Quality Audits

2018-19

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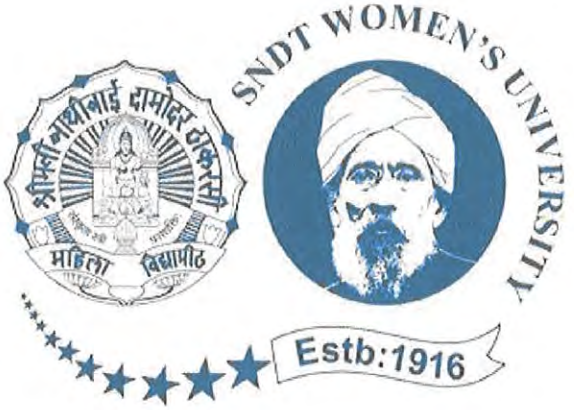
ENERGY AUDIT REPORT
of
SNDT WOMEN'S UNIVERSITY
MUMBAI



Year: 2018-19

Prepared by

Enrich Consultants
Yashashree, 26, Nirmal Bag Society
Near Muktangan English School, Parvati, Pune 411009
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MAHARASHTRA ENERGY DEVELOPMENT AGENCY

Maharashtra Energy Development Agency
(A Government of Maharashtra undertaking)
2nd Floor, MHADA Commercial Complex, Opp. Tridal Nagar, Yerwada, Pune 411 006,
Ph No: 020-26614393/266144403
Email: eee@mahaurja.com, Web: www.mahaurja.com

ECN/2018-19/CR-05/4174 19th September , 2018

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	:	**Enrich Consultants** Yashashree, Plot No. 26, Nirmal Bag Society, Near Muktangan English School, Parvati, Pune - 411009.
Registration Category	:	Empanelled *Consultant for Energy Conservation Programme*
Registration Number	:	***MEDA/ECN/CR-05/2018-19/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 the firm at any time without giving any prior information and canceling the registration, if the information is found incorrect.
- This empanelment is valid till **31st March 2021** 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.

19/9/18
(Smita Kudarikar)
General Manager (EC)

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Enrich Consultants

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Near Muktangan English School, Parvati, Pune 411 009
Tel: 09890444795 Email: enrichcons@gmail.com

Ref: EC/SNDT/18-19/01 Date: 20/08/2019

CERTIFICATE

This is to certify that we have conducted Energy Audit at SNDT Women's University, Mumbai in the year 2018-19.

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

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Mumbai - 20

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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: 2018-19.

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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	820449	656.36
2	Maximum	133517	106.81
3	Minimum	27522	22.0176
4	Average	68370.75	54.6966

3. Various measures adopted for Energy Conservation:

- 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 **1105381 kWh.**
- Annual Alternate Energy Usage is **284932 kWh.**
- The percentage of Alternate Energy to Annual Energy requirement is **25.78 %.**

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

- The Annual Total Lighting Demand is **338738 kWh.**
- The annual LED Lighting Demand is **53474 kWh.**
- The % of LED to the total annual lighting power requirement works out to be **15.79 %**

6. Notes & Assumptions:

1. **1 kWh** of Electrical Energy releases **0.8 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-**6 Nos** (For Lighting Calculations)
4. Annual working Days-**250 Nos** (For Lighting Calculations)
5. Annual Energy Generation Days: For Solar PV Plant: **50 Nos**
6. Annual Solar Thermal Water System Usage Period: **250 Nos**

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7. References:

1. For Electrical Energy saved by Solar Thermal Plant: www.mahaurja.com
2. For Energy Generated by Solar PV Plant: www.solarrooftop.gov.in

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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 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) Pune Campus,
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 All Three Campuses:

No	Equipment	Qty	Load, W/Unit	Load, kW
1	FTL	4712	40	188.48
2	20W LED	1205	20	24.1
3	2*20 W LED	19	40	0.76
4	LED D/L 16 W	256	16	4.096
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	1306	150	195.9
15	Printer	230	150	34.5
16	AC-1.5 Ton-Old	43	2025	87.075
17	AC-2 Ton	46	2700	124.2
18	AC- New	39	1800	70.2
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**			**1043**

