GREEN AUDIT REPORT 2023

PERIYAR MANIAMMAI INSTITUTE OF SCIENCE & TECHNOLOGY

PMIST

PERIYAR MANIAMMAI INSTITUTE OF SCIENCE & TECHNOLOGY

(Deemed to be University)

Established Under Sec. 3 of UGC Act, 1956 • NAAC Accredited

think • innovate • transform

Periyar Nagar, Vallam, Thanjavur - 613 403, Tamilnadu, India

Report Prepared By

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This is certify that myself **Dr.M.Vivekanandan**, Certified Energy Auditor of Bureau of Energy Efficiency, India bearing the registration no. EA-19216, had reviewed Energy and Green audit at the Periyar Maniammai Institute of Science and Technology, Vallam, Thanjavur during March 2022 and recommendations to conserve energy is given in the report. I thank the management of Periyar Maniammai Institute of Science and Technology for providing me the opportunity, I also thank the team members of energy audit and green audit for rendering their support to the audit.

TryCAE Industrial Engineering Pvt. Ltd. TRICHY TAMILNADU

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1.0 INTRODUCTION

1.1 PERIYAR MANIAMMAI INSTITUTE OF SCIECNE AND TECHNOLOGY – A BRIEF PROFILE

Periyar Maniammai Institute of Science and Technology (PMIST), located in Thanjavur, Tamil Nadu, the granary of South India, celebrated its Silver Jubilee in 2013, marking 25 years of dedicated service to education (1988–2013). Established with a mission to uplift the underprivileged and empower rural women, PMIST began as the world's first women-only engineering college, founded by the visionary rationalist leader Thanthai Periyar and his devoted wife Annai Maniammai. Their progressive philosophy aimed to dismantle the barriers suppressing women's participation in education. Over the years, the institution achieved remarkable success and evolved into a full-fledged institute. Recognizing its contributions, the Ministry of Human Resource Development (MHRD) and the University Grants Commission (UGC) granted it Deemed-to-be University status under Section 3 of the UGC Act, 1956.

1.2 ENVIRONMENTAL FRIENDLY TOPOGRAPHY AND ECO-FRIENDLY LOCATION

The Periyar Maniammai Institute of Science and Technology is stretched in a lush green land area of 216 acres, which was once barren, dry and a laterite quarry. This land has been transformed and metamorphosed into a land of thick foliage, green vegetation, and technology-hub. It is energy efficient, pollution-free, zero waste, well-laid campus, and is ecofriendly in nature. The Institute is situated 10km from Thanjavur and 45km from Tiruchirappalli and is easily accessible by road, rail and air. The built-up area in the main campus at Vallam is 84,450sq.m. Vallam, the place wherein Periyar Maniammai Institute of Science an Technology situated is not only the center of environmental attraction but also the center of entire geography of Tamil Nadu. Periyar Maniammai Institute strives to achieve the twin factors of Environmental Protection and Environmental Management by

- Rainwater Harvesting
- Demonstration on practical technologies in the Rural areas and at selected field sites
- Training, capacity building and awareness on Solid Waste Management

- Creating and maintaining the Bio diversity of the campus
- Solid Waste Management through Biomethanisation
- Enhancing the Green cover for reducing Carbon emission and increasing nitrogen cycle
- Zero waste management campus keeping the philosophy of ―Waste from Wealth
- Energy conservation steps right from the planning, execution and ensuring them throughfrequent green audits
- Demonstrations and usage of Bio-compost, Vermicomposting, Bio fertilizer, protected cultivation, Water harvesting, Cultivation of medicinal & aromatic plants, Bio fencing,Bio briquetting etc. have been set up in our campus.

1.3 GREEN AUDIT CONTEXT

The National Assessment and Accreditation Council (NAAC), New Delhi, has mandated that all Higher Educational Institutions submit an annual Green Audit Report. This initiative aligns with the institutions' Corporate Social Responsibility (CSR) obligations, ensuring their active role in mitigating environmental pollution and combating global warming through measures aimed at reducing their carbon footprint.

