Tree Plantation at Juhu Campus:



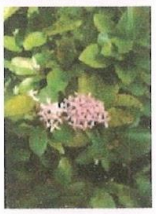
Photograph of Tree Plantation at Pune Campus:



8.5 Details of Ornamental Plants:

Botanical name	Common name	Family	Picture
Plumbago zeylanica	Wild Leadwort	Plumbaginaceae	
Clitoria Ternatea	Gokarana	Fabaceae	
Crossandra infundibuliformis	Aboli	Acanthaceae	
Hibiscus rosa-sinensis	Jaswand	Malvaceae	
Impateins walleriana	Balsam	Balsaminaceae	
Ipomoea quamoclit	Ganesh vel	Convolvulaceae	

Lantana montevidensis	Trailing Lantana	Verbenaceae	
Calliandra haematocephala	Red Powder-puff	Fabaceae	
Catharanthus roseus	Sadaphuli	Apocynaceae	
Lantana camra	Ghaneri	Verbenaceae	
Cosmos sulphureus	Yellow cosmos	Asteraceae	
Jatropha podagrica	Gout Stalk	Euphorbiaceae	

Turnera ulmifolia	Yellow Alder	Passifloraceae	
Ixora coccinea	Jungle flame	Rubiaceae	
Canna indica	Saka Siri (Indian shot)	Cannaceae	
Bougainvillea spectabilis	paperflower	Nyctaginaceae