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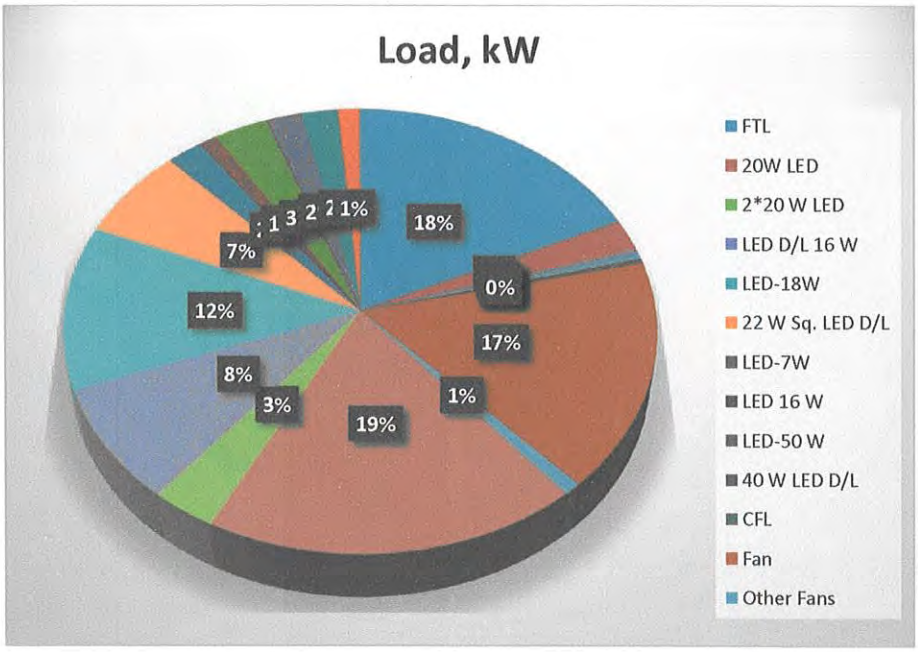
Chart No 1: Total Connected Load of All Three Campuses:



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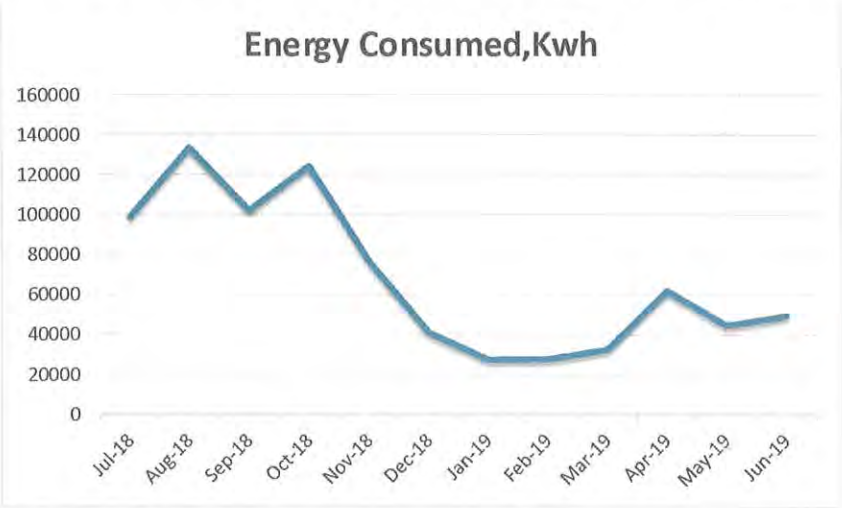
CHAPTER-III
STUDY OF PRESENT ENERGY CONSUMPTION

In this chapter, we present the consumption of Electrical Energy of all three campuses for the Academic Year: 2018-19.

Table No 3: Study of Consumption of Electrical Energy: 2018-19:

No	Month	Campus Wise Energy Consumed, kWh			Total Energy Consumption, kWh
		Churchgate	Juhu	Pune	
1	Jul-18	1561	81384	15833	98778
2	Aug-18	27218	85230	21069	133517
3	Sep-18	1489	81804	18884	102177
4	Oct-18	30746	75528	18116	124390
5	Nov-18	28801	36456	11411	76668
6	Dec-18	1366	27255	12311	40932
7	Jan-19	1245	10560	15717	27522
8	Feb-19	816	10734	16273	27823
9	Mar-19	1230	12423	18845	32498
10	Apr-19	23211	25119	13618	61948
11	May-19	25081	8478	11116	44675
12	Jun-19	24240	10284	14997	49521
13	Total				820449
14	Maximum				133517
15	Minimum				27522
16	Average				68370.75

Chart No 2: Study of variation of Monthly Electrical Energy Consumption, kWh:



Key Observations:

Table No 4: Various Important Parameters:

No	Parameter/ Value	Energy Consumed, kWh
1	Total	820449
2	Maximum	133517
3	Minimum	27522
4	Average	68370.75

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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 for day to day activities.