In response to the NAAC directive on Green Auditing, the management of Periyar Maniammai Institute of Science and Technology, Vallam, Thanjavur, initiated an external Green Evaluation. This evaluation was conducted by a qualified Green Auditor, supported by a Green Audit Assessment Team led by Dr. J. Santhosh, Director i/c of the Centre for Energy & Environment, and Dr.D. Thayalnayaki, Head of the Department of Civil Engineering.

The Green Audit or Environmental Audit emphasizes key areas such as water and wastewater management, solid waste management, and the implementation of carbon footprint reduction strategies. These measures reflect the institute’s commitment to sustainability and environmental stewardship.

The auditing was done for the period extending from 01/07/2022 to 31/06/2023.

1.4 GREEN AUDIT CONCEPT

The term ‘Environmental audit’ or ‘Green audit’ means differently to different people. Terms like ‘assessment,’ ‘survey’ and ‘review’ are also used to describe similar activities. Furthermore, some organizations believe that an ‘environmental audit’ addresses only environmental matters, whereas others use the term to mean an audit of health, safety, and environment-related matters. Although there is no universal definition of Green Audit, many leading companies/institutions follow the basic philosophy and approach summarized by the broad definition adopted by the International Chambers of Commerce (ICC) in its publication of Environmental Auditing (1989). The ICC defines Environmental Auditing as:

A management tool comprising a systematic, documented, periodic and objective evaluation of how well environmental organization, management and equipment are performing with the aimof safeguarding the environment and natural resources in its operations/projects.

In the present scenario organizations are facing numerous challenges, issues and risks Environmental changes, depletion of natural resources. A flexible, secure, dynamic infrastructure must be devised to help organizations to address critical energy and power costs. Perhaps the time has come when it becomes immensely essential to unearth that up to what extent an organization is contributing towards environmental sustainability by adoption of techniques like Green Audit.

The Green Auditing is the process of determining whether our operations and practicesare following regulatory requirements, institutional policies and procedures, and accepted standards. It is a systematic objective evaluation of facility activities for a finite review period designed to:

- Verify compliance with environmental regulations, internal policies, and accepted practices.
- Evaluate the effectiveness of environmental "management systems" in place, and identify and assess any reasonably foreseeable risks associated with hazardous conditions attributable to our operations and prevent or mitigate such risks.

