A. R. ENGINEERING COLLEGE

(Approved by AICTE, New Delhi & Affiliated to Anna university, Chennai)
Vadakuchipalayam, Kappiyampuliyur post, Villupuram-605601, Tamil Nadu.

Authentication Certificate

Certified that the Institution conducts audits on environment and energy regularly and have institutional environment and energy initiatives as following.

1. Green audit / Environment audit
2. Energy audit.
3. Clean and green campus initiatives.
4. Beyond the campus environmental promotion activities.

List of Supporting Documents

- Audit Certificates (Green Audit, Environment Audit and Energy Audit)
- Audit Reports (Green Audit, Environment Audit and Energy Audit)
- Green Campus Report
- Social Engagement Report (Beyond Campus environmental Activities)

PRINCIPAL

Dr.R.PANNEERDHASS,M.E.,Ph.D.,
PRINCIPAL
A.R.ENGINEERING COLLEGE
VADAKUCHIPALAYAM,
KAPPIYAMPULIYUR POST,
VILLUPURAM-605 601.

The supporting documents for this metric are made available on HEI website

https://www.arenggc.com/img/naac/DVV/7.1.3.pdf

A.R.ENGINEERING COLLEGE
VILLUPURAM
605 601

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Vadakuchipalayam, Kappiyampuliyur post,Villupuram-605601,Tamilnadu.

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DVV	Provide Policy document on environment and energy usage, Provide Action taken reports and achievement report as clear and Green campus initiatives, Provide reports of the audits. Provide certificate from the external accredited auditing agency (preferably government, concern department of affiliating university) Provide Geo tagged photographs with caption and date. Provide any other supporting document for beyond the campus environmental promotions for the year 2022-23	83

RAM KALAM CENTRE FOR ENERGY CONSULTANCY & TRAINING
No.8, VPK Garden, Mylampatti, Coimbatore – 641 062
GSTIN: 33AAZFR8890A1ZN

GREEN AUDIT CERTIFICATE

RAM KALAM/AREC/GA/Nov/2019/03

(Audited and Accounted from June 2018 to May 2019)

This is to certify that, we have conducted a detailed ***GREEN AUDIT*** in **A. R. ENGINEERING COLLEGE,** Vadakuchipalayam, Kappiyampuliyur (P.O), Villupuram-605 601, Tamil Nadu, India on **04 November 2019.** The college is fully covered with **Lust greenery**, Non-Polluting **transportation** system, scientific approach in **waste management** and rich collection of Flora & Fauna.

Audit conducted and verified by

Dr. S.R. SIVARASU
BEE Certified Energy Auditor (EA-27299)
Lead Auditor – ISO 14001: EMS; IGBC AP, GRIHA CP
CII Certified Professional in SWM
ISO-14064: Implementor & Auditor - Carbon Footprint Management

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Audit conducted and verified by

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GREEN AUDIT CERTIFICATE

RAM KALAM/AREC/GA/Nov/2023/03

(Audited and Accounted from June 2022 to May 2023)

AUDIT SUMMARY

- ❖Float Sensor based Water Controller
- ❖Assessment of Mature trees, bushes & shrubs (nearly 250 No's)
- ❖Assessment of Rain Water Harvesting (RWH)
- ❖Pollution certificates for all transport vehicles
- ❖Study on effective Solid Waste Management (SWM) system
- ❖Maintaining excellent Bio-diversity & Ecology

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Audit conducted and verified by

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Audit conducted and verified by

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ENVIRONMENT AUDIT CERTIFICATE

RAM KALAM/AREC/ENA/Nov/2023/02

(Audited and Accounted from June 2022 to May 2023)

AUDIT SUMMARY

S. No.	Annual Energy Consumption & CO_2 Emission			Annual CO_2 Neutralization		
	Description	Energy Quantity	CO_2 Emission (Tons)	Description	Parameters	CO_2 Neutralized (Tons)
1.	Electricity	25,792 kWh	21.1	Electricity (DG)	2,060 kWh	1.7
2.	Wood	15 Tons	28.9			
3.	Diesel	9,584 Litres	7.9			
4.	LPG	2,584 kg	7.8	Mature Tree	250 Nos	5.5
Total Emission			65.7	Total-Neutralized		7.1
Balance CO_2 to be Neutralized = 58.6 Tons/Annum; Per capita Consumption = 0.17 Tons/Person						

(Note: No. of Students, Faculty & Staff for the year 2022-23 is 339)

A.R.ENGINEERING COLLEGE VILLUPURAM 605 601

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Audit conducted and verified by

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Audit conducted and verified by

S.R. Sivarasu

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ENERGY, ENVIRONMENT & GREEN AUDIT REPORT

AUDIT CONDUCTED FOR

A. R. ENGINEERING COLLEGE

VADAKUCHIPALAYAM, KAPPIYAMPULIYUR (P.O),
VILLUPURAM-605 601, TAMIL NADU, INDIA.

DATE OF AUDIT

02 November 2023

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

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

Dr.R.PANNEERDHASS,M.E.,Ph.D
PRINCIPAL
A.R.ENGINEERING COLLEGE
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ENERGY, ENVIRONMENT & GREEN AUDIT REPORT

1. ACKNOWLEDGEMENT

A.R.ENGINEERING COLLEGE VILLUPURAM 605 601

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KAPPIYAMPULIYUR POST,
VILLUPURAM-605 601.

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. A.R. ENGINEERING COLLEGE,** Vadakuchipalayam, Kappiyampuliyur (P.O), Villupuram-605 601, Tamilnadu, 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. A.R. ENGINEERING 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.

Management Team Members	
Thiru. G. MADHADEVAN	CHAIRMAN
Thiru. M. KUBERAN	VICE CHAIRMAN
Thiru. M. PRABU	SECRETARY
Thiru. M. KALAISELVI	MEMBER

Audit Team Members	
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**
Er. P. MALLIGARJUN	**Director (Technical)**
Er. R. MARIMUTHU	**Junior Engineer**

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ENERGY, ENVIRONMENT & GREEN AUDIT REPORT

2. INTRODUCTION

TO

ENERGY-ENVIRONMENT-GREEN

AUDIT PROCESS

A.R.ENGINEERING COLLEGE VILLUPURAM 605 601

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VILLUPURAM-605 601.

2.1: Preface about the Institution:

- **A.R. Engineering college** started in 2008, situated on the National Highways NH-45 in Vadakuchipalayam, Kappiyampuliyur (Post), Villupuram with the goal to stress the prime values like Integrity, Transparency, Accessibility, Equity, and Quality.
- The College is affiliated to Anna University, Chennai and Approved by AICTE, New Delhi. Currently, we offer Six undergraduate programme such as B.E., Civil Engineering, B.E., Computer Science and Engineering, B.E., Electrical and Electronics Engineering, B.E., Electronics and Communication Engineering, B.E., Mechanical Engineering and B.Tech., Artificial Intelligence and Data Science which comprises of well experienced teaching and non-teaching staff members.
- Our enthusiastic faculty members are always in date with the current development in the technologies and trends by attending national and international conferences, workshops and seminars. Our faculty motivates the students to take up NPTEL course, add-on courses in order to make them more competitive to the current scenario. The college has grown considerably under the dynamic leadership of its **Chairman Sri. G. Mahadevan, Vice Chairman Sri. M. Kuberan, Secretary Sri. M. Prabhu** and **Principal Dr. R. Panneerdhass** spear heading all academic and non-academic activities.
- The faculty also motivates our students to participate in technical events such as paper presentations, project presentations, quiz, design challenge, which makes our students endure a happy learning environment in our college.

2.2: Vision:

- ✓ To emerge as a ladder for rural students in creating and disseminating knowledge, and providing them a unique learning experience, and other areas of scholarship that will best serve the survival and betterment of mankind and 'lead-role' in grooming the younger generation socially responsible and professionally competent to face the challenges ahead.

2.3: Mission:

- ☞ To achieve higher level technological and professional excellence.
- ☞ To impart quality and holistic professional education.
- ☞ To train professionals to be entrepreneurs and employment generators.
- ☞ To enhance the capabilities of faculty through research and consultancy by providing greater facilities.

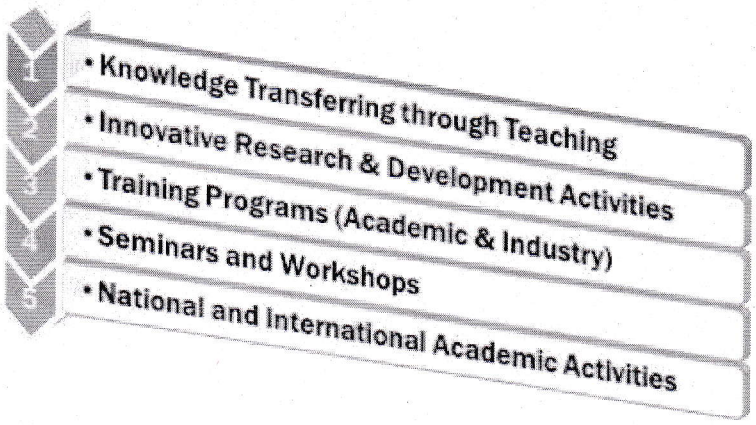
2.4: Quality Policy:

- ↗ A.R. Engineering College, Villupuram will endeavour to provide quality engineering education to meet the changing needs of society through continual improvement in educational process for the upliftment of rural students in and around Villupuram district.

A.R. ENGINEERING COLLEGE VILLUPURAM 605 601

Dr.R.PANNEERDHASS,M.E.,Ph.D.,
PRINCIPAL
A.R.ENGINEERING COLLEGE
VADAKUCHIPALAYAM,
KAPPIYAMPULIYUR POST,
VILLUPURAM-605 601.

2.5: Major Activities in the Institution:



2.6: 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.

2.7: 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

2.8: Audit Approach:

The audit team completed the assessment of energy consumption in the factory premises and operating hours of each machines (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.

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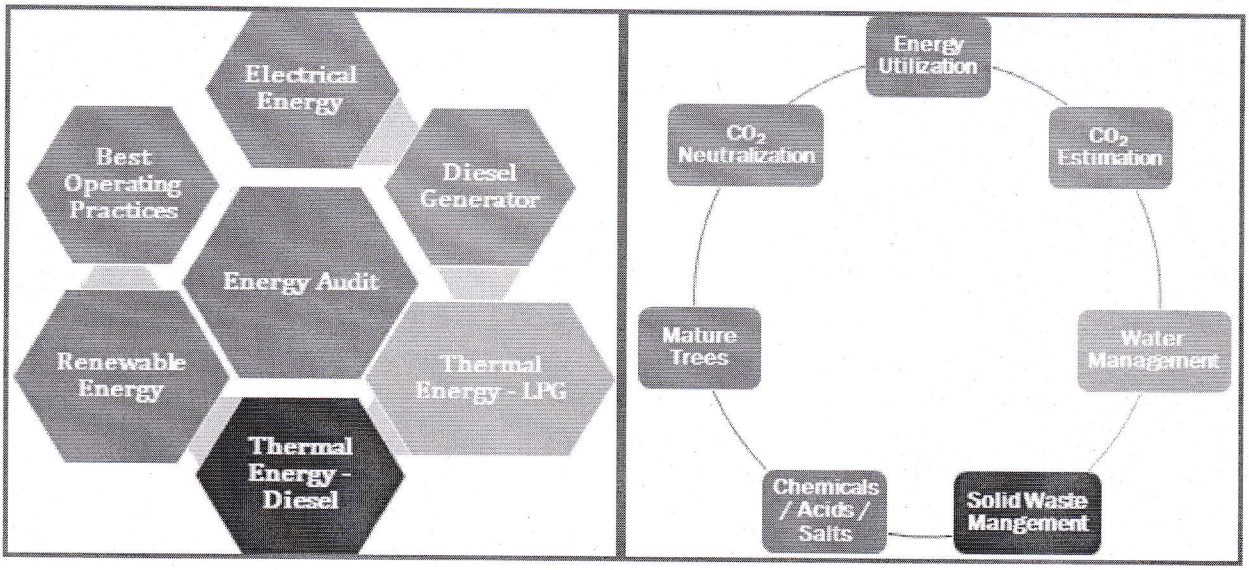
Dr.R.PANNEERDHASS,M.E.,Ph.D.,
PRINCIPAL
A.R.ENGINEERING COLLEGE
VADAKUCHIPALAYAM,
KAPPIYAMPULIYUR POST,
VILLUPURAM-605 601.

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



2.10: List of Faculties assisted the Audit Process & Data Collection:

S. No.	Faculty Details	Contribution
1.	**Mr. R. UDHAYAKUMAR**	Solar PV System
2.	**Mr. S. RAMAMOORTHY**	Transport vehicle, A/C loads
3.	**Mr. P. M. KUMARASAN**	Electrical Energy consumption
4.	**Mr. D. MANIKANDAN**	LPG / Fire wood, UPS
5.	**Mr. MUTHUKUMARAN**	Toilet flushing system
6.	**Mr. VINOTH**	Matured trees, shrubs, flowers

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PRINCIPAL
A.R.ENGINEERING COLLEGE
VADAKUCHIPALAYAM,
KAPPIYAMPULIYUR POST,
VILLUPURAM-605 601.