Basis for computation of CO_2 Emissions:

- **1 kWh** of Electrical Energy releases **0.8 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-18	1561	81384	15833	98778	79.02
2	Aug-18	27218	85230	21069	133517	106.81
3	Sep-18	1489	81804	18884	102177	81.74
4	Oct-18	30746	75528	18116	124390	99.51
5	Nov-18	28801	36456	11411	76668	61.33
6	Dec-18	1366	27255	12311	40932	32.75
7	Jan-19	1245	10560	15717	27522	22.02
8	Feb-19	816	10734	16273	27823	22.26
9	Mar-19	1230	12423	18845	32498	26.00
10	Apr-19	23211	25119	13618	61948	49.56
11	May-19	25081	8478	11116	44675	35.74
12	Jun-19	24240	10284	14997	49521	39.62
13	Total				820449	656.36
14	Maximum				133517	106.81
15	Minimum				27522	22.0176
16	Average				68370.75	54.6966

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Chart No 3: Representation of Month wise CO_2 Emissions:

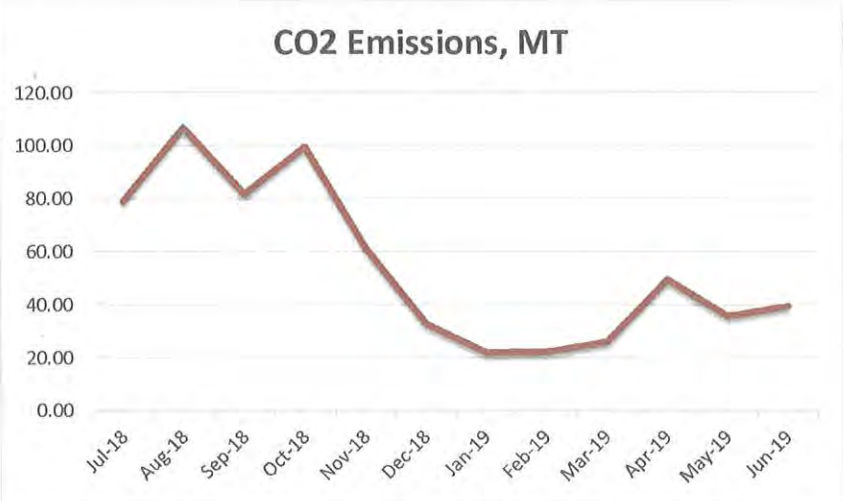

Table No 6: Various Important Parameters:

No	Parameter/ Value	Energy Consumed, kWh	CO_2 Emissions, MT
1	Total	820449	656.36
2	Maximum	133517	106.81
3	Minimum	27522	22.0176
4	Average	68370.75	54.6966

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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 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 Usage of Alternate Energy to Annual Power requirement:

No	Particulars	Value	Unit
1	Total Energy Purchased by the three campuses	**820449**	**kWh**
2	Installed Roof Top Solar PV Plant Capacity	500	kWp
3	Average Daily Energy Generated	4	kWh/kWp
4	Annual Generation Days	50	Nos
5	Annual Solar Energy Generated	**100000**	**kWh**
6	Solar Water Heating System at Hostel Block	18000	LPD

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7	Equivalent Electrical Energy saved by100 LPD System in 365 days	270000	kWh
8	Energy saved by 18000 LPD System in 250 Days	184932	kWh
9	Equivalent Electrical Energy saved by 18000 LPD System in 19-20=9855	**184932**	**kWh**
10	Total Renewable Energy usage = **(5) + (9)**	**284932**	**kWh**
11	**Total Energy Requirement = (1) + (5) + (9)**	**1105381**	**kWh**
12	**% of Usage of Alternate Energy = (10) *100/ (12)**	**25.78**	**%**