1.5 OBJECTIVES OF GREEN AUDITING

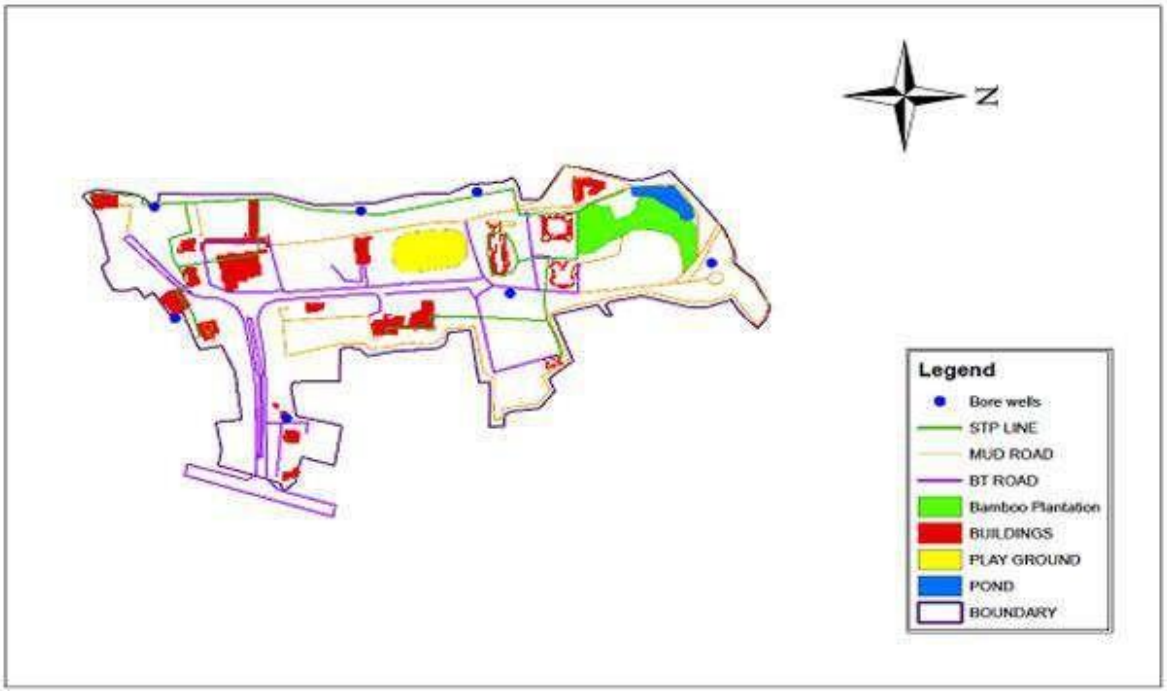
- To assess whether the measures implemented by PMIST have helped to reduce the Carbon Footprint.
- To assess whether investments made in increasing awareness among students regarding electricity, biodiversity and environment have helped the Institution achieve the required carbon dioxide emission and absorption in the campus.
- To assess whether non-academic activities of the Institution support the collection, recovery, reuse, and recycling of solid wastes that harm the environment.
- To identify gaps and suggest recommendations to improve the Green Campus status ofthe institution.

1.6 BENEFITS OF THE GREEN AUDITING

- More efficient resource management
- To provide basis for improved sustainability
- To create a green campus
- To enable waste management through reduction of waste generation, solid- waste andwater recycling
- To create plastic free campus and evolve health consciousness among the stakeholders
- Recognize the cost saving methods through waste minimizing and managing
- Empower the organizations to frame a better environmental performance
- Financial savings through a reduction in resource use
- Development of ownership, personal and social responsibility for the institute and itsenvironment
- Green auditing should become a valuable tool in the management and monitoring of environmental and sustainable development programs of the institute.

1.7 TARGET AREAS OF GREEN AUDITING

Target areas included in this green auditing are water, energy, waste, green campus and carbon footprint.



Layout map of Periyar Maniammai Institute of Science & Technology, Vallam

Periyar Maniammai Institute of Science and Technology being one of the best green campuses in the city, responds to eco concerns with its ecofriendly initiatives. In our Institute, we have carried out energy audit and green audit in the areas of

1.0 Energy Conservation & Energy saving opportunities

2.0 Energy saving opportunities -Renewable Energy Devices

3.0 Water Quality and Conservation

4.0 Climate Change and Air Quality

5.0 Solid Waste Generation and Management

6.0 Alternating Building Materials

2.0 Energy Conservation & Energy saving opportunities – A Separate report is prepared and submitted

3.0 Energy saving opportunities -Renewable Energy Devices

Bio-Mass Gasifier

200 kWe bio mass gasifier for power generation (100% producer gas mode) Funded by MNRE, Govt. of India

200 kwe bio-mass gasifier

Usage	: For Power Requirement Operational
viability	: Attractive ROI and cost effective
Energy Savings	: 25,000units/month (Rs.125000 / $2804.57)
Future Outlook	: Matches with conventional energy costs

Tree branches and wood primarily sourced from wastelands are repurposed as feedstock. The selected wood is processed by cutting and drying, making it suitable for power generation. This approach helps prevent environmental pollution. Notably, 60% of the campus's electricity requirements are met through the use of a biomass gasifier.

b) Thermal Gasifier

The thermal mode gasifiers are used for hostel cooking

purpose.Usage : For cooking and heating

Operational viability : Attractive ROI

Energy Savings : 30-cylinder Month (Rs.37170/ $833.97)

Future Outlook : Matches with conventional energy cost

Cost : Rs.1, 50,000 (Approx)

Biomass Thermal Gasifier 20kWe working at our Ladies Hostel]

c) Briquetting Unit

Briquetting is the process of converting a powdery or granular material into a larger, more convenient form. This is achieved by compacting the material using a screw press, often with the addition of a binding agent. A briquette is a compact block of flammable material used to ignite and sustain a fire. Common feed materials include rice husk, sawdust, and coconut coir pith.