ENERGY, ENVIRONMENT & GREEN AUDIT REPORT

3. EXECUTIVE SUMMARY

A.R.ENGINEERING COLLEGE VILLUPURAM 605 601

Dr.R.PANNEERDHASS,M.E.,Ph.D.,
PRINCIPAL
A.R.ENGINEERING COLLEGE
VADAKUCHIPALAYAM,
KAPPIYAMPULIYUR POST,
VILLUPURAM-605 601.

EXECUTIVE SUMMARY

Energy Analysis:

→ A detailed audit was conducted **M/s. A.R. ENGINEERING COLLEGE,** Vadakuchipalayam, Kappiyampuliyur (P.O), Villupuram-605 601, Tamilnadu, India

→ The audit team has come out with ***05 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	25,792 kWh + 2,584 kg LPG	17,026 kWh + 2,454.8 kg LPG	8,766 kWh + 129.2 kg LPG
2.	Annual Financial Cost	Rs.8.6 Lakhs	Rs. 6.3 Lakhs	Rs. 2.6 Lakhs
3.	Initial Investment	Rs. 1.5 Lakhs		
4.	Payback Period	Nearly 0.6 Years (7.0 Months)		
5.	Overall Energy Reduction	34.0 % 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 & 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

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Dr.R.PANNEERDHASS,M.E.,Ph.D.,
PRINCIPAL
A.R.ENGINEERING COLLEGE
VADAKUCHIPALAYAM.
KAPPIYAMPULIYUR POST,
VILLUPURAM-605 601.

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 Sanctioned Demand from the 51 kW to 40 kW and reduce the Fixed cost	Savings on Fixed Cost	--	60,720	Zero Cost	Immediate
2.	Reduction of Cable Losses and Active Power Consumption using Capacitor Compensation	2 % on Electrical	516 kWh	10,991	9,000	0.8 Years
3.	Replacement of Fluorescent Lamps with Energy Efficient Lamps (Considering only **50 Nos of Lamps** in Phase-I Implementation swapping to LED Lamps)	50 % on Lighting	3,000 kWh	63.900	30,000	0.5 Years
4.	Replacement of Existing Convention Ceiling Fans into EC BLDC Fans (Considering only **50 Nos of fans** in Phase-I Implementation swapping to BLDC Fans)	50 % on Fans Load	5,250 kWh	1,11,825	1,05,000	0.9 Years
5.	Reduction of LPG Consumption using Burner Cleaning and Swapping of Active Burners.	5 % of LPG for Stoves	129.2 kg	14,987	5,000	0.3 Years
Total	**8,766 kWh + 129.2 kg LPG**			**2,62,423**	**1,49,000**	--

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
- ⊕ Convert the existing conventional lightings and fans into energy efficient lights and fans
- ⊕ Earth pits must be visible for easy access, should be done regular maintenance and measure their values annually
- ⊕ Similar to Fan, now BLDC based ACs are made available in the market; which consumes less amount of energy (Power) during its starting and running condition.
- ⊕ It is essential and the right time to form an **Energy Management Team**

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Dr.R.PANNEERDHASS,M.E.,Ph.D.,
PRINCIPAL
A.R.ENGINEERING COLLEGE
VADAKUCHIPALAYAM,
KAPPIYAMPULIYUR POST,
VILLUPURAM-605 601.

ENERGY, ENVIRONMENT & GREEN AUDIT REPORT

PART-A: ENERGY AUDIT REPORT

4. STUDY ON ENERGY CONSUMPTION PATTERN

A.R.ENGINEERING COLLEGE VILLUPURAM 605 601

Dr.R.PANNEERDHASS,M.E.,Ph.D
PRINCIPAL
A.R.ENGINEERING COLLEGE
VADAKUCHIPALAYAM
KAPPIYAMPULIYUR PO
VILLUPURAM-605 601

4.1: Assessment of Existing Electrical and Thermal Energy Systems:

<table>
<tr><th>S. No.</th><th>Description</th><th colspan="3">Details</th></tr>
<tr><td colspan="5">Electrical Energy Usage</td></tr>
<tr><td>1.</td><td>Name of the customer</td><td colspan="3">A.R. ENGINEERING COLLEGE</td></tr>
<tr><td>2.</td><td>Communication Address</td><td colspan="3">Vadakuchipalayam, Kappiyampuliyur (P.O), Villupuram-605 601, Tamilnadu, India</td></tr>
<tr><td>3.</td><td>Service Number Type of Supply & Tariff</td><td colspan="3">SC No 02-417-006-497; Low Tension; Tariff-LM2B2</td></tr>
<tr><td rowspan="3">4.</td><td rowspan="3">Tariff Structure:
↗ Old: Before July 2023
↗ New: From July 2023</td><td>Description</td><td>Old</td><td>New *</td></tr>
<tr><td>Unit Charge</td><td>Rs. 8.50/kWh</td><td>Rs. 8.70/kWh</td></tr>
<tr><td>Fixed Charge</td><td>Rs. 325 /kW</td><td>Rs. 664/kW</td></tr>
<tr><td>5.</td><td>Energy Suppliers</td><td colspan="3">Tamilnadu Generation & Distribution Corporation (TANGEDCO)</td></tr>
<tr><td>6.</td><td>Generator Details</td><td colspan="3">63 kVA (Inbuilt fuel tank – 150 L)</td></tr>
<tr><td>7.</td><td>DG Operation</td><td colspan="3">63 kVA Manual Operation</td></tr>
<tr><td colspan="5">Annual Electrical Energy Consumption, Electricity Consumption from DG & Diesel Consumption</td></tr>
<tr><td colspan="5">Electricity 25,792 kWh | Diesel for DG 644 Litres | Units Generated 2,060 kWh</td></tr>
<tr><td colspan="5">Thermal Energy Used</td></tr>
<tr><td rowspan="2">8.</td><td colspan="2">Liquified Petroleum Gas (LPG)</td><td colspan="2">Cooking</td></tr>
<tr><td colspan="2">Diesel (Ordinary)</td><td colspan="2">Transport+ DG</td></tr>
<tr><td colspan="5">Annual Energy Consumption of Thermal System</td></tr>
<tr><td colspan="2">LPG</td><td>2,584 kg</td><td>Diesel (Transport)</td><td>9,584 Litres</td></tr>
<tr><td colspan="5">General Loads (Both Electrical and Thermal)</td></tr>
<tr><td rowspan="2">9.</td><td rowspan="2">Lighting System</td><td colspan="3">❖ Indoor lighting: The management is now committed to convert the existing FTL into LED in a phased manner</td></tr>
<tr><td colspan="3">❖ 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>
<tr><td>10.</td><td>Fan Loads (Ceiling)</td><td colspan="3">❖ 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)</td></tr>
</table>

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Dr.R.PANNEERDHASS, M.E., Ph.D.,
PRINCIPAL
A.R.ENGINEERING COLLEGE
VADAKUCHIPALAYAM,
KAPPIYAMPULIYUR POST,
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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 • Small motors are used in hotel kitchen equipment's & in the canteen
13.	Uninterrupted Power System (UPS)	• All the computers, server, surveillance, projectors, telephonic units are connected with UPS with nominal back up time of **1.5 hours (old) & 2.5 hours (New)** • Total capacity of the UPS is nearly **130 kVA.**

Table-2: Annual Energy Consumption (2022-23)

S. No.	Month	Electricity Consumption (kWh)*	Fuel Consumption		Diesel Consumed (L)		
			LPG (kg)	Wood (Tons)	DG	Transport	Total
1.	Jun-22	2,528	228	1.5	35	780	815
2.	Jul-22	1,284	209	1.4	40	810	850
3.	Aug-22	1,440	228	1.2	39	750	789
4.	Sep-22	2,500	228	1.3	44	840	884
5.	Oct-22	1,640	228	1.3	71	780	851
6.	Nov-22	2,012	190	1.4	50	750	800
7.	Dec-22	1,452	171	0.8	41	630	671
8.	Jan-23	1,252	190	0.9	51	540	591
9.	Feb-23	2,580	228	1.4	51	780	831
10.	Mar-23	3,232	228	1.4	56	750	806
11.	Apr-23	2,388	228	2	86	750	836
12.	May-23	3,484	228	1	78	780	858
Total		25,792	2,584	15.3	644	8,940	9,584

- It is the cumulative energy consumption of all four LT services
- The cost of the electricity is Rs. 21.0/kWh.
- The cost of the LPG is Rs. 115.79/kg
- The cost of the Wood is Rs.3,500/Ton

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Dr.R.PANNEERDHASS,M.E.,Ph.D.
PRINCIPAL
A.R.ENGINEERING COLLEGE
VADAKUCHIPALAYAM,
KAPPIYAMPULIYUR POST,
VILLUPURAM-605 601.

ENERGY, ENVIRONMENT & GREEN AUDIT REPORT

PART-B: ENVIRONMENT AUDIT REPORT

5. ESTIMATION

OF

CO_2 EMISSION & NEUTRALIZATION

(ELECTRICITY, LPG, DIESEL & MATURE TREES)

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Dr.R.PANNEERDHASS,M.E.,Ph.D.,
PRINCIPAL
A.R.ENGINEERING COLLEGE
VADAKUCHIPALAYAM.
KAPPIYAMPULIYUR POST,
VILLUPURAM-605 601.

5.1: 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 (LT 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 **250 mature trees** of different varieties which are more than 2**0 years old.**	

5.2: 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 (2022-23)

S. No.	Annual Energy Consumption & CO_2 Emission			Annual CO_2 Neutralization		
	Description	Energy Quantity	CO_2 Emission (Tons)	Description	Parameters	CO_2 Neutralized (Tons)
1.	Electricity	25,792 kWh	21.1	Electricity (DG)	2,060 kWh	1.7
2.	Wood	15 Tons	28.9			
3.	Diesel	9,584 Litres	7.9			
4.	LPG	2,584 kg	7.8	Mature Tree	250 Nos	5.5
Total Emission			65.7	Total-Neutralized		7.1
Balance CO_2 to be Neutralized = 58.6 Tons/Annum; Per capita Consumption = 0.17 Tons/Person						

(Note: No. of Students, Faculty & Staff for the year 2022-23 is 339)

5.3: Calculation Table:

For Electricity = $\left[\text{kWh} \times \frac{0.82 \text{ kg of CO2 emission}}{\text{kWh}}\right]$
For Diesel = $\left[\text{Diesel Consumption (Litre)} \times \frac{2.64 \text{ kg of CO2 emission}}{\text{Litre of Fuel Consumption}}\right]$
For LPG = $\left[\text{LPG Consumption (kg)} \times \frac{3.0 \text{ kg of CO2 emission}}{\text{kg of LPG Consumption}}\right]$
For Wood = [Wood Consumption (kg) x 1.9 kg of CO2 Consumption]

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Dr.R.PANNEERDHASS,M.E.,Ph.D.,
PRINCIPAL
A.R.ENGINEERING COLLEGE
VADAKUCHIPALAYAM,
KAPPIYAMPULIYUR P ST,
VILLUPURAM-605 601.

A mature tree is able to absorb nearly CO_2 at a rate of 21.8 kg/annum; $\frac{(21.8 \times 250)}{1,000} = 5.5 \frac{\text{Tons}}{\text{Annum}}$

5.4: Recommendations:

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

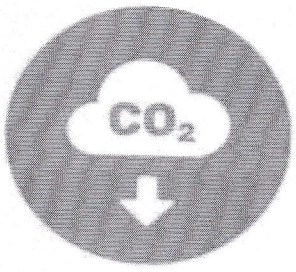
- Increase the foot print of trees planted inside the college campus.
- Encourage the students to plant more trees and account them all.
- It is a right time to install considerable amount of roof top solar PV plant and generate the electricity. This must reduce the utility supply and hence reduce the direct CO_2 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:

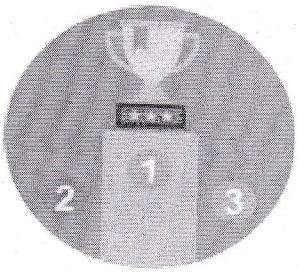
[1]https://ecoscore.be/en/info/ecoscore/co2

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

CO_2 Emission:
65.7 Tons/Annum



Planned CO_2 Reduction
7.1 Tons/Annum



CO_2 to be Neutralized
58.6 Tons/Annum

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605 601

Dr.R.PANNEERDHASS,M.E.,Ph.D.,
PRINCIPAL
A.R.ENGINEERING COLLEGE
VADAKUCHIPALAYAM,
KAPPIYAMPULIYUR POST,
VILLUPURAM-605 601.

ENERGY, ENVIRONMENT & GREEN AUDIT REPORT

PART-B: ENVIRONMENT AUDIT REPORT

6. TRANSPORT & REFRIGERANT GASES IN AC SYSTEM

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Dr.R.PANNEERDHASS,M.E.,Ph.D.,
PRINCIPAL
A.R.ENGINEERING COLLEGE
VADAKUCHIPALAYAM,
KAPPIYAMPULIYUR POST,
VILLUPURAM-605 601.