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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 10: Computation of % of Annual LED Lighting Load:

No	Particulars	Value	Unit
1	No of FTL Fittings	4712	Nos
2	Load/Unit of FTL Fitting	40	W/Unit
3	Total Load of FTL Fittings	**188.48**	kW
4	No of 20 W LED Fittings	1205	Nos
5	Load/Unit of LED Fitting	20	W/Unit
6	Total Load of 20 W LED Fittings	**24.1**	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	256	Nos
11	Load/Unit of 16 W LED D/L Fitting	16	W/Unit
12	Total Load of 16 W LED D/L Fittings	**4.096**	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 Load 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	**2.5**	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	**225.825**	kW
32	Total LED Lighting Load	**35.649**	kW
33	Average Daily Usage Period	5	Hrs/Day
34	Annual Working Days	180	Nos
35	Annual Total Lighting Load=31*33*34	203243	kWh
36	Annual LED Lighting Load=32*33*34	32084.1	kWh
37	**% of LED Lighting to Annual Lighting Load=36*100/35**	**15.78**	%

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GREEN AUDIT REPORT
of
SNDT WOMEN'S UNIVERSITY
MUMBAI

Year: 2018-19

Prepared by

Enrich Consultants

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CERTIFICATE

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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

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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: 2018-19.

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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 **100000 kWh.**
- Energy saved by Solar Thermal Water Heating Plant is **184932 kWh.**
- Annual Alternate Energy Usage is **284932 kWh.**
- The reduction in Annual CO_2 Emissions is **228 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 **0.8 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: **50 Nos**
4. Annual Solar Thermal Water System Usage Period: **250 Nos**

9. References:

1. For Electrical Energy saved by Solar Thermal Plant: www.mahaurja.com
2. For Energy Generated by Solar PV Plant: www.solarrooftop.gov.in

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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

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CHAPTER-II
STUDY OF PRESENT ENERGY CONSUMPTION

In this chapter, we present the consumption of Electrical Energy for the Academic Year: 2018-19:.

Table No 2: Study of Consumption of Electrical Energy: 2018-19:

No	Month	Campus Wise Energy Consumed, kWh			Total Energy Consumption, kWh
		Churchgate	Juhu	Pune	
1	Jul-18	1561	81384	15833	98778
2	Aug-18	27218	85230	21069	133517
3	Sep-18	1489	81804	18884	102177
4	Oct-18	30746	75528	18116	124390
5	Nov-18	28801	36456	11411	76668
6	Dec-18	1366	27255	12311	40932
7	Jan-19	1245	10560	15717	27522
8	Feb-19	816	10734	16273	27823
9	Mar-19	1230	12423	18845	32498
10	Apr-19	23211	25119	13618	61948
11	May-19	25081	8478	11116	44675
12	Jun-19	24240	10284	14997	49521
13	Total				820449
14	Maximum				133517
15	Minimum				27522
16	Average				68370.75

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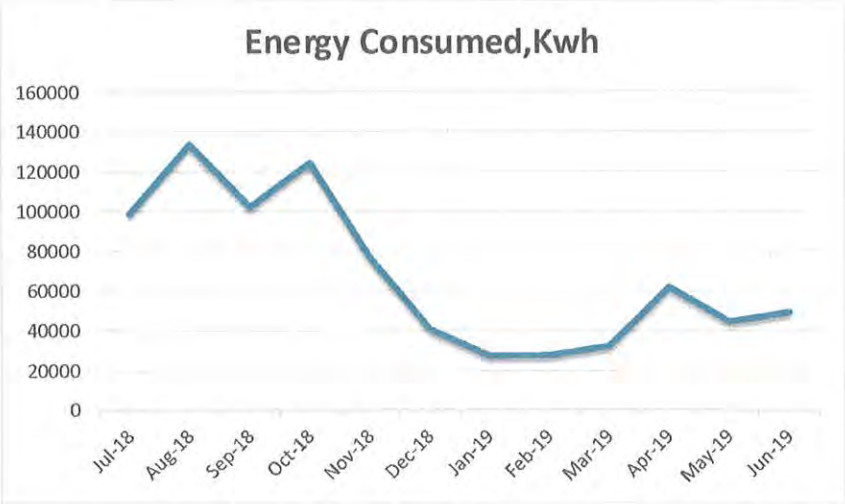
Chart No 1: Study of variation of Monthly Electrical Energy Consumption, kWh:



Key Observations:

Table No 3: Various Important Parameters:

No	Parameter/ Value	Energy Consumed, kWh
1	Total	820449
2	Maximum	133517
3	Minimum	27522
4	Average	68370.75

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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 for 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-18	1561	81384	15833	98778	79.02
2	Aug-18	27218	85230	21069	133517	106.81
3	Sep-18	1489	81804	18884	102177	81.74
4	Oct-18	30746	75528	18116	124390	99.51
5	Nov-18	28801	36456	11411	76668	61.33
6	Dec-18	1366	27255	12311	40932	32.75
7	Jan-19	1245	10560	15717	27522	22.02
8	Feb-19	816	10734	16273	27823	22.26
9	Mar-19	1230	12423	18845	32498	26.00
10	Apr-19	23211	25119	13618	61948	49.56
11	May-19	25081	8478	11116	44675	35.74
12	Jun-19	24240	10284	14997	49521	39.62
13	Total				820449	656.36
14	Maximum				133517	106.81
15	Minimum				27522	22.0176
16	Average				68370.75	54.6966

Chart No 2: Representation of Month wise CO_2 Emissions:

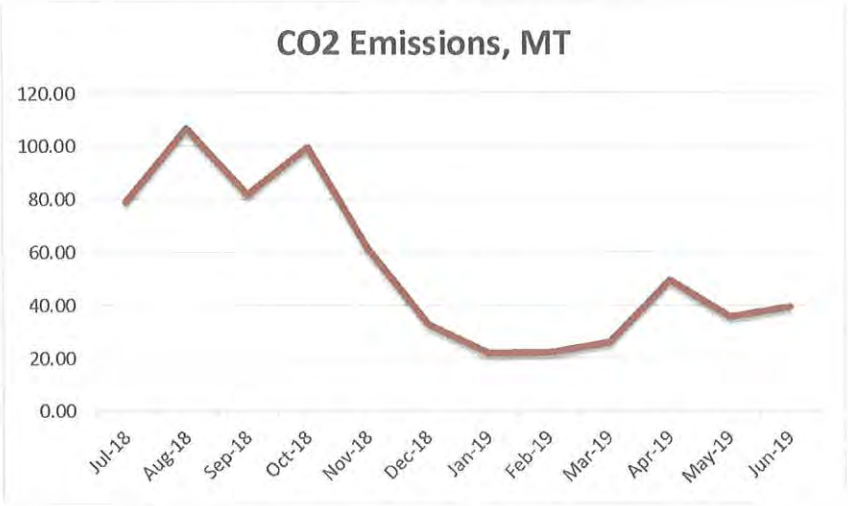

Table No 5: Various Important Parameters:

No	Parameter/ Value	Energy Consumed, kWh	CO_2 Emissions, MT
1	Total	820449	656.36
2	Maximum	133517	106.81
3	Minimum	27522	22.0176
4	Average	68370.75	54.6966

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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.

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 Reduction in Annual CO_2 Emissions:

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

No	Particulars	Value	Unit
1	Installed Roof Top Solar PV Plant Capacity	500	kWp
2	Average Daily Energy Generated	4	kWh/kWp
3	Annual Generation Days	300	Nos
4	Annual Solar Energy Generated	**600000**	**kWh**
5	Solar Water Heating System at Hostel Block	18000	LPD
6	Equivalent Electrical Energy saved by100 LPD System in 365 days	270000	kWh
7	Energy saved by 18000 LPD System in 250 Days	184932	kWh
8	Equivalent Electrical Energy saved by 18000 LPD System in 19-20=9855	**184932**	**kWh**
9	Total Renewable Energy usage = **(5) + (9)**	**284932**	**kWh**

10	1 kWh of Electrical Energy releases	0.8	Kg of CO_2
11	**Reduction in CO_2 Emissions in 19-20= (10) * 0.8/1000**	**228**	**MT**

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CHAPTER-V
STUDY OF WASTE MANAGEMENT

5.1 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

5.2 E-Waste Management:

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

CHAPTER-VI
RAIN WATER HARVESTING

The University is implementing Rain Water Harvesting Project at Churchgate campus. The water collected will be used to recharge the ring well.

