GREEN AUDIT REPORT

of

SAPTHAGIRI COLLEGE OF ENGINEERING

#14/5, Chikkasandra, Hesarghatta Main Road, Bangalore 560057

SAPTHAGIRI
College of Engineering
Creating Tomorrow

Year: 2020-21

Principal
Sapthagiri College of Engineering
14/5, Chikkasandra, Hesaraghatta Main Road
Bengaluru - 560 057

Prepared by:

Enrich Consultants

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

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MAHARASHTRA ENERGY DEVELOPMENT AGENCY

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

Maharashtra Energy Development Agency
(Government of Maharashtra Institution)
Aundh Road, Opposite Spicer College Road, Near Commissionerate of Animal Husbandary,
Aundh, Pune, Maharashtra 411067
Ph No: 020-35000450
Email: eee@mahaurja.com, Web: www.mahaurja.com

ECN/2021-22/CR-14/1577

22nd April, 2021

CERTIFICATE OF REGISTRATION
FOR CLASS 'A'

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

Name and Address of the firm : **M/s Enrich Consultants**
Yashashree, Plot No. 26, Nirmal Bag Society,
Near Muktangan English School, Parvati,
Pune - 411009.

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

Registration Number : *MEDA/ECN/2021-22/Class A/EA-03*

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

General Manager (EC)

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Enrich Consultants

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Tel: 09890444795 Email: enrichcons@gmail.com

Ref: EC/SCOE/20-21/02

Date: 10/8/2021

CERTIFICATE

This is to certify that we have conducted Green Audit at Sapthagiri College of Engineering, Bangalore in the Academic year 2020-21

The College has adopted following Green Practices:

- Usage of Energy Efficient LED Light Fitting
- Usage of BEE STAR Rated Energy Efficient Equipment
- Maximum Usage of Day Lighting
- Installation of 40 kWp Roof Top Solar PV Plant
- Provision of Separate bins for Dry & Wet Waste
- Installation of Bio Composting Plant for organic waste management
- Maintenance of pedestrian friendly road in the campus
- Tree Plantation in the campus
- Provision of Ramp for Divyangajan
- Provision of Sanitary Waste Incinerator

We appreciate the support of Management, involvement of faculty members and students in the process of Energy Conservation & 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 Sapthagiri College of Engineering, Bangalore, for awarding us the assignment of Green Audit of their Campus for the Academic Year: 2020-21.

We are thankful to:

- Dr. H. Ramakrishna, Principal

We are also thankful to other Staff members for helping us during the field study.

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EXECUTIVE SUMMARY

1. Sapthagiri College of Engineering, Bangalore consumes Energy in the form of **Electrical Energy and Diesel** used for various day to day activities.

2. Present Consumption of Electrical Energy, Diesel & CO_2 Emission:

No	Parameter/ Value	Energy Consumed, kWh	Diesel Consumed, Liters	CO_2 Emissions, MT
1	Total	322211	2115	295.55
2	Maximum	40645	265	36.58
3	Minimum	12062	0	11.17
4	Average	26851	176.25	24.63

3. Energy Conservation projects already installed:

- Usage of Energy Efficient LED fittings
- Usage of BEE STAR Rated Equipment
- Maximum Usage of Day Lighting
- Installation of **40 kWp** Roof Top Solar PV Plant

4. Usage of Renewable Energy & CO_2 Emission Reduction:

- The College has installed **40 kWp** Capacity Solar Roof Top Solar Plant.
- Energy generated by Solar PV Plant **48000 kWh.**
- The Annual Reduction in CO2 Emissions in 20-21 is **43.2 MT.**

5. Waste Management:

5.1 Solid Waste Management:

The recyclable waste, like paper, plastic waste is segregated at source and is handed over to Authorized waste collecting agent for further recycling.

5.2 Organic Waste Management:

The College has installed a Bio Composting Plant and the organic Waste is composted in the Plant.

5.3 E-Waste Management:

The E-Waste is disposed of through Authorized E-Waste collecting agency.

6. Rain Water Harvesting:

The College has installed the Rainwater harvesting project, the rain water falling on the terrace is collected and is used for increasing the underground water level.

