

# ENVIRONMENT & GREEN AUDIT REPORT

## AUDIT CONDUCTED FOR **GOVERNMENT COLLEGE OF TECHNOLOGY** **(AUTONOMOUS)**

Thadagam Road, Coimbatore – 641 013, Tamilnadu, India.

### DATE OF AUDIT

**05 JUNE 2023**

**(Audited and Accounted from June 2022 to May 2023)**



### AUDIT CONDUCTED BY

**RAM-KALAM CENTRE FOR ENERGY CONSULTANCY AND TRAINING**

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# **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. GOVERNMENT COLLEGE OF TECHNOLOGY, Thadagam Road, Coimbatore – 641 013, Tamilnadu, India for providing an opportunity to conduct a detailed 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. GOVERNMENT COLLEGE TECHNOLOGY 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.

<b><i>Head of The Institution</i></b>	
<b>Dr. K. MANONMANI</b>	<b>PRINCIPAL</b>

<b><i>Audit Team Members</i></b>	
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# **ENVIRONMENT & GREEN AUDIT REPORT**

## **2. INTRODUCTION TO ENVIRONMENT & GREEN AUDIT PROCESS**

### **2.1: Preface about the Institution:**

- The **Government College of Technology**, Coimbatore formerly known as Arthur Hope College of Technology, was started in July 1945. The Institute is one of the premier Engineering Institutions of the Country having a very large contribution to the academic and technological developments.
- Ever since that prestigious moment, it has set the standard of recognition standing out as an outstanding Institution with technical expertise.
- This Institution offers nine UG programs and eleven PG programs with recognized research supervisors to pursue Ph.D. Programs in all the branches of study.
- All departments have well qualified staff members and excellent infrastructural facilities. This Institute is supported by World bank funding under TEQIP in the Phase II to the tune of Rs. 12.5 crores along with two centres of excellence, each granted with Rs. 5 crores.
- The college has received **BEST COLLEGE AWARD** in the year 2010 from the State Government of TamilNadu and “**GREEN CAMPUS OF THE YEAR - 2013**” award from Dr. Rangasamy, Chief Minister of Pondicherry on April 4<sup>th</sup> for the measures taken on environmental activities.
- In addition the Institute received a certificate from India Book of Records for the National symposium on Zero paper event.

### **2.2: Vision:**

- ✓ To emerge as a Centre of Excellence and eminence by imparting futuristic technical education in keeping with global standards, making our students technologically competent and ethically strong so that they can readily contribute to the rapid advancement of society and mankind.

### **2.3: Mission:**

- ☞ To achieve Academic excellence through innovative teaching and learning practice.
- ☞ To enhance employability and entrepreneurship.
- ☞ To improve the research competence to address societal needs.
- ☞ To inculcate a culture that supports and reinforces ethical, professional behaviours for a harmonious and prosperous society.

#### 2.4: Major Activities in the Institution:



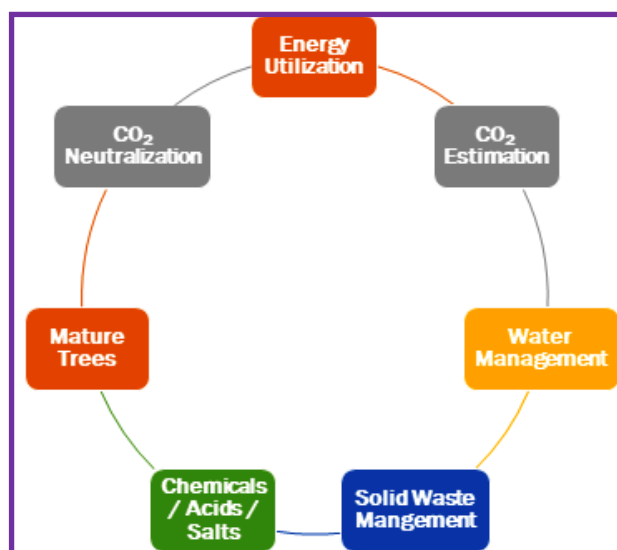
#### 2.5: Scope of the Audit Process:

- **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<sub>2</sub> due to green energy system and identification of possible implementation and enhancement of current greenery practices.

