ENERGY, ENVIRONMENT & GREEN AUDIT REPORT

AUDIT CONDUCTED FOR

GOBI ARTS & SCIENCE COLLEGE

Karattadipalayam, Gobichettipalayam – 638 453, Tamil Nadu, India.

DATE OF AUDIT

29 MAY 2024

(Audited and Accounted from June 2023 to May 2024)

AUDIT CONDUCTED BY

RAM-KALAM CENTRE FOR ENERGY CONSULTANCY AND TRAINING

(Chennai ♦ Coimbatore ♦ Erode)

Mobile: +91- 80567 19372, 99420 14544 (WhatsApp) E-mail: ramkalamcect@gmail.com

ENERGY, ENVIRONMENT & GREEN AUDIT REPORT

1. ACKNOWLEDGEMENT

ACKNOWLEDGEMENT

- **RAM-KALAM CENTRE FOR ENERGY CONSULTANCY AND TRAINING,** Coimbatore – 641 062 is thankful to the Management, Principal, Faculty and Technical team members of **M/s. GOBI ARTS & SCIENCE COLLEGE,** Karattadipalayam, Gobichettipalayam – 638 453, Tamil Nadu, India for providing an opportunity to conduct a detailed Energy, Environment and Green Audit process in the college premises.
- It is our great pleasure which must be recorded here that the Management of **M/s. GOBI ARTS AND SCIENCE COLLEGE** extended all possible support and assistance resulting in thorough completion of the audit process. The audit team appreciates the cooperation and guidance extended during the course of site visit and measurements. We are also thankful to all those who gave us the necessary inputs and information to carry out this very vital exercise.
- Finally, we offer our sincere thanks to all the members in the engineering division/ technical / non-technical divisions and office members who were directly and indirectly involved with us during collection of data and while conducting field measurements.

Audit Team Member	
Dr. S.R. SIVARASU, Ph.D.,	**BEE Certified Energy Auditor (EA-27299)** Lead Auditor-ISO-14001:2015 (EMS), IGBC AP, GRIHA CP, CII CP in SWM Carbon Footprint Auditor & Implementor **Mobile: +91- 80567 19372, 99420 29372**

ENERGY, ENVIRONMENT & GREEN AUDIT REPORT

2. INTRODUCTION TO ENERGY-ENVIRONMENT-GREEN AUDIT PROCESS

2.1: Preface about the Institution:

- **Gobi Arts & Science College** established in the year 1968 is one of the top ranking post-graduate cum research institutions affiliated to Bharathiar University, Coimbatore.
- It is a co-educational grant-in-aid institution managed by the Gobi Arts College Council, registered on 25.8.1967 as a Society.
- The college was started with the noble objective of opening the doors of higher education to the poor and meritorious students who mostly first generation students are coming from agricultural families.
- The college commenced its educational service with Pre-University classes to begin with, made a steady but phenominal growth since inception, thanks to the vision and efficient strategies engineered by the management, coupled with unstinted support of the staff, in shaping the destiny of the college.
- The unique philosophy and principle cherished by the Management of the college to admit students strictly on merit basis, abhoring the concept of collecting donations or capitation fees, fully recognizing the difficulties of the students who belong to the socially and economically deprived sections of the society, has earned the goodwill of the public.
- The college is located in a sprawling 50acre land a top the 'Silver Hills' on the western outskirts of Gobichettipalayam town, 40 km west of Erode. The institution enjoys the status of autonomy since 1987.
- The autonomy offersflexibility to the various departments to fine the syllabi, based on the dynamic changes in the industrial and employment environment. With its excellent infra-structural facilities, the college has the cutting edge in the dissemination of knowledge and development of skills of very high order.

2.2: Vision:

- ✓ Social and Economic upliftment of the people of this area through value based quality Education.

2.3: Mission:

- Committed to serve the society with humility and trust, devoid of exploitation; to impart value based higher education, particularly to the socially and economically deprived sections of this area; to make students of this institution worthy citizens of our glorious motherland

2.4: Major Activities in the Institution:

1. • Knowledge Transferring through teaching learning process
2. • Innovative research and development activities
3. • Training programs(Academic & Industry)
4. • Value added and certification courses
5. • Career and Placement opportunities

2.5: Scope of the Audit Process:

- **Energy Audit:** To conduct a detailed energy audit in the college campus with a main focus to identify judicious usage of electrical and thermal energy (where, when, why and how energy is being utilized).
- **Environmental Audit:** Identification of history of activities, present environmental practices followed, monitoring records and known sources of environmental issues inside the college.
- **Green Audit:** Assessment on Campus greenery in terms of mature trees, flowering shrubs, bushes, medicinal plants, adoption of green energy generation and utilization, reduction of CO_2 due to green energy system and identification of possible implementation and enhancement of current greenery practices.

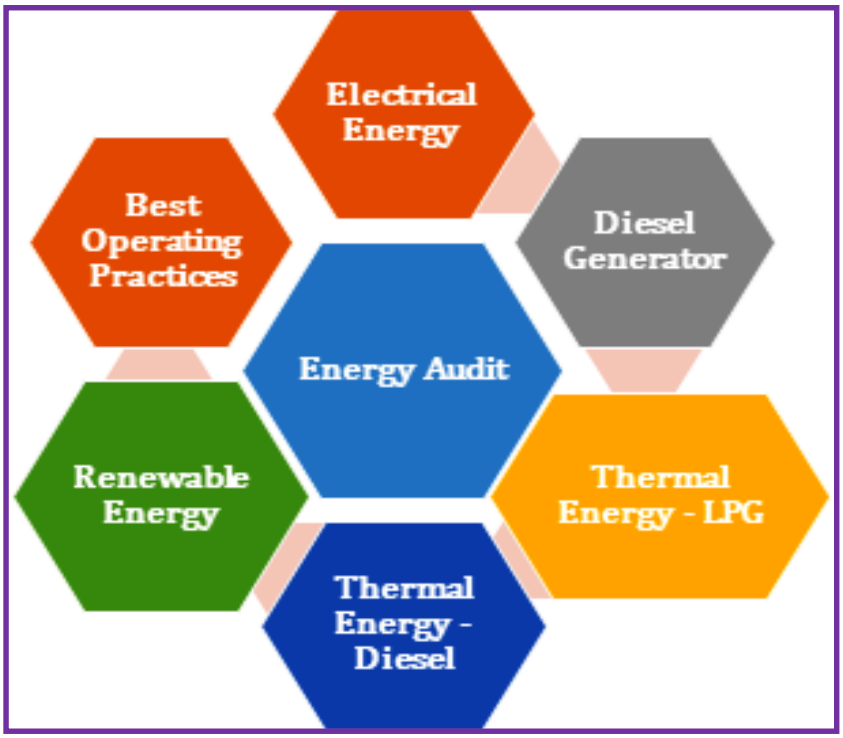
2.6: Outcomes of the Audit Process:

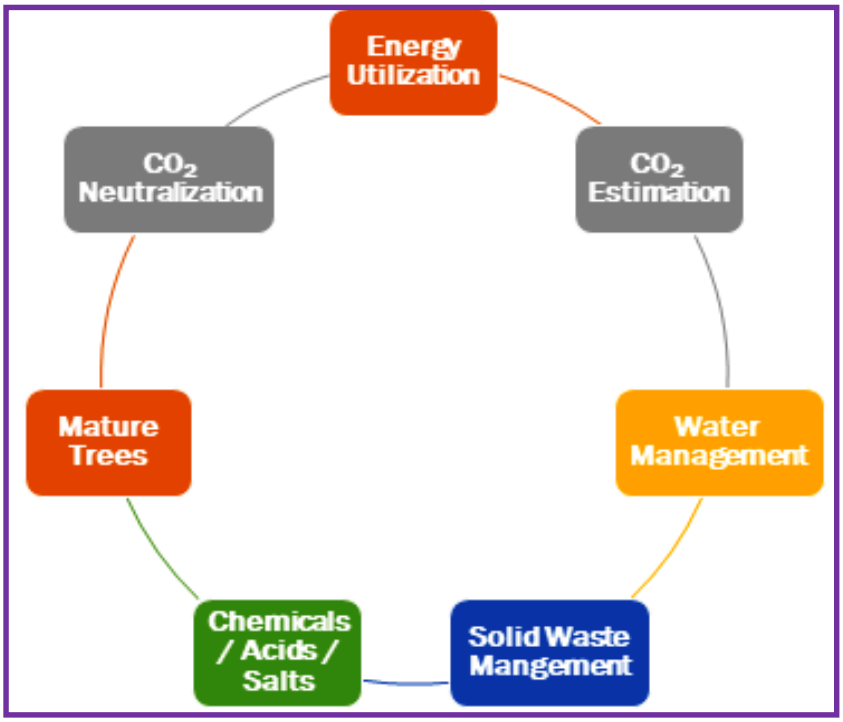
- Recommendations based on field measurement with achievable **En**ergy **Con**servation (ENCON) proposals under **No cost/Low cost and Cost investment categories**
- **Minimization of present energy cost** by adjusting and optimizing energy usage and reduction of energy wastage without affecting the regular activities
- **Identification of possible cost and energy saving from energy conservation, waste reduction, reuse and recycling**
- Formation of methodology for long term road map for maintaining green environment within the campus and encourage the stakeholders for continuous improvements

2.7: Audit Approach:

The audit team completed the assessment of energy consumption in the factory premises and operating hours of each machine (system) using two approaches namely **i) Objective Approach** in which a detailed measurement was taken and **ii) Subjective Approach** in which field data is collected from the maintenance department.

2.8: Coverage in Energy- Environment & Green Audit Process:





ENERGY, ENVIRONMENT & GREEN AUDIT REPORT

3. EXECUTIVE SUMMARY

EXECUTIVE SUMMARY

Energy Analysis:

→ A detailed audit was conducted **M/s. GOBI ARTS & SCIENCE COLLEGE,** Karattadipalayam, Gobichettipalayam – 638 453, Tamil Nadu, India.

→ The audit team has come out with ***03 Energy Conservation Proposals (ENCONs)*** and the summary of all the ENCONs are given below:

S. No.	Description	Parameters		
		Present	After	Savings
1.	Annual Energy Consumption	**2,71,436kWh + 3,401 kg**	**2,60,007 kWh + 3,231 kg LPG**	**11,429 kWh + 170 kg LPG**
2.	Annual Financial Cost	**Rs.42.9 Lakhs**	**Rs. 41.1 Lakhs**	**Rs. 1.8 Lakhs**
3.	Initial Investment	Rs. 1.1 Lakhs		
4.	Payback Period	**Nearly 0.61 Years (7.3 Months)**		
5.	Overall Energy Reduction	**4.2 % Electricity + 5.0 % LPG**		

Note:

- Apart from the Energy Conservation, the audit team proposes ***many technical recommendations*** focusing on energy, equipment's life improvement, safety and best operating practices.
- All types of energy carriers (like **Electricity, Wood & LPG**) used for regular applications are considered for this audit process.

