

# Quality Audits

2020-21

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**ENERGY AUDIT REPORT**  
of  
**SNDT WOMEN'S UNIVERSITY**  
**MUMBAI**



Year: 2020-21

Prepared by

**Enrich Consultants**

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**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,  
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ECN/2021-22/CR-14/1577

22<sup>nd</sup> 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 **21<sup>st</sup> 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)



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## Enrich Consultants

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Tel: 09890444795 Email: [enrichcons@gmail.com](mailto:enrichcons@gmail.com)

Ref: EC/SNTD/20-21/01

Date: 30/11/2021

### CERTIFICATE

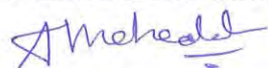
This is to certify that we have conducted Energy Audit at SNTD Women's University, Mumbai in the year 2020-21.

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



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## ACKNOWLEDGEMENT

We Enrich Consultants, Pune, express our sincere gratitude to the management of SNT 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.

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## EXECUTIVE SUMMARY

1. **SNT 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<sub>2</sub> Emissions:

| No | Parameter/<br>Value | Energy<br>Consumed, kWh | CO <sub>2</sub><br>Emissions,<br>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<sub>2</sub>** 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)



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

**7. References:**

1. For Computation of CO<sub>2</sub> Emissions: [www.tatapower.com](http://www.tatapower.com)
2. For Energy Generated by Solar PV Plant: [www.solarroftop.gov.in](http://www.solarroftop.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                            |



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## 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<sub>2</sub> 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                  | SNTD Women's University                                                              |
| 2  | Address               | 1, Nathibai Thackersey Road, Mumbai 400 020                                          |
| 3  | Campuses Under Study  | 1) Churchgate Campus, Mumbai<br>2) Juhu Campus, Mumbai<br>3) Karve Road Campus, Pune |
| 3  | Year of Establishment | 1916                                                                                 |



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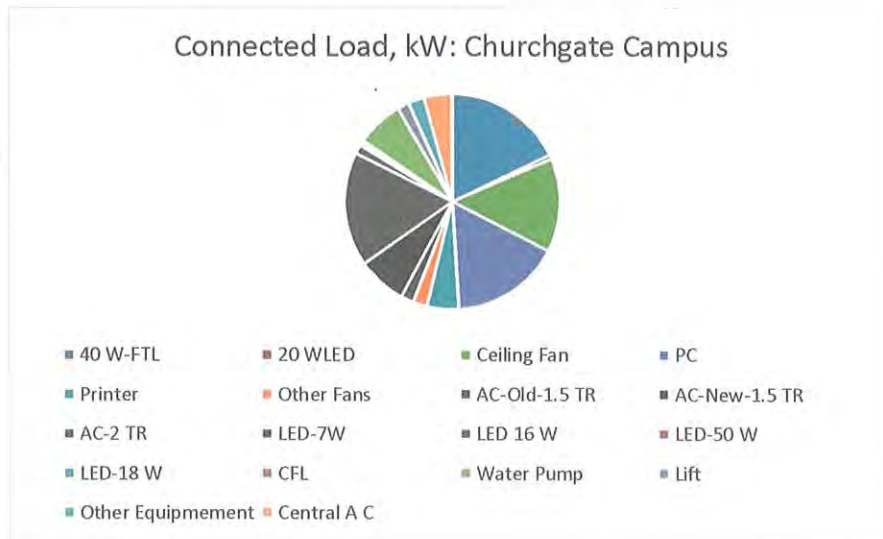
## CHAPTER-II STUDY OF CONNECTED LOAD

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 | <b>Total</b>    |      |              | <b>316</b> |

**Chart No 1: Connected Load of Churchgate Campus:**



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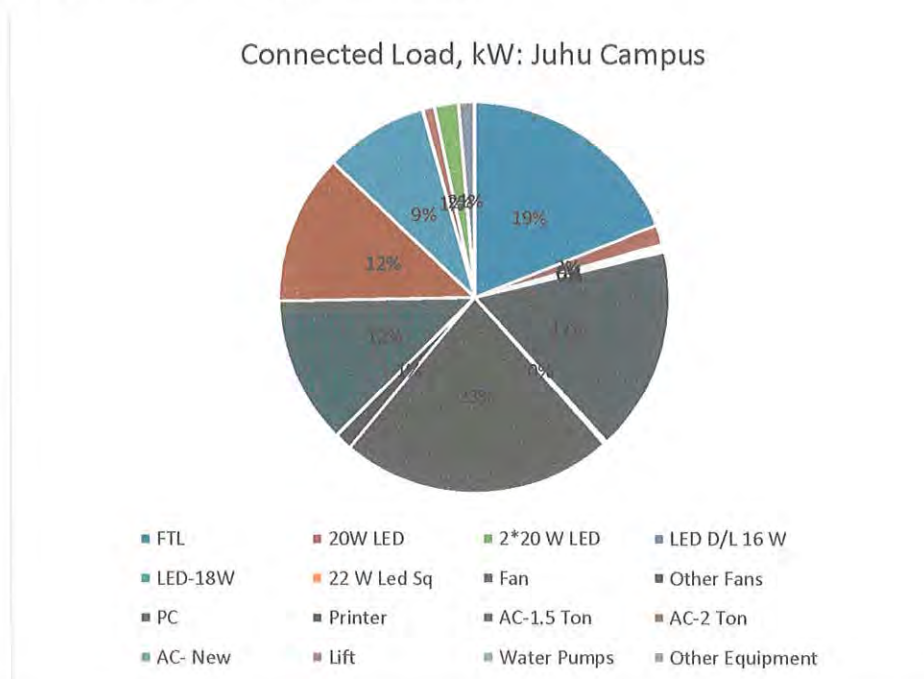
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**Table No 3: Details of Overall Connected Load of Juhu Campus:**

| 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 | <b>Total</b>     |      |              | <b>566</b> |