#### 2.6: 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.

#### 2.7: Coverage in Environment & Green Audit Process:



**2.8: List of Faculties assisted the Audit Process & Data Collection:**

<b>S. No.</b>	<b>Faculty Details</b>	<b>Contribution</b>
1.	<b>Dr. R. RAJESWARI,</b> Professor/EEE <b>Dr. M. C. REVATHI,</b> Assistant Professor / Civil Engineering.	Coordinator for the Audit Process
2.	<b>Prof. S. SOWKARTHIKA,</b> Assistant Professor, Department of EEE <b>Mr. P. KANNAN,</b> Maintenance Engineer, PWD-Electrical	Collection of Electrical Energy Parameters, Water, Fuel consumption details from College side
3.	<b>Mr. MURUGIAH,</b> Maintenance Engineer, Electrical Hostels	Collection of Electrical Energy Parameters, Water, Fuel consumption details from Hostel Side
4.	<b>Dr. SIVASHANKARI,</b> Professor, Department of Chemistry	Collection of Chemicals/Salts/Acids
5.	<b>Mr. KUMARESAN,</b> Store Keeper, Hostels	Collection of LPG Consumption Data
6.	<b>Mr. MURUGESAN,</b> Environment Engineer, Hostel	Collection of Chemicals/Salts/Acids used for STP Application



# **ENVIRONMENT & GREEN AUDIT REPORT**

## **3. EXECUTIVE SUMMARY**

## EXECUTIVE SUMMARY

### Environment & Green Audit Analysis:

- A detailed audit was conducted M/s. **GOVERNMENT COLLEGE OF TECHNOLOGY**, Thadagam Road, Coimbatore – 641 013, Tamilnadu, India.
- The following tables provide the balance sheet indicating various energy carriers associated with the regular activities and their CO<sub>2</sub> mapping.

S. No.	Annual Energy Consumption & CO <sub>2</sub> Emission			Annual CO <sub>2</sub> Neutralization		
	Description	Parameters	Emission (Tons)	Description	Parameters	Neutralized (Tons)
1.	Electricity	13,39,304 kWh	1,098.2	Solar PV	33,307 kWh	27.3
				Solar Thermal	29,000 kWh	23.8
2.	LPG	64,269 kg	192.8	Electricity (DG)	6,300 kWh	5.2
				Mature Tree	344 Nos	7.5
<b>Total Emission</b>			<b>1,291.0</b>	<b>Total-Neutralized</b>		<b>64.3</b>
<b>Balance CO<sub>2</sub> to be Neutralized = 1.226.7 Tons/Annum;</b> <b>Per capita Consumption = 0.40 Tons/Person*</b>						

### Note:

- All types of energy carriers (like **Electricity, LPG, Diesel, Solar PV & Solar Thermal**) used for regular applications are considered for this audit process.

**Audit Conducted & Verified by**



(Dr. S.R. SIVARASU)

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# **ENVIRONMENT & GREEN AUDIT REPORT**

## **4. STUDY ON ENERGY CONSUMPTION PATTERN**

**4.1: Assessment of Existing Electrical and Thermal Energy Systems:**

S. No.	Description	Details			
<b>Electrical Energy Usage</b>					
1.	Name of the customer	<b>GOVERNMENT COLLEGE OF TECHNOLOGY</b>			
2.	Communication Address	Thadagam Coimbatore – 641 013, Tamilnadu, India			
3.	Service Number Type of Supply & Tariff	SC No: 03-909-435-0078; HV/LV-Level :11 KV/433 V; HT II A 1			
4.	Tariff Structure: ➤ Old: Before July 2023 ➤ New: From July 2023	<b>Description</b>	<b>Old</b>	<b>New</b>	
		Unit Charge	Rs. 7.00/kWh	Rs. 7.15/kWh	
		Fixed Charge	<b>Rs. 550/kVA</b>	<b>Rs. 562 /kVA</b>	
5.	Energy Suppliers	Tamilnadu Generation & Distribution Corporation (TANGEDCO)			
6.	Generator Details	<b>380 kVA – Cummins - (Inbuilt fuel tank – 400 L)</b>			
7.	DG Operation	<b>Manual Operation</b>			
<b>Annual Electrical Energy Consumption, Electricity Consumption from DG &amp; Diesel Consumption</b>					
Electricity	<b>13,39,304 kWh</b>	Diesel for DG	<b>2,600 Litres</b>	Units Generated	<b>6,300 kWh</b>
<b>Energy Generation from Renewable Source (Roof Top Solar PV System)</b>					
Energy Generation		<b>33,307kWh</b>	<b>Installed in three different places</b>		
<b>Annual Energy Consumption of Thermal System</b>					
8.	Liquified Petroleum Gas (LPG)	Cooking	<b>64,269 kg</b>		
<b>General Loads (Both Electrical and Thermal)</b>					
9.	Lighting System	❖ <b>Indoor lighting:</b> The management is now committed to convert the <b>existing FTL into LED in a phased manner.</b>			
		❖ <b>Outdoor lighting:</b> All the street lightings are LED based energy efficient lamps ❖ Requested to <b>retrofit timer based ON-OFF</b> control in the existing street lighting system			
10.	Fan Loads (Ceiling)	❖ All the ceiling fans are conventional type only which consumes nearly <b>60-70 W/fan</b> at maximum position. ❖ The audit team requested to change the conventional fans into <b>BLDC based Electronically Commutated fans</b> in a phased manner.			