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7. Green & Sustainable Initiatives

- Maintenance of good Internal Road
- Maintenance of Internal Garden
- Provision of Ramp for Divyangajan
- Provision of Sanitary Waste Incinerator
- Display of Posters on Plastic Free Campus.

8. Notes & Assumptions:

- **1 kWh** of Electrical Energy releases **0.9 Kg of CO_2** into atmosphere
- **1 Kg of Diesel** releases **2.63 Kg of CO_2** into atmosphere.

9. References:

- For CO_2 Emissions: www.tatapower.com
- For Energy Saved by Solar Thermal Water Heating System: www.mahaurja.com

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ABBREVIATIONS

BEE	Bureau of Energy Efficiency
kWh	Kilo Watt Hour
LPD	Liters Per Day
Kg	Kilo Gram
MT	Metric Ton
CO_2	Carbon Di Oxide
Qty	Quantity

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CHAPTER-I
INTRODUCTION

1.1 Objectives:

1. To study present Energy Consumption
2. To Study the present CO_2 emissions
3. To study usage of Renewable Energy
4. Study of Waste Management
5. Study of Rain Water Harvesting
6. Study of Green & Sustainable Practices

1.2 General Details of College: Table No 1:

No	Head	Particulars
1	Name of Institution	Sapthagiri College of Engineering
2	Address	#14/5, Chikkasandra, Hesarghatta Main Road, Bangalore 560057
3	Year of Establishment	2001

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CHAPTER-II
STUDY OF PRESENT ENERGY CONSUMPTION

In this chapter, we present the analysis of last year Energy Consumption.

Table No 2: Consumption of Electrical Energy & Diesel: 2020-21:

No	Month	Energy Consumed, kWh	Diesel Consumed, Liters
1	Aug-20	32770	210
2	Sep-20	33908	225
3	Oct-20	31618	250
4	Nov-20	22330	0
5	Dec-20	26968	220
6	Jan-21	35538	180
7	Feb-21	26969	265
8	Mar-21	40645	0
9	Apr-21	21787	240
10	May-21	22412	230
11	Jun-21	12062	120
12	Jul-21	15206	175
13	Total	322211	2115
14	Maximum	40645	265
15	Minimum	12062	0
16	Average	26851	176.25

Chart No 1: Variation in Monthly Energy Consumption:

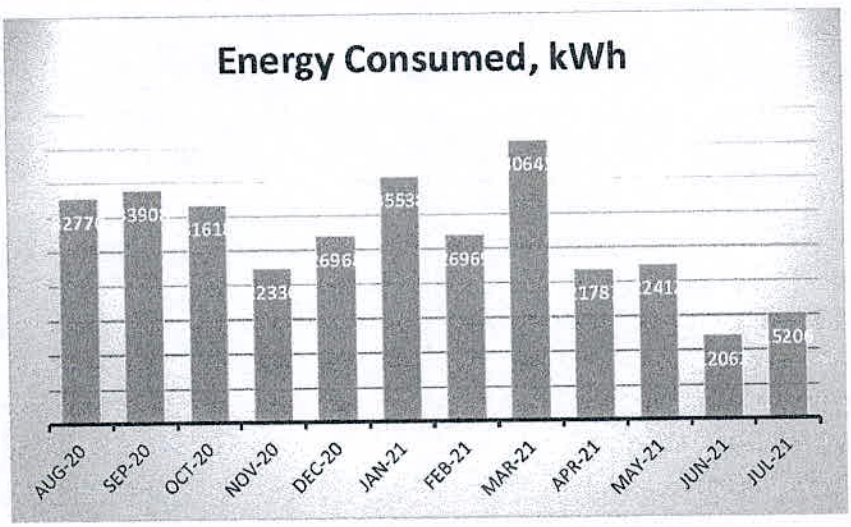

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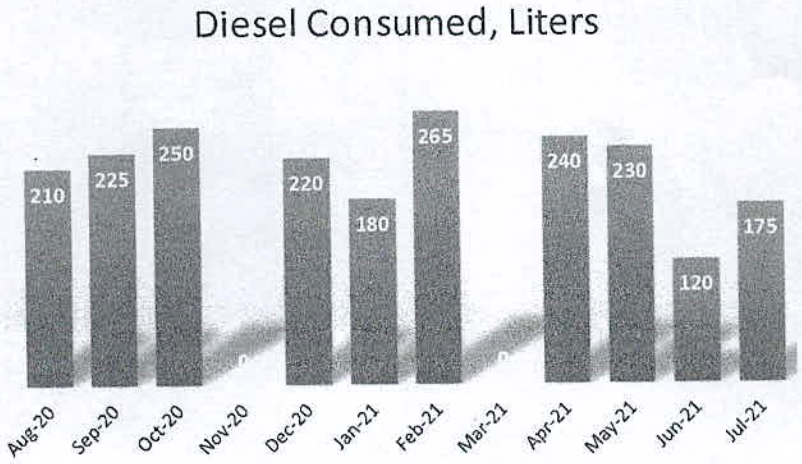
Chart No 2: Variation in Monthly Diesel Consumption:



3.4 Key Parameters:

From the above analysis, we present following important parameters:

Table No 3: Variation in Important Parameters:

No	Parameter/ Variation	Energy Consumed, kWh	Diesel Consumed, Liters
1	Total	322211	2115
2	Maximum	40645	265
3	Minimum	12062	0
4	Average	26851	176.25

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CHAPTER III
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 College for performing its day to day activities

The College uses Electrical Energy for various Electrical gadgets & Diesel for vehicles.

Basis for computation of CO_2 Emissions:

- **1 kWh** of Electrical Energy releases **0.9 Kg of CO_2** into atmosphere
- **1 Liter** of Diesel releases **2.63 Kg of CO_2** into atmosphere.

Based on the above Data we compute the CO_2 emissions which are being released in to the atmosphere by the College due to its Day to Day operations

Table No 4: Computation of Month wise CO_2 Emissions:

No	Month	Energy Consumed, kWh	Diesel Consumed, Liters	CO2 Emissions, MT
1	Aug-20	32770	210	30.05
2	Sep-20	33908	225	31.11
3	Oct-20	31618	250	29.11
4	Nov-20	22330	0	20.10
5	Dec-20	26968	220	24.85
6	Jan-21	35538	180	32.46
7	Feb-21	26969	265	24.97
8	Mar-21	40645	0	36.58
9	Apr-21	21787	240	20.24
10	May-21	22412	230	20.78
11	Jun-21	12062	120	11.17
12	Jul-21	15206	175	14.15
13	Total	322211	2115	295.55
14	Maximum	40645	265	36.58
15	Minimum	12062	0	11.17
16	Average	26851	176.25	24.63

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Chart No 3: Month wise CO_2 Emissions:

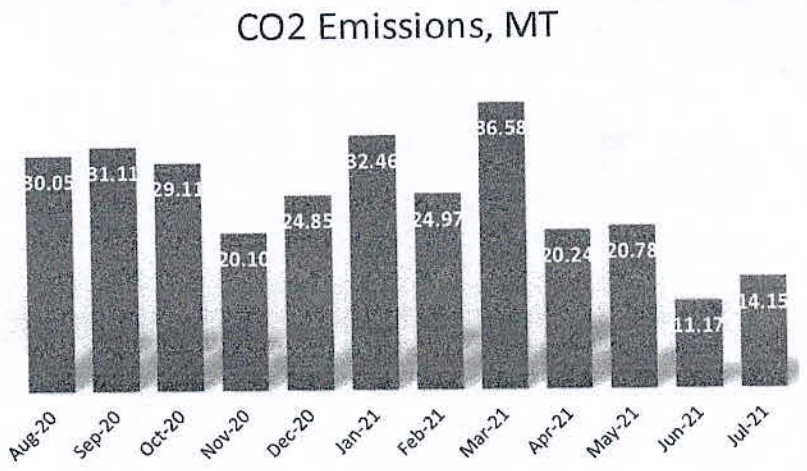

Table No 5: Variation in Important Parameters:

No	Parameter/ Variation	Energy Consumed, kWh	Diesel Consumed, Liters	CO_2 Emissions, MT
1	Total	322211	2115	295.55
2	Maximum	40645	265	36.58
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CHAPTER IV
STUDY OF USAGE OF RENEWABLE ENERGY