6.1: 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.	Bus	Diesel	3	Yes
Total No. of Vehicles			**3**	Yes

6.2: 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. In order to commute the students and staff; the management is operating vehicle services from various places to the college.
- 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, no. of passengers 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. These vehicles are fitted with Bharat Standard (BS)-IV type engines. However, the management has a commitment to convert the vehicles to BS-VI; once the life time of the vehicles are ended.
- The college administration is also providing skill development training to the bus operator through renowned experts and improve their productivity. Further the management is also conducting regular medical camps for all the bus operator through which i) complete body check-up, ii) blood pressure, iii) blood sugar level, iv) vision check-up and v) other general medical examination are carried out.
- **High Speed Diesel (HSD)** is used as fuel for all the vehicles; which emits less CO_2 in the atmosphere than compared to conventional fuel. Further; the fuel is procured from a single consumer and hence it maintains the quality and provides good engine life.

A.R. ENGINEERING COLLEGE VILLUPURAM 605 601

Dr.R.PANNEERDHASS,M.E.,Ph.D.,
PRINCIPAL
A.R.ENGINEERING COLLEGE
VADAKUCHIPALAYAM,
KAPPIYAMPULIYUR POST,
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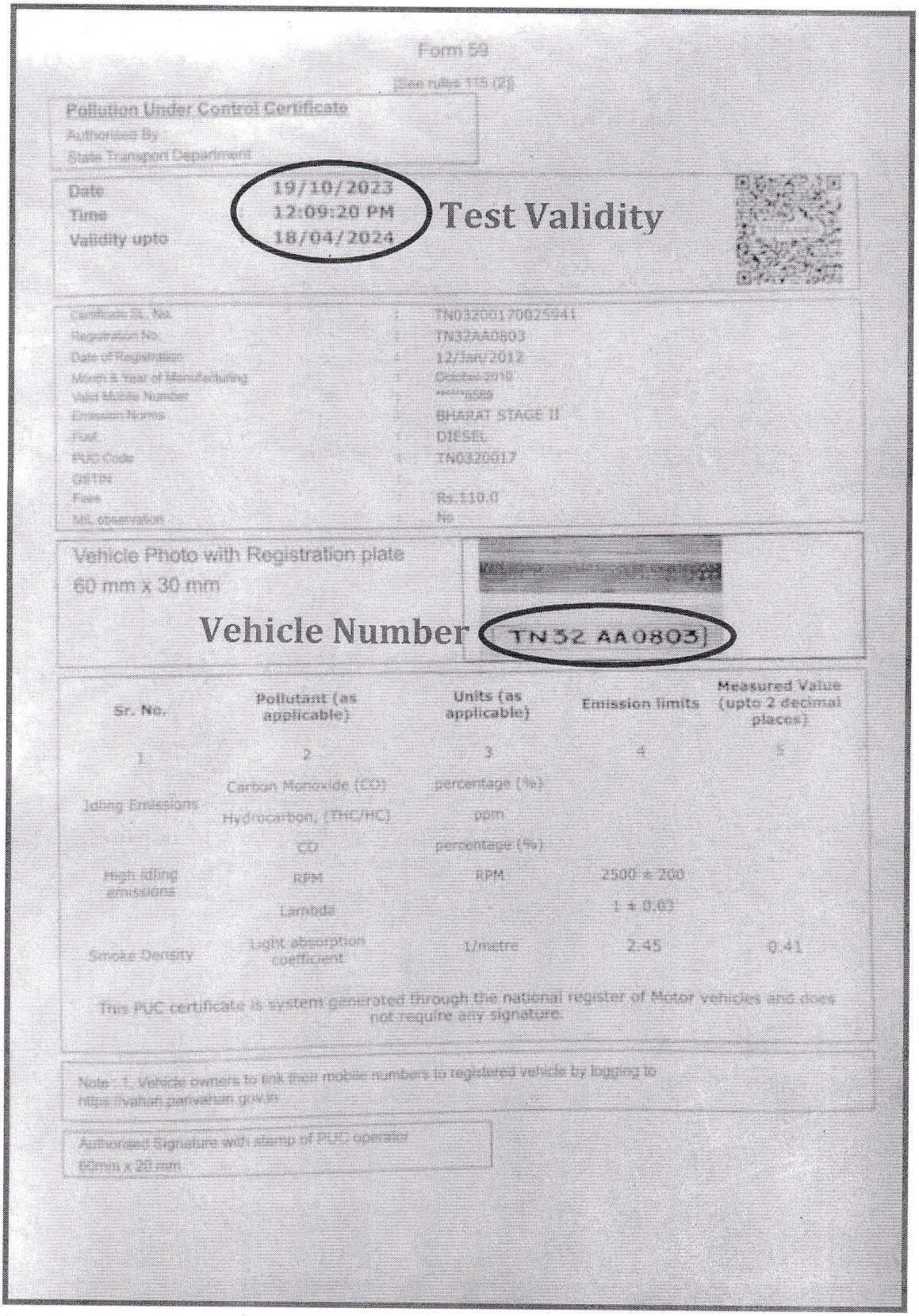

Form 59

[See rules 115 (2)]

Pollution Under Control Certificate

Authorised By :

State Transport Department

Date 19/10/2023

Time 12:09:20 PM

Validity upto 18/04/2024

Test Validity

Certificate No. No.	:	TN0320017002259841
Registration No.	:	TN32AA0803
Date of Registration	:	12/Jan/2012
Month & Year of Manufacturing	:	October 2010
Valid Mobile Number	:	[illegible]
Emission Norms	:	BHARAT STAGE II
Fuel	:	DIESEL
PUC Code	:	TN0320017
GSTIN	:	
Fees	:	Rs.110.0
ML observation	:	No

Vehicle Photo with Registration plate

60 mm x 30 mm

[redacted]

Vehicle Number TN32 AA0803

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		
	CO	percentage (%)		
High idling emissions	RPM	RPM	2500 ± 200	
	Lambda	-	1 ± 0.03	
Smoke Density	Light absorption coefficient	1/metre	2.45	0.41

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://vahan.parivahan.gov.in

Authorised Signature with stamp of PUC operator

60mm x 20 mm

Sample Pollution Certificate for a Transport Vehicle

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Dr.R.PANNEERDHASS, M.E., Ph.D.,
PRINCIPAL
A.R.ENGINEERING COLLEGE
VADAKUCHIPALAYAM,
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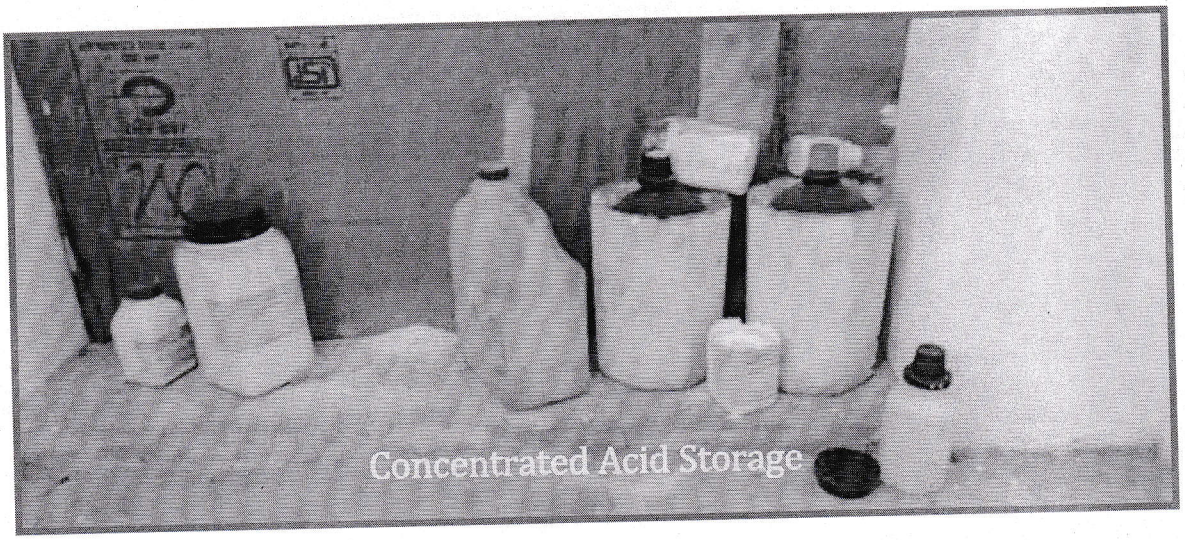

Storage of Chemicals/Salts/Acids Storage

7.3: 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

7.4: 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.	Vessel Cleaning Soap	Vessel Cleaning
2.	Soap Oil & Bleaching Powder	Floor Cleaning

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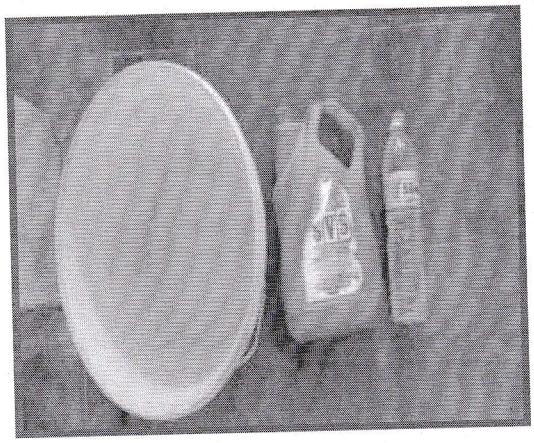
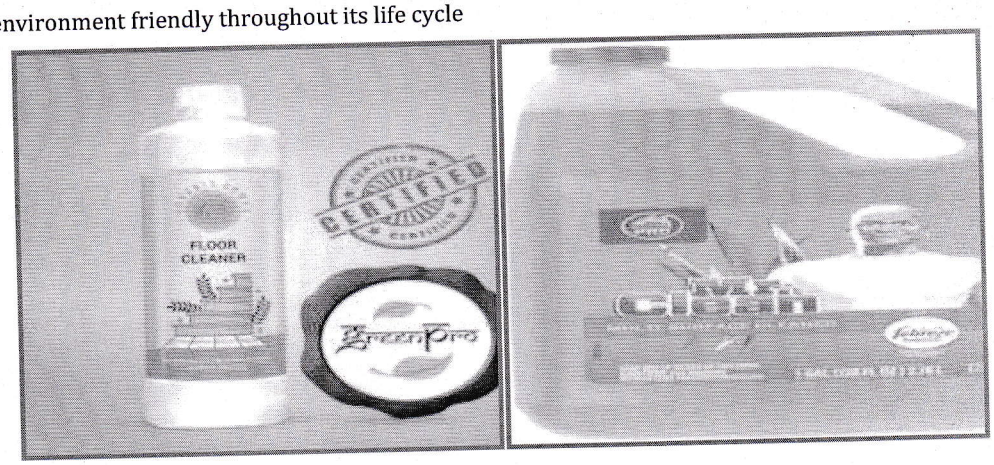
PRINCIPAL
A.R.ENGINEERING COLLEGE
VADAKUCHIPALAYAM,
KAPPIYAMPULIYUR POST,
VILLUPURAM-605 601.



Cleaning & Refreshing Agents used for Vessel & Floor Cleaning

7.5: 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)

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PRINCIPAL
A.R.ENGINEERING COLLEGE
VADAKUCHIPALAYAM,
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PART- C: GREEN AUDIT REPORT

8. WATER UTILIZATION, CONSERVATION & WATER MANAGEMENT

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Dr.R.PANNEERDHASS,M.E.,Ph.D.
PRINCIPAL
A.R.ENGINEERING COLLEGE
VADAKUCHIPALAYAM,
KAPPIYAMPULIYUR POST,
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8.1: 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
Fresh Water	Product RO Plant	Drinking application
Bore Water	**Total No. of Bore-2** **1 No (252 ft depth each)** **1 No (265 ft depth)** VVIS school front side: **1 No.** AR block 2 south side: **1 No.**	Utensil Cleaning, Bathing, Cloth Washing & RO Plant
Rain Water Harvesting System (RWHS)	4 Nos Size of the pit: **Length**: 3 feet (0.91m) **Breath**: 3 feet (0.91m) **Depth**: 10 feet (3.05m)	↗ Used to increase the ground water ↗ To store building run-off only

8.2: 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 - I	Motor Capacity	Storage - II
1.	VVIS School Front Side (Or) AR Block 2 South Side	252 ft Bore 1 or 265 ft Bore 2	5.5 kW Or 7.5 kW	OH Tank AREC 60,000 L	0.5 Hp	Block 2 1000 L x 1 No (Sintex)
						Block 2 750 L x 1 No. (Sintex)
					-	Block 4 (R.O Plant) 500 L x 1 No. (3 Layer Sintex)
					1 Hp	Boys Hostel 3000 L x 1. No. (Cement Tank)

Note:

- Over Head (OH) tanks are made using cement construction & Sintex.
- The maintenance team ensure to clean the tank for every month.
- Bleaching power is mostly used to clean the inside tank.