		❖ The average power consumption will be <b>35 W/fan</b> at maximum position ( <b>More than 50 % reduction</b> )
11.	Air Conditioning System	<ul style="list-style-type: none"> <li>Mostly <b>BEE star rated</b> ACs and the outdoor units are mostly placed in shaded area of the respective building</li> </ul>
12.	Motors and Pump loads	<ul style="list-style-type: none"> <li>Mainly used for water distribution, purification and waste water treatment</li> <li>Small motors are used in hotel kitchen equipment's &amp; in the canteen</li> </ul>
13.	Uninterrupted Power System (UPS)	<ul style="list-style-type: none"> <li>All the computers, server, surveillance, projectors, telephonic units are connected with UPS with nominal back up time of <b>2.5 hours</b>.</li> <li>Total capacity of the UPS is nearly <b>20 kVA</b>.</li> </ul>

**Table-1: Annual Energy Consumption and Energy Generation (2022-2023)**

S. No.	Month	Electricity Consumption (kWh)*	LPG Consumed (kg)	Diesel Consumed (L)	Solar Energy Generation (kWh)
				DG	
1.	Jun-22	1,32,502	5,648.94	300	2,881
2.	Jul-22	88,332	3,024.18	200	2,677
3.	Aug-22	1,01,421	3,442.62	300	3,046
4.	Sep-22	1,09,181	5,439.72	200	2,809
5.	Oct-22	92,999	4,678.92	200	2,670
6.	Nov-22	1,16,450	6,067.38	400	2,136
7.	Dec-22	1,17,837	6,828.18	200	2,346
8.	Jan-23	93,648	5,706.0	200	2,702
9.	Feb-23	1,08,915	6,523.86	200	2,797
10.	Mar-23	1,34,202	6,162.48	100	2,905
11.	Apr-23	12,3013	5,915.22	100	3,183
12.	May-23	1,20,804	4,831.08	200	3,155
<b>Total</b>		<b>13,39,304</b>	<b>64,269</b>	<b>2,600</b>	<b>33,307</b>
<ul style="list-style-type: none"> <li><b>The cost of the electricity is Rs. 8.94/kWh.</b></li> <li><b>The cost of the LPG is Rs. 94.64/kg</b></li> <li><b>The contribution from Green Energu is nearly 2.4 %</b></li> </ul>					

# **ENVIRONMENT & GREEN AUDIT REPORT**

## **PART-A: ENVIRONMENT AUDIT REPORT**

### **5. ESTIMATION OF CO<sub>2</sub> EMISSION & NEUTRALIZATION (ELECTRICITY, LPG, DIESEL, SOLAR PV, SOLAR THERMAL & MATURE TREES)**

### **5.1: Assessment of Annual Energy Usage:**

Table-2 shows the types of energy carriers used for their regular operation in the college campus along with application area and their source.

**Table-2: 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
3.	Liquified Petroleum Gas (LPG)	Used only for cooking	
4.	Mature Trees, Bushes & shrubs	The college has nearly <b>344 mature trees</b> of different varieties which are more than <b>20 years old</b> .	

### **5.2: Environmental System: CO<sub>2</sub> Balance Sheet:**

- CO<sub>2</sub> 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<sub>2</sub> mapping.

**Table-3: Environmental System: CO<sub>2</sub> Balance Sheet (2022-23)**

S. No.	Annual Energy Consumption & CO <sub>2</sub> Emission			Annual CO <sub>2</sub> Neutralization		
	Description	Parameters	Emission (Tons)	Description	Parameters	Neutralized (Tons)
3.	Electricity	13,39,304 kWh	1,098.2	Solar PV	33,307 kWh	27.3
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<b>Total Emission</b>			<b>1,291.0</b>	<b>Total-Neutralized</b>		<b>64.3</b>
<b>Balance CO<sub>2</sub> to be Neutralized = 1.226.7 Tons/Annum;</b> <b>Per capita Consumption = 0.40 Tons/Person*</b>						

(\*Note: No. of Students, Faculty & Staff for the year 2022-2023 is 3,079)

**5.3: Calculation Table:**

For Electricity = $\left[ \text{kWh} \times \frac{0.82 \text{ kg of CO}_2 \text{ emission}}{\text{kWh}} \right]$
For LPG = $\left[ \text{LPG Consumption (kg)} \times \frac{3.0 \text{ kg of CO}_2 \text{ emission}}{\text{kg of LPG Consumption}} \right]$
A mature tree is able to absorb nearly CO <sub>2</sub> at a rate of 21.8 kg/annum; $\frac{(21.8 \times 344)}{1,000} = 7.5 \frac{\text{Tons}}{\text{Annum}}$