Audit Conducted & Verified by

(Dr. S.R. SIVARASU)

Dr. S.R. SIVARASU,Ph.D.,
BEE Certified Energy Auditor (EA-27299)
Lead Auditor - ISO 14001: EMS
IGBC - AP, GRIHA - CP
Mobile: 80567 19372, 99420 29372
E-Mail: ramkalamcect@gmail.com

Table-1: Energy Conservation Proposal (ENCON) along with Annual Energy and Financial Savings

S. No.	Proposed Energy Conservation Measures	% Saving & Source	Estimated Savings		Initial Investment (Rs.)	Payback Period
			Annual Energy Savings	Monetary Savings (Rs.)		
1.	Reduction of Cable Losses and Active Power Consumption using Capacitor Compensation	2 % on Electrical	5,429 kWh	79,802	40,000	0.50 Years
2.	Replacement of Fluorescent Lamps with Energy Efficient Lamps (Considering only **100 Nos of Lamps** in Phase-I Implementation swapping to LED Lamps)	50 % on Lighting	6,000 kWh	88,200	60,000	0.68 Years
3.	Reduction of LPG Consumption using Burner Cleaning and Swapping of Active Burners.	5 % of LPG for Stoves	170 kg	14,960	5,000	0.33 Years
4.						
Total		**11,429 kWh + 170 kg LPG**		**1,82,962**	**1,05,000**	**--**

Recommendations and Best Operating Practices:

- ⊕ All SSB must be fitted with digital energy meters.
- ⊕ Prepare block wise maintenance checklist of electrical and thermal system
- ⊕ Calculate the **Unit Per Litre (UPL)** for every run of DG and average it for monthly
- ⊕ Earth pits must be visible for easy access, should be done regular maintenance and measure their values annually
- ⊕ It is essential and the right time to form an **Energy Management Team**

ENERGY, ENVIRONMENT & GREEN AUDIT REPORT

PART-A: ENERGY AUDIT REPORT

4. STUDY ON ENERGY CONSUMPTION PATTERN

4.1: Assessment of Existing Electrical and Thermal Energy Systems:

<table>
<tr><th>S. No.</th><th>Description</th><th colspan="6">Details</th></tr>
<tr><td colspan="8">Electrical Energy Usage</td></tr>
<tr><td>1.</td><td>Name of the customer</td><td colspan="6">GOBI ARTS & SCIENCE COLLEGE</td></tr>
<tr><td>2.</td><td>Communication Address</td><td colspan="6">Karattadipalayam, Gobichettipalayam – 638 453, Tamil Nadu,</td></tr>
<tr><td>3.</td><td>Service Number Type of Supply & Tariff</td><td colspan="6">SC No: 04-909-436-0136; HV/LV: 11KV/433KV</td></tr>
<tr><td rowspan="3">4.</td><td rowspan="3">Tariff Structure</td><td colspan="3">Description</td><td colspan="3">Charges</td></tr>
<tr><td colspan="3">Unit Charge</td><td colspan="3">Rs. 7.65/kWh</td></tr>
<tr><td colspan="3">Fixed Charge</td><td colspan="3">Rs. 562/kVA/Month</td></tr>
<tr><td>5.</td><td>Energy Suppliers</td><td colspan="6">Tamilnadu Generation and Distribution Corporation Company</td></tr>
<tr><td>6.</td><td>Generator Details</td><td colspan="6">160 & 63 kVA – Cummins –
(Inbuilt fuel tank – 200 & 100 L)</td></tr>
<tr><td>7.</td><td>DG Operation</td><td colspan="6">Manual Operation</td></tr>
<tr><td colspan="8">Annual Electrical Energy Consumption, Electricity Consumption from DG & Diesel Consumption</td></tr>
<tr><td colspan="2">Electricity</td><td colspan="2">2,71,436 kWh</td><td>Diesel for DG</td><td>888 Litres</td><td>Units Generated</td><td>2,842 kWh</td></tr>
<tr><td colspan="8">Energy Genertaion from Renewable Source (Roof Top Solar PV System)</td></tr>
<tr><td colspan="3">Capacity</td><td>116 kW</td><td colspan="2">Energy Generation</td><td colspan="2">1,70,483 kWh</td></tr>
<tr><td colspan="8">Thermal Energy Used</td></tr>
<tr><td rowspan="2">8.</td><td colspan="4">Liquified Petroleum Gas (LPG)</td><td colspan="3">Cooking</td></tr>
<tr><td colspan="4">Diesel (Ordinary)</td><td colspan="3">Transport+ DG</td></tr>
<tr><td colspan="8">Annual Energy Consumption of Thermal System</td></tr>
<tr><td>LPG</td><td>3,401 kg</td><td>Diesel (Transport)</td><td>195 Litres</td><td colspan="2">Diesel (Transport)</td><td colspan="2">316 Litres</td></tr>
<tr><td colspan="8">General Loads (Both Electrical and Thermal)</td></tr>
<tr><td rowspan="2">9.</td><td rowspan="2">Lighting System</td><td colspan="6">❖ Indoor lighting: The management is now committed to convert the existing FTL into LED in a phased manner</td></tr>
<tr><td colspan="6">❖ Outdoor lighting: All the street lightings are LED based energy efficient lamps
❖ Requested to retrofit timer based ON-OFF control in the existing street lighting system</td></tr>
</table>

10.	Fan Loads (Ceiling)	❖ All the ceiling fans are conventional type only which consumes nearly **60-70 W/fan** at maximum position. ❖ The audit team requested to change the conventional fans into **BLDC based Electronically Commutated fans** in a phased manner. ❖ The average power consumption will be **35 W/fan** at maximum position (**More than 50 % reduction**)
11.	Air Conditioning System	• Mostly **BEE star rated** ACs and the outdoor units are mostly placed in shaded area of the respective building
12.	Motors and Pump loads	• Mainly used for water distribution, purification and waste water treatment
13.	Uninterrupted Power System (UPS)	• All the computers, server, surveillance, projectors, telephonic units are connected with UPS with nominal back up time of **1.0 hours.** • Total capacity of the UPS is nearly **241 kVA.**

Table-2: Annual Energy Consumption and Energy Generation (2023-2024)

S. No.	Month	Electricity Consumption (kWh)*	Wood Consumption (Tons)	LPG Consumed (kg)	Diesel Consumed (L)			Solar Energy Generation (kWh)
					DG	Diesel + Petrol	Total	
1.	Jun-23	18,624	2	171	108	39.8	148	14,200
2.	Jul-23	34,145	2	418	62	39.8	102	13,920
3.	Aug-23	36,965	2	418	65	39.8	105	13,980
4.	Sep-23	32,915	2	285	27	39.8	67	13,910
5.	Oct-23	27,973	2	399	115	58.4	173	13,850
6.	Nov-23	17,890	2	152	63	51.4	114	13,940
7.	Dec-23	24,999	2	285	135	19.8	155	13,900
8.	Jan-24	15,065	2	285	59	10	69	12,031
9.	Feb-24	19,755	2	285	67	15	82	15,480
10.	Mar-24	20,017	2	380	33	19.4	52	15,648
11.	Apr-24	13,726	2	323	42	157.5	200	16,655
12.	May-24	9,362	0	0	112	0	132	12,969
Total		**2,71,436**	**22**	**3,401**	**661**	**511**	**1,399**	**1,70,483**

- **The cost of the electricity is Rs. 14.73/kWh.**
- **The cost of the LPG is Rs. 87.90/kg**
- **The cost of the Wood is Rs. 2,000/Tons**
- **The contribution from Green Energy is nearly 39.0 %**

ENERGY, ENVIRONMENT & GREEN AUDIT REPORT

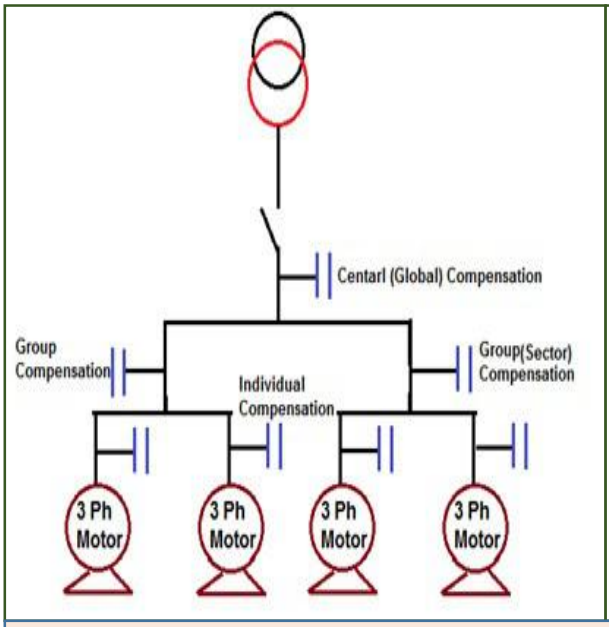
PART-B: ENERGY AUDIT REPORT

5. ENERGY CONSERVATION PROPOSALS (ENCONs)

ENCON-I	Reduction of Cable Losses and Active Power Consumption using Load End Capacitor Compensation (At DB Level)
Assessment Area	Electrical Distribution System
Observations	• HT electrical system from power house is being distributed through various electrical distribution panel board conveniently located in each building all over the college campus. • Supply side power factor is maintained by fixed capacitors; whereas the load end PF is to be corrected by connecting suitable values of FC, mostly at the distribution panels.
Assessments	• In any electrical distribution network, the distribution losses may account for 2-6 % and this can be reduced by i) Selecting proper cable size (class 1 or 2) with reduced resistance and ii) Compensate the distribution losses by connecting load end capacitors at each higher capacity load and/or at DB level. • This method has many advantages like i) reduction of kVA demand (applicable for HT consumer), ii) reduction of distribution losses and iii) maintaining the terminal voltage from source to load end.
Recommendation (Target)	• Connect suitable rating of capacitors (Nearly 10 kVAr, 3-Phase, 440/400 V, Heavy Duty) at the PCC and try to reduce the distribution line loss.

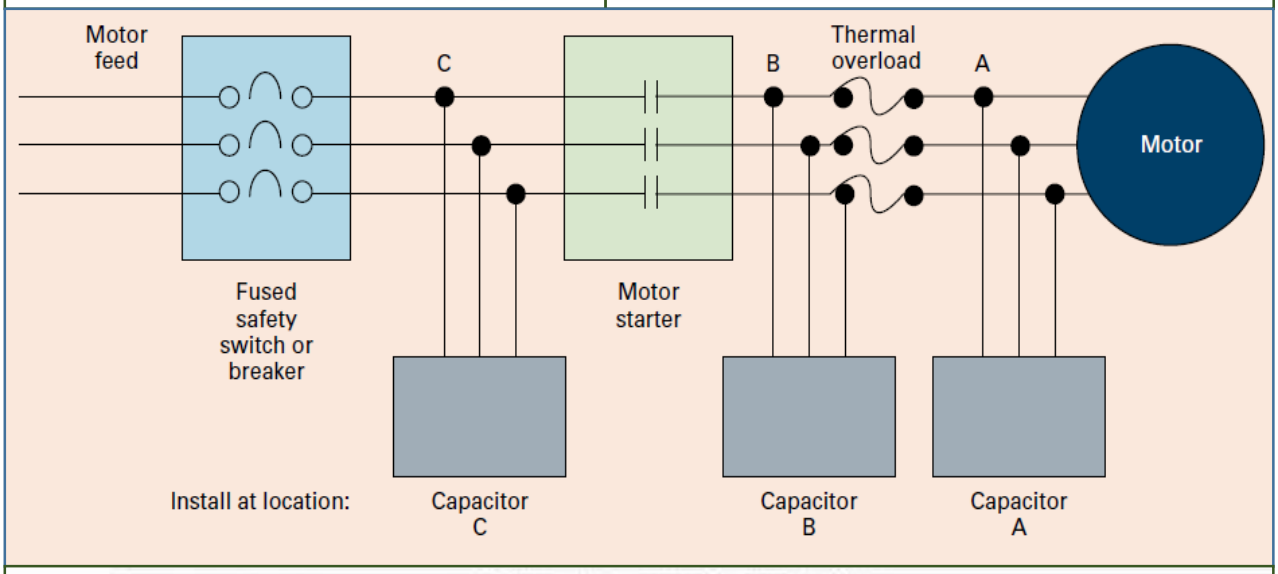
Energy & Financial Saving Calculation:

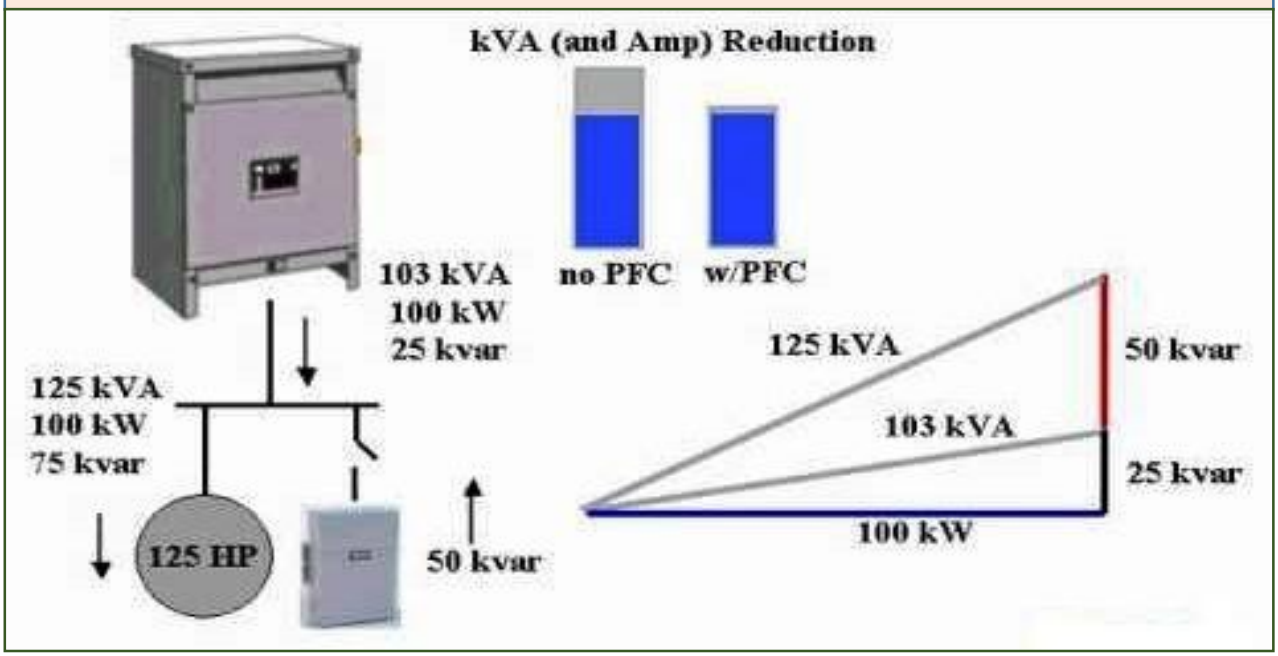
Parameters	Description	
No. of DBs (Approx. Value)	10 No's. (Fix as a trail at the entry of each block)	
kVAr required to connected	10 kVAr each in all DB	
Energy Calculation	**Before**	**After**
Expected % of Energy Saving	**--**	**2.0 %**
Annual Energy Consumed	2,71,436 kWh	1,67,519 kWh
Annual Energy Saving	--	**5,429 kWh**
Annual Financial Saving	--	**Rs. 79,802 /-**
(5,429 kWh x Rs.14.70/kWh = Rs. 79,806/-)		
Initial Investment	-	**Rs. 40,000 /-**
Per kVAr charge of Heavy-Duty Standard Make Capacitor is around **Rs.400/-.** Hence for 10 kVAr x 10 locations = **100 kVAr**; the initial investment is **Rs. 40,000/-**		
Simple Payback	**--**	**0.50 Years**
CO_2 Reduction	**--**	**4.5 Tons/Annum**



CASE STUDY -CAPACITOR BANK AT LOAD END
CONNECTED LOAD 970 KW AT 200 METERS
FROM POWER HOUSE CAPS OFF – 0.8 PF & CAP ON – 0.97 PF

Description	Capacitor at powerhouse	Capacitor at load end
Rating	1211 KVA	1000 KVA
Line current	1715 amps	1443 amps
Cables in I I	5 runs	5 runs
Current /cable	343 mps	289 amps
Cable losses	35 kw	25 kw
cable loss pm	22000 units	15000 units (for 700 hrs)
Net savings	nil	7000 units per month

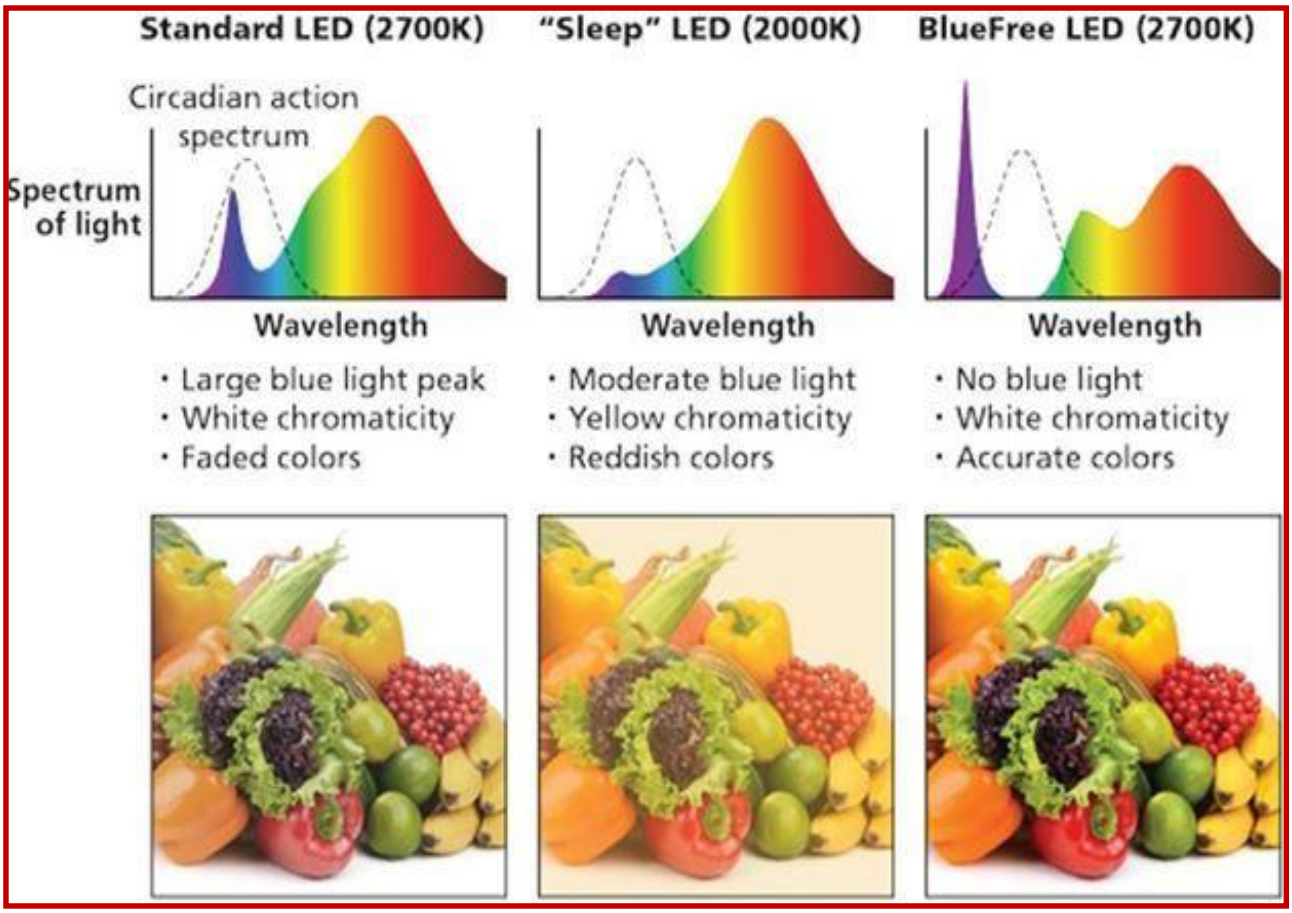




ENCON-II	Replacement of Fluorescent Lamps with Energy Efficient Lamps (Swap FTL to LED Lamps)
Assessment Area	Compact Fluorescent Lighting System located in college area with magnetic/electronic choke fitting
Observations	College Area – Main Building (Including Class, Lab and Others) FTL + CFL + LED lightings
Assessments	• The college is now replacing FTL and CFL into LED and this step must bring considerable amount of energy saving. • A 36 W FTL consumes 40 W including power consumption of the Choke. • Lighting loads are more sensitive to voltage variations. Supplying a constant voltage provides i) Reduction of breakdown of lamps and luminaries and ii) Considerable amount of energy saving. • In order to reduce the lighting bulb failures, it is necessary to supply a safe working voltage (say about 210 V) through a dedicated Servo Stabilizer (SS) connected at the output of the lighting DB.
Recommendation (Target)	• College administration has to replace the FTL to LED (20 W with choke) of branded round LED tube fitting without Blue Tinge.

Energy and Financial Saving Calculation:

Parameters	Description	
Replacement Lighting Quantity	36 W FTL in hostel area (100 Nos) contributes nearly **4.0 kW (40 W including choke)**	
Power rating of new lamps	LED-18 W (One to One – 20 W including choke) with the total power consumption of (100 X 20 W) = **2.0 kW**	
Approx. Operating Hours (Average assumed value)	**10 hours/day & 300 days/Annum = 3,000 Hours/Annum** (Actual operating hours may change)	
Energy Calculation	**Before**	**After**
Power Consumed (Approx.)	4.0 kW	2.0 kW
Expected Power Savings	--	2.0 kW
Annual Energy Saving	--	**6,000 kWh**
Annual Financial Saving	--	**Rs. 88,200 /-**
Initial Investment	-	**Rs. 60,000 /-**
(Considering **Rs. 600/Lamp** fittings of branded LED Day Cool Light)		
Simple Payback	**--**	**Nearly 0.68 Years**
CO_2 Reduction	**--**	**4.9 Tons/Annum**



