GREEN AUDIT REPORT
of
SNDT WOMEN'S UNIVERSITY
MUMBAI

Year: 2020-21

Prepared by

Enrich Consultants

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

CERTIFICATE OF REGISTRATION
FOR CLASS 'A'

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

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

- Energy Conservation Programme intends to identify areas where wasteful use of energy occurs and to evaluate the scope for Energy Conservation and take concrete steps to achieve the evaluated energy savings.
- MEDA reserves the right to visit at any time without giving prior information to verify quarterly activities performed by the firm and canceling the registration, if the information is found incorrect.
- This empanelment is valid till **21st April, 2023** from the date of registration, to carry out energy audits under the Energy Conservation Programme
- The Director General, MEDA reserves the right to cancel the registration at any time without assigning any reasons thereof.

General Manager (EC)

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Enrich Consultants

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Tel: 09890444795 Email: enrichcons@gmail.com

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

CERTIFICATE

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

The University has adopted following Energy Efficient Practices:

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

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

For Enrich Consultants,

A Y Mehendale,
Certified Energy Auditor
EA-8192

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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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EXECUTIVE SUMMARY

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

2. Present Energy Usage & CO_2 Emissions:

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

3. Various measures adopted for Energy Conservation:

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

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

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

5. Waste Management:

5.1 Solid Waste Management:

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

5.2 E- Waste Management:

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

6. Rain Water Harvesting:

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

7. Green, Innovative and Sustainable Practices:

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

8. Notes & Assumptions:

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

9. References:

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

ABBREVIATIONS

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

CHAPTER-I
INTRODUCTION

1.1 Objectives:

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

1.2 General Details of University:

Table No 1: General Details:

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

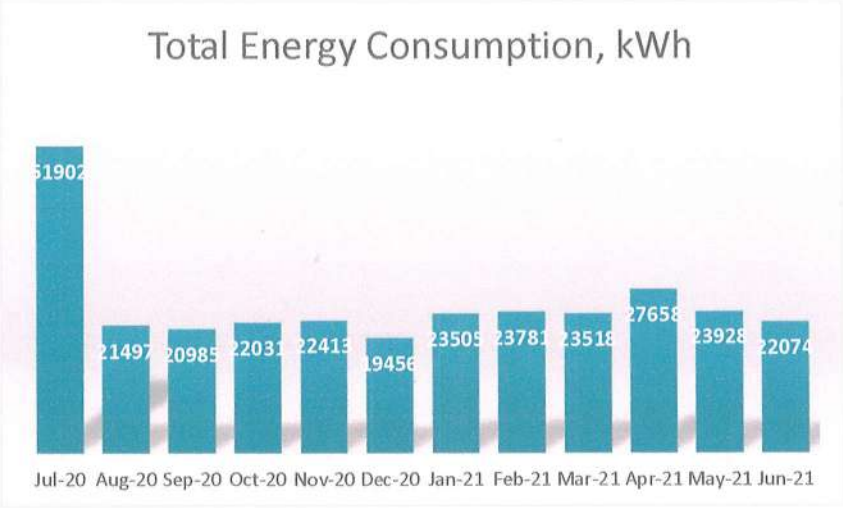
CHAPTER-II
STUDY OF PRESENT ENERGY CONSUMPTION

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

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

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

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



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Key Observations:

Table No 3: Various Important Parameters:

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

CHAPTER-III
STUDY OF CO_2 EMISSIONS

A Carbon Foot print is defined as the Total Greenhouse Gas Emissions, emitted due to various activities.

In this we compute the emissions of Carbon-Di-Oxide, by usage of the various forms of Energy used by the University for performing its day to day activities. The University uses Electrical Energy, LPG and Diesel for various Electrical gadgets & day to day activities.

Basis for computation of CO_2 Emissions:

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

Table No 4: Month wise CO_2 Emissions:

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

Chart No 2: Representation of Month wise CO_2 Emissions:

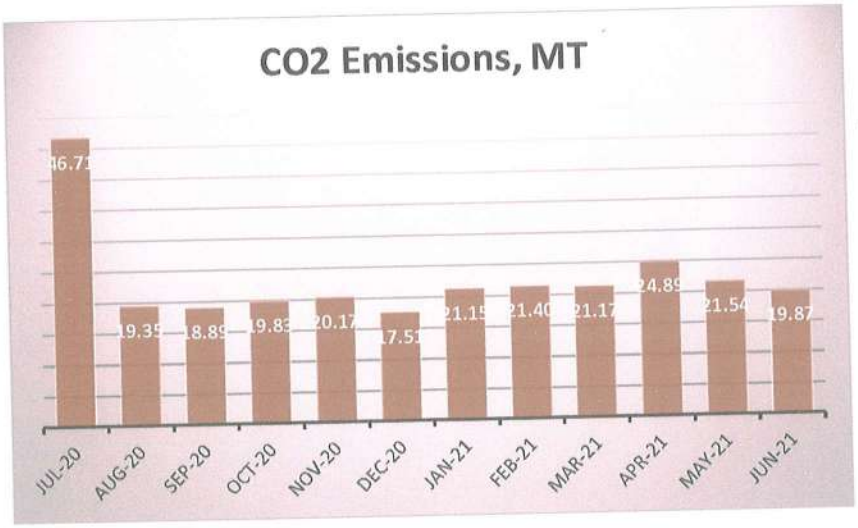


Table No 5: Various Important Parameters:

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

CHAPTER-IV
STUDY OF USAGE OF RENEWABLE ENERGY

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

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

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

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

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

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

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

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

Photograph of Roof Top Solar PV Plant:

CHAPTER-V
STUDY OF WASTE MANAGEMENT

5.1 Solid Waste Management:

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

Photograph of Waste Collection Bin:

5.2 E-Waste Management:

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

CHAPTER-VI
RAIN WATER HARVESTING

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

Photograph of Rain Water Harvesting Pipe at Churchgate campus:

CHAPTER-VII
STUDY OF GREEN & INNOVATIVE PRACTICES

7.1 Internal Roads:

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

Photograph of Internal Road at Juhu Campus:

7.2 Internal Lawn:

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

Photograph of Internal Pond & Garden at Juhu Campus:

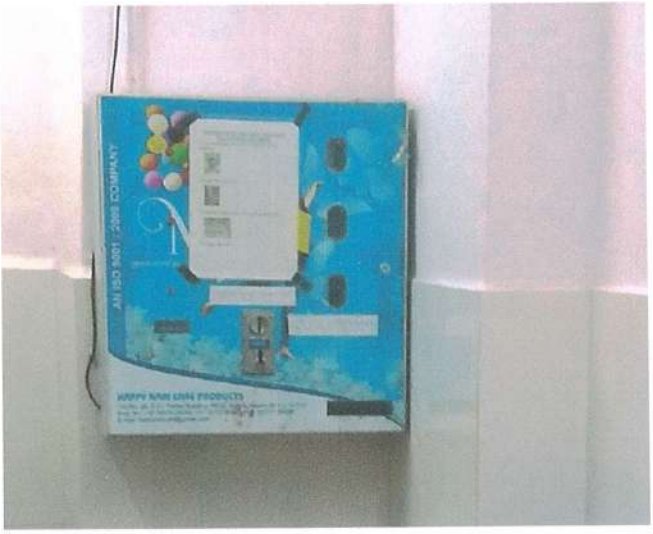
7.3 Provision of Ramp for Divyanga Students:

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

Photograph of Ramp:

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

Photograph of Sanitary Pad Dispenser:



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

Photograph of Sanitary Waste Incinerator:

CHAPTER-VIII
STUDY OF BIODIVERSITY OF PLANTS

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

8.2 List of Plants:

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

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

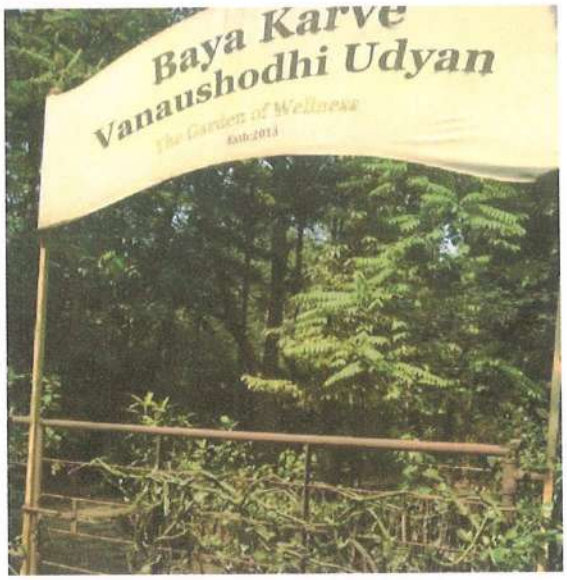
Benefits – O - Ornamental, N = Nesting, S = Shade, F = Flower and Fruit bearing, FI = Nectar containing Flowers, M = Medicinal.

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

8.3 Population of Trees

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

8.4 Photographs of Tree Plantation at Juhu Campus:



Photograph of Tree Plantation at Pune Campus:

8.5 Details of Ornamental Plants:

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

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

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