**5.4: Recommendations:**

From the above discussion points; it is evident that activities taken forward to neutralize the CO<sub>2</sub> 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.
- It is a right time to install considerable amount of roof top solar PV plant and generate the electricity. This must reduce the utility supply and hence reduce the direct CO<sub>2</sub> reduction.
- **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.**
- Convert existing convention street lightings into solar based battery-operated lightings.
- Identify higher fuel consuming vehicle and either rework or replace it.
- Conduct training programmes for the transport staffs at regular interval and encourage them to maintain the vehicles at good condition throughout the year.

**5.5: References:**

<sup>1</sup> <https://ecoscore.be/en/info/ecoscore/co2>

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



**CO<sub>2</sub> Emission:**  
**1,291 Tons/Annum**



**Planned CO<sub>2</sub> Reduction**  
**64.3 Tons/Annum**



**CO<sub>2</sub> to be Neutralized**  
**1.226.7 Tons/Annum**



# **ENVIRONMENT & GREEN AUDIT REPORT**

## **PART-A: ENVIRONMENT AUDIT REPORT**

### **6. USAGE OF CHEMICALS, SALTS & ACIDS**

**(STORAGE, HANDLING & BEST OPERATING PRACTICES)**

### **6.1: Handling of Chemicals/Salts/Acids used in the Laboratories:**

The 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 prevent accidents
- 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

### **6.2: 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





**Concentrated  
Chemical  
Bottles**



**Safety  
Equipment's  
used in lab**

### **Storage of Chemicals/Salts/Acids Storage**

#### **6.3: 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)

#### **6.4: 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-4 shows the cleaning agents used to clean the above-mentioned area;

**Table-4: Cleaning Agents used for Floor and Vessel Cleaning**

<b>S. No.</b>	<b>Cleaning Agent</b>	<b>Application</b>
1.	Sabena Powder	Vessel Cleaning
2.	Bleaching Powder	Floor Cleaning



***6.5: 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)**

# **ENVIRONMENT & GREEN AUDIT REPORT**

## **PART- B: GREEN AUDIT REPORT**

### **7. WATER UTILIZATION, CONSERVATION & WATER MANAGEMENT**

**7.1: Source of Water, Storage and Distribution:**

Table-5 shows the source of water, location of storage along with their application.

**Table-5: Source of Water, Location of Storage and Application**

Type of Water	Source	Application
Fresh Water	Siruvani water	Drinking application
Bore Water	<b>Total No. of Bore - 02</b>	Gardening & Construction
	1. Krishnapary kolthari – 200 ft 2. Krishnapary kolthari – 200 ft	Utensil Cleaning, Bathing & Cloth Washing
Rain Water Harvesting System (RWHS)	Near Each Building	<ul style="list-style-type: none"> <li>➤ Used to increase the ground water</li> <li>➤ To store building run-off only</li> </ul>

**7.2: 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-6: Details of the Water Utilities, Storage, Motor Capacity and Approximate Run Hours**

S. No.	Location	Depth	Tank Capacity	Motor Capacity	Usage
1.	Bore 1 & Bore 2	200 ft	1,50,000 Litters	7.5 HP / 5.5 kW	Boys 1 to 7 Hostel – Top 5,000 – Litters * 42 No's (Syntax) 50,000 – Litters * 8 No's (RCC)
					Girls 1 to 4 Hostel – Top 5,000 – Litters * 24 No's (Syntax) 50,000 – Litters * 8 No's (RCC)
					To All Blocks (Syntax & RCC ) 5,000 – Litters * 51 No's (Syntax) 50,000 – Litters * 26 No's (RCC)
2.	Siruvani water		65,000 Litters	10 HP / 7.5 kW	Boys & Girls Hostel Filter With Water Doctor No. of. Water Doctor : <b>22 Nos</b>
					To All Blocks Filter With Water Doctor No. of. Water Doctor: <b>40 Nos</b>

**Note:**

- ☞ Over Head (OH) tanks are made using Syntax.
- ☞ The maintenance team ensure to clean the tank for six months once.
- ☞ Bleaching power is mostly used to clean the inside tank.