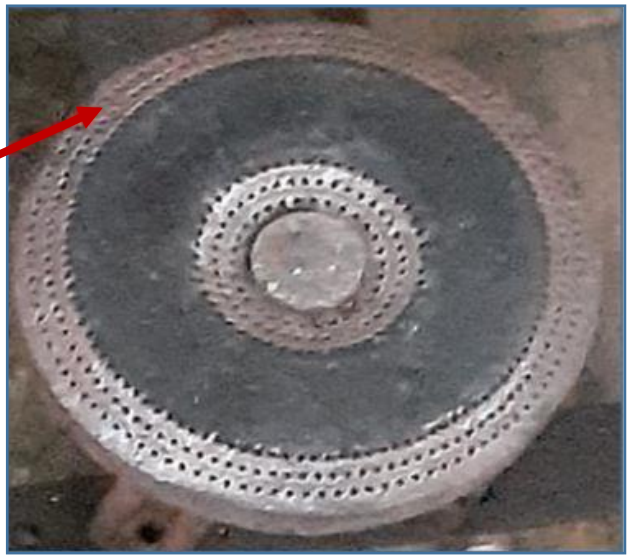
Tube Light with Copper Choke						
V	**I**	**W**	**VA**	**VAR**	**PF**	**Lumens**
200	0.278	31.96	55.60	45.50	0.5748	877
210	0.313	35.65	65.73	44.22	0.5424	971
220	0.346	39.25	76.12	65.22	0.5156	1033
230	0.377	42.70	86.71	75.47	0.4924	1089
240	0.415	46.96	99.60	87.83	0.4715	1157
250	0.438	49.70	109.5	97.57	0.4539	1163
LED Light						
200	0.137	20.83	27.40	17.80	0.7602	1315
210	0.126	21.10	26.46	15.97	0.7974	1280
220	0.122	20.44	26.84	17.40	0.7615	1267
230	0.120	19.68	27.60	19.35	0.7130	1277
240	0.108	19.97	25.92	16.52	0.7704	1270
250	0.105	19.27	26.25	17.82	0.7341	1275

ENCON-III	Reduction of LPG Consumption using Regular Burner Cleaning and Swapping of Active Burners.
Assessment Area	LPG Consumption (Cooking system in kitchen area)
Assessment	• Cooking system in the college mess mainly uses LPG as an energy carrier and utilize Gas stoves as a medium to cook the food. • Gas stoves are easy to maintain. However, when the flow of gas gets blocked, the burner heads cannot burn efficiently. • The best indicator for the efficiency of LPG system is the irregular flame pattern and yellow flames. • Formation of soot in both side of the burners, cleaning methods and interval improves the efficiency and reduce the LPG consumption.
Recommendation (Target)	• LPG commercial burners are made up of cast iron in which smoke formation is high and frequently able to crack due to aging. • It is recommended to clean the burner every week with solvent, rinse and gently clean the holes with ordinary fine cloth. Also, it is highly encouraged to swap with active spare burners. The investment on spare burners are less expensive. Make it a practice to swap the burner every week. • Identify an alternative with Stainless Steel (SS) burners (slightly costlier compared with existing one). But the lifespan is longer and replacement cost is much reduced. • Recommend to clean the burner at least twice in the week and saves nearly 5 % assured LPG saving. • Kindly do this ENCONs in a stage by stage and reap the benefits.

Energy and Financial Saving Calculation:

Parameters	Description	
Swapping of new burners every week and cleaning of existing burner with natural ingredients (Ex: Dishwashing detergent, Non-abrasive scrub pad, Microfiber towels)		
Energy Calculation	**Before**	**After**
Expected Savings on LPG	**--**	**5 %**
LPG Consumption/Annum	**3,401 kg**	**3,231 kg**
LPG Savings/Annum	--	**170 kg**
The expected financial savings is 170 kg x Rs. 88/kg = **Rs. 14,960/Annum**		
Initial Investment	-	**Rs. 5,000 /-**
Purchasing of cleaning ingredients for Rs. 5,000 with a payback of 0.33Years		
CO_2 Reduction – 0.51 Tons/Annum		

Examples of Soot Formation in LPG burners:



ENERGY, ENVIRONMENT & GREEN AUDIT REPORT

PART-C: ENVIRONMENT AUDIT REPORT

6. ESTIMATION OF CO_2 EMISSION & NEUTRALIZATION

(ELECTRICITY, LPG, DIESEL, PETROL, SOLAR PV & MATURE TREES)

6.1: Assessment of Annual Energy Usage:

Table-3 shows the types of energy carriers used for their regular operation in the college campus along with application area and their source.

Table-3: Energy Carriers, Application area and their sources used for College Operation

S. No.	Type of Energy Carrier	Application Area	Source of Procurement
1.	Electricity (HT Service - 01 No)	Powering to all electrical / electronic / HVAC equipment's	From TANGEDCO
2.	Diesel	Transport vehicles and Diesel Generator (Captive Generation)	From authorised distributor
	Petrol		
3.	Liquified Petroleum Gas (LPG)	Used only for cooking	
4.	Seasonal Wood	Used only for cooking	From Local Vendor
5.	Roof Top Solar PV System	Powering to all electrical / electronic / HVAC equipment's	Installed in i) Yoga Hall, ii) canteen and iii) Main Building
6.	Mature Trees, Bushes & shrubs	The college has nearly **98 mature trees** of different varieties which are more than 2**0 years old.**	

6.2: Environmental System: CO_2 Balance Sheet:

→ CO_2 Balance sheet is the indicator on the carbon emission and their neutralization in a year

→ As per the Environmental Management System (EMS); only Scope-1 & Scope-2 based energy consumption is accounted.

→ The following tables provide the balance sheet indicating various energy carriers associated with the regular activities and their CO_2 mapping.

Table-4: Environmental System: CO_2 Balance Sheet (2023-24)

S. No.	Annual Energy Consumption & CO_2 Emission			Annual CO_2 Neutralization		
	Description	**Parameters**	**CO_2 Emission (Tons)**	**Description**	**Parameters**	**CO_2 Neutralized (Tons)**
1.	Electricity	2,71,436 kWh	222.6	Solar PV	1,70,483 kWh	139.8
2.	Wood	22 Ton	41.8			
3.	LPG	3,401 kg	10.2	Mature Tree	844 Nos	18.4
4.	Diesel	1,399 Litres	3.7			
5.	Petrol	316	0.7	Electricity (DG)	2,842 kWh	2.3
Total Emission			**279.0**	**Total-Neutralized**		**160.5**
Balance CO_2 to be Neutralized = 118.5 Tons/Annum						

6.3: Calculation Table:

For Electricity = $\left[\text{kWh x } \frac{\text{0.82 kg of CO2 emission}}{\text{kWh}}\right]$
For Diesel = $\left[\text{Diesel Consumption (Litre) x } \frac{\text{2.64 kg of CO2 emission}}{\text{Litre of Fuel Consumption}}\right]$
For Petrol = $\left[\text{Petrol Consumption (Litre) x } \frac{\text{2.32 kg of CO2 emission}}{\text{Litre of Fuel Consumption}}\right]$
For LPG = $\left[\text{LPG Consumption (kg) x } \frac{\text{3.0 kg of CO2 emission}}{\text{kg of LPG Consumption}}\right]$
For Wood = [Wood Consumption (kg) x 1.9 kg of CO2 Consumption]
A mature tree is able to absorb nearly CO_2 at a rate of 21.8 kg/annum; $\frac{(21.8\ x\ 844)}{1{,}000} = 18.4\ \frac{\textbf{Tons}}{\textbf{Annum}}$

6.4: Recommendations:

From the above discussion points; it is evident that activities taken forward to neutralize the CO_2 is predominant and to become a Net-Zero Carbon Emission buildings. The management has to plan several activities achieve the target.

- Increase the foot print of trees planted inside the college campus.
- Encourage the students to plant more trees and account them all.
- **As per the Solar Policy-2019** from Government of Tamilnadu; for any educational institutions have to implement substantiate a minimum of **6 % of its energy generation from renewable energy source**.
- Identify higher fuel consuming vehicle and either rework or replace it.

6.5: References:

[1] https://ecoscore.be/en/info/ecoscore/co2

[3]http://www.tenmilliontrees.org/trees/#:~:text=A%20mature%20tree%20absorbs%20carbon,the%20average%20car's%20annual%20mileage

CO_2 Emission:
279.0 Tons/Annum

CO_2 Reduction
160.5 Tons/Annum

CO_2 to be Neutralized
118.5 Tons/Annum

ENERGY, ENVIRONMENT & GREEN AUDIT REPORT

PART-B: ENVIRONMENT AUDIT REPORT

7. TRANSPORT & REFRIGERANT GASES IN AC SYSTEM

7.1: List of Transport Vehicles:

Pollution level of all vehicles are regularly monitored and are maintained within the prescribed limit since the college is committed to provide green environment for better atmosphere. The list of transporting vehicles along with their type of engine are represented in Table-5.

Table-5: List of Transporting Vehicles available in the College

S. No.	Type of Vehicle	Fuel used	No. of vehicles	Pollution certified (Y/N)
1.	Auto	Diesel	01	Yes
2.	Omni	Petrol	01	Yes
Total No. of Vehicles			**02**	Yes

7.2: Details of Pollution Free Transport Vehicles & Copy of Pollution Certificate:

- The college is committed to green environment not only in the campus; but also, to the entire atmosphere.
- These vehicles are well maintained by a set of dedicated bus operators and are continuously monitored by the management officials.
- No history of accidents (either major and/or minor) for the past five years. Maintaining best performance on the engine, tyre and other accessories.
- Maintaining proper records on each trip, fuel consumption, distance travelled and mileage (kmpl)
- All the drives and helpers are well experienced with good track records on i) fuel economy, ii) maintenance free operation, iii) accident free and iv) student friendly.
- All the vehicles are checked periodically and are having valid pollution certificate and certificate of insurance.

Form 59

[See rules 115 (2)]

Pollution Under Control Certificate

Authorised By :
State Transport Department

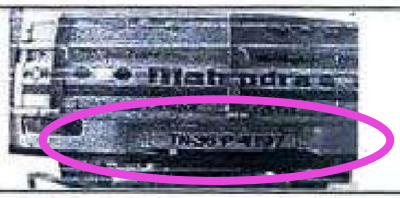
Date	:	30/01/2024
Time	:	11:32:19 AM
Validity upto	:	29/07/2024

Test Validity

Certificate SL. No.	:	TN03600370014542
Registration No.	:	TN36P4197
Date of Registration	:	30/Dec/2010
Month & Year of Manufacturing	:	October-2010
Valid Mobile Number	:	******2879
Emission Norms	:	BHARAT STAGE III
Fuel	:	DIESEL
PUC Code	:	TN0360037
GSTIN	:	
Fees	:	Rs.60.00 (GST to be paid extra as applicable)
MIL observation	:	No

Vehicle Photo with Registration plate
60 mm x 30 mm

Vehicle Number



Sr. No.	Pollutant (as applicable)	Units (as applicable)	Emission limits	Measured Value (upto 2 decimal places)
1	2	3	4	5
Idling Emissions	Carbon Monoxide (CO)	percentage (%)		
	Hydrocarbon, (THC/HC)	ppm		
High idling emissions	CO	percentage (%)		
	RPM	RPM	2500 ± 200	
	Lambda	-	1 ± 0.03	
Smoke Density	Light absorption coefficient	1/metre	2.45	1.3

This PUC certificate is system generated through the national register of motor vehicles and does not require any signature.