**Chart No 2: Connected Load of Juhu Campus:**

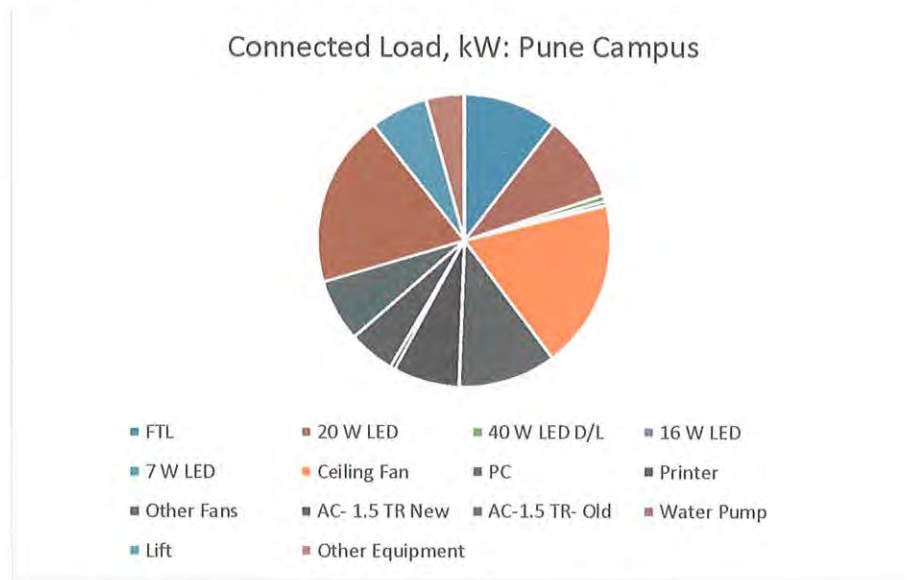




**Table No 4: Details of Overall Connected Load of Pune Campus:**

| 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 | <b>Total</b>    |     |              | <b>177</b> |

**Chart No 3: Connected Load of Pune Campus:**



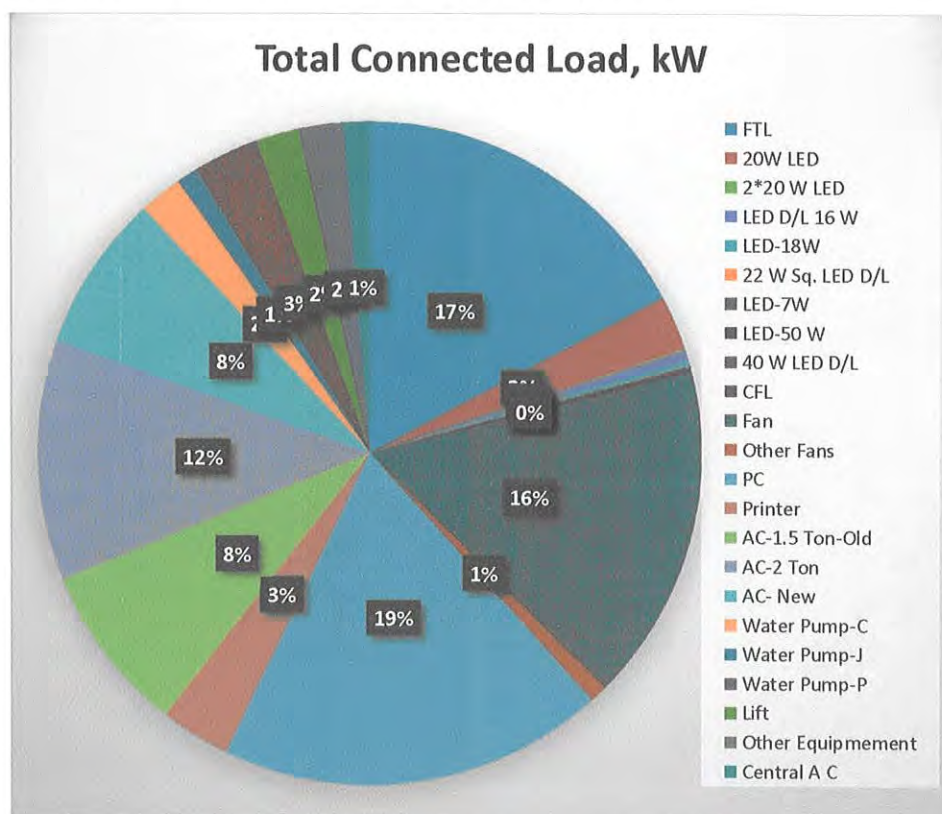
**Table No 5: Details of Overall Connected Load of All Three Campuses:**

| 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 | <b>Grand Total</b> |      |       | <b>1059</b> |

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





### CHAPTER-III

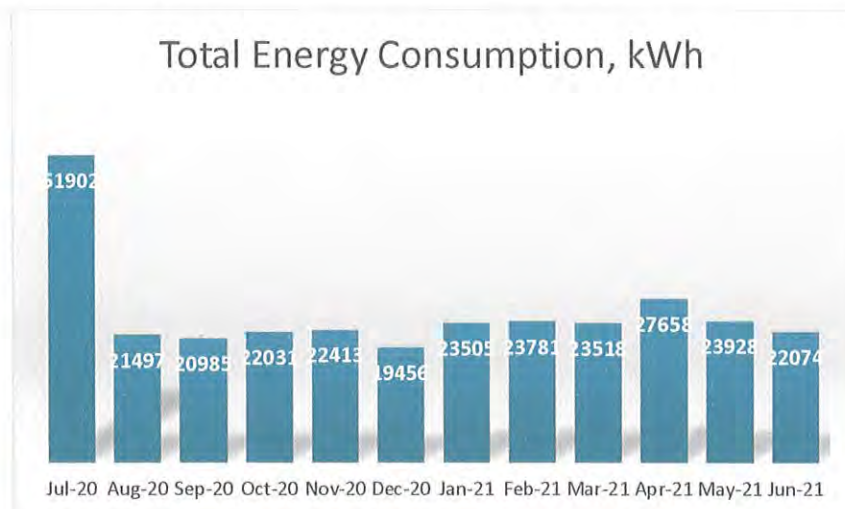
#### STUDY OF PRESENT ENERGY CONSUMPTION