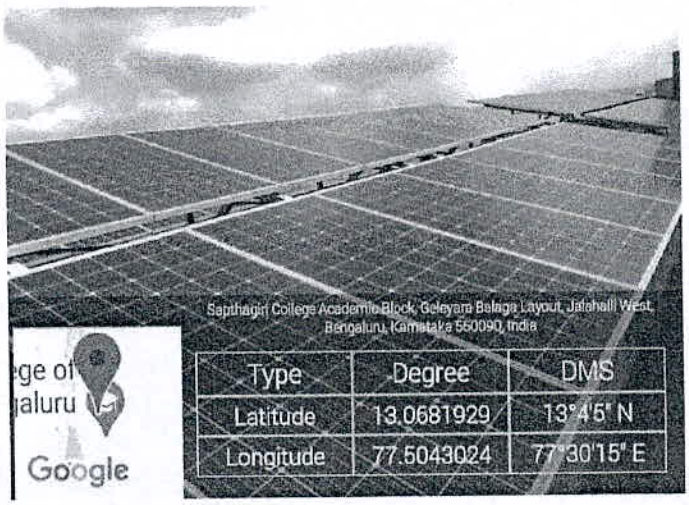
The College has installed Roof Top Solar PV Plant of Capacity **40 kWp.**

In the following Table, we compute the Electrical Energy generated by Solar PV Plant and reduction in CO2 emissions due to usage of Solar Energy.

Table No 6: Computation of % Annual Energy Demand met by Alternate Energy:

No	Particulars	Value	Unit
1	Capacity of Roof Top Solar PV Plant	40	kWp
2	Energy generated per kWp by Rooftop Solar PV Plant	4	kWh/kWp
3	Generation Days in 20-21	300	Nos
4	Solar Energy generated in 20-21= 1*2*3	48000	kWh
5	1 kWh of Electrical Energy is equivalent to	0.9	Kg of CO_2
6	Reduction in CO2 Emission in 20-21 = 4*5/1000	**43.2**	MT

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 and is further disposed of through Authorized vendors.

Photograph of Waste Collection Bins:

5.2 Organic Waste Management:

The Bio degradable waste like leafy waste is composted in a Bio composting Unit.

Photograph of Bio Composting Unit:

5.3 E-Waste Management: The E-Waste is disposed of through Authorized Agency.

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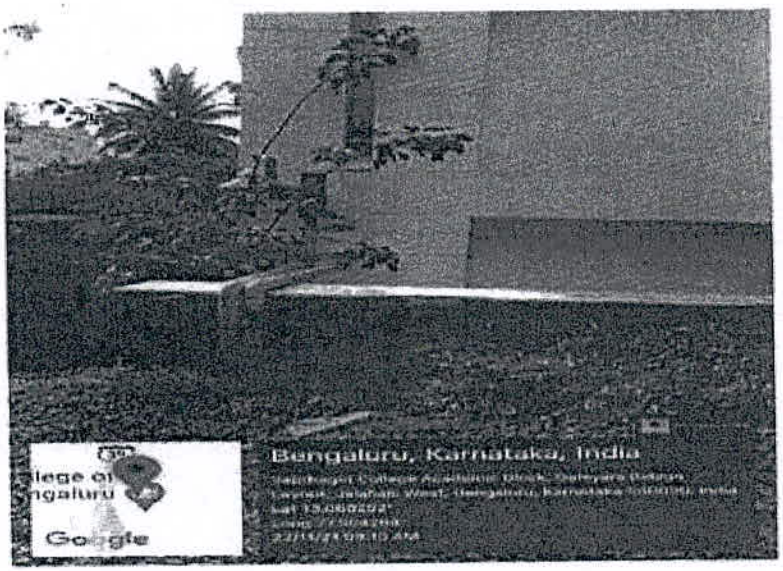
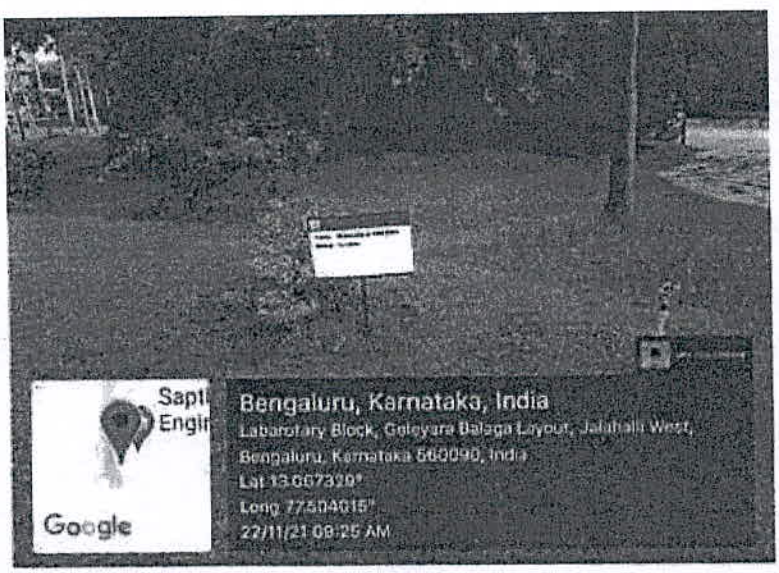
CHAPTER-VI
STUDY OF RAIN WATER HARVESTING