Note : 1. Vehicle owners to link their mobile numbers to registered vehicle by logging to https://puc.parivahan.gov.in

Authorised Signature with stamp of PUC operator
60mm x 20 mm

Sample Pollution Certificate for a Transport Vehicle

7.3: List of Air Conditioning System along with its Refrigerant:

The AC system has combined of **R-22** as refrigerant which has different **Global Warning Potential (GWP) and Ozone Depletion Potential (ODP).**

Table-6: List of Multi-variant AC System available in the College

S. No.	Location	Quantity	Refrigerant Type	(GWP)	(ODP)
1.	Management Room	1	R-22	1,810	Medium
2.	Principal Room	2	R-22	1,810	Medium
3.	Staff Counselling Hall	2	R-22	1,810	Medium
4.	IT Company	3	R-22	1,810	Medium
5.	Control Office	1	R-22	1,810	Medium
6.	Guest Room	1	v	1,810	Medium
7.	Management Counselling Hall	1	R-22	1,810	Medium
8.	Server Room	1	R-22	1,810	Medium
9.	I Lab	1	R-22	1,810	Medium
10.	II Lab	1	R-22	1,810	Medium
11.	III Lab	3	R-22	1,810	Medium
12.	IV Lab	1	R-22	1,810	Medium
13.	V Lab	1	R-22	1,810	Medium
14.	VI Lab	1	R-22	1,810	Medium
15.	VII Lab	1	R-22	1,810	Medium
16.	VIII Lab	1	R-22	1,810	Medium
17.	AC Hall	1	R-22	1,810	Medium
18.	Dean Room	1	R-22	1,810	Medium
19.	Botany Lab	2	R-22	1,810	Medium
20.	Chemistry Common Instrument Lab	1	R-22	1,810	Medium

- **Note:** The most environment-friendly refrigerants that are available in Indian market currently are "R-290" and "R-600A". They are Hydrocarbons and their chemical names are "Propane" for R-290 and "Iso-Butane" for R-600A.
- They are completely halogen free, have no ozone depletion potential and are lowest in terms of global warming potential. They also have high-energy efficiency but are highly flammable as they are hydrocarbons. (Kindly refer: https://www.bijlibachao.com/air-conditioners/comparison-of-various-refrigerants-r-410a-r-22-r-290-r-134a-used-for-air-conditioners-and-refrigerators.html).

ENERGY, ENVIRONMENT & GREEN AUDIT REPORT

PART-B: ENVIRONMENT AUDIT REPORT

8. USAGE OF CHEMICALS, SALTS & ACIDS

(STORAGE, HANDLING & BEST OPERATING PRACTICES)

8.1: Handling of Chemicals/Salts/Acids used in the Laboratories:

The science departments & Department of S & H and Civil Engineering use chemicals for experimental applications and are having strict safety rules as follows;

- Well trained faculty and lab assistants who have knowledge about the hazardous nature of each and every chemical are only allowed to handle the chemicals safely
- Strictly follow the manufacturer's instruction on the container in order to preventaccidents
- Volatile or highly odorous chemicals, fuming acids are stored in a ventilated area
- Chemicals are stored in eye level and never on the top shelf of storage unit
- All stored chemicals; especially flammable liquids are kept away from heat and direct sunlight. Reactive chemicals are not stored closely
- Hazardous and corrosive chemicals are kept on sand platform to avoid corrosion
- First aid box and fire extinguishers are readily available in the laboratory

8.2: Storage of Chemicals/Salts/Acids:

Less concentrated chemicals, salts and acids are stored in proper racks, cupboards and high concentrated acids are stored in separate area filled with sand.

- Most of the chemicals, salts and acids used in the science departments are inorganic in nature and no harmful effects are created during the experiment process
- However, after completion of each experiment, the wastes are washed in the water sink and are rooted to common choke pit.
- Only trained teaching and non-teaching staffs are handling the chemicals and also, they are well trained to handle any abnormal laboratories with chemicals are well ventilated with proper emergency exits. Adequate and correct sequence of fire extinguishers are placed near all the laboratories.

Storage of Chemicals/Salts/Acids Storage

8.3: Recommendations:

- ⇒ Display the Dos and Don'ts inside the laboratory
- ⇒ Print the Dos & Don'ts in the Students laboratory manual
- ⇒ During the first class, demonstrate a PPT presentation and explain the safety procedures
- ⇒ Provide training to the teaching and technical staffs member on latest updates on chemical storage, handling, and safe disposal
- ⇒ Also encourage to conduct such type of training programmes by the faculty member to nearby schools and college (as an outreach programme)
- ⇒ Fix the First Aid Box (with all necessary medicines)
- ⇒ Place the names (along with their photo and mobile number) of the professionals training to handle fire extinguishers
- ⇒ Prepare & adopt a **Chemical Policy** (Including procurement, storage, handling, distribution, & disposal

8.4: Use of Chemical for Vessels & Floor Cleaning:

In order to maintain hygiene in the College campus; the administration regularly clean the floors and restrooms. In addition to this, the hostel management has to monitor i) the cleaning of vessels, kitchen floor, dining hall, store room and gas station. Table-7 shows the cleaning agents used to clean the above-mentioned area;

Table-7: Cleaning Agents used for Floor and Vessel Cleaning

S. No.	Cleaning Agent	Application
1.	Phenol	Vessel Cleaning
2.	Soap Oil	Floor Cleaning

Cleaning & Refreshing Agents used for Vessel & Floor Cleaning

8.5: Recommendations: Eco Friendly – Green Cleaning Agents:

- It is recommended to use natural ingredients like orange peel extract & vinegar. It leaves a mild and pleasant fragrance after use. The formula is free from all harmful chemicals & toxins. It is pH-neutral, gentle on the skin as well as on the surface where it is used
- Also, these products are **IGBC GreenPro** certified. GreenPro is a mark of guarantee that the product is environment friendly throughout its life cycle

Green Pro Certified Eco-Friendly Cleaning Agents (ZERODER)

ENERGY, ENVIRONMENT & GREEN AUDIT REPORT

PART- C: GREEN AUDIT REPORT

9. WATER UTILIZATION, CONSERVATION & WATER MANAGEMENT

9.1: Source of Water, Storage and Distribution:

Table-8 shows the source of water, location of storage along with their application.

Table-8: Source of Water, Location of Storage and Application

Type of Water	Source	Application
Bore	**Total No. of Bore – 08** 1. Main Gate – 900 ft 2. Main Rood – 800 ft 3. Indoor Stadium – 900 ft 4. Temple – 800 ft 5. Thoppu I – 800 ft 6. Thoppu II – 800 ft 7. Women's Hostel – 800 ft 8. Boys Hostel – 1000 ft	Drinking application, Utensil Cleaning, Bathing, Cloth Washing, Gardening & Construction
Open well	**Total No. of Open well – 01** **1.** Near Power House – 95 ft	
Rain Water Harvesting System (RWHS)	1. Back Side of New Building	↗ Used to increase the ground water ↗ To store building run-off only

9.2: Details of the Water Utilities, Storage, Motor Capacity and Approximate Run Hours:

The following table provides the details of the Water Utilities, Storage, Motor Capacity and Approximate Run Hours available inside the college for regular application.

Table-9: Details of the Water Utilities, Storage, Motor Capacity and Approximate Run Hours

S. No.	Location	Depth	Motor Capacity	Storage & Location		Usage
1.	Near Power House (Open Well)	95 Ft	10 Hp / 7.5 Kw	Near Canteen Sump 1 & 2 10 Hp / 7.5 Kw (Rewinding)	Main Building (RCC Tank)	1) Water Doctor (No. of. WD: **25**) For Drinking 2) Gardening 3) Rest Room
2.	Main Gate (Bore)	900 Ft	10 Hp / 7.5 Kw		It Building (RCC Tank)	

3.	Main Road (Bore)	800 Ft	7.5 Hp / 5.5 Kw		Waiting Hall I & II (RCC Tank)	
4.	Indoor Stadium (Bore)	900 Ft	10 Hp / 7.5 Kw			
5.	Temple (Bore)	800 Ft	10 Hp / 7.5 Kw			
6.	Thoppu I (Bore)	800 Ft	3 HP / 3.7 Kw	ARS Tank		
7.	II (Bore)	800 Ft	10 Hp / 7.5 Kw	Commerce Block		
8.	Women's Hostel (Bore)	800 Ft	7.5 Hp / 5.5 Kw	Women's Hostel		
9.	Boys Hostel (Bore)	1000 Ft	10 Hp / 7.5 Kw	Boys Hostel		

Note:

- ☞ WD; Water Dispensers
- ☞ The maintenance team ensure to clean the tank for six months once.
- ☞ Bleaching power is mostly used to clean the inside tank.

9.3: Treated Water for Drinking Application:

- The college management is keen on providing uninterrupted, safe and healthy drinking water to all; throughout the year.
- Water dispenser are provided at appropriate places offering the treated water for the students (Both Normal and Hot temperature)
- The overhead tanks storing the well water are cleaned at regular intervals and the water management team has been maintaining a cleaning schedule Utensil Cleaning, Bathing & Cloth Washing.

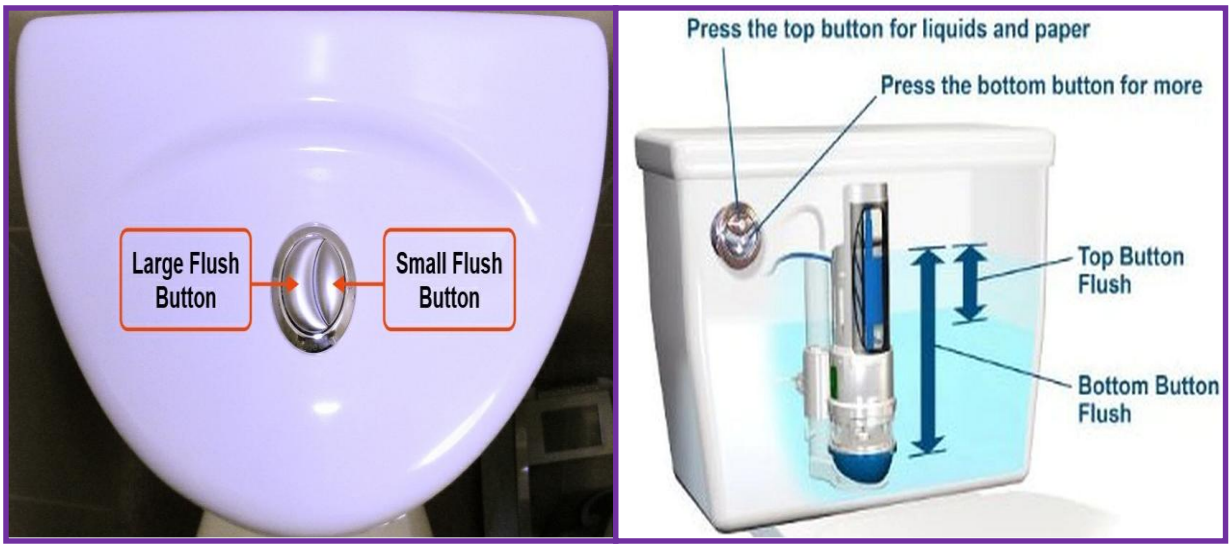
9.4: Water Savings in Foreign Toilets:

✓ The list of availability of Indian & Foreign style toilets are presented in the below Table-10.

Table-10: List of Indian & Foreign Style Toilets

S. No.	Location	No. of Toilets	
		Indian	Foreign
1.	Administrative Building	10	2
2.	MP & Economics Building	14	4
3.	Main & IT Building	16	4
4.	Waiting Hall	69	3
5.	Fitness Centre	3	3
6.	Outdoor & Indoor Stadium	16	4
7.	Ladies Hostel	37	2
8.	Boys Hostel	17	-
9.	Commerce Black & Placement Cell	5	5
Total		**187**	**27**

- In general, the flush tank capacity may be 8 to 10 Litres (depends on make and model). Water savings also leads to power saving it saves the operating duration of the water pumps directly.



9.5: Rain Water Harvesting (RWH) – from Building Roof Area & Run-off Area:

- ☞ The audit team appreciates the effects taken by the management of **GOBI ARTS & SCIENCE COLLEGE** for harvesting the rain water almost in all buildings.
- ☞ The roof area is so arranged to collect the rainwater and then passed through proper piping system, and then bring back to a Common Collection System with a collection capacity of Nearly **2 Crore Liters**.
- ☞ It look like a Pond and many living species are available in and around the pond.
- ☞ Because of implementing this centralized storage facility; the ground water level in and around the college are in increased.