The collected feed materials are first crushed into fine particles and deposited into a feed pit. From there, they are transported via a bucket elevator into a heating chamber. The chamber's heating coils are heated to a temperature range of 350°C to 400°C, causing the feed materials to reach the same temperature.

Simultaneously, the material is pushed through the chamber by the screw press. As it exits through a sleeve, the heated and compacted feed material emerges as briquettes, produced in specific lengths and ready for use.

Briquetting machine

Briquettes

d) Biomethanisation Practice – Nodal Agency of MNRE, Govt. of India

Periyar Maniammai Institute of Science and Technology is identified as the Nodal Agency by MNRE, Govt. of India for providing technical know-how and guidance for installing the bio-gas based power generation units in the institutions like SASTRA University, Thanjavur, Indian Express Esates, Annasalai, Chennai, Vellore Institute of Technology, Vellore, Karpaga Vinayaga College of Engineering and Technology, Chinnakalambakkam, Tamilnadu.

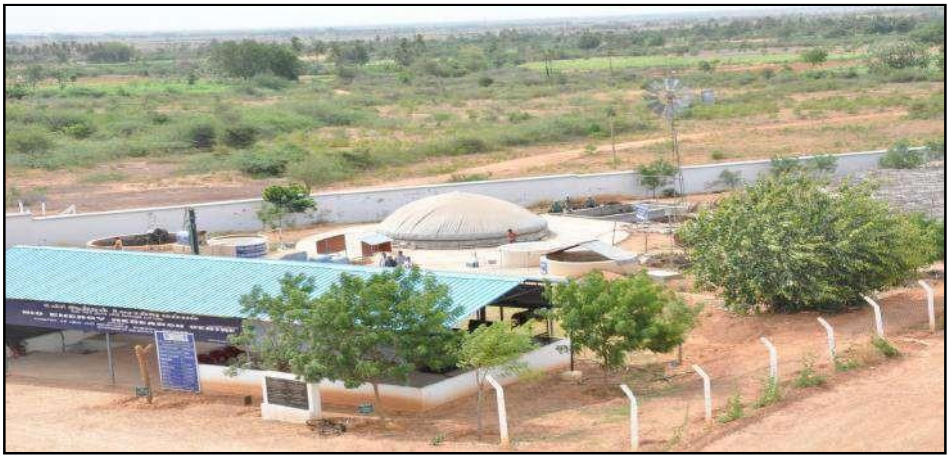
The Biomethanisation plant in this Institute is multi feed with the following feeds like Cattle dung, Night soil, Vegetable waste and Food waste. The gas producing capacity of the digester is 500cu.m per day. The volume of gas produced will generate 60 KW of electricity. This will not only generate significant quantity of Biogas but also generate the digested material used as a high grade soil conditioner.

The Digester is of 16.2m diameter and 5.7m height. Quantity of feeding required per day is 10 tons. Different inlet units were constructed for Night soil, Vegetable waste and food waste.

Two inlet pipes are provided to feed the digester and one outlet pipe for collecting the digested effluent. One inlet pipe is exclusively for night soil and other for other wastes.

60 KWe-500m^3 Biomethanisation plant inaugurated by former President of India, His Excellency Dr. A.P.J. Abdul Kalam on 27.7.2011

Vegetable wastes and food wastes are pulverized using rasper and sent to mixing unit. Then it is allowed to the digester. Cattle dung is also mixed in the same mixing unit and sent to the digester. The hydraulic retention time for producing the gas in this digester is 42 days. The digester is provided with Tarpaulin hood for holding the gas. To prevent the formation of scum, a pump is provided for re circulating the wastes.