**7.3: 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.



**PVC and Metal Based Taping System for Water Distribution Line**

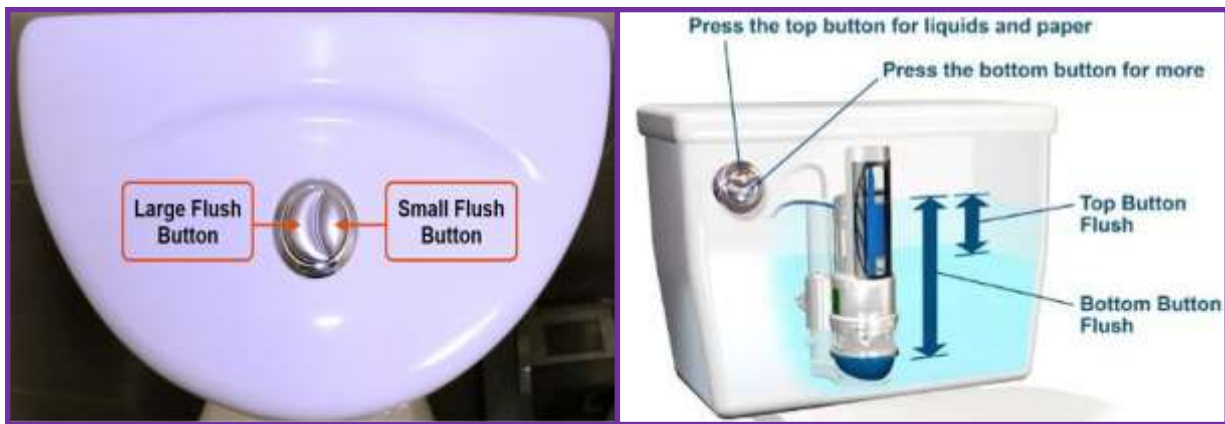
**7.4: Water Savings in Foreign Toilets:**

- The list of availability of Indian & Foreign style toilets are presented in the below Table-7.

• **Table-7: List of Indian & Foreign Style Toilets**

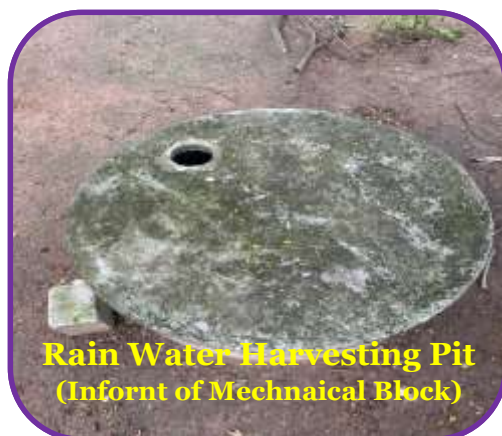
S. No.	Location	Description (Quantity)	
		Indian	Foreign
1.	All Blocks	89	16
2.	Boys Hostel	170	01
3.	Girls Hostel	108	30
<b>Total</b>		<b>367</b>	<b>47</b>

- 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.



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

- The audit team appreciates the effects taken by the management of **GOVERNMENT COLLEGE OF TECHNOLOGY** 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 the RWH pits which are located close to each pit
- The building run off are collected through each pit mostly located in each building. Common area and road run-off are properly collected and routed to nearby water body.





### **7.6: General Recommendations for Rain Water Harvesting:**

- RWH has been fitted with their specifications indicating their i) year of installation, ii) approximate average rainfall and duration in the RWH location and iii) filter cleaning schedule (if any).
- Conduct a GIS based study on the improvement of ground water table especially before the rainy session and after rainy session. Compare the data and ensure that the water table improves due to percolation of rain water.
- Similar study must be conducted (in future) before installing an RWH and after RWH.
- Increase the no. of RWH pits and may be developed to place at least 2 per building.