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<br>Energy Consumed, kWh |        |         | Total Energy<br>Consumption,<br>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/<br>Value | Energy<br>Consumed, kWh |
|----|---------------------|-------------------------|
| 1  | Total               | 302748                  |
| 2  | Maximum             | 51902                   |
| 3  | Minimum             | 19456                   |
| 4  | Average             | 25229                   |



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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, LPG and Diesel for various Electrical gadgets & day to day activities.

### Basis for computation of CO<sub>2</sub> Emissions:

- 1 Unit kWh of Electrical Energy releases **0.9 Kg of CO<sub>2</sub>** into atmosphere

**Table No 8: Month wise CO<sub>2</sub> Emissions:**

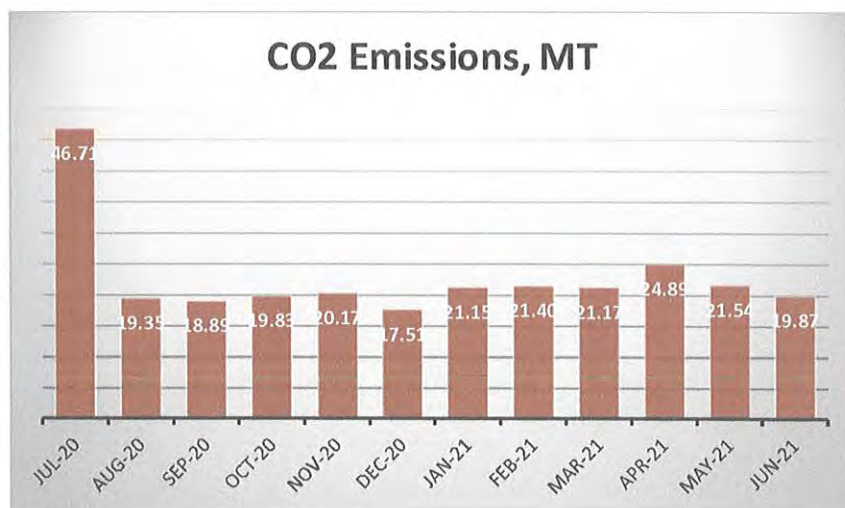
| No | Month   | Campus Wise<br>Energy Consumed, kWh |        |         | Total Energy<br>Consumption,<br>kWh | CO <sub>2</sub><br>Emissions, MT |
|----|---------|-------------------------------------|--------|---------|-------------------------------------|----------------------------------|
|    |         | 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                            |



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**Chart No 6: Representation of Month wise CO<sub>2</sub> Emissions:**



**Table No 9: Various Important Parameters:**

| No | Parameter/<br>Value | Energy<br>Consumed, kWh | CO <sub>2</sub><br>Emissions,<br>MT |
|----|---------------------|-------------------------|-------------------------------------|
| 1  | Total               | 302748                  | 272.47                              |
| 2  | Maximum             | 51902                   | 46.71                               |
| 3  | Minimum             | 19456                   | 17.51                               |
| 4  | Average             | 25229                   | 22.71                               |

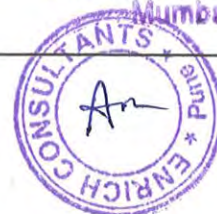


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## CHAPTER-V

### 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 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  | <b>Total</b>              | <b>500</b>          |

**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  | <b>Total</b> | <b>16000</b>    |

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  | <b>Annual Energy Purchased for all three campuses</b>       | <b>302748</b> | <b>kWh</b> |
| 2  | Installed Solar PV Plant Capacity                           | 500           | kWp        |
| 3  | Average Energy generated per Day                            | 4             | kWh        |
| 4  | Annual Generation Days                                      | 300           | Nos        |
| 5  | <b>Annual Electrical Energy generated by Solar PV Plant</b> | <b>600000</b> | <b>kWh</b> |
| 6  | <b>Total Annual Energy Requirement = (1) + (5)</b>          | <b>902748</b> | <b>kWh</b> |
| 7  | <b>Total Alternate Energy Generated = (5)</b>               | <b>600000</b> | <b>kWh</b> |





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

Photograph of Roof Top Solar PV Plant:



## 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          | <b>182.24</b> | 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     | <b>28.14</b>  | 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   | <b>0.76</b>   | 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 | <b>5.808</b>  | 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     | <b>2.214</b>  | 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 | <b>0.506</b>  | 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      | <b>0.273</b>  | kW     |
| 22 | No of 50 W LED Fittings             | 2             | Nos    |
| 23 | Load/Unit of 50 W LED Fitting       | 50            | W/Unit |



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|    |                                                     |         |         |
|----|-----------------------------------------------------|---------|---------|
| 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.