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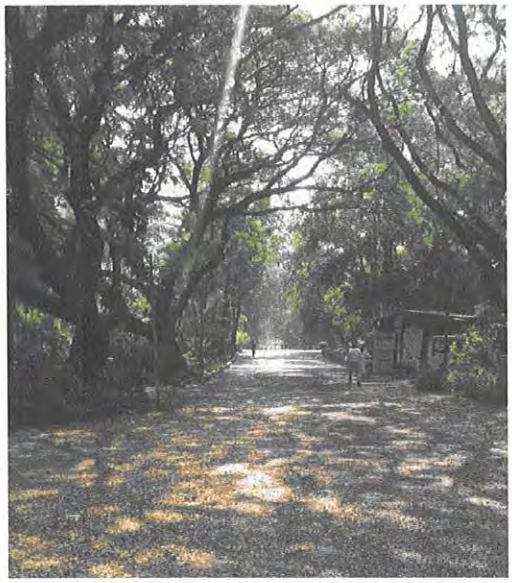
CHAPTER-VII
STUDY OF GREEN & INNOVATIVE PRACTICES

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 as Sanitary Waste Incinerator.

Photograph of Sanitary Waste Incinerator:

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ENVIRONMENTAL AUDIT REPORT
of
SNDT WOMEN'S UNIVERSITY
MUMBAI

Year: 2018-19

Prepared by

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

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MAHARASHTRA ENERGY DEVELOPMENT AGENCY

Maharashtra Energy Development Agency
(A Government of Maharashtra undertaking)
2nd Floor, MHADA Commercial Complex, Opp. Tridal Nagar, Yerwada, Pune 411 006.
Ph No: 020-26614393/266144403
Email: ece@mahaurja.com, Web: www.mahaurja.com

ECN/2018-19/CR-05/4174 — 19th September , 2018

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	:	**Enrich Consultants** Yashashree, Plot No. 26, Nirmal Bag Society, Near Muktangan English School, Parvati, Pune - 411009.
Registration Category	:	Empanelled *Consultant for Energy Conservation Programme*
Registration Number	:	***MEDA/ECN/CR-05/2018-19/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 the firm at any time without giving any prior information and canceling the registration, if the information is found incorrect.
- This empanelment is valid till **31st March 2021** 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.

19/9/18
(Smita Kudarikar)
General Manager (EC)

Registrar
S.N.D.T. Women's University
Mumbai

Enrich Consultants

Vastushree, 26, Nirmal Bag Society,
Near Mukundnagar English School, Parvati, Pune 411 009
Tel: 09890844736, Email: enrichcons@gmail.com

Ref: EC/SNDT-18-19/07 Date: 20/08/2019

CERTIFICATE

This is to certify that we have conducted Green Audit at SNDT Women's University, Mumbai in the year 2018-19.

The University has adopted following Eco-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
- Well maintained Tree Plantation in the campus

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

For Enrich Consultants,

A. Y. Mehendale,
Certified Energy Auditor
EA-8192

ENRICH CONSULTANTS PUNE

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S.N.D.T. Women's University
Mumbai

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3	Study of Present CO_2 Emissions	11
4	Study of Usage of Renewable Energy	13
5	Study of Waste Management	15
6	Study of Rain Water Harvesting	16
7	Study of Eco- Friendly Practices	17

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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: 2018-19.

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Mumbai

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	820449	656.36
2	Maximum	133517	106.81
3	Minimum	27522	22.0176
4	Average	68370.75	54.6966

3. **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 **100000 kWh.**
- The reduction in Annual CO_2 Emissions is **228 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 Sanitary Waste Management:

The University has made provision for Sanitary Waste Incinerator, for disposal of Sanitary Waste.

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.

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7. Eco-Friendly Practices:

- Tree Plantation in the Campus

8. Assumptions:

1. 1 kWh of Electrical Energy releases 0.8 Kg of CO_2 into atmosphere.
2. Annual Energy Generation Days: For Solar PV Plant: **50 Nos**
3. Annual Solar Thermal Water System Usage Period: **250 Nos**

9. Reference:

1. For Energy Generated by Solar PV Plant: www.solarrooftop.gov.in

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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

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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 Environment Friendly Practices

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

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CHAPTER-II
STUDY OF PRESENT ENERGY CONSUMPTION

In this chapter, we present the consumption of Electrical Energy for the Academic Year: 2018-19.