9.6: General Recommendations:

→ It is advisable to replace all the old taps without aerator into aerator-based taps in a phased manner.

→ Aerators helps to reduce and regulate water flow and also offer the following benefits;

- ✓ Lower Water Bills & Improved Water Pressure
- ✓ Increased Filtration & Minimized Splashing

- All the pump motor must be fitted and controlled by floating sensor and hence the motors are automatically ON and OFF. It avoids the overflow; saves water and electrical energy.
- All the buildings are fitted with water flow meters & hence the water utilization must be properly accounted. Similar to the water flow meter; energy consumption of all pumping motors is recorded using panel board meters.
- Fault and leakage in the water distribution line will be promptly informed by the respective in-charges to the maintenance team and immediately arrested.

9.7: Installation on Fire extinguishers:

- The college has installed Fire extinguishers at all the vulnerable points.
- They are also refilled and in good condition (with adequate pressure indicated in the meter)

Sample Fire extinguishers & First Aid Kit Placed in the College

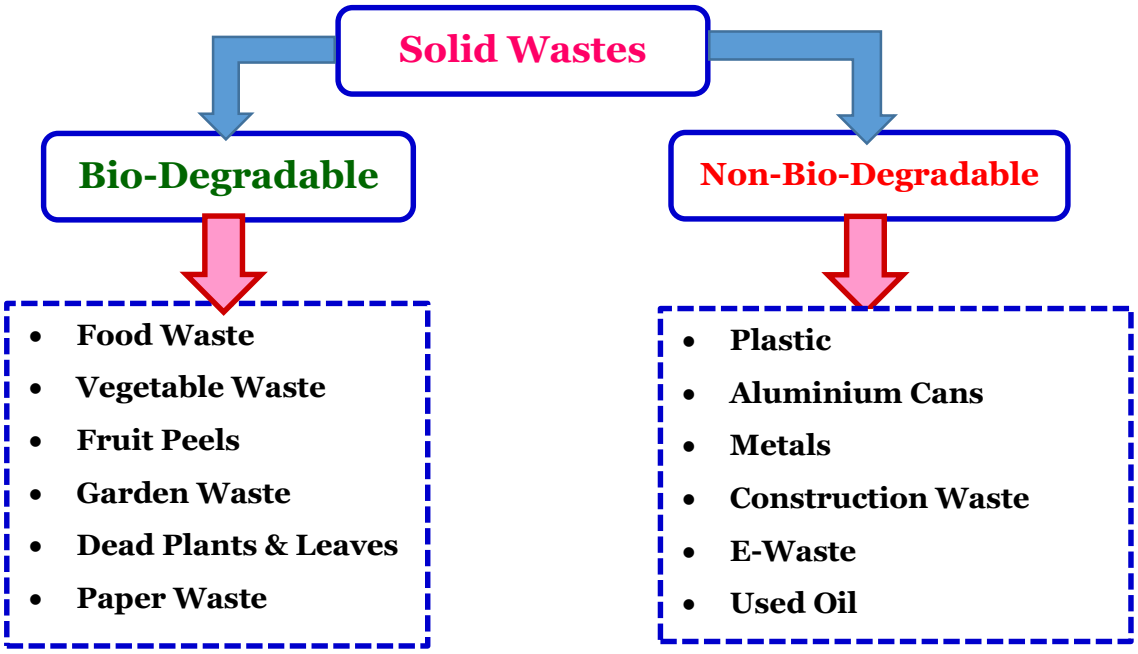
ENERGY, ENVIRONMENT & GREEN AUDIT REPORT

PART – C: GREEN AUDIT REPORT

10. WASTE HANDLING & MANAGEMENT

10.1: Solid Waste Management System:

Different types of wastes generated inside the college premises are represented in the block diagram given below.



10.2: Process of Waste Management:

The college management practised some methods to treat the waste generated and Table-11 shows the process of treating the solid waste generated inside the college campus.

Table-11: Process of Waste Management

S. No.	Waste Type	Waste Treatment
Bio-Degradable Waste Management		
1.	Food and Vegetable Waste	• Collected and given to nearby farm
2.	Garden Wastes and Plant Leaves	• Daily collected and dumped in a yard
3.	Paper Waste	• Collected and stored in a separate place
		• Sold to third party for recycling
		• Daily paper waste stored in a yard
Non-Bio-Degradable Waste Management		
4.	Plastics	• Banned in the college campus **(Welcome step).** • The chemical/salt storage containers are disposed to third party
5.	Metals	• Construction metals or metals from any other sources are stored & sale to third party for recycling
6.	Transport Oil + Tyres	• Stored in a separate place and sold to third party

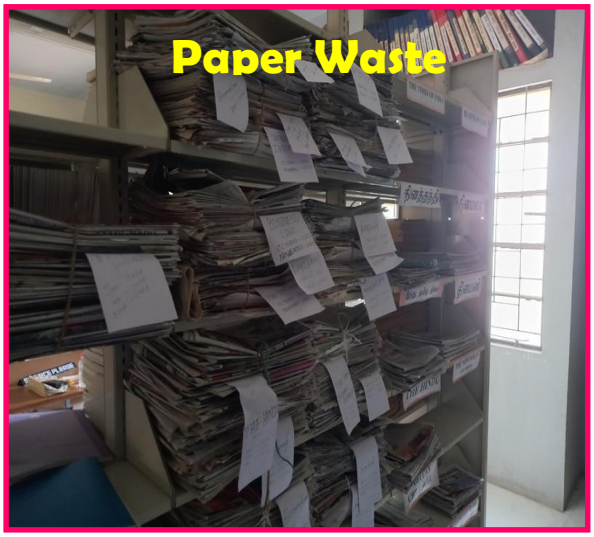
7.	DG Engine oil & Coolant	• Stored in a separate place and sold to Construction Purpose Only
8.	Vehicle & Computer Batteries	• Procuring new batteries with buyback offer • (Old battery replacement)
9.	Used edible oil	• Almost zero waste. Mostly used for internal cooking and frying.
10.	E-Waste Management	• Used for sale to third party for recycling

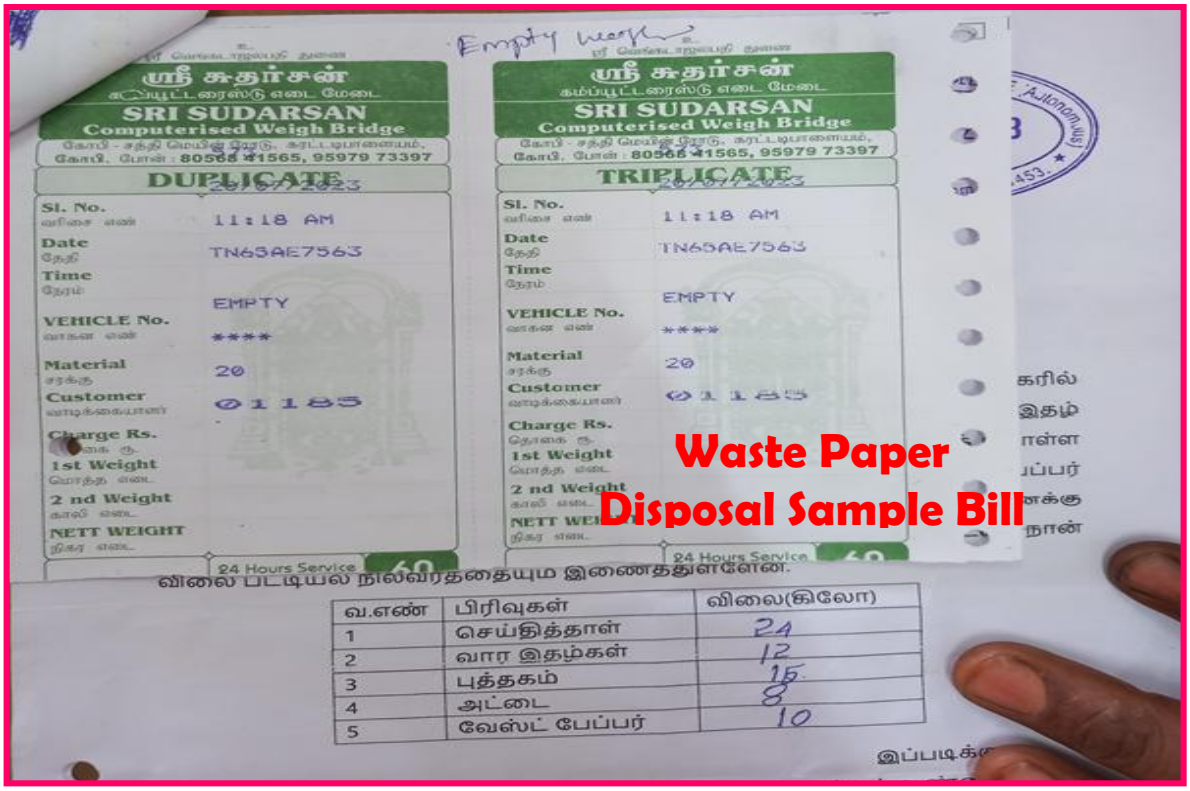
10.3: Standards Followed for Waste Handling & Management:

1. Solid Waste Management Rules – 2016
2. E-Waste Management Rules – 2016
3. Hazardous Waste Management Rules – 2016 (Management & Transboundary)
4. Battery Management Rules – 2001 (Management & Handling)

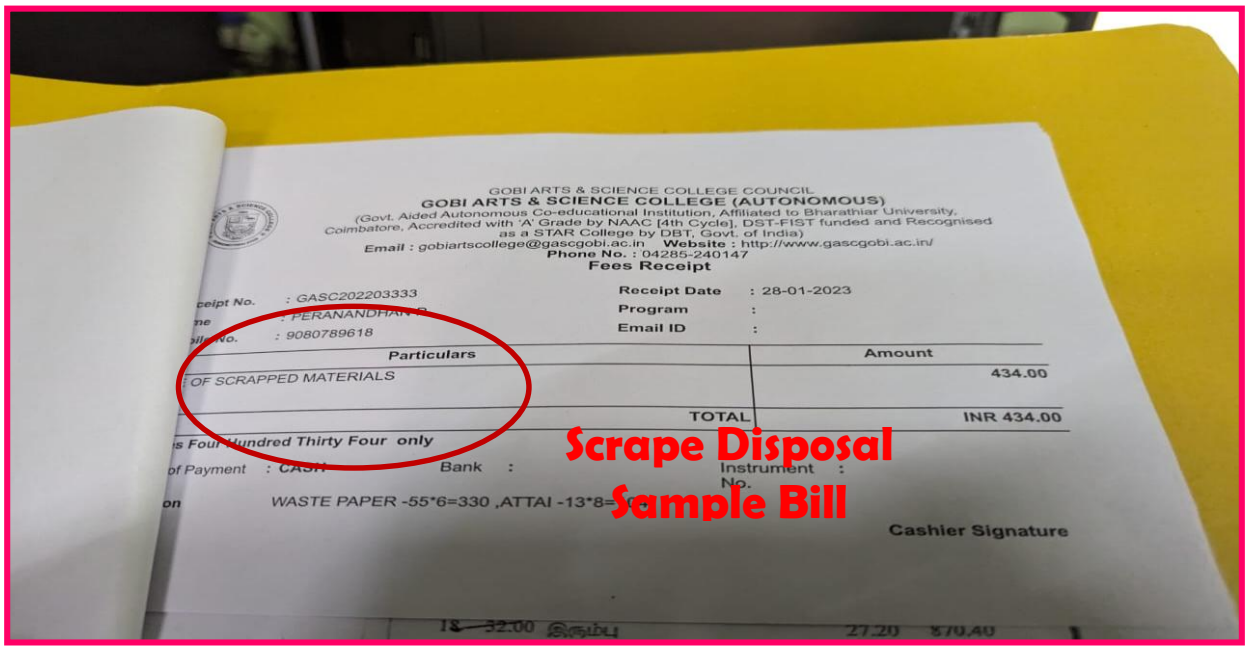
10.4: General Note:

- Prepare a flow chart for collection of E-waste from Generation to Disposal and paste it on appropriate places
- An electronic weighing scale (with suitable capacity) must be installed in the storage yard and should be properly calibrated
- One emergency lamp (with UPS supply) must be installed along with suitable fire extinguisher. Ensure proper ventilation in the yard
- Form rule for declaring the waste as E-Waste & Assign the singing authorities
- Identify a third-party vendor to procure the E-waste from the college
- Establish MoU with that party. Disseminate the following information at appropriate places i) E-Waste Policy, ii) Process Methodology, iii) Copy of MoU with third party vendor, iv) Contact persons mobile number and E-mail.
- Identify certain vehicle to carry the waste from generation to storage yard
- Provide training to the man power who are handling the waste
- Maintain separate Delivery Challan, Billing, weighing mechanism for handling the E-Waste
- Update the status of E-waste (through digital circular) to all the concerned management representatives, faculty members and staff at regular intervals (month wise is good)





Solid Waste Management (Collection, Segregation, Storage & Safe Disposal)


GOBI ARTS & SCIENCE COLLEGE COUNCIL
GOBI ARTS & SCIENCE COLLEGE (AUTONOMOUS)
(Govt. Aided Autonomous Co-educational Institution, Affiliated to Bharathiar University, Coimbatore, Accredited with 'A' Grade by NAAC [4th Cycle], DST-FIST funded and Recognised as a STAR College by DBT, Govt. of India)
Email : gobiartscollege@gascgobi.ac.in Website : http://www.gascgobi.ac.in/
Phone No. : 04285-240147
Fees Receipt
: GASC202203333
: 9080789618
Receipt Date : 28-01-2023
Program :
Email ID :
Particulars
Amount
OF SCRAPPED MATERIALS
434.00
TOTAL
INR 434.00
Four Hundred Thirty Four only
of Payment : CASH
Bank :
Instrument No. :
WASTE PAPER -55*6=330 ,ATTAI -13*8=
Cashier Signature
Scrape Disposal
Sample Bill


Plastic recycling MoU
GAECOSERV
15.03.23

ENERGY, ENVIRONMENT & GREEN AUDIT REPORT

PART - C: GREEN AUDIT REPORT

11. ASSESSMENT ON MATURE TREES, & BIO-DIVERSITY

11.1: Campus Greenery:

The college is completely covered with mature trees grown for more than **30 years**. The total number of mature trees available in the college campus is ***844 with nearly 40 varieties of trees.*** Apart from the mature trees; preserving the ecology; the entire college campus is planted with various flowering shrubs and bushes. Below Table shows the list of mature trees available in the college + hostel campus.

Table-12: List of Mature Trees Available in the College Campus

S. No.	Name of the Tree	Botanical Name	Quantity
1.	Neem	Azadirachta indica	395
2.	Mango	Mangifera indica	1
3.	Aneca Palm	Aneca catechu	1
4.	vilvam	Aegbe marmelos	1
5.	Jungle geranium	Ixora coccinea	3
6.	Milo	Thespesia populnea	7
7.	Indian Beech	Pongannia pinnata	40
8.	Phonix tree	Delonix regia	23
9.	Indian blackwood	Hardwickia binata	7
10.	Indian gooseberry	Phyllanthus emblica	6
11.	Indian Blackberry	Eugenia Jambolana	3
12.	Royal palm	Roysfonea regia	14
13.	Golden Shower	Cassia Fistula	4
14.	Scared big	Ficus religiosa	4
15.	Teak	Tectona grandis	56
16.	Camels foot	Bauhinia purpurea	6
17.	Wild almond tree	Sterculia foetida	9
18.	Asparagus	Asparagus sp	4
19.	False Ashoka	Polyalthia longifolia	65
20.	Geiger tree	Cordia subcordata	5
21.	Yellow flame tree	Peltophorum pterocarpum	29
22.	coconut	Cocos nucifera	55
23.	Dates palm	Phoenix dactylifera	4
24.	Desert banana	Musa acuminata	5
25.	Bottle brush	callestemon	2
26.	Tamarinal	Tamarindus indicus	17
27.	Oil nut	Calophyllum inophyllum	1
28.	Red lucky seed	Adenanthera Pavonina	1
29.	Fern tree	Filicium decipiens	1
30.	Banyan tree	Ficus benghabensis	3
31.	Surrogate tree	Albizia lebbeck	19
32.	Mahogany	Swietenia macrophylla	3

S. No.	Name of the Tree	Botanical Name	Quantity
33.	African Tulip	Spathodium campanulata	2
34.	Kumil Teak	Gmelina arbore	1
35.	Bullet Wood	Mimusopus elengi	2
36.	Paala maram	--	4
37.	Papaya	Carica papaya	2
38.	Malay gooseberry	Phyllanthus officinalis	1
39.	Chempak	Magnolia champaca	3
40.	Oil cake tree	Albizia amara	1
41.	Frangipani	Plumeria alba	1
42.	Indian Almond	Terr=minalia cadappa	3
43.	Fig	Ficus carica	2
44.	Butter tree	Madhuca longifolia	1
45.	Astronium	Astronis colo	22
46.	Palmyra palm	Borassus flabellifer	1
47.	Australia octopus tree	Heptapleurum actinophylum	1
48.	Drumstick	Moringa obeifera	1
TOTAL			**844**

No. of Mature Trees available in the campus is 844 which contributes for a reduction of 18.4 Tons of CO_2 Emission/Annum

11.2: Roof Top Solar Photovoltaic System:

The college has installed roof-top solar PV plants with a capacity of nearly **116 kW (96 + 20 kW)** generate and feed power to the respective HT services and are utilized by the campus load.

Energy saving from solar PV system is *1,39,200 kWh* which reduces 114.1 Tons of CO_2 Emission

Components of Roof Top Solar PV Plants

11.3: Decomposition of Campus Leaf Litter:

- **Gobi ASC** has a vision to properly dispose the food and dead leaves waste into manure.
- Vermicomposting is a natural process whereby earthworms convert waste material with rigid structures into compost. The compost produced in this green process is traditionally and popularly used as a natural fertilizer for enhancing plant growth.
- Food waste mixed with the dead leaves collected inside the campus are mixed with proper ratio. The kept in an RCC based open chamber allow to decompose it for a specified period of time.

Dead Leaves to generate Organic Manure

11.4: Medical Plants inside the College:

→ Medicinal garden is a natural repository of medicinal plants which signifies a rich heritage of traditional knowledge and plant diversity.

→ A medicinal plant contains substances that can be used for therapeutic purposes.

→ Medicinal plants will be useful for Maternal and Child health care, as essential drugs, in food and nutrition, for common illnesses and injury, for endemic infectious diseases, mental health and oral health. A part from that, these plants play a critical role in the development of human cultures around the whole world.

→ The college has establishment a Medicinal plant initiation was started under the leadership of Principal and other faculty members.

List of Medicinal Plants in the College

S. No.	Name of the Plant	
1.	Ocimum sanctum Linn	Acalypha indica Linn
2.	Phyllanthus emblica Linn	Piper Betel
3.	Aegle Marmelos Linn	Sapindus trifoliatus
4.	Moringa Oleifera Linn	Ricinus communis
5.	Phyllanthus Urinaria	Azadirachta indica A.Juss
6.	Bauhinia purpurea	Aloe barbadensis Mill
7.	Nyctanthes Arbor-tristis	Hibiscus rosa-sinensis
8.	Anthocephalus indicus	Kalanchoe pinnata
9.	Musa paradisiaca Linn	Jatropha curcas
10.	Annona squamosa Linn	Punica granatum Linn
11.	Euphorbia hirta	Plectranthus amboinicus
12.	Tinospora cordifolia	Catharanthus roseus
13.	Cassia occidentalis	Cissus quadrangularis
14.	Abutilon indicum	Aerva Lanata Linn

Medicinal Plantation inside the College Campus

11.5: Miyawaki Forest:

- Miyawaki is a technique (also called *Potted Seedling Method*) as that helps build dense, native, multi-layered forests. The approach is supposed to ensure that plant growth is 10 times faster and the resulting plantation is 30 times denser than usual. It involves planting dozens of native species in the same area, and becomes maintenance-free after the first three years. The overall density of the forest is beneficial in lowering temperature, making soil nutritious, supporting local wildlife and sequestration of carbon.
- The NSS Unit of Gobi Arts & Science College (GASC) in association with Village Panchayat Unions has established two dense forest covers – Miyawaki Forests in the following locations during 2018-22 using locally available tree saplings.

S. No.	Location	Extent Area (Acres)	Year of Planting
1.	Kottupullampalayam	0.20	2018
2.	Chettiyampalayam	0.75	2022

- The prominent tree species planted in both the locations include Tamarind, Poovarasu, Naaval, Neem, Polyalthia, Butter wood, Manila tamarind, Guava, etc. The trees that were planted in Kottupullampalayam have reached an average height of about 15-20 ft. and have established as a dense cover. Those raised in the second location (Chettiyampalayam) have reached a height of 3-4 ft. and will get well established after the next monsoon.
- Among the locations, Kottupullampalayam is situated near a pond ecosystem. In both the locations more than 5000 saplings were being raised and maintained in proper conditions. In near future, the established forest cover will play a significant role in sequestering CO_2 and similar plantations have also been planned to be established in other locations in the coming years.

11.6: Campus Flora:

- The Campus of **Gobi Arts & Science College** is well known for its lush green environment and serene beautiful landscapes. In a recent enumeration of flora within the campus, a total of 2,160 mature trees as well as shrubs were recorded.
- Besides, the institution has plenty of lawn areas covered with grasses and climbers. The study was conducted by involving the Botany graduates with the co-ordination of faculty members.

11.7: Implementation of Indoor Plants as Natural Air Purifier:

- Indoor plants not only do plants look good while bringing life to our living space, they also help purify the air, according to a NASA study that explains that even a small plant inside the workspace can help remove at least three household toxins (think benzene, formaldehyde, and trichloroethylene, which are carcinogenic chemicals commonly found in stagnant indoor environments).