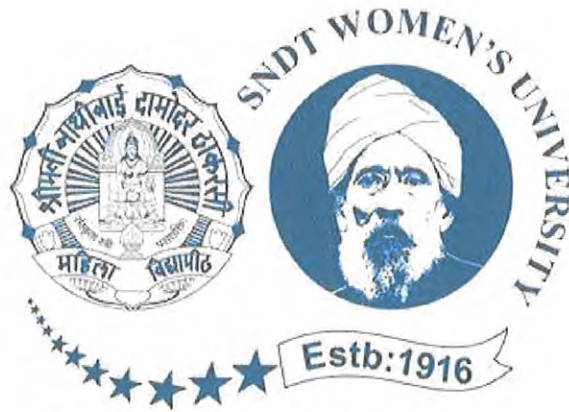
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**GREEN AUDIT REPORT**  
of  
**SNDT WOMEN'S UNIVERSITY**  
**MUMBAI**



Year: 2020-21

Prepared by

**Enrich Consultants**

Yashashree, 26, Nirmal Bag Society  
Near Muktangang English School, Parvati, Pune 411009  
Phone: 09890444795, Email: [enrichcons@gmail.com](mailto:enrichcons@gmail.com)

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**SNDT Women's University**  
**Mumbai - 20**

**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](mailto:eee@mahaurja.com), Web: [www.mahaurja.com](http://www.mahaurja.com)

ECN/2021-22/CR-14/1577

22<sup>nd</sup> 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 **21<sup>st</sup> 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.

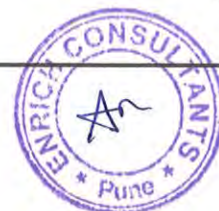
General Manager (EC)



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SNTD Women's University



## Enrich Consultants

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

Ref: EC/SNTD/20-21/02

Date: 30/11/2021

### CERTIFICATE

This is to certify that we have conducted Green Audit at SNTD 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





## INDEX

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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: 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.



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A handwritten signature in blue ink, likely belonging to the Registrar.

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## EXECUTIVE SUMMARY

1. **SNTD 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<sub>2</sub> Emissions:

| No | Parameter/<br>Value | Energy<br>Consumed, kWh | CO <sub>2</sub><br>Emissions,<br>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<sub>2</sub> 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 CO<sub>2</sub> 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.



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#### 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<sub>2</sub>** 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<sub>2</sub> Emissions: [www.tatapower.com](http://www.tatapower.com)
2. For Energy Generated by Solar PV Plant: [www.solarroftop.gov.in](http://www.solarroftop.gov.in)



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## ABBREVIATIONS

|      |                                         |
|------|-----------------------------------------|
| SNTD | : 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<sub>2</sub> 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<br>2) Juhu Campus, Mumbai<br>3) Pune Campus |
| 3  | Year of Establishment | 1916                                                                     |



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## CHAPTER-II

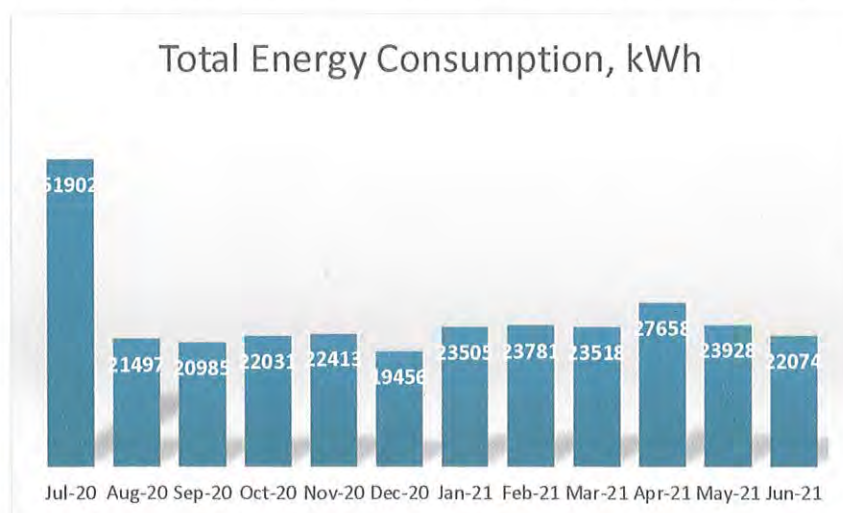
### STUDY OF PRESENT ENERGY CONSUMPTION

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

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

| No | Month   | Campus Wise<br>Energy Consumed, kWh |        |         | Total Energy<br>Consumption,<br>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/<br>Value | Energy<br>Consumed, kWh |
|----|---------------------|-------------------------|
| 1  | Total               | 302748                  |
| 2  | Maximum             | 51902                   |
| 3  | Minimum             | 19456                   |
| 4  | Average             | 25229                   |



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### CHAPTER-III STUDY OF CO<sub>2</sub> 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<sub>2</sub> Emissions:

- 1 Unit kWh of Electrical Energy releases **0.9 Kg of CO<sub>2</sub>** into atmosphere

**Table No 4: Month wise CO<sub>2</sub> Emissions:**

| No | Month   | Campus Wise<br>Energy Consumed, kWh |        |         | Total Energy<br>Consumption,<br>kWh | CO <sub>2</sub><br>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                            |



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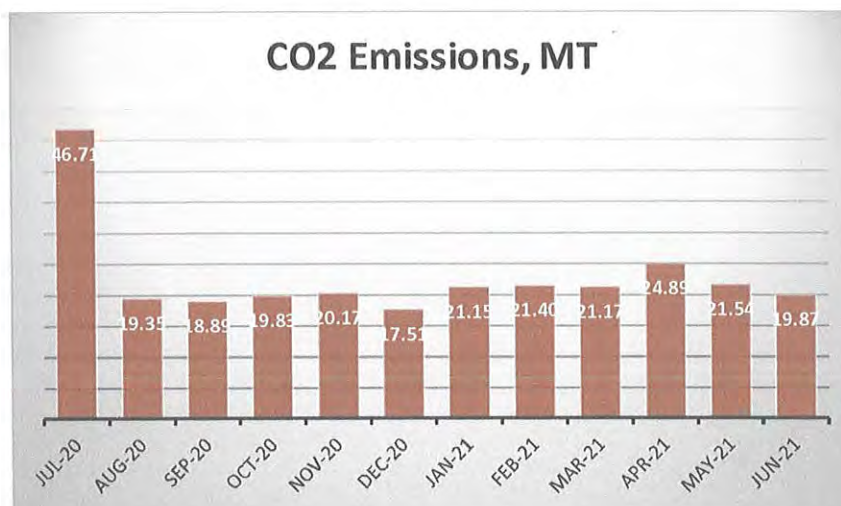
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**Chart No 2: Representation of Month wise CO<sub>2</sub> Emissions:**