**Sample Name Board in front a Rain Water Harvesting System**

### **7.7: 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.

**7.8: 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**

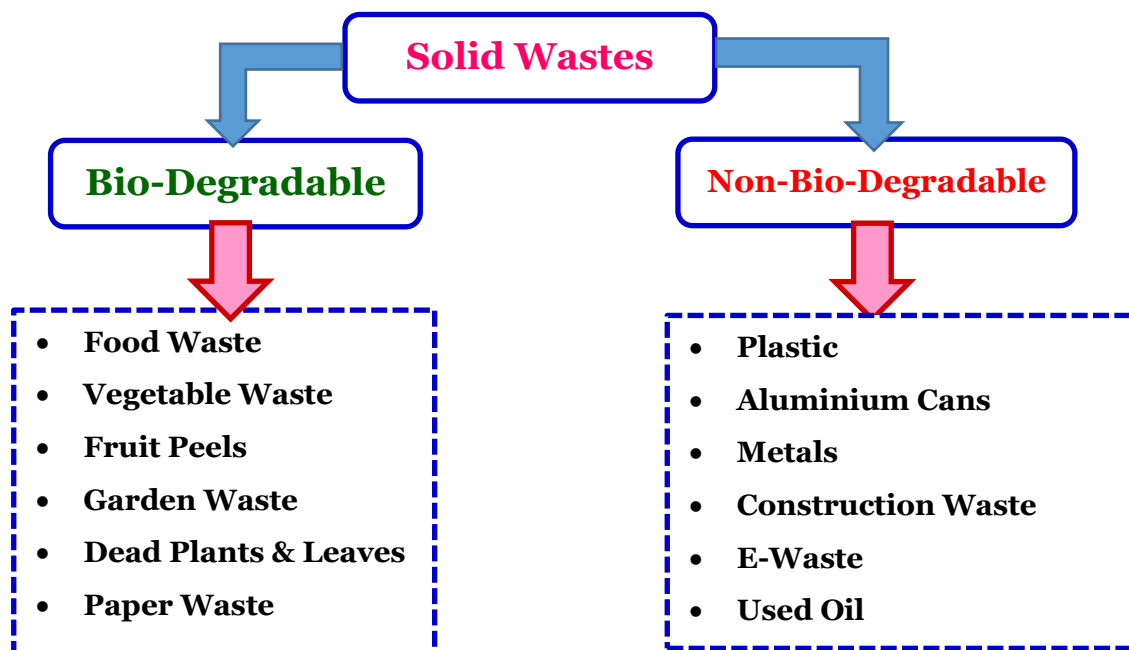
# **ENVIRONMENT & GREEN AUDIT REPORT**

## **PART – B: GREEN AUDIT REPORT**

### **8. WASTE HANDLING & MANAGEMENT**

**8.1: Solid Waste Management System:**

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



**8.2: Process of Waste Management:**

The college management practised some methods to treat the waste generated and Table-8 shows the process of treating the solid waste generated inside the college campus.

**Table-8: Process of Waste Management**

S. No.	Waste Type	Waste Treatment
<b>Bio-Degradable Waste Management</b>		
1.	Food and Vegetable Waste	<ul style="list-style-type: none"> <li>Collected and given to nearby farm</li> </ul>
2.	Garden Wastes and Plant Leaves	<ul style="list-style-type: none"> <li>Daily collected and dumped in a yard</li> </ul>
3.	Paper Waste	<ul style="list-style-type: none"> <li>Collected and stored in a separate place</li> </ul>
		<ul style="list-style-type: none"> <li>Sold to <b>TNPL</b> for recycling</li> </ul>
		<ul style="list-style-type: none"> <li>Daily paper waste stored in a yard</li> </ul>
<b>Non-Bio-Degradable Waste Management</b>		
4.	Plastics	<ul style="list-style-type: none"> <li>Banned in the college campus <b>(Welcome step).</b></li> <li>The chemical/salt storage containers are disposed to third party</li> </ul>
5.	Construction Waste	<ul style="list-style-type: none"> <li>Mostly used by their own construction and used for internal land filling</li> </ul>
6.	Metals	<ul style="list-style-type: none"> <li>Construction metals or metals from any other sources are stored &amp; sale to third party for recycling</li> </ul>

7.	Transport Oil + Tyres	<ul style="list-style-type: none"> <li>• Stored in a separate place and sold to third party</li> </ul>
8.	DG Engine oil & Coolant	<ul style="list-style-type: none"> <li>• Stored in a separate place and Mechanical department Workshop use Only</li> </ul>
9.	Vehicle & Computer Batteries	<ul style="list-style-type: none"> <li>• Procuring new batteries with buyback offer</li> <li>• (Old battery replacement)</li> </ul>
10.	Used edible oil	<ul style="list-style-type: none"> <li>• Almost zero waste. Mostly used for internal cooking and frying.</li> </ul>
11.	E-Waste Management	<ul style="list-style-type: none"> <li>• Used for sale to third party for recycling</li> </ul>

### **8.3: 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)

### **8.4: 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 signing 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)**

**8.5: E-Waste Management:**

- ⊕ With the proliferation of electronics also comes the challenge of their proper disposal. The institute has very efficient mechanism to dispose E wastes generated from various sources.
- ⊕ The major e-waste such as written-off instruments/equipment, old version computers, printers, electronic gadgets/circuits, kits have been written off on regular basis and condemned devices and materials from computer lab are sold to the e-waste management companies/buyers in Coimbatore.
- ⊕ All the miscellaneous e-waste such as CDs, batteries, fluorescent bulbs, PCBs, and electronic items are collected and delivered for safe disposal. Minor repairs are addressed by the lab technician with the support of staff members whereas the major issues are repaired by professionally trained personnel.