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PRINCIPAL
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VADAKUCHIPALAYAM,
KAPPIYAMPULIYUR POST,
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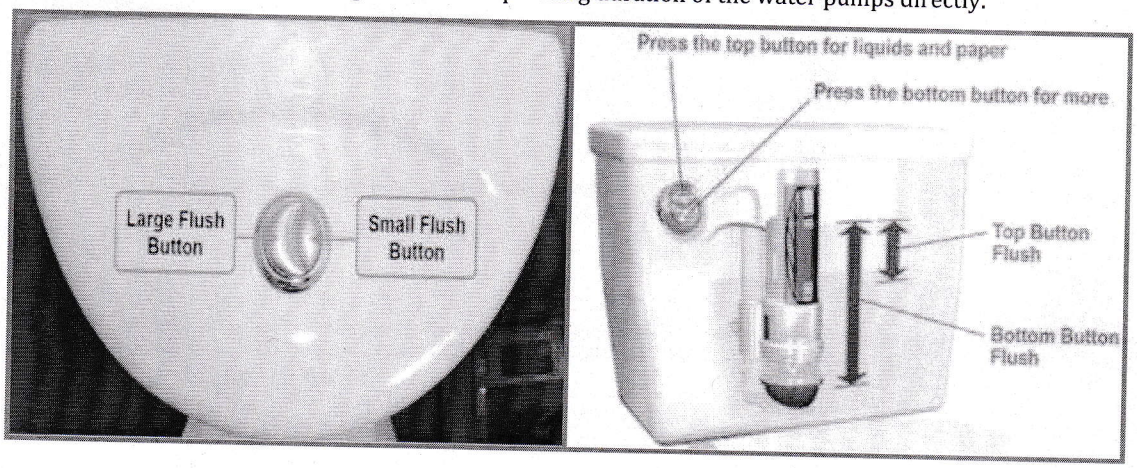
8.4: Water Savings in Foreign Toilets:

- 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	Description (Quantity)	
		Indian	Foreign
1.	Block-1 (GF)	02	02
2.	Block–1 (FF)	01	-
3.	Block–1 (SF)	01	-
4.	Block-2 (GF)	02	01
5.	Block-2 (FF)	02	01
6.	Block-2 (SF)	02	-
7.	Block-3 (GF)	01	-
8.	Hostel Block (FF)	03	-
9.	Hostel Block (SF)	04	-
10.	GMK Arangam	-	02
11.	Block-4 (GF)	-	-
12.	Block-4 (FF)	-	-
Total		**18**	**06**

- 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.



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

- The audit team appreciates the effects taken by the management of **A.R. ENGINEERING 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 the RWH pits which are located close to each pit

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Dr.R.PANNEERDHASS, M.E. Ph.D.,
PRINCIPAL
A.R.ENGINEERING COLLEGE
VADAKUCHIPALAYAM,
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- 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.

Existing Rain Water Harvesting (RWH) available in the College Campus

8.6: 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 mast 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.

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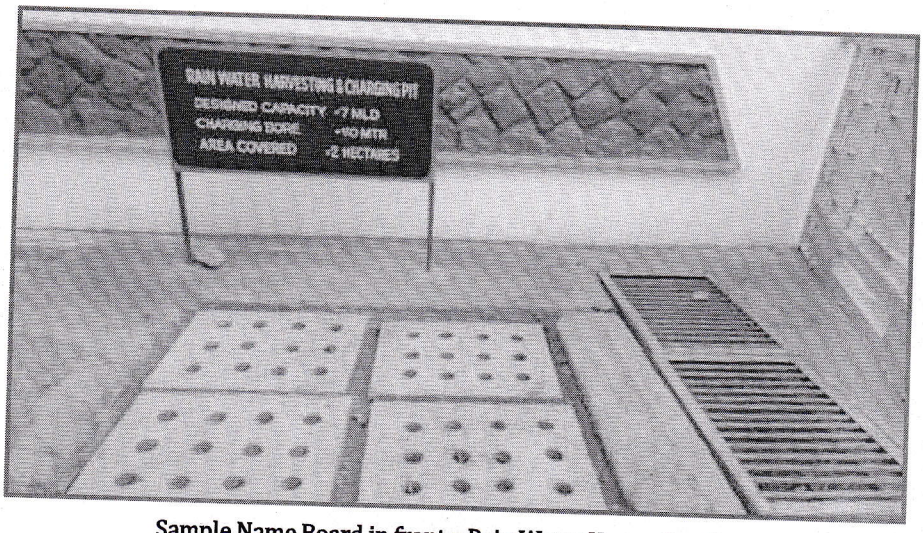
Dr.R.PANNEERDHASS, M.E., Ph.D.,
PRINCIPAL
A.R.ENGINEERING COLLEGE
VADAKUCHIPALAYAM,
KAPPIYAMPULIYUR POST,
VILLUPURAM-605 601.

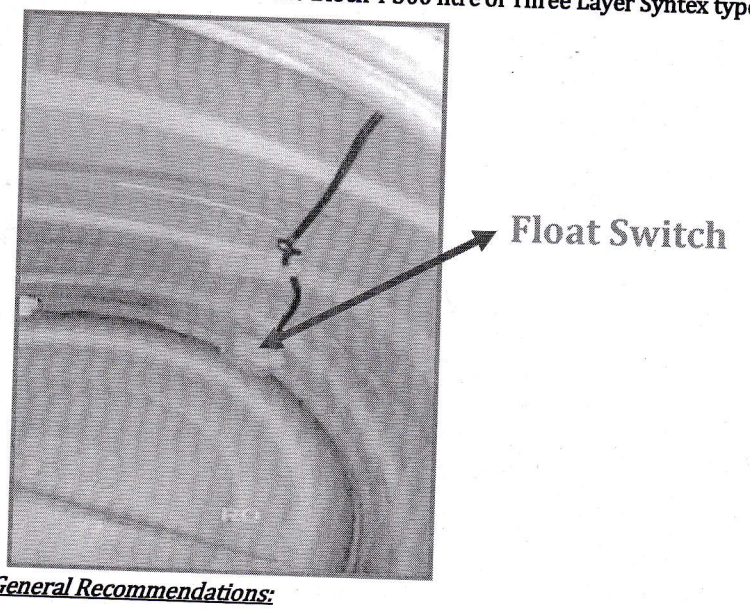


Sample Name Board in front a Rain Water Harvesting System

8.7: Sensor Based Water Control System:

→ The water level sensor is a device that measures the liquid level in a fixed container that is too high or too low. According to the method of measuring the liquid level, it can be divided into two types: contact type and non-contact type.

→ Since the MPNMJ has implemented **Float Switch based water level controller** implemented in the Over Head tank located in the **Block 4 500 litre of Three Layer Syntex type tank.**



8.8: 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;

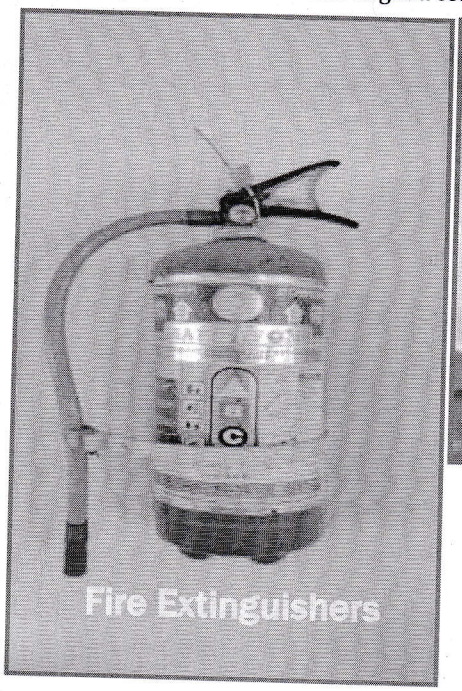
- ✓ Lower Water Bills & Improved Water Pressure
- ✓ Increased Filtration & Minimized Splashing

- 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.

8.9: 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

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Dr.R.PANNEERDHASS,M.E.,Ph.D.,
PRINCIPAL
A.R.ENGINEERING COLLEGE
VADAKUCHIPALAYAM,
KAPPIYAMPULIYUR POST,
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ENERGY, ENVIRONMENT & GREEN AUDIT REPORT

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9. WASTE HANDLING

&

MANAGEMENT

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Dr.R.PANNEERDHASS,M.E.,Ph.D.,
PRINCIPAL
A.R.ENGINEERING COLLEGE
VADAKUCHIPALAYAM
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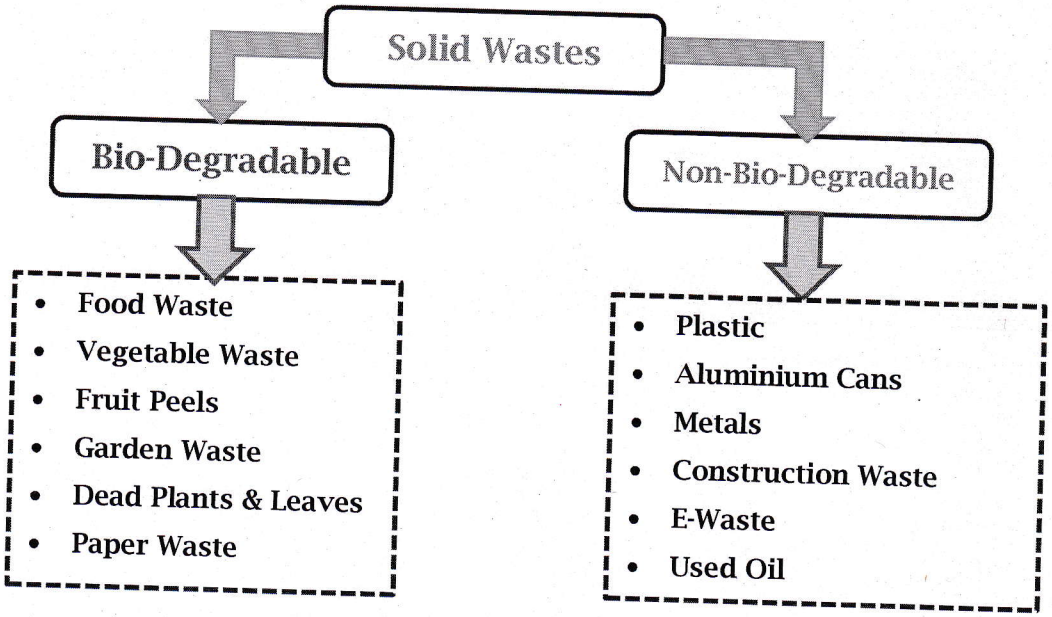
9.1: Solid Waste Management System:

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



9.2: 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 fam
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.	Construction Waste	• Mostly used by their own construction and used for internal land filling
6.	Metals	• Construction metals or metals from any other sources are stored & sale to third party for recycling
7.	Transport Oil + Tyres	• Stored in a separate place and sold to third party

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

9.3: 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)

9.4: 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)

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Dr.R.PANNEERDHASS,M.E.,Ph.D.
PRINCIPAL
A.R.ENGINEERING COLLEGE
VADAKUCHIPALAYAM,
KAPPIYAMPULIYUR POST,
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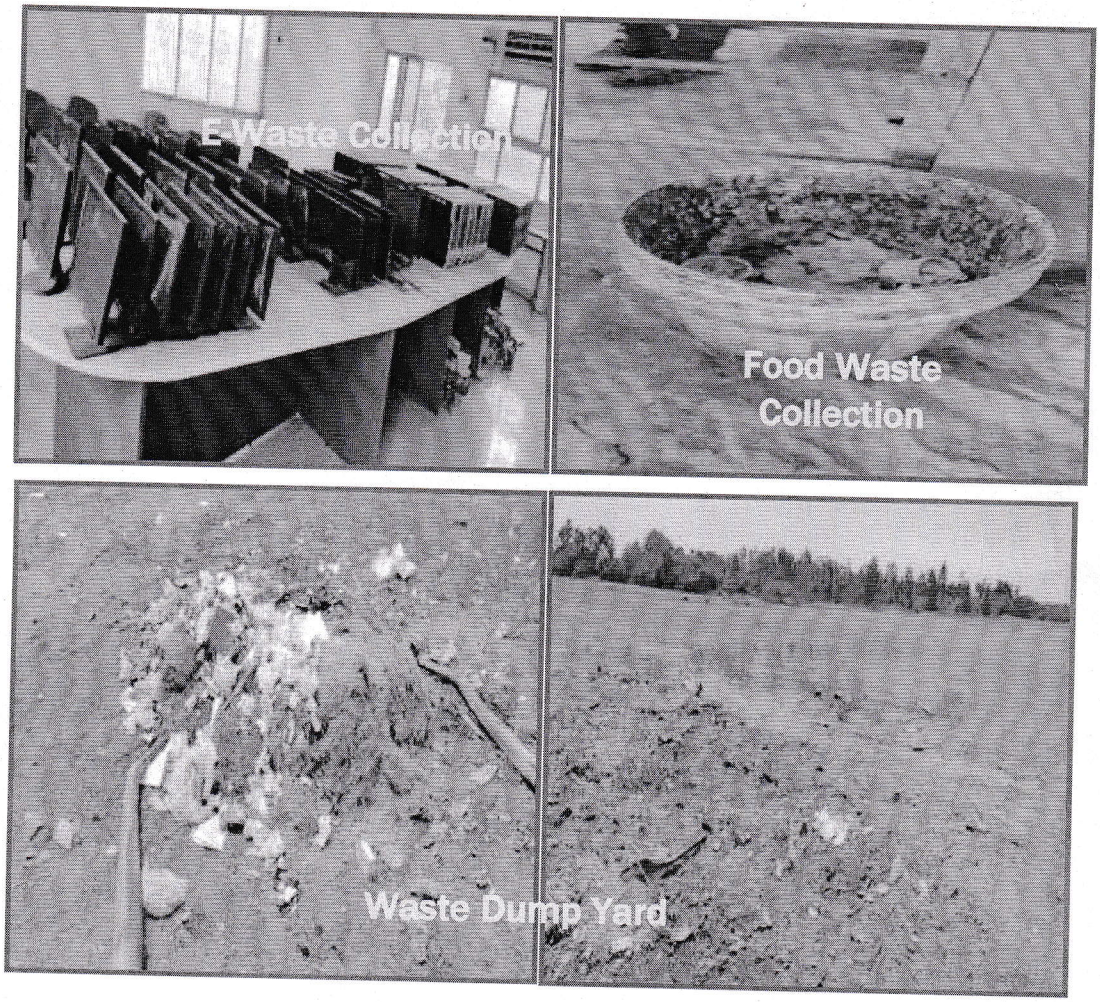

Solid Waste Management (Collection, Segregation, Storage & Safe Disposal)

9.5: 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.