**Table No 5: Various Important Parameters:**

| No | Parameter/<br>Value | Energy<br>Consumed, kWh | CO <sub>2</sub><br>Emissions,<br>MT |
|----|---------------------|-------------------------|-------------------------------------|
| 1  | Total               | 302748                  | 272.47                              |
| 2  | Maximum             | 51902                   | 46.71                               |
| 3  | Minimum             | 19456                   | 17.51                               |
| 4  | Average             | 25229                   | 22.71                               |



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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. 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  | <b>Total</b>              | <b>500</b>          |

**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  | <b>Total</b> | <b>16000</b>    |

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<sub>2</sub> 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 <sub>2</sub> |
| 6  | <b>Annual Reduction in CO<sub>2</sub> Emissions= (4)*(5)/1000</b> | <b>540</b> | <b>MT</b>             |



**Photograph of Roof Top Solar PV Plant:**



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## **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.



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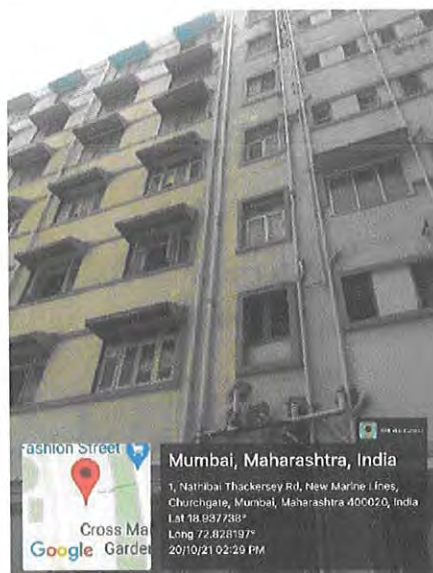
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## CHAPTER-VI RAIN WATER HARVESTING

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:**



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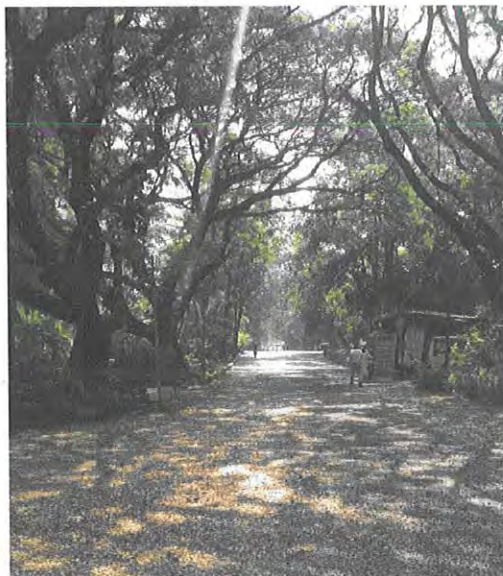
## **CHAPTER-VII**

### **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:

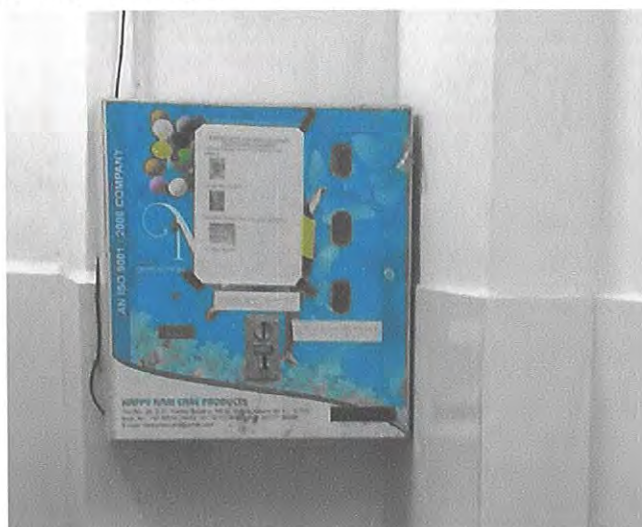
The University has made provision of Ramp, for easy movement of Divyanga students. Also dedicated washrooms are provided for Divyanga students.

#### Photograph of Ramp:



### 7.4 Sanitary Waste Incinerator: The University has installed 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:**