Table No 2: Study of Consumption of Electrical Energy: 2018-19:

No	Month	Campus Wise Energy Consumed, kWh			Total Energy Consumption, kWh
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13	Total				**820449**
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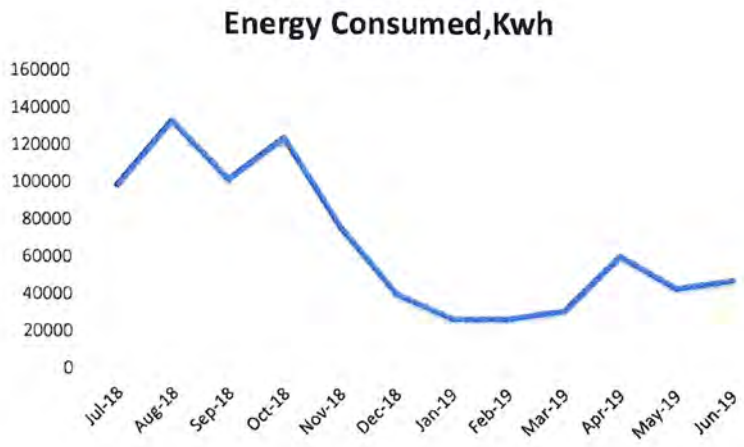
Chart No 1: Study of variation of Monthly Electrical Energy Consumption, kWh:



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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 for 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 3: Month wise CO_2 Emissions:

No	Month	Campus Wise Energy Consumed, kWh			Total Energy Consumption, kWh	CO_2 Emissions, MT
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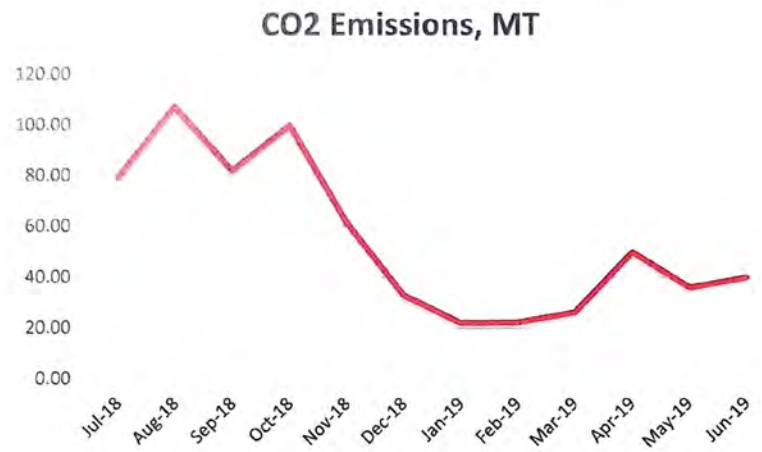
Chart No 2: Representation of **Month wise CO_2 Emissions:**



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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.

Table No 3: 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 4: 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 Reduction in Annual CO_2 Emissions:

Table No 5: Computation of Reduction in Annual CO_2 Emissions:

No	Particulars	Value	Unit
1	Installed Roof Top Solar PV Plant Capacity	500	kWp
2	Average Daily Energy Generated	4	kWh/kWp
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8	Equivalent Electrical Energy saved by 18000 LPD System in 18-19	**184932**	**kWh**
9	Total Renewable Energy usage = **(5) + (9)**	**284932**	**kWh**

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10	1 kWh of Electrical Energy releases	0.8	Kg of CO_2
11	**Reduction in CO_2 Emissions in 19-20= (10) * 0.8/1000**	**228**	**MT**

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CHAPTER-V
STUDY OF WASTE MANAGEMENT

5.1 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

5.2 Sanitary Waste Management:

The University has installed Sanitary Waste Incinerator, for disposal of Sanitary Waste.
Photograph of **Sanitary Waste Incinerator:**

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CHAPTER-VI
RAIN WATER HARVESTING

The University is implementing Rain Water Harvesting Project at Churchgate campus. The water collected will be used to recharge the ring well.

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CHAPTER-VII
STUDY OF ECO-FRIENDLY PRACTICES

7.1 Internal Lawn & Tree Plantation:

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

Photograph of Internal Pond & Garden at Juhu Campus:

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