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Dr.R.PANNEERDHASS,M.E.,Ph.D.,
PRINCIPAL
A.R.ENGINEERING COLLEGE
VADAKUCHIPALAYAM,
KAPPIYAMPULIYUR POST,
VILLUPURAM-605 601.

SAKTHI ENTERPRISES

No 3/196,GST Road(Petrol Bunk Opp),
Mundiyampakkam Post,
VillupuramDist,
Tin No 33320416519
Mobile: [illegible]
Date

M/s. A.R. ENGINEERING COLLEGE.

Date : 12/01/2023.

1. Exam. Waste

Paper - 202 kg = 202 x 22 = 4444/-

2. Scrab - 32 kg = 32 x 32.50 = 1072/-

Rs. 5516/-

SAKTHI ENTERPRISES
3/196A, Chennai Main Road,
Mundiyampakkam,
Villupuram-605 601.
Cell: 96599 19463

Sample bill for paper waste and old scraps

Dr.R.PANNEERDHASS,M.E.,Ph.D.,
PRINCIPAL
A.R.ENGINEERING COLLEGE
VADAKUCHIPALAYAM,
KAPPIYAMPULIYUR POST,
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NUPULSE

The Power Bank.

UPS, Inverter & Batteries Sales & Service

Cell: 9659919463
9566972605

No. 3/196, Chennai Main Road
Petrol Bunk Opposite
Mundiyampakkam
Villupuram Dist. 605 602.

M/s. A.R. ENGINEERING COLLEGE. Date: 24/3/2023

1. BATTERIES – 6 Nos. – Rs. 12000/–
(Ex-change)

2. New Batteries – 2 Nos – Rs. 1340/–

Rs. 1400/–

Rs. 1400 payment paid in.
A.R. Engineering College.

Sample bill for old batteries

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PRINCIPAL
A.R.ENGINEERING COLLEGE
VADAKUCHIPALAYAM,
KAPPIYAMPULIYUR POST,
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ENERGY, ENVIRONMENT & GREEN AUDIT REPORT

PART - C: GREEN AUDIT REPORT

10. ASSESSMENT ON MATURE TREES, & BIO-DIVERSITY

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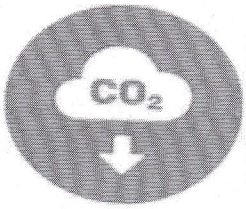
Dr.R.PANNEERDHASS,M.E.,Ph.D.,
PRINCIPAL
A.R.ENGINEERING COLLEGE
VADAKUCHIPALAYAM,
KAPPIYAMPULIYUR POST,
VILLUPURAM-605 601.

10.1: 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 ***20 with many varieties of trees.***

Table-12: 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	250



Total No. of Mature Trees available in the college campus is **250** which contributes for reduction of **5.5 Tons of CO_2 emission/Annum**

Campus Greenery Initiatives Taken by the College Management

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Dr.R.PANNEERDHASS,M.E.,Ph.D.,
PRINCIPAL
A.R.ENGINEERING COLLEGE
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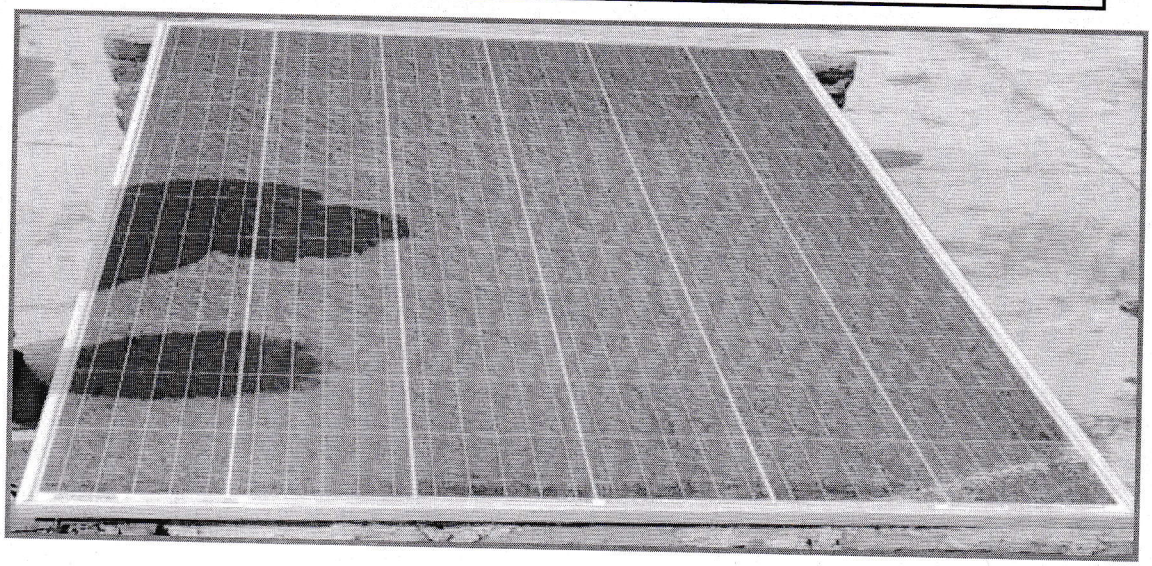
10.2: Green Energy Generation - II (Roof Top Solar PV System):

The college has installed solar PV plants with a capacity of **1 kW (Developed as student project)**, generate and feed power to the respective LT services and are utilized by the campus load. The details of the roof top solar PV system is represented in the Table-13.

Table-13: Description of the Roof-Top Solar PV System

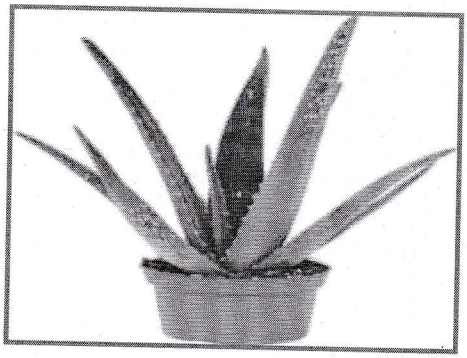
Total Capacity (kWp)	1 KW
Location of SPV Plant & Panel Orientation	Roof top of the EB Room
No. of Panels per Inverter	4 Panels with 1 kVA Inverters Directly Connected
Number of DC & Inverter Earthing	1 No Each
Average Units Generated per Day	4 – 5 Units /Day
Year of Installation	March 2019



10.3: 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 (benzene, formaldehyde, and trichloroethylene)

TULSI: Generates more oxygen per day



Aloe Vera:

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

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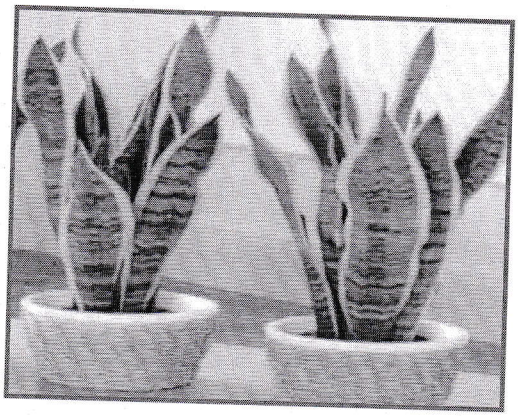
PRINCIPAL
A.R.ENGINEERING COLLEGE
VADAKUCHIPALAYAM,
KAPPIYAMPULIYUR POST,
VILLUPURAM-605 601.



Snake Plant:

- Removes Xylene, Benzene, Formaldehyde, Trichloroethylene toxins.

Spider Plant:

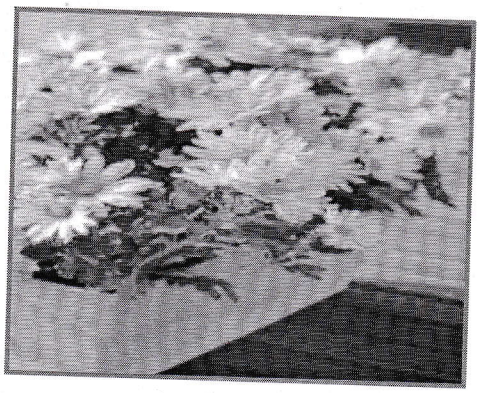
- Removes CO and Formaldehyde
- Absorbs Nicotine

Money Plant (Devil IVY):

- Best air purifying plant
- Remove benzene & Formaldehyde

Bosten Fern:

- High humidity application
- Remove xylene & Formaldehyde



Chrysanthemum:

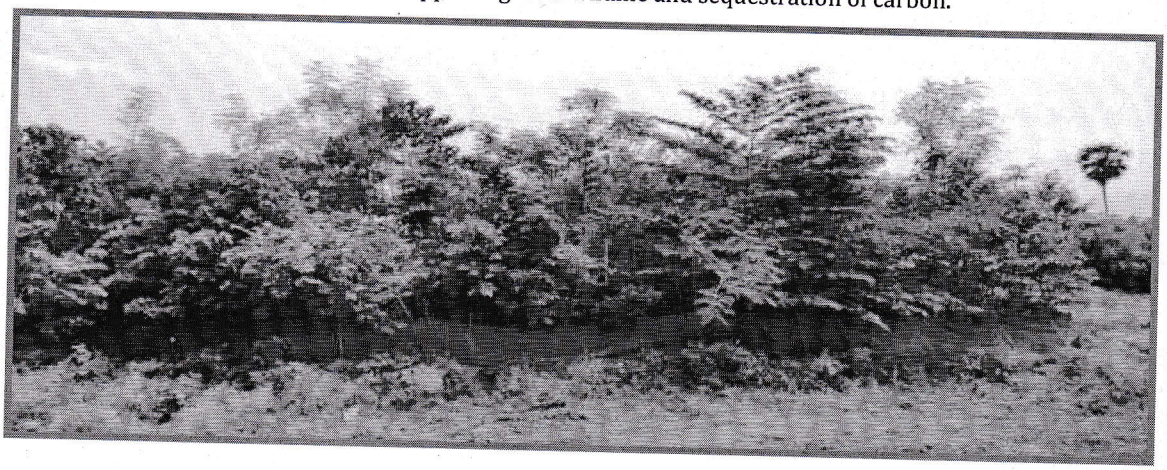
- Removes Ammonia, Xylene, Benzene & Formaldehyde

Kimberly Queen Fern:

- Works well in carriage
- Absorb vehicular exhaust

10.4: 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.



10.5: 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.

10.6: 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.

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Dr.R.PANNEERDHASS,M.E., Ph.D.,
PRINCIPAL
A.R.ENGINEERING COLLEGE
VADAKUCHIPALAYAM,
KAPPIYAMPULIYUR POST,
VILLUPURAM-605 601.

ENERGY, ENVIRONMENT & GREEN AUDIT REPORT

11. AUDIT SUMMARY & CONCLUSION

A.R.ENGINEERING COLLEGE VILLUPURAM 605 601

Dr.R.PANNEERDHASS, M.E., Ph.D.,
PRINCIPAL
A.R.ENGINEERING COLLEGE
VADAKUCHIPALAYAM,
KAPPIYAMPULIYUR POST,
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I. Energy Conservation & Management – Electrical Energy:

- In a phased manner, ceiling fans must be changed from conventional fans into BLDC fans. Also change FTL into LED with adequate illumination levels
- 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
- 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 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

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Dr.R.PANNEERDHASS, M.E., Ph.D.,
PRINCIPAL
A.R.ENGINEERING COLLEGE
VADAKUCHIPALAYAM,
KAPPIYAMPULIYUR POST,
VILLUPURAM-605 601.

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. A.R. ENGINEERING COLLEGE,** Vadakuchipalayam, Kappiyampuliyur (P.O), Villupuram-605601, Tamilnadu, India. by **RAM-KALAM CENTRE FOR ENERGY CONSULTANCY AND TRAINING,** Coimbatore-641 109 Tamil Nadu, India.