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## 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   | <i>Aloe vera</i>                    | Korphad          | Asphodelaceae | Herb    | O/M      |
| 2   | <i>Artocarpus heterophyllus</i>     | Jackfruit        | Moraceae      | Tree    | F        |
| 3   | <i>Azadirachta indica</i>           | Neem             | Meliaceae     | Tree    | S/M      |
| 4   | <i>Bambusa tulda</i>                | Bamboo           | Poaceae       | Shrub   | O/FI     |
| 5   | <i>Bauhinia variegata</i>           | Kanchan          | Fabaceae      | Tree    | S/M      |
| 6   | <i>Bougainvillea spectabilis</i>    | Paperflower      | Nyctaginaceae | Shrub   | O        |
| 7   | <i>Butea monosperma</i>             | Palas            | Fabaceae      | Tree    | O/FI     |
| 8   | <i>Calliandra haematocephala</i>    | Red Powder-puff  | Fabaceae      | Shrub   | O        |
| 9   | <i>Canna indica</i>                 | Saka Siri        | Cannaceae     | Herb    | O        |
| 10  | <i>Carica papaya</i>                | Papaya           | Caricaceae    | Shrub   | F        |
| 11  | <i>Catharanthus roseus</i>          | Sadaphuli        | Apocynaceae   | Shrub   | O        |
| 12  | <i>Citrus limetta</i>               | Mosambi          | Rutaceae      | Tree    | F        |
| 13  | <i>Clitoria Ternatea</i>            | Gokarana         | Fabaceae      | Climber | O        |
| 14  | <i>Codiaeum Variegatum</i>          | Crotan           | Euphorbiaceae | Shrub   | O        |
| 15  | <i>Colocasia esculanta</i>          | Taro Plant       | Araceae       | Herb    | O        |
| 16  | <i>Cosmos sulphureus</i>            | Yellow cosmos    | Asteraceae    | Herb    | O        |
| 17  | <i>Crossandra infundibuliformis</i> | Aboli            | Acanthaceae   | Shrub   | O/FI     |
| 18  | <i>Croton tiglium</i>               | Jaipal           | Euphorbiaceae | Herb    | O        |
| 19  | <i>Cynodon dactylon</i>             | Scutch Grass     | Poaceae       | Herb    | W/O/M    |
| 20  | <i>Delonix regia</i>                | Gulmohr          | Fabaceae      | Tree    | O/S      |
| 21  | <i>Duranta erecta</i>               | Gold Duranta     | Verbenaceae   | Shrub   | O        |
| 22  | <i>Duranta erecta</i>               | Silver Duranta   | Verbenaceae   | Shrub   | O        |
| 23  | <i>Dyopsis lutescens</i>            | Golden Cane Palm | Arecaceae     | Shrub   | O        |
| 24  | <i>Eucalyptus globulus</i>          | Nilgiri          | Myrtaceae     | Tree    | S/M/F    |
| 25  | <i>Ficus elastica</i>               | Rubber Tree      | Moraceae      | Tree    | S        |
| 26  | <i>Ficus racemosa</i>               | Cluster fig      | Moraceae      | Tree    | S/N/F    |
| 27  | <i>Ficus religiosa</i>              | Sacred fig       | Moraceae      | Tree    | S/N      |





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

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

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



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**8.3 Population of Trees**

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



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#### 8.4 Photographs of Tree Plantation at Juhu Campus:



#### Photograph of Tree Plantation at Pune Campus:

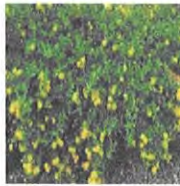




### 8.5 Details of Ornamental Plants:

| Botanical name                      | Common name   | Family                         | Picture                                                                               |
|-------------------------------------|---------------|--------------------------------|---------------------------------------------------------------------------------------|
| <i>Plumbago zeylanica</i>           | Wild Leadwort | Plumbaginaceae                 |    |
| <i>Clitoria Ternatea</i>            | Gokarana      | Fabaceae                       |    |
| <i>Crossandra infundibuliformis</i> | Aboli         | <a href="#">Acanthaceae</a>    |   |
| <i>Hibiscus rosa-sinensis</i>       | Jaswand       | Malvaceae                      |  |
| <i>Impatiens walleriana</i>         | Balsam        | <a href="#">Balsaminaceae</a>  |  |
| <i>Ipomoea quamoclit</i>            | Ganesh vel    | <a href="#">Convolvulaceae</a> |  |



|                                  |                  |                             |                                                                                       |
|----------------------------------|------------------|-----------------------------|---------------------------------------------------------------------------------------|
| <i>Lantana montevidensis</i>     | Trailing Lantana | Verbenaceae                 |    |
| <i>Calliandra haematocephala</i> | Red Powder-puff  | <a href="#">Fabaceae</a>    |    |
| <i>Catharanthus roseus</i>       | Sadaphuli        | <a href="#">Apocynaceae</a> |   |
| <i>Lantana camra</i>             | Ghaneri          | Verbenaceae                 |  |
| <i>Cosmos sulphureus</i>         | Yellow cosmos    | <a href="#">Asteraceae</a>  |  |
| <i>Jatropha podagrica</i>        | Gout Stalk       | Euphorbiaceae               |  |



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|                                  |                         |                                |                                                                                       |
|----------------------------------|-------------------------|--------------------------------|---------------------------------------------------------------------------------------|
| <i>Turnera ulmifolia</i>         | Yellow Alder            | <a href="#">Passifloraceae</a> |    |
| <i>Ixora coccinea</i>            | Jungle flame            | Rubiaceae                      |    |
| <i>Canna indica</i>              | Saka Siri (Indian shot) | Cannaceae                      |    |
| <i>Bougainvillea spectabilis</i> | paperflower             | <a href="#">Nyctaginaceae</a>  |  |



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**ENVIRONMENTAL AUDIT REPORT**  
of  
**SNDT WOMEN'S UNIVERSITY**  
**MUMBAI**



Year: 2020-21

Prepared by

**Enrich Consultants**

Yashashree, 26, Nirmal Bag Society  
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**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](mailto:eee@mahaurja.com), Web: [www.mahaurja.com](http://www.mahaurja.com)

ECN/2021-22/CR-14/1577

22<sup>nd</sup> 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 **21<sup>st</sup> 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)



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## Enrich Consultants

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

Ref: EC/SNTD/20-21/03

Date: 30/11/2021

### CERTIFICATE

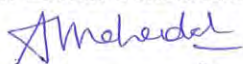
This is to certify that we have conducted Environmental Audit at SNTD Women's University, Mumbai in the year 2020-21.

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



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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: 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.



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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 Usage & CO<sub>2</sub> Emissions:

| No | Parameter/<br>Value | Energy<br>Consumed, kWh | CO <sub>2</sub><br>Emissions,<br>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<sub>2</sub> 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<sub>2</sub> 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<sub>2</sub> Emission due to usage of Alternate Energy is **540 MT**.