**E-Waste**



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27.9.2022

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TO

THE PRINCIPAL AND CHAIRMAN (AUTONOMOUS) –  
GOVERNMENT COLLEGE OF TECHNOLOGY  
COIMBATORE,  
TAMIL NADU 641 013

Dear Sir,

Please find the enclosed Original Cheque for the Local waste paper supply payment as per the details mentioned below

S. NO	SUPPLIER NAME	BANK NAME	CHEQUE NO	CHEQUE DATED	AMOUNT (Rs.)
1	THE PRINCIPAL AND CHAIRMAN (AUTONOMOUS) – GOVERNMENT COLLEGE OF TECHNOLOGY	SBI	111134	22.09.2022	1,11,345.00
<b>TOTAL</b>					<b>1,11,345.00</b>

Kindly acknowledge the receipt of above Original cheques.

Thanking You,

Yours faithfully,

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# **ENVIRONMENT & GREEN AUDIT REPORT**

## **PART - B: GREEN AUDIT REPORT**

### **9. ASSESSMENT ON MATURE TREES, & BIO-DIVERSITY**



### 9.1: Campus Greenery:

The college is completely covered with mature trees grown for more than 20 years. The total number of mature trees available in the college campus is **38 with many varieties of trees.**

**Table-9: List of Mature Trees available in the College Campus**

S. No.	Location	Name of the Tree	Quantity
1.0	Entire Campus Location	Variety of Mature Trees	<b>344 Nos</b>



Total No. of Mature Trees available in the college campus is **344** which contributes for reduction of **0.9 Tons of CO<sub>2</sub> emission/Annum**



**Campus Greenery Initiatives Taken by the College Management**

### 9.2: Green Energy Generation (Roof Top Solar PV System):

The college has installed solar PV plants with a capacity of **37 kW**, generate and feed power to the respective panel boards (with reverse power relay protection) and are utilized by the campus load. The details of the roof top solar PV system is represented in the Table-10.

**Table-10: Description of the Roof-Top Solar PV System**

Total Capacity (kWp)	37 KW
Location of SPV Plant & Panel Orientation	Rudra Block: <b>20 kW</b> Boy's Hostel: <b>8.5 kW</b> Girl's Hostel: <b>8.5 kW</b>
Number of DC & Inverter Earthing	1 No. Each
Average Units Generated per Day	4 to 5 Units /Day
Year of Installation	January 2022



Energy saving from Solar PV system is **33.307 kWh** (for the year 2022-23) which reduces **27.3 Tons of CO<sub>2</sub> Emission.**



**9.3: Hot Water Generation using Solar Thermal System:**

- In order to promote more green generation; the management has installed **Solar Thermal system** in the staff quarter’s roof top and generates hot waters for bathing application
- It is a good practice to use renewable energy based system for hot water generation by avoiding conventional heating methods (electricity or wood based)
- The specifications of the existing solar thermal hot water system is shown in Table-11.

**Table-11: Specifications of the Solar Thermal Hot Water System**

Total Capacity (LPD)	500 Litre x 4 Nos	500 Litre x 4 Nos
Make and Model	HM Mono Block	KONDAAS
Location	Boys hostel	Girls hostel
Panel Orientation	North - South face	North - South face
Source of Water	Siruvani	Siruvani
Application	Bathing only	Bathing only
Year of Installation	2018	2018
Total Capacity	<b>2,000 LPD</b>	<b>2,000 LPD</b>

**Energy Calculation:**

S. No	Description	Parameters
1.	Assuming 70 % of the total capacity is being utilized	$= (0.8 * 4,000)$ $= 3,200 \text{ Litres/Day}$
2.	Energy required to heat the water from ambient (25°C) to maximum of 60°C (Normal bathing temperature)	$= m \times C_p \times \Delta t$ $= 3,200 \times 1 \times (60-25)$

		= <b>1,12,000 kcal/Day</b>
3.	Considering a 10 % cumulative losses in the electric heating element + electrical network; then energy input to the heater is given by,	$= \frac{1,12,000}{0.9}$ = 1,24,444 <b>kcal/day</b>
4.	Electrical energy required to heat up the same quantity of water for the same condition is given by;	$= \frac{124,444}{860}$ = <b>145 kWh/Day</b>
5.	Considering nearly 200 working days in a Year; then electrical energy savings will be;	<b>29,000 kWh/Annum</b>



Energy saving from Solar Thermal system is **29,000 kWh** (for the year 2022-23) which reduces **23.8 Tons of CO<sub>2</sub> Emission**.

#### **9.4: Recommendations to Grow 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).
- Here are the list of the indoor plants acts as a natural air purifier one can try with indoor area to remove toxins and improve air quality.