The College has implemented the Rain Water Harvesting Project. The College has installed Pipes from the terrace and the Rain water falling on the terrace is gathered and is used to increase the underground water level.

Photograph of Rain water Harvesting Pipe:



Photograph of Rain water Harvesting Recharge Well:



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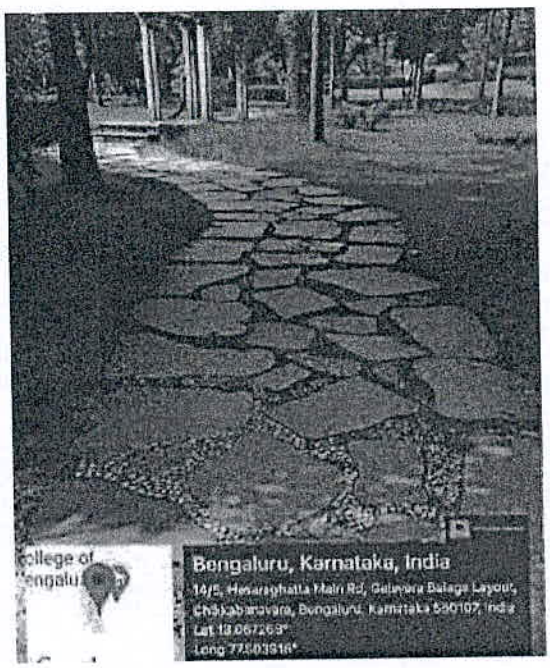
CHAPTER-VII
STUDY OF GREEN & SUSTAINABLE PRACTICES

7.1 Pedestrian Friendly Roads:

The College has well maintained internal road to facilitate the easy movement of the students within the campus.

Photograph of Internal Road:



7.2 Internal Tree Plantation:

The College has well maintained landscaped garden in the campus.

Photograph of Tree plantation:

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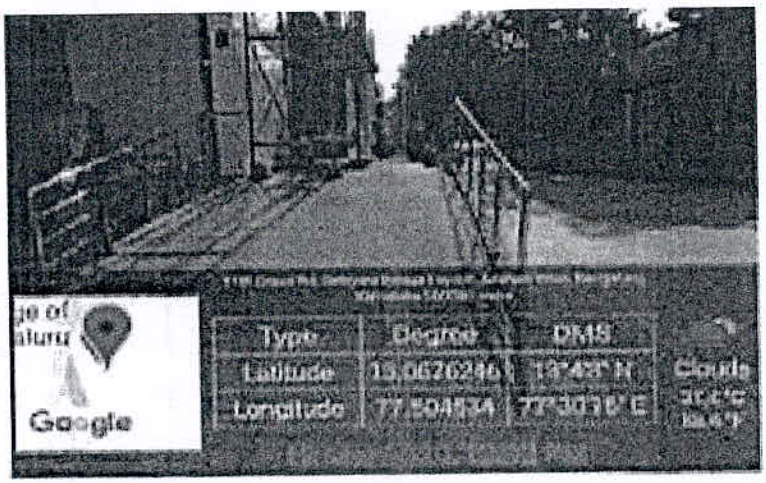
7.3 Provision of Ramp:

For easy movement of Divyangajan, the College has made provision of Ramp at the main entrance.