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AREC, VILLUPURAM

Dr.R.PANNEERDHASS,M.E.,PH.D.,
PRINCIPAL
A.R.ENGINEERING COLLEGE
VADAKUCHIPALAYAM,
KAPPIYAMPULIYUR POST,
VILLUPURAM-605 601.

ENERGY, ENVIRONMENT & GREEN AUDIT REPORT

ANNEXURE:

AUTHORISED CERTIFICATES OF THE AUDITOR

A.R.ENGINEERING COLLEGE VILLUPURAM 605 601

Dr.R.PANNEERDHASS,M.E.,Ph.D.,
PRINCIPAL
A.R.ENGINEERING COLLEGE
VADAKUCHIPALAYAM,
KAPPIYAMPULIYUR POST,
VILLUPURAM-605 601.

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

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

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

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Dr.R.PANNEERDHASS,M.E.,Ph.D.,
PRINCIPAL
A.R.ENGINEERING COLLEGE
VADAKUCHIPALAYAM,
KAPPIYAMPULIYUR POST,
VILLUPURAM-605 601.

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.

Digitally Signed by K V R RAJU
Mon Apr 22 18:22:42 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

AREC - VILLUPURAM

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Dr.R.PANNEERDHASS,M.E.,Ph.D.,
PRINCIPAL
A.R.ENGINEERING COLLEGE
VADAKUCHIPALAYAM,
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VILLUPURAM-605 601.

IGBC

CII
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

AREC/ENGINEERING/CIVIL

A.R.ENGINEERING COLLEGE VILLUPURAM 605 601

Dr.R.PANNEERDHASS,M.E.,Ph.D.,
PRINCIPAL
A.R.ENGINEERING COLLEGE
VADAKUCHIPALAYAM,
KAPPIYAMPULIYUR POST,
VILLUPURAM-605 601.

CII

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

Learning

Issued by CII Sohrabji Godrej Green Business Centre

Issued on 1 June 2021

CERTIFICATE NO.

HSSERisk Academy

CERTIFICATE

OF APPRECIATION

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 01, 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

01092021006

HSSERisk
MANAGEMENT SERVICES
www.hsserisk.com

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Dr.R.PANNEERDHASS,M.E.,Ph.D.,
PRINCIPAL
A.R.ENGINEERING COLLEGE
VADAKUCHIPALAYAM,
KAPPIYAMPULIYUR POST,
VILLUPURAM-605 601.

GREEN CAMPUS INITIATIVES

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A.R.ENGINEERING COLLEGE
VADAKUCHIPALAYAM,
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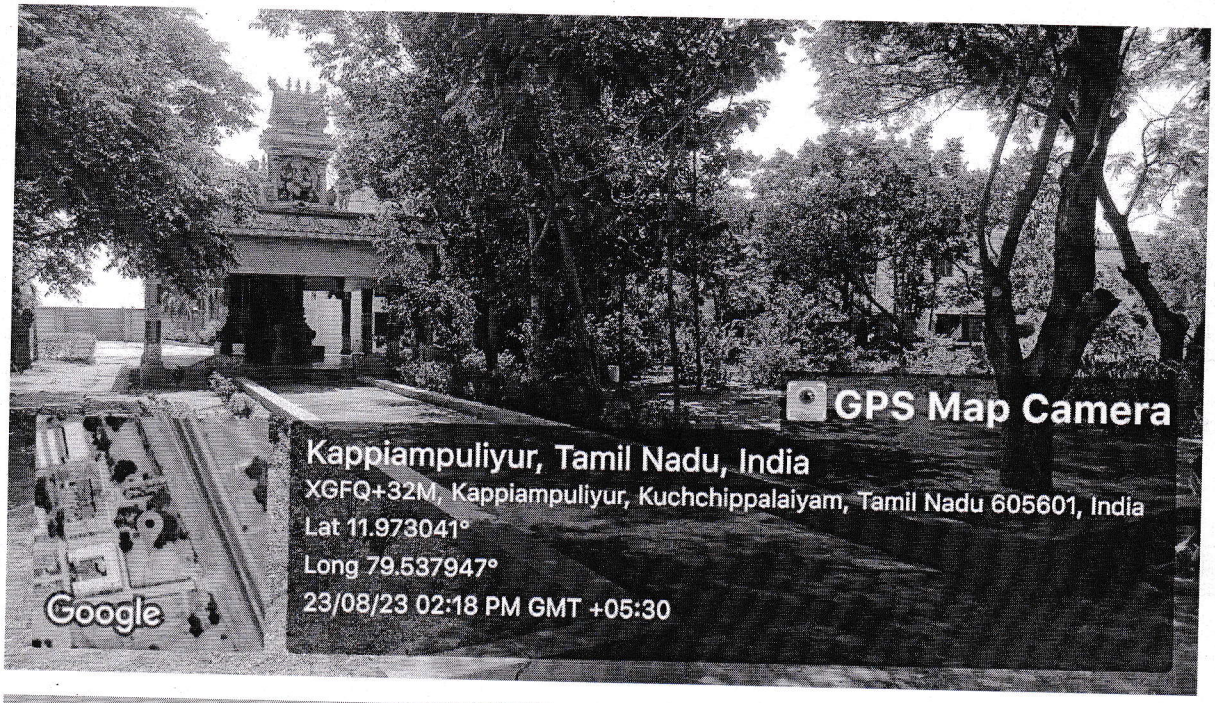

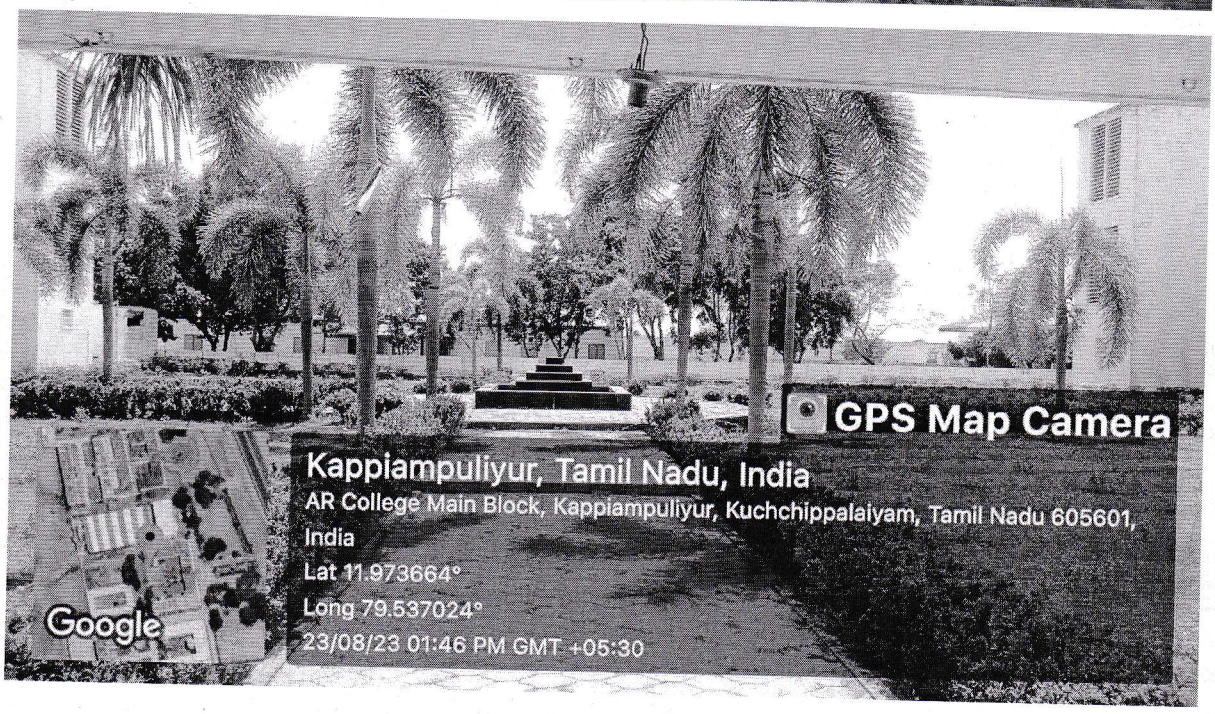

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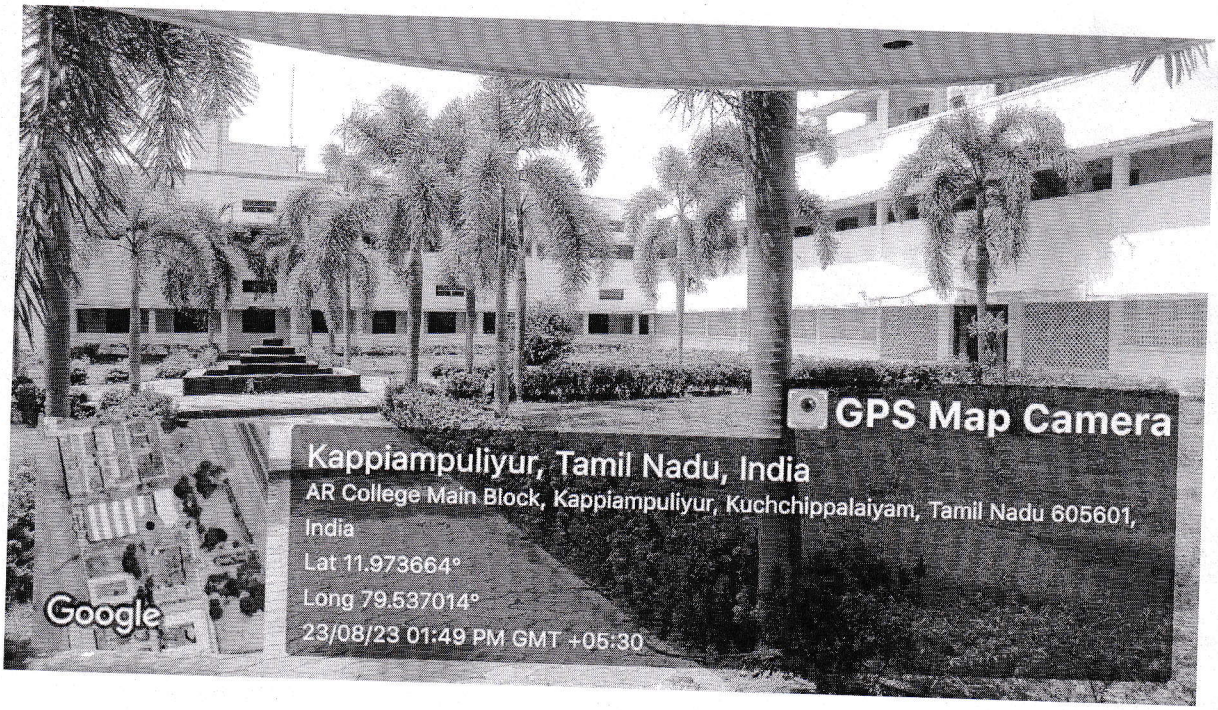

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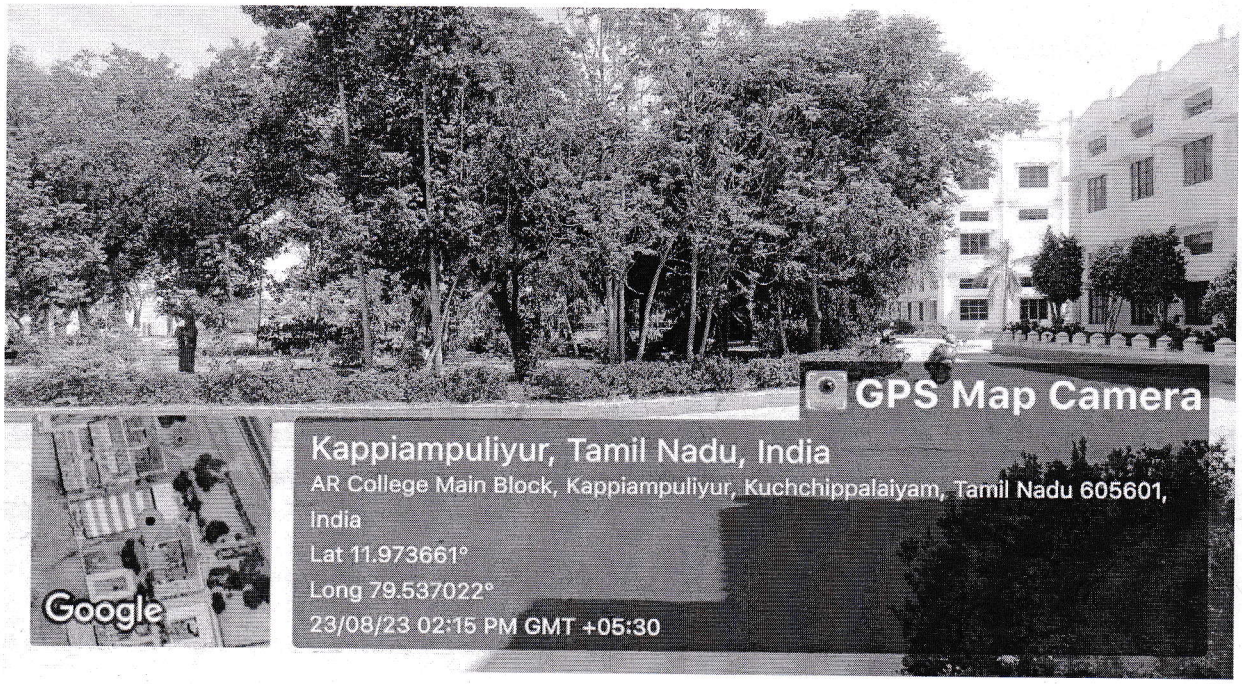