**TULSI: Generates more oxygen**



**Aloe Vera:**

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



**Snake Plant:**

- Removes Xylene, Benzene, Formaldehyde, Trichloroethylene



**Spider Plant:**

- Removes CO and Formaldehyde
- Absorbs Nicotine



**Money Plant (Devil IVY):**

- Best air purifying plant
- Remove benzene & Formaldehyde



**Boston Fern:**

- High humidity application
- Remove xylene & Formaldehyde



**Chrysanthemum:**

- Removes Ammonia, Xylene, Benzene & Formaldehyde



**Kimberly Queen Fern:**

- Works well in carriage
- Absorb vehicular exhaust

### **9.5: Recommendations for 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.



### **9.6: One Student – One Tree:**

This is an Initiative of AICTE to increase the green coverage inside the campus and committed to reduce the Urban Heat Island Effect (UHIE), through NSS volunteers (or any other Green club); One Student: One Tree scheme. Through this scheme, college may plan to plant nearly 2,000 trees in future, make the entire campus with complete green cover and maintain a excellent bio-diversity.

### **9.7: 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.

**9.8: 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.

**9.9: Formation of Green Energy Team (GET):**

- It is essential and the right time to form an Energy Management Team comprising of the following members with their roles and responsibilities as shown in Table-12:

**Table-12: Roles of Responsibilities of Green Energy Team (GET)**

S. No	Members	Roles	Responsibilities
1.	Management Commitment	Overall Monitoring	<ul style="list-style-type: none"> <li>• Encourage members to carry out the activities</li> <li>• Propose possible think tank ideas to be implemented in the college campus</li> </ul>
2.	Head of the Institution	Team Head	<ul style="list-style-type: none"> <li>• Monitoring all energy related activities</li> <li>• Report to the Management</li> </ul>
3.	Heads of various Departments	Team Manager	<ul style="list-style-type: none"> <li>• Assessing the energy target</li> <li>• Monitoring the energy performance</li> <li>• Revising the target based on performance</li> <li>• Monitoring projects/activities/implementation</li> </ul>
4.	Faculty members from various department	Team Members	<ul style="list-style-type: none"> <li>• Identify the viable energy saving projects</li> <li>• Prepare the detailed work plan/time frame</li> <li>• Project guides for energy related projects</li> <li>• Pre and post project implement study</li> <li>• Rework if there is any deviation</li> </ul>
5.	Student volunteers	Energy Ambassadors	<ul style="list-style-type: none"> <li>• Responsible of identified areas</li> <li>• Floor in-charge for energy utilities</li> <li>• Development energy saving projects</li> <li>• Testing and Implementation</li> </ul>

# **ENVIRONMENT & GREEN AUDIT REPORT**

## **10. AUDIT SUMMARY & CONCLUSION**

### **I. 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
- To check the quantity of water utilized by each building by connecting digital water flow meter and optimize the water usage
- Prepare and maintain a Single Line Diagram (SLD) for water distribution network.
- Try to reduce water tapped from the ground water source since it is not environmentally friendly
- 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
- Retrofit aerator-based water taps for good water savings. For hand washing applications, all the pipes must be fitted with aerators
- 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 3<sup>rd</sup> 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

### **II. 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**



### **III. Way Forward towards Energy & Environmental Sustainability:**

- Prepare an exclusive **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 ASSOCHAM GEM rating)

## COMPLETION OF THE REPORT

This report is prepared as a part of the **Environment and Green Audit** process conducted at **M/s. GOVERNMENT COLLEGE OF TECHNOLOGY**, Thadagam, Coimbatore – 641 013, Tamilnadu, India. by **RAM-KALAM CENTRE FOR ENERGY CONSULTANCY AND TRAINING**, Coimbatore-641 062, Tamil Nadu, India.

# **ENVIRONMENT & GREEN AUDIT REPORT**

## **ANNEXURE: AUTHORISED CERTIFICATES OF THE AUDITOR**



# 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](mailto: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



Reg No.: EA-27299



Certificate No.: 9645/19

**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.

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

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

Controller of Examination



**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

08<sup>th</sup> - 12<sup>th</sup> 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





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



## 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

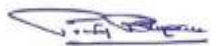
This is to certify that

**SIVARASU S R**

is a

**CII Certified Professional in Sustainable Waste Management**

  
**K S Venkatagiri**  
Executive Director  
CII - Godrej GBC

  
**Pradeep Bhargava**  
Chairman  
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# CERTIFICATE OF APPRECIATION



THIS CERTIFICATE IS AWARDED TO  
*Sivarasu Rathinavelu*

FOR SUCCESSFUL COMPLETION 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 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.

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DATE

  
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