### 5. Indoor Air Quality Parameters:

| No | Campus     | Parameter/<br>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/<br>Value | Temperature,<br>°C | Humidity, % | Lux Level,<br>Lumen | Noise<br>Level, dB |
|----|------------|---------------------|--------------------|-------------|---------------------|--------------------|
| 1  | Churchgate | Maximum             | 27.6               | 92          | 275                 | 80                 |
|    |            | Minimum             | 23                 | 65          | 50                  | 54                 |
| 2  | Juhu       | Maximum             | 28.5               | 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<sub>2</sub>** 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<sub>2</sub> Emissions: [www.tatapower.com](http://www.tatapower.com)
2. For Indoor Air Quality: [www.cpcb.com](http://www.cpcb.com)
3. For Indoor Comfort Parameters: [www.ishrae.com](http://www.ishrae.com)
4. For Energy Generated by Solar PV Plant: [www.solarroftop.gov.in](http://www.solarroftop.gov.in)



## ABBREVIATIONS

|        |                                                                              |
|--------|------------------------------------------------------------------------------|
| LED    | : Light Emitting Diode                                                       |
| SNTD   | : 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                                                             |



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## CHAPTER-I INTRODUCTION

### 1.1 Important Definitions:

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

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

#### 1.1.2. Environmental Audit: Definition:

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

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

**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               |



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**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<sub>2</sub> Emissions
2. To Study Usage of Renewable Energy & CO<sub>2</sub> 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                  | SNTD Women's University                                                  |
| 2  | Address               | 1, Nathibai Thackersey Road, Mumbai 400 020                              |
| 3  | Campuses Under Study  | 1) Churchgate Campus, Mumbai<br>2) Juhu Campus, Mumbai<br>3) Pune Campus |
| 3  | Year of Establishment | 1916                                                                     |



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## CHAPTER-II

### STUDY OF CONSUMPTION OF VARIOUS RESOURCES & CO<sub>2</sub> 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

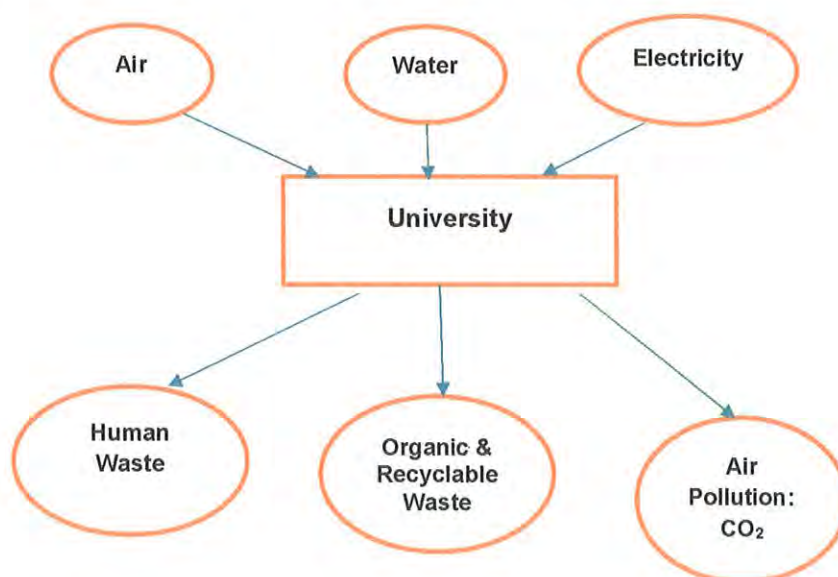


Chart No 1: Representation of University as a System & Environment

2.3 Computation of CO<sub>2</sub> 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<sub>2</sub> Emissions:**

- 1 kWh of Electrical Energy releases 0.9 Kg of CO<sub>2</sub> into atmosphere

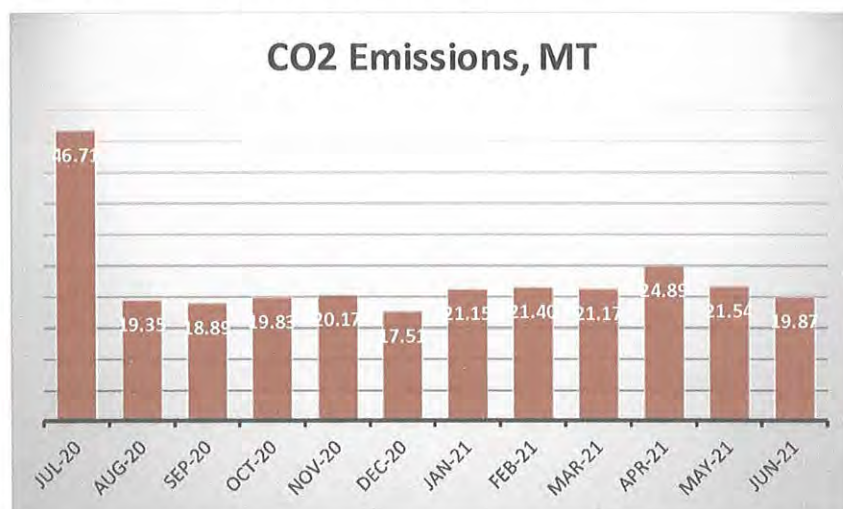




**Table No 5: Month wise CO<sub>2</sub> Emissions:**

| No | Month   | Campus Wise<br>Energy Consumed, kWh |        |         | Total Energy<br>Consumption,<br>kWh | CO <sub>2</sub><br>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<sub>2</sub> Emissions:**





**Table No 6: Various Important Parameters:**

| No | Parameter/<br>Value | Energy<br>Consumed, kWh | CO <sub>2</sub><br>Emissions,<br>MT |
|----|---------------------|-------------------------|-------------------------------------|
| 1  | Total               | 302748                  | 272.47                              |
| 2  | Maximum             | 51902                   | 46.71                               |
| 3  | Minimum             | 19456                   | 17.51                               |
| 4  | Average             | 25229                   | 22.71                               |



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### CHAPTER-III

#### STUDY OF CO<sub>2</sub> 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  | <b>Total</b>              | <b>500</b>          |