Photograph of Ramp:



7.4 Provision of Sanitary Waste Incinerator:

For disposal of Sanitary Waste, a Sanitary Waste Incinerator is installed in the campus.

Photograph of Sanitary Waste Incinerator:

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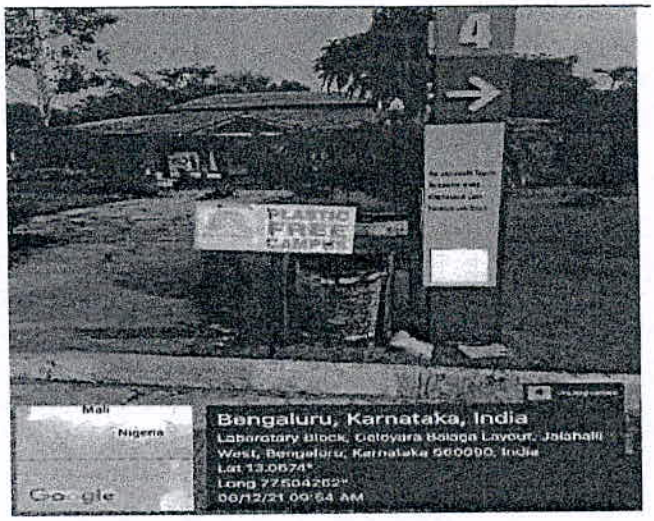
7.5 Creation of Awareness about Green Campus:

The College has displayed posters emphasizing on importance of Plastic Free Campus.

Photograph of Poster on Plastic Free Campus:



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ANNEXURE-1:
LIST OF TREES & PLANTS IN THE CAMPUS:

No	Common Name of Tree	Botanical Name	Family Name
1	Beteinut palm	Areca catechu	Arecaceae
2	Silver oak tree	Timber value	
3	Snadel tree	Santalum album	Snatalceae
4	Whistling pine	Casuarina equisetifolia	Casuarinaceae
5	Indian date plam	Phoenix aylvestris	Arecaeae
6	Jackfruit tree	Artocarpus heterophyllus	moraceae
7	Butter fruit tree		
8	Mango		
9	Pomegranate	puncia granatum	Lythraceae
10	Fish tail palm		
11	Star gooseberry	Phyllanthus acidus	phyllanthaceae
12	Guava	psidium guajava	myrtaceae
13	Lemon	Citrus x limon	Rutaceae
14	Chaste tree	Video negundo	Lamiaceae
15	Nilagiri tree	Avenue tree,oil from leaf medicinal	
16	crown flower	calotropis gigantea	apocynaceae
17	peepal	ficus religiosa	moraceae
18	Singapore cherry	Muntingia Calabura	Muntingiaceae
19	Caribbean trumpet tree	Tabebuia argentea	bignoniaceae
20	pink trumpet tree	Tabebuia rosea	Bignoniaceae
21	Fern tree	Filicium decipiens	sapindaceae
22	Royal plam	Royatined reiga	Arecaeae
23	Copper pod tree		
24	Jacaranda		
25	periwinkle	capharanthus roseus	apocynaceae
26	Lantana	Lantana camara	Verbenaceae
27	Broadleaf lady palm	Rhapis excelsa	Arecaceae
28	Joy weed	Alternanchera brasiliana	Amaranthaceae
29	Ixora	Bora coccinea	Rubiaceae
30	Lesser bougainvillea		