TULSI: Generates more oxygen per day

Aloe Vera:

- **Removes benzene and formaldehyde**
- **Eliminate harmful microorganism and absorb dust**

Snake Plant:

- **Removes Xylene, Benzene, Formaldehyde, Trichloroethylene toxins.**

Spider Plant:

- **Removes CO and Formaldehyde**
- **Absorbs Nicotine**

Money Plant (Devil IVY):

- **Best air purifying plant**
- **Remove benzene & Formaldehyde**

Bosten Fern:

- **High humidity application**
- **Remove xylene & Formaldehyde**

Chrysanthemum:

- **Removes Ammonia, Xylene, Benzene & Formaldehyde**

Kimberly Queen Fern:

- **Works well in carriage**
- **Absorb vehicular exhaust**

11.8: Bio-Diversity in the Campus:

- Biodiversity is all the different kinds of life you'll find in one area—the variety of animals, plants, fungi, and even microorganisms like bacteria that make up our natural world.
- Each of these species and organisms work together in ecosystems, like an intricate web, to maintain balance and support life.
- Biodiversity supports everything in nature that we need to survive: food, clean water and shelter.
- **Gobi Arts & Science College**
- **is blessed with more varieties of resident birds (species always living inside the campus)** and amphibians (Amphibians are small vertebrates that need water, or a moist environment, to survive).

11.9: Recommendations to maintain Bio-Diversity:

- **Bird Sighting and Survey:** Conduct a dedicated bird sighting and identify the list of birds both residing birds and migratory birds available in the college campus.
- Prepare the list of birds with their local name, scientific name, their average life time, nesting facility created by the bird and photo of the bird. Show case the result to all the stake holder and inculcate a habit of friendly environment
- Discuss with the ornithologists and facilitate the environment with more birds coming to the campus and especially migratory birds.
- **Reptile & Amphibian survey:** Similar to bird survey; conduct a survey to list the amphibians available in the campus
- Amphibian and reptile surveys are often performed as part of the Green Audit process or terrestrial survey. These surveys are effective at detecting the presence of even the most elusive species.

ENERGY, ENVIRONMENT & GREEN AUDIT REPORT

12. AUDIT SUMMARY

&

CONCLUSION

I. Energy Conservation & Management – Electrical Energy:

- Implement Energy Management System (EMS) to accurately measure & monitor energy flow
- Prepare a policy plan to convert the distributed UPS layout into centralized UPS and save energy. This step also saves the maintenance time due to reduction in number of batteries
- Implement automatic street light controller to turn on and off based on different time in a day. Use astrological timer for better results and energy savings
- Diesel flow meter must be fitted with each DG and calculate the UPL accurately
- Prepare suitable formats for all energy consumption and regularly follow the records. At regular intervals conduct internal audits to assess the effectiveness of the practice. Make proper corrections; if it deviates from the standard operating procedure
- Regularly conduct i) Illumination study, ii) Thermal comfort study, iii) Flue gas study on DG, and Boiler, iv) Water quality assessment (for all types of water utilized) and v) Indoor and ambient air quality study.
- Regularly clean the stove burners and ensure that the flame should be in light bluish colour

II. Water Conservation & Management:

- Utilize more amount of treated water; since most of the approving agencies like AICTE, UGC etc., are now requesting to utilize the treated water
- Prepare and maintain a Single Line Diagram (SLD) for water distribution network.
- Paste water and energy saving slogans at appropriate places
- Generate your own power and water for regular activities and move towards Net Zero Energy and Net Zero Water Building
- Captures almost 100 % rain water harvesting through i) Recharging pits and ii) Open well type storage pits
- Properly follow scientific method of handling chemicals/Acids/Salts and safe disposal through 3rd party
- Water treatment log must be maintained indicating the water inlet, treated and outlet water quantity
- Install **sensor-based water controller** in each Over Head Tanks and reduce the water waste and power required to operate the pump
- With the advent of smart technologies, it is possible to have centralized monitoring in real-time using Internet of Things (IoT), Geographic Information System (GIS) software, etc. as per **Jal Jeevan Mission,** Department of Drinking Water & Sanitation **Ministry of Jal Shakti**
- Awareness campus must be conducted to all the stakeholders at regular interval. Through this initiative; Painting, Photography, Slogan and Poster making contest are conducted to create consciousness among the students and faculties

III. Impart Training to Faculty and Technical Staffs:

- **Energy Conservation and Management**
- **Environmental impact and assessment**
- **Fire and Safety (Operation and Handling)**
- **Electrical maintenance, AC, Battery Maintenance & Safety**

- **Emergency Preparedness**
- **E-Waste, Chemicals Handling & Solid Waste Management**
- **Training for Transport employees**
- **Training for Faculty and Students on Vehicle Operation**
- **Training for Kitchen Employees**
- **General Medical Camps for Employees**
- **Training on Stress Management and Yoga**

IV. Way Forward towards Energy & Environmental Sustainability:

- Prepare an exclusive **Energy and Environment Policy** based on the energy and environment practices followed in the campus. This must reflect the i) Present energy consumption & generation, ii) Projection of energy need, iii) Commitment by the college to conserve energy (in terms of percentage), iv) Road map to achieve the commitment, v) Facilities needed to achieve the same, vi) Roles and responsibilities of all stake holders, vii) Interim and final review mechanism, viii) Corrective measures, if the results deviates from the committed value and ix) Benchmarking, Case study preparation, Knowledge sharing and rewards
- Practice appropriate ISO standards for System Management. The audit team highly recommend to follow **i) ISO-9001 (Quality Management System), ISO-14001 (Environmental Management System) and ISO-50001 (Energy Management System)**
- Working towards Net Zero Energy and Net Zero Water Campus and achieve **Platinum rated Global Leadership campus (as per IGBC rating)** and/or **5-star rated campus** (as per GRIHA rating) and/or **GEM-5 rated campus** (as per ASSOCHEM GEM rating)

COMPLETION OF THE REPORT

This report is prepared as a part of the Energy, Environment and Green Audit process conducted at **M/s. GOBI ARTS & SCIENCE COLLEGE,** Karattadipalayam, Gobichettipalayam – 638 453, Tamil Nadu, India by **RAM-KALAM CENTRE FOR ENERGY CONSULTANCY AND TRAINING,** Coimbatore-641 109 Tamil Nadu, India.

ENERGY, ENVIRONMENT & GREEN AUDIT REPORT

ANNEXURE:

AUTHORISED CERTIFICATES OF THE AUDITOR

ZERTIFIKAT ◆ CERTIFICATE ◆ 認証書 ◆ СЕРТИФИКАТ ◆ CERTIFICADO ◆ CERTIFICAT

South Asia

CERTIFICATE

The Certification Body
of TÜV SÜD South Asia Private Limited

certifies that

M/S RAMKALAM CENTRE FOR ENERGY CONSULTANCY & TRAINING

No.8, VPK Garden, Velanaipatti, Coimbatore – 641 062, India

has implemented Quality Management System

in accordance with **ISO 9001:2015**

for the scope of

Providing Energy, Environment, Green audits to industry, Academic institutions and organizations

The certificate is valid from **2023-11-22** until **2026-11-21**

Subject to successful completion of annual periodic audits

The present status of this certificate can be obtained through TUV SUD website by scanning below QR code and by entering the certificate number (without spaces) on web page. Further clarifications regarding the status & scope of this certificate may be obtained by consulting the certification body at info.in@tuvsud.com

Certificate Registration No. **99 100 23573**

Date of Initial certification: **2023-11-22**

Issue Date: **2023-11-22** Rev. **00**

Rahul Kale
Head of Certification Body
of TÜV SÜD South Asia Private Limited,
Mumbai
Member of TÜV SÜD Group

NABCB QM011

TÜV SÜD South Asia Pvt. Ltd. ● TÜV SÜD House ● Saki Naka ● Andheri (East) ● Mumbai – 400072 ● Maharashtra ● India

Reg No.: EA-27299

Certificate No.: 9645/19

NATIONAL PRODUCTIVITY COUNCIL

National Productivity Council

(National Certifying Agency)

PROVISIONAL CERTIFICATE

This is to certify that Mr./ Mrs./ Ms. **SIVARASU SULUR RATHINAVELU**

son / daughter of Mr. **P RATHINAVELU** *has passed the National certification Examination for Energy Auditors held in September 2018, conducted on behalf of the Bureau of Energy Efficiency, Ministry of Power, Government of India. He / She is qualified as* ***Certified Energy Manager*** *as well as* ***Certified Energy Auditor****.*

He / She shall be entitled to practice as Energy Auditor under the Energy Conservation Act 2001, subject to the fulfillment of qualifications for Accredited Energy Auditor and issuance of certificate of Accreditation by the Bureau of Energy Efficiency under the said Act.

This certificate is valid till the Bureau of Energy Efficiency issues an official certificate.

Digitally Signed by:K V R RAJU
Mon Apr 22 16:22:42 IST 2019
Controller of Examination, NPC AIP Chennai

Place : Chennai, India
Date : **22nd April, 2019**

Controller of Examination

TÜV NORD

ISO 14001:2015 Lead Auditor
(Environmental Management Systems)
Training course

it is hereby certified that

Dr. S. R. Sivarasu

has successfully completed the above mentioned course and examination

08th - 12th December 2017

Coimbatore, India

Certificate No. 3521 2982 02

Delegate No. 71968

for TÜV NORD CERT GmbH

Essen, 2018-01-11

Course 18125 is certified by CQI/IRCA and meets the training requirements for those seeking certification under the IRCA EMS auditor certification scheme.

TÜV NORD CERT GmbH Langemarckstraße 20 45141 Essen www.tuev-nord-cert.com

CQI | IRCA CERTIFIED COURSE

CQI | IRCA APPROVED TRAINING PARTNER

IGBC

Confederation of Indian Industry

The Indian Green Building Council

hereby certifies that

Sivarasu S R

has successfully demonstrated knowledge on the Green Building Design & Construction, Building Standards & Codes, IGBC Resources & Processes and Green Design Strategies & their Impacts, required to be awarded the title of

IGBC Accredited Professional

K S Venkatagiri
Executive Director
CII-Godrej GBC

V Suresh
Chairman
Indian Green Building Council

Gurmit Singh Arora
Vice-Chairman
Indian Green Building Council

200239

20 June 2020

GRIHA

GREEN RATING FOR INTEGRATED HABITAT ASSESSMENT

GRIHA CERTIFIED PROFESSIONAL CERTIFICATE

This is to certify that

Sivarasu sr

has qualified as a **GRIHA** Certified Professional For V. 2015

Date of issue: 18th September 2020

Note : This certification is valid only for GRIHA version 2015.

Chief Executive Officer
GRIHA Council

Confederation of Indian Industry

This is to certify that

SIVARASU S R

is a

CII Certified Professional in Sustainable Waste Management

K S Venkatagiri
Executive Director
CII - Godrej GBC

Pradeep Bhargava
Chairman
CII GreenCo Council

IGBC

e-Learning

Issued by CII Sohrabji Godrej Green Business Centre | Issued on 9 June 2021 | CIGBC-SWM-0621-298

HSSERisk Academy

CERTIFICATE

OF APPRECIATION

EMPOWERING PEOPLE THROUGH KNOWLEDGE TRANSFER

THIS CERTIFICATE IS AWARDED TO

Sivarasu Rathinavelu

FOR SUCCESSFUL COMPETION OF TRAINING COURSE ON

ISO 14064-1:2018
ISO 14064-2:2019
ISO 14064-3:2019
ISO 14066:2011
ISO 14067:2018

AND CERTIFY HIM/ HER AS

IMPLEMENTOR & AUDITOR
CARBON FOOTPRINT MANAGEMENT

This certificate is awarded for successful completion of Global Virtual Training course conducted from August 27, 2021 to September 01, 2021. It's serves as a proof of his/her knowledge, competence and ability to implement, verify and validate carbon footprint as per above mentioned standards and methods. This certificate was awarded on August 01, 2021.

01.09.21
DATE

SIGNATURE

010920211006

HSSE Risk MANAGEMENT SERVICES
www.hsserisk.com