**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  | <b>Total</b> | <b>16000</b>    |

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<sub>2</sub> 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 <sub>2</sub> |
| 6  | <b>Annual Reduction in CO<sub>2</sub> Emissions= (4)*(5)/1000</b> | <b>540</b> | <b>MT</b>             |



**Photograph of Roof Top Solar PV Plant:**



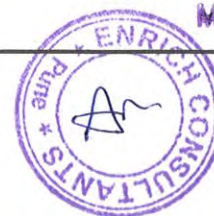
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## CHAPTER IV

### 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  |
|          |                            |     |     |     |
| <b>2</b> | <b>Annex Building</b>      |     |     |     |
|          | <b>3rd Floor</b>           |     |     |     |
|          | 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  |     |     |
| <b>3</b> | <b>Patkar Hall</b>         | 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 |
|----------|---------------------------|-----|-------|------|
| <b>1</b> | <b>Composite Building</b> |     |       |      |
|          | Estate Department         | 190 | 94    | 111  |
|          | Office                    | 189 | 84    | 110  |
|          |                           |     |       |      |
| <b>2</b> | <b>P. V. Polytechnic</b>  |     |       |      |
|          | 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 | <b>C. V. Shah College</b>      |     |     |     |
|   | 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 | <b>CFBP Dept</b>               |     |     |     |
|   | 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 | <b>SHPT College Of Science</b> |     |     |     |
|   | 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 | <b>Pariksha Bhavan</b>         |     |     |     |
|   | Gr. floor-ac section           | 193 | 86  | 92  |



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|          |                                  |     |     |     |
|----------|----------------------------------|-----|-----|-----|
|          | 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  |
|          |                                  |     |     |     |
| <b>7</b> | <b>Jankidevi Bajaj Institute</b> |     |     |     |
|          | 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  |
|          |                                  |     |     |     |
| <b>8</b> | <b>SVT College</b>               |     |     |     |
|          | 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  |
|          |                                  |     |     |     |
| <b>9</b> | <b>Usha Mittal Institute</b>     |     |     |     |
|          | 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  |



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**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   |

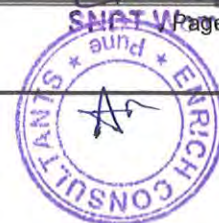


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## CHAPTER V

### 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  | <b>Main Building</b>      |                 |             |           |                 |
|    | 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           |
|    |                           |                 |             |           |                 |
|    | <b>Annex Building</b>     | 23              | 89          | 214       | 54              |
| 2  | <b>3rd Floor</b>          | 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  | <b>Patkar Hall</b>        | 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  | <b>Composite Building</b> |                 |             |           |                 |
|    | Estate Department         | 26.2            | 72          | 856       | 58              |
|    | Office                    | 26.2            | 72          | 945       | 56              |





|   |                           |      |    |     |    |
|---|---------------------------|------|----|-----|----|
| 2 | <b>P. V. Polytechnic</b>  |      |    |     |    |
|   | 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 | <b>C. V. Shah College</b> |      |    |     |    |
|   | 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 | <b>CFBP Dept</b>          |      |    |     |    |
|   | 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 |



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|   |                                  |      |    |     |    |
|---|----------------------------------|------|----|-----|----|
|   |                                  |      |    |     |    |
| 5 | <b>SHPT College Of Science</b>   |      |    |     |    |
|   | 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 | <b>Pariksha Bhavan</b>           |      |    |     |    |
|   | 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 | <b>Jankidevi Bajaj Institute</b> |      |    |     |    |
|   | 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 | <b>SVT College</b>               |      |    |     |    |
|   | 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 | <b>Usha Mittal Institute</b>     |      |    |     |    |
|   | 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    | 28.5 | 59 | 411 | 62    |
|  | Drawing Hall        | 28.8 | 76 | 116 | 54    |
|  | 5th-library         | 28.5 | 58 | 220 | 62    |
|  | Office              | 28.4 | 63 | 200 | 59    |
|  |                     |      |    |     |       |
|  | Maximum             | 28.5 | 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-2nd Floor   | 27.7            | 85          | 42        | 96              |
| 17 | PGSR-Ground Floor             | 25.8            | 94          | 50        | 115             |



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|    |                |      |    |    |     |
|----|----------------|------|----|----|-----|
| 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  |



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## **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:**

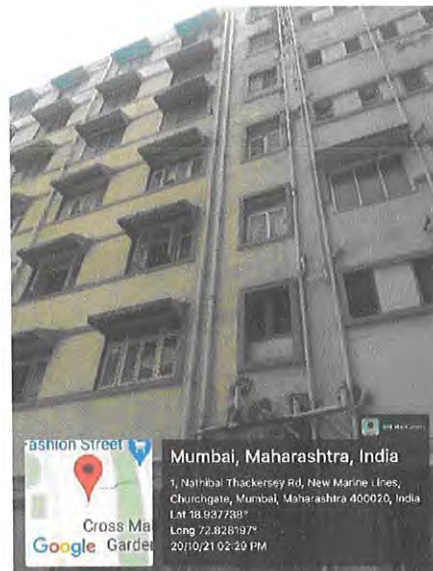
It is recommended to dispose of the E-Waste through Authorized Vendors.



## 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:**



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## 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:**



# 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<br>Dissolved Oxygen 6 mg/l or more |
| 2  | Drinking water source after conventional treatment and disinfection         | pH between 6 to 9<br>Dissolved Oxygen 4 mg/l or more     |
| 3  | Outdoor Bathing (Organized)                                                 | pH between 6.5 to 8.5<br>Dissolved Oxygen 5 mg/l or more |
| 4  | Controlled Waste Disposal                                                   | pH between 6 to 8.5                                      |



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### 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° C |
| 2  | Humidity    | Less Than 70%   |

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