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31	Schefflera		
32	Dracaena	Dracena ellenbeckiana	Asparagaceae
33	Areca palm		
34	Christmas tree	vitex negundo	Lamiaceae
35	Blue agave	Agave tequilana	Asparagaceae
36	henna	lawsonia inermisl	lythraceae
37	yellow bells	tecoma stans	bignoniaceae
38	croton gold	codiaeum varitgatum	euphorbiaceae
39	red leea	leea guineense	vitaceae
40	barbados lily	hippeastrum puniceum	amaryllidaceae
41	allamanda	allamanda cathartiva	apocynaceae
42	apocynaceae	duranta erecta	verbenaceae
43	pink rain ily	zephyranthes rosea	amaryllidaceae
44	plumeria	plumeria pudica	apocynaceae
45	mediterranean cypress	cupressus sempervirens	cupressaceae
46	Canna	canna indicia	cannaceae
47	peacock flower	caesalpinia pulcherrima	Fabaceae
48	Garden croton	codiaeum variegatum	Euphorblaceae
49	Jacob's coat	Acalypha wilkesiana	Euphorbiaceae
50	Fox tail asparagus	Asparagus densiflorus	Asparagaceae
51	Buddha belly	Jatropha Podagrica	Euphorbiaceae
52	Gazania	Gazania rigens	Asteraceae
53	Juhu/amburu	Jasmine auriculatum	Oleaceae
54	Mexican oleander	Casabela thevetia	Apocynaceae
55	morpankhi	platycladus orientalis	cupressaceae
56	weeping bottle brush	callistemon viminalis	myrtaceae
57	crape	tabernaemontana divaricata	apocynaceae
58	Arabian jasmine	Jasminum sambac	Oleacee
59	cape honeysuckle	Tacoma capenis	Bignoniaceae
60	Ponytail palm	Beaucarnea recurvata	Bignoniaceae
61	China rose	Hibiscus rosa-sinensis	Malvaceae
62	climbing fig	ficus pumila	Moraceae
63	spider plant	chlophytum comosum	asparagacelae
64	Bougainvillea	Bougainvillea spectabilis	Nyctaginaceae
65	Croton	Codiaeum variegatum	Euphorbiaceae

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66	Persian lilac	Melia azedarach	Meliacea
67	Champa	Magnolia champaca	Magnoliaceae
68	Pride of India	Lagerstroemia speiosa	lythraceae
69	Cycas	Cycas Revoluta	cycadaceae
70	octopus tree	schefflera actinophyll	araliaceae
71	weeping fig	ficus benjamina	moraceae
72	white frangipani	plumeria obtusa	apocynaceae
73	triangle palm	dypsis decaryi	arecaceae
74	pygmy date palm	phoenix roebelenii	arecaceae
75	bird of paradise	strelitzia reginae	strelitziaceae
76	agave	agave americana	asparagaceae
77	firebush	hamelia patens	rubiaceae
78	glory bower	volamaria inermis	lamiaceae
79	Bengal Clockvine	Thunbergia grandiflora	Acanthaceae
80	Bower vine	Pandora jasminoides	Bignoniaceae
81	ashoka	polyalthia longifolia	annonaceae
82	African tulip tree	Spathodea campanulata	Bignoniaceae
83	Indian cork tree	Millingtonia	Bignoniaceae
84	Neem	Azadirachta indica	Meliaceae
85	Pongam tree	Pongamia pinnata	favaceae
86	Jamun tree	Syzygium cumini	myrtaceae
87	Amla	Phyllanthus embnica	Phyllanthaceae
88	Pithraj tree	Aphanamixis polystachya	Meliaceae
89	sapota	Achras sapota	Sapotaceae
90	Tamarind	Tamarindus indica	Fabaceae
91	Lime	Citrus x aurantiifolia	Rutaceae
92	Banana	Musa x paradisiaca	Musaceae
93	Rose Apple	syzygium jambos	Myrtaceae
94	Creeping foxglove	Asystasia gangetica	Acanthacea
95	Crown of throns	Euphorbia milii	Euphoriaceae
96	Aloe vera	Aloe vera	xanthorrhoeaceae
97	Betel vine	Piper betle	Piperaceae
98	Black pepper	Piper nigrum	piperaceae
99	Sacred basil	Ocimum tenuiflorum	Lamiaceae
100	Paper mulberry	Broussonetia papyrifera	Moraceae

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