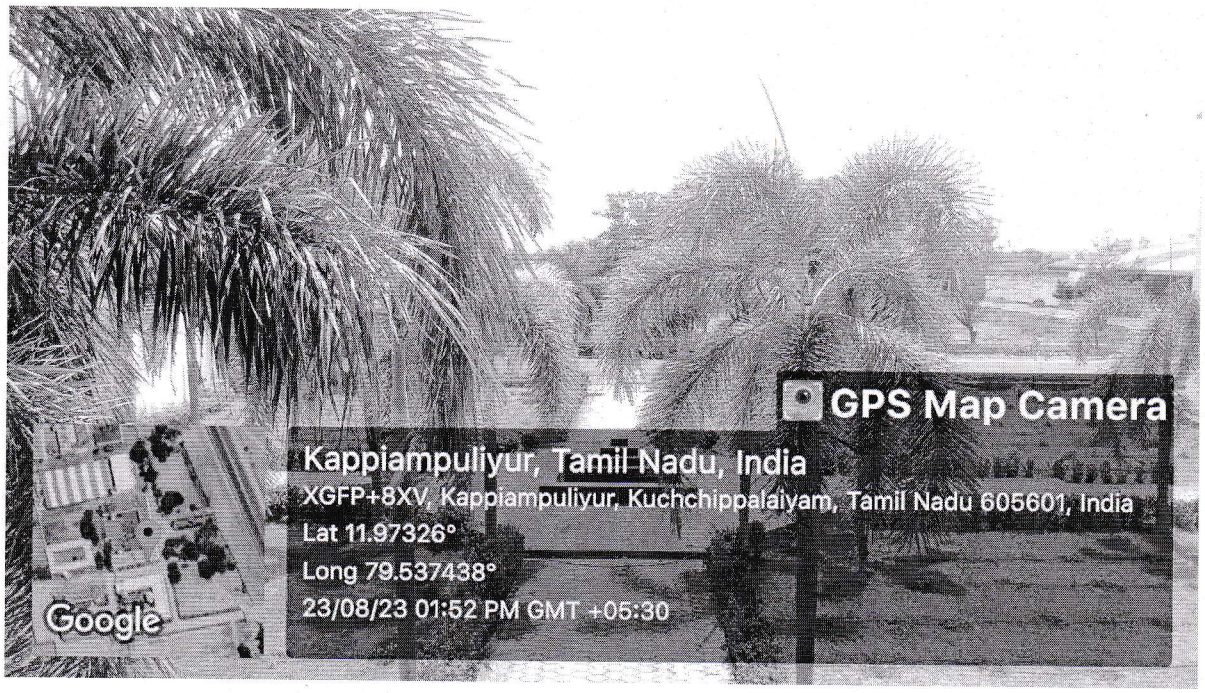

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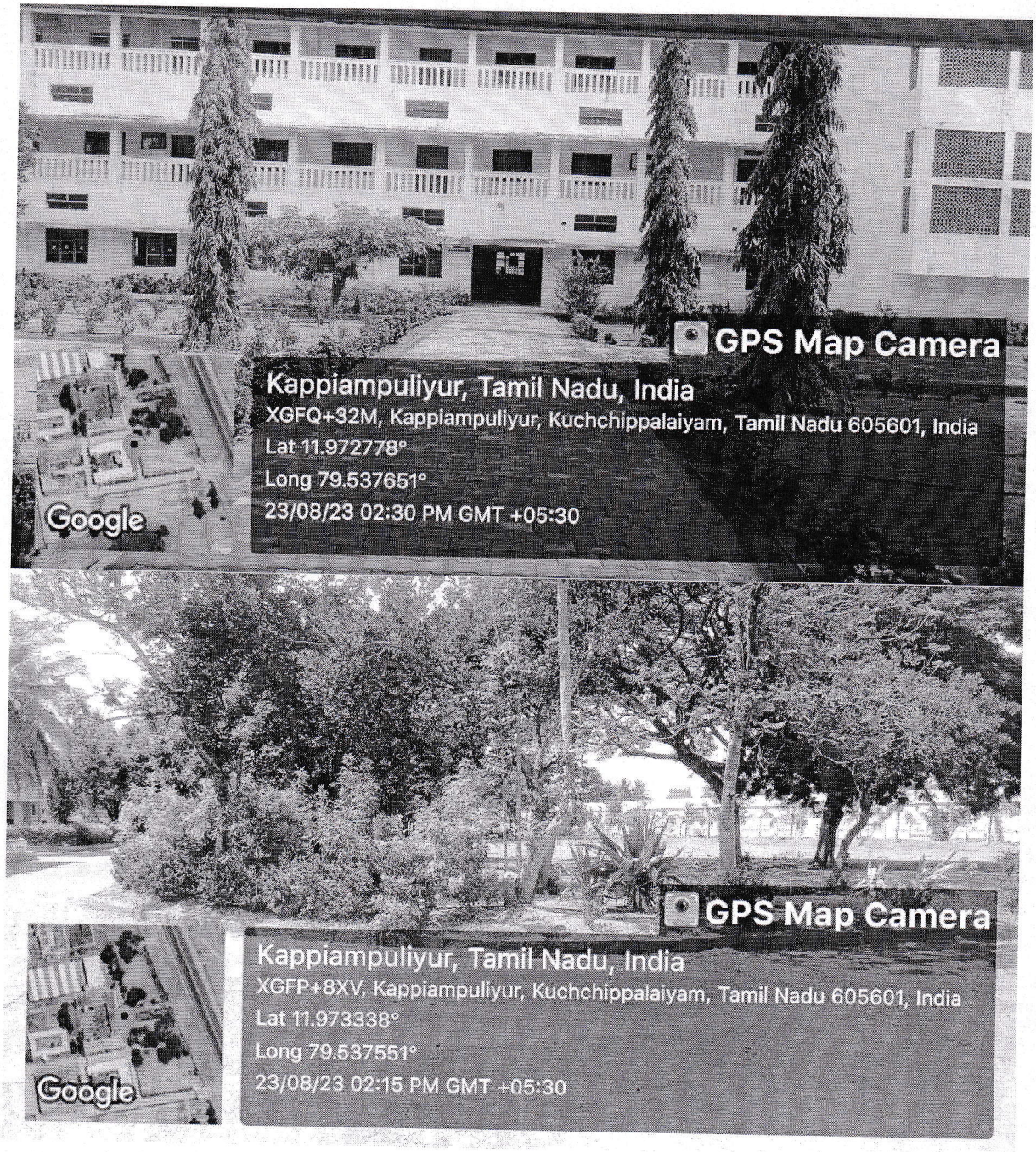

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VADAKUCHIPALAYAM,
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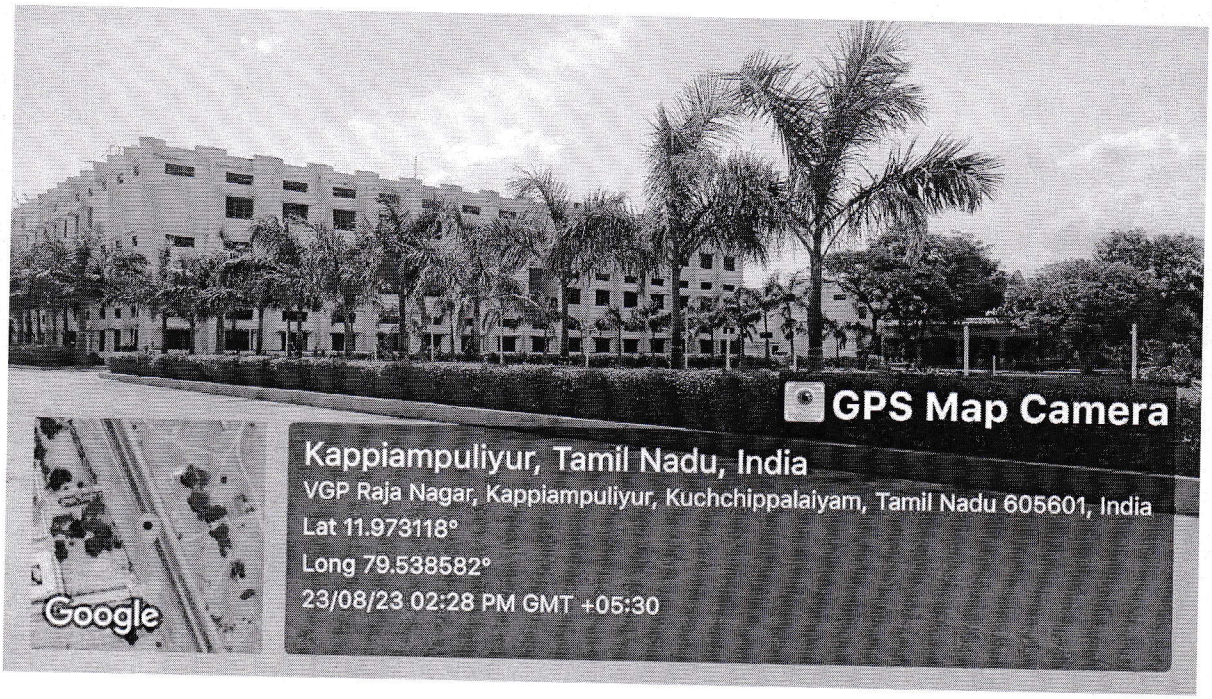

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PRINCIPAL
A.R.ENGINEERING COLLEGE
VADAKUCHIPALAYAM,
KAPPIYAMPULIYUR POST,
VILLUPURAM-605 601.

7.1.3 Beyond the campus environmental promotional and sustainable activities

PLANTATION OF TREE SAPLINGS ALONG BYPASS

As a part of environmental promotional activities in A.R Engineering College, over 50 tree saplings are planted along the bypass road by students and faculty members. Chairmen, Vice Chairmen, Principal and faculty members initiated the planting ceremony on June 05,2018.

A speech was given by the Chairmen and Vice Chairmen about the importance of this tree plantation drive.

Students planting tree saplings (05.06.2018)

Students, Staffs and faculty members are actively participated in this plantation drive.

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Dr.R.PANNEERDHASS,M.E.,Ph.D.
PRINCIPAL
A.R.ENGINEERING COLLEGE
VADAKUCHIPALAYAM,
KAPPIYAMPULIYUR POST,
VILLUPURAM-605 601.

GREEN CAMPUS AND CLEAN CAMPUS

A.R Engineering College –NSS cell has organized "Green Campus and clean campus" programme in Sri Venkatachalapathy Polytechnic College Villupuram on June 05 2019 with a great zeal. The programme has started with a Speech by Vice Chairmen of the College and students and teachers of the college along with our NSS team have planted the saplings in the Sri Venkatachalapathy polytechnic college premises.

In order to save environment, we have recently started a campaign under the caption - "Green Campus and Clean Campus". Under this programme the students were explained the importance of plants and their usefulness in our daily life. The Management sponsored the saplings and the students and planted the saplings in the College ground. They marched with banners around the College with slogan "Green Campus and Clean Campus"

NSS Volunteers planting saplings (05.06.2019)

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PRINCIPAL
A.R.ENGINEERING COLLEGE
VADAKUCHIPALAYAM,
KAPPIYAMPULIYUR POST,
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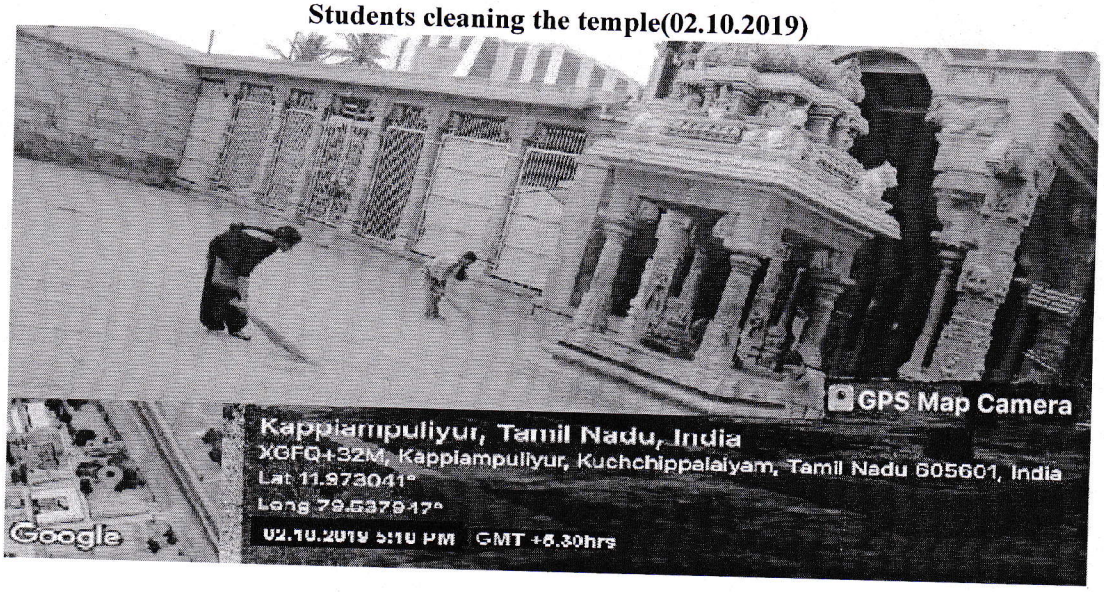
TEMPLE CLEANING CAMPAIGN

A.R Engineering College Students took part in temple cleaning campaign at Sri Valeeshwarar temple Koliyanoor, Villupuram. AREC NSS Students initiated the campaign. Student Volunteers from various departments are also took part in this campaign. Valeeswarar koliyanoor was built between 6th and 7th century CE during the time of Narasimha pallava. In 995 CE Raja raja chola renovated the temple.

Students cleaning the temple(02.10.2019)



Temple is a very sacred place for worship, and this place has to be remain sacred. Therefore, the proper cleaning and care should be done on regular basis. NSS Volunteers of A.R Engineering College, Villupuram of Tamil Nadu collectively joined the motion of Temple Cleaning and Tree Plantation which was organized by our NSS cell. They explained the road-map of the programme, a day before the event. The event was organized on 02 October morning (02.10.2019, Wednesday) around 7:00AM. Nearly 45 students gathered near Koliyanoor to participate in the event. Cutting tools and other equipment's were already arranged by one of the NSS Volunteers the night before the event. They collected all the garden tools, plants and reached near temple.

After that without wasting time they divided themselves into four teams.

I) The plastic picking team
II) The grass cutting team
III) The digging team
IV) The plantation team

In every group there were around 11 students, they sub divided their work as per their interest. They planted around 20 plants saplings. Volunteers worked and made the temple area clean and green. One of the NSS Volunteer did tremendous effort by making water path connecting all plants saplings. In the meantime students were served with delicious food items like, poori,

A.R. ENGINEERING COLLEGE VILLUPURAM 605 601

Dr.R.PANNEERDHASS, M.E., Ph.D.,
PRINCIPAL
A.R.ENGINEERING COLLEGE
VADAKUCHIPALAYAM,
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pongal, idli, vada, sambhar,tea biscuits etc. they shared all the food items equally and enjoyed the good taste, as it was very well prepared.

The event was called off by 05.30 PM in evening. The students had really worked hard in the programme. Towards the end a wonderful speech was delivered by NSS officer in that he thanked all for participating in the event and also told that we are the future of the nation. We need to keep our environment clean and green.

A.R.ENGINEERING COLLEGE VILLUPURAM 605 601

Dr.R.PANNEERDHASS,M.E.,Ph.D.,
PRINCIPAL
A.R.ENGINEERING COLLEGE
VADAKUCHIPALAYAM,
KAPPIYAMPULIYUR POST,
VILLUPURAM-605 601.

A. R. ENGINEERING COLLEGE

(Approved by AICTE, New Delhi & Affiliated to Anna university, Chennai)
Vadakuchipalayam, Kappiyampuliyur post, Villupuram-605601, Tamilnadu.

DISTRIBUTION OF MASKS DURING COVID PERIOD

The following Report is based on the activity conducted by the NSS unit of A.R Engineering College Villupuram on 28th July, 2020.

Masks are distributed to the Public (28.07.2020)

Life has completely changed for everybody with the outbreak of a global Pandemic Covid-19. The care and protection is the need of an hour. There are responsibilities towards our countrymen and we ought to discharge our duties more sincerely and with utmost responsibilities. The NSS unit of A.R Engineering College did the same to set an example for all to follow.

They distributed masks in their near by area Koliyanoor. The number of masks distributed goes around 100 and not only they distributed the masks but also interacted with the localities. They created an awareness about the present situation and guided the people to approach positively in this difficult phase.

The live demonstration of face mask usage as well as its importance was also highlighted.

Thus, under the abled leadership of Mr. K.Sivakumar, The NSS Presiding Officer, the team managed to add one more feather to its cap.

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PRINCIPAL
A.R.ENGINEERING COLLEGE
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FOOD DISTRIBUTION DURING FLOOD

In Villupuram, Marakanam taluk received the highest rainfall on the past five days, and more than 1,000 acres of land in villages like Asappur, Rayanallur, Nallampakkam, Alandhur, Vasakodipakkam were inundated. Paddy and cassava crops were affected.

Following incessant rainfall, the overflowing Ongur River has surrounded Mandagapattu village near Marakanam in Villupuram district, and has marooned it. With transportation blocked, its residents are now forced to wade through the floodwater for more than 15 km to reach nearby villages.

Food distribution to the Public (12.11.2021)

The NSS Unit of A.R Engineering College distributed food and clothing to the people who are affected by the flood on November 12,2021. And also NSS Volunteers helped the people to stay in the safest place. The infants and pregnant ladies are sent to the safer place. The medical help for them also arranged immediately.

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AWARENESS PROGRAMME ON FOREST FIRE

NSS Unit of A.R Engineering College, Villupuram and Forest Department of Kalvarayan hills Kallakurichi set an awareness campaign on April 05,2022 to teach students about the steps they should take to prevent forest fires from breaking out. They sensitised students about the dangers of forest fires and conveyed the necessity to discourage people from clearing fields and wooded patches with fire.

Demo for extinguish the fire (05.04.2022)

The officials pointed out the issues of forest fires caused by people. They also said that the forest department is not the only one to take the responsibility for forest protection, he appealed to the public to join hands to bring greenery. Students are very interested in participating in this programme.

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VADAKUCHIPALAYAM,
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BEACH CLEAN UP PROGRAMME

NSS Volunteers and students from A.R Engineering College are actively participated in one day Beach Clean up drive- Veerampattinam on March 21,2023. The Programme started on Morning 7am, Around 50 students are participated in this campaign. With the guidance of NSS officer Students split into groups and divided the beach areas for collecting wastes.

Volunteers from NSS for Beach Clean-up programme (21.03.2023)

Approximately 40 to 50 sacks of plastic wastes and other Non degradable materials are collected by afternoon. They are properly disposed and sent to the recycling industries.

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ENVIRONMENT POLICY

A.R Engineering College is committed to a Clean, Safe, Healthy and Sustainable Environment. We will always strive for continuous improvements in environmental activities. Caring of the environment is one of the core values of our college.

- We take care of Air, Water, Soil, Flora & Fauna of Campus.
- We maintain our college premises in an environmentally sensitive, responsible and sustainable manner.
- College is committed to work in accordance with environmental laws and regulations.
- Our staff working together, our efforts will benefit students, staff, Society and communities by protecting and improving the quality and sustainability of the environment in which we live.

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GREEN POLICY

Introduction:

The future of humankind depends very much on our ability to change our lifestyles and agree to follow a low consumption pattern of living in terms of resources taken from the globe and return to a sustainable development path at the earliest. Climate around the world in developed as well as developing regions - has started showing violent changes, destroying life and property and annihilating peaceful living conditions. The opportunity window for restoring nature to its prolonged state of hosting life forms to flourish under its caring environs is according to Scientists, very short and lasting only up to 2030. Within this time, with the willing actions of every citizen wherever they are, coordinated and directed actions should start and continue thereafter till a balancing stage is reached where moderate use of resources and mitigation actions for healing the hurts already inflicted, balance positively to a sustainable nature. If we do not start action now, the situation may go out of control and when our grandchildren reach adulthood; their chances of survival will be very bleak. Life expectancy of those few who survive will be much shorter than what we have now. This is something we all agree to avoid. The students who are in schools and colleges now are to be the enlightened leaders of Immediate tomorrow, Our national educational authorities, as in most developed countries, therefore insist that every student in our country should learn how damages to the environment occur and how to avoid such situations, emphasizing more on possible remedial measures. This green education should start from schools and colleges, and the insistence on Green Audit of higher education institutions on an annual basis, is to make students and staff well informed of the extent of ecological footprints each one creates, as well as on which areas one should concentrate to make his or her environs greener than before. The Green Policy of A.R Engineering College is prepared in such a manner that it can educate every stakeholder of step the institution, on the major contributors tending to destroy and on every helpful/to restoration status. Leading to further flourishing of its green status

A.R. ENGINEERING COLLEGE VILLUPURAM 605 601

Dr.R.PANNEERDHASS,M.E.,Ph.D.,
PRINCIPAL
A.R.ENGINEERING COLLEGE
VADAKUCHIPALAYAM,
KAPPIYAMPULIYUR POST,
VILLUPURAM-605 601.

Policy:

The College is committed:

- To improve energy efficiency and reduce other college activities, including lighting, air and water heating and refrigeration. It will also take associated with domestic and account of the concept of embodied energy where it is pertinent to purchasing policy and waste management. and materials; to consumption of water, energy services
- To minimize products and consider the cradle-to-grave impact of all which, not incurring purchased, giving preference to those excessive cost, attempt to minimize their environmental impact.
- To encourage suppliers to provide the College with environmentally friendly goods and services.
- To embrace the Precautionary Principle in the use of chemical products, such as domestic chemicals, detergents and pesticides. This refers to known hazards controlled under health and safety regulations, as well as unknown hazards to health and the environment.
- To reduce material and organic waste and to facilitate the reuse and recycling of paper, glass, aluminium, plastics and organic refuse generated by College activities, using the most environmentally effective means.
- To promote an awareness of environmental issues in and outside the College Campus and to encourage participation of all stakeholders in environmental matters.
- To continue to invest a proportion of its capital on the basis of ethical and environmental criteria and to adjust that proportion as financially appropriate for the College.

Objectives:

- To secure the environment and cut down the threats posed to human health.
- To make sure that rules and regulations are taken care of
- To avoid the interruptions in environment that are more difficult to handle and their correction requires high cost.
- To suggest the best protocols for adding to sustainable development.
- To promote the Environment Management and Conservation in the College Campus.

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A.R.ENGINEERING COLLEGE
VADAKUCHIPALAYAM,
KAPPIYAMPULIYUR POST,
VILLUPURAM-605 601.

- To identify, quantify, describe and prioritize framework of Environment Sustainability in compliance with the applicable regulations, policies and standards.

Benefits:

- It would help to prepare plan to protect the environment.
- Recognize the cost saving methods through waste minimization and management.
- Point out the prevailing and forthcoming impacts on environment.
- Ensures conformity with the applicable laws.
- Empower the organizations to frame a better environmental performance.
- It portrays a good image of an institute which helps building better relationships with the group of interested parties.
- Promotes the alertness for environmental guidelines and duties.

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A.R.ENGINEERING COLLEGE
VADAKUCHIPALAYAM,
KAPPIYAMPULIYUR POST,
VILLUPURAM-605 601.

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WASTE MANAGEMENT POLICY

POLICY STATEMENT

The College will prefer the Principles of the Best Practicable environmental options for Waste management services. The College requires all the teaching and non-teaching staff, students, guests and anyone else making use of the premises to comply with this Policy.

Policy Objectives:

The objectives of this policy are:

- To ensure that waste management is performed in accordance with all waste legislative requirements,
- To promote environmental consciousness in order to increase & encourage waste minimization, reuse and recycling.
- To invest into the expansion of recycling opportunities on campus and transform waste into value added products.
- To verify the safe handling and storage of wastes on college campus.
- To provide guidance for teacher, resident, staff, students and other stakeholders on waste management issues.
- **Waste recycling system**:
  Vermicomposting plant is installed for waste recycling, waste water from drinking water filter is utilized for garden.
- **E-waste management:**
  Reuse of computer related peripherals and parts for practical purpose of computer students Batteries and different electric and electronic items are disposed through authorized vendors by the college management.
- **Hazardous chemicals and radioactive waste management**:
  Chemicals used in laboratory are diluted and given out by drainage system. Radioactive elements are not used in laboratories. Fire extinguishers are placed in the laboratories.

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ENERGY CONSERVATION POLICY

Energy conservation is a smart way of protecting environment to sustain life. The Institution takes various measures to contribute towards Energy Conservation. The Institution makes use of the latest technological advancements towards conserving energy. Right from using LED lights to servicing the electronic devices frequently the Institution strives hard to reduce the consumption of energy resources. Based on this the institution has postulated certain objectives,

Objectives:

- Practice energy saving methods in every way possible.
- Make the stakeholders be aware of the ill effects of energy depletion
- Conscious purchase of power conserving devices
- Frequent servicing of all the energy consuming objects. Immediate action on wastage of resources

Save Energy TIPS to be followed:

- Activate power management features on computer and monitor so that it will go into a low power
- Turn off the monitor when the students and staff leave the table.
- Activate power management features on laser printer.
- Whenever possible, shut down rather than logging off.
- Turn off unnecessary lights and use daylight instead.
- Avoid the use of decorative lighting.
- Use LED or compact fluorescent bulbs.
- Keep lights off in CFC halls, classrooms, auditorium halls when they are not in use.
- Use the fans only when they are needed.

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VILLUPURAM-605 601.

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