An aerial view of the Biomethanisation plant. The gas production capacity of the plant is 500m^3/day. Utilizing this gas the power produced is 60 kwe / hr. The digested material is convertedinto nutrient rich soil conditioner through vermicomposting process.

Anaerobic Digester of Biomethanisation plant

For generating power, Carbon di oxide and hydrogen sulphide gases are scrubbed off by providing a scrubber. The Scrubbed gas is stored in the Gas balloon and from there it is conveyed to the bio engine for power generation. The following Research works are being carried out in this plant:

- Characterization of various solid wastes as input in this anaerobic digester
- Study of Suitable environmental factors which favours the anaerobic digestion.
- Lab scale study for optimization of the digestion using feed stocks

e) Solar Power Utilization

Solar Panel

Solar Street Light

Solar Water Heater

Solar Cooker

The unreliability of the rural electricity grid, made us decide to employ solar panels embedded in the arch for electricity generation. The arch hold the solar panels, oriented towards south-west, catering to the needs of the security cabins, entrance pathways and lights lighting the landscapes of Periyar Maniammai Institute of Science and Technology. Throughout the building proved to be a useful testing and teaming process for latest architectural technologies. It is a catalyst for further application of appropriate building, technologies in the interior and exterior constructions. And thus environmental sound solar energy trapping systems are maintained in the Periyar Maniammai Institute of Science and Technology campus.

Solar PV panels are installed at the hostels resulting in an annual savings of Rs.72,000/-. and also reduces 10 tonnes of CO_2 emission. Solar water heaters installed in the hostels saves electricity and an annual savings of Rs.1, 85, 000/- along with reduction of 197 tonnes of CO_2 emission.

This SOLAR CAMPUS RIDER is specially designed to ride inside the campus replacing bikes, cars and other vehicles which emits CO_2 leading to endangering Global warming. It is an electric rider which can be charged using both solar and electrical energy. It is cost effective.

Eco Challenger is solar powered battery-operated vehicle for differently abled people. This vehicle carries 120 kg, accelerates to about 25 kmphr and the mileage comes up to 45 km/ charge.

Solar Car Fabricated by our students Maruti 800 engine has remodeled by traction batteries and motors. Thus, by utilizing all the renewable energy resources, the wastes in our campus is minimized and the environmental pollution is avoided and the campus continues to flourish in a sustainable way.

f) Paper Recycling Unit

Processes taking place in Paper recycling unit. Sources for the paper recycling unit are retrieved from our Institute and reinforcing materials (cotton waste)are added to strengthenthe quality of the paper.

Periyar TBI houses the Periyar Paper Re-Processing Unit, a paper recycling facility committed to sustainable practices. Paper waste collected from the institute is recycled, with cotton waste added as a reinforcing material to enhance the paper's quality. Through this initiative, the unit produces approximately two tonnes of recycled paper annually, saving 8.5 m^3 of wood pulp as part of its green mission.

The recycled paper is utilized for various purposes, such as office files, paper bags, and packing materials, with an average output of 1.2 tonnes per year. By recycling paper, the institute significantly reduces its environmental footprint. For instance, while 500 tonnes of fresh paper generate 401 tonnes of carbon emissions, recycled paper reduces this by 329 tonnes. This initiative alone saves 0.2 tonnes of carbon emissions annually.

In addition to promoting sustainability, the unit serves as a demonstration facility, offering aspiring entrepreneurs a practical model for establishing their own paper recycling units. This dual role underscores its contribution to environmental conservation and entrepreneurial development.

g) Alternate Building Materials Research Unit

Alternative building materials like hollow blocks, interlocking blocks, paver blocks are manufactured using innovative technologies to meet our own infrastructural requirements.

Alternative Building material research unit - Building materials like hollow blocks, interlocking blocks and paver blocks are manufactured.

Fly ash bricks reduce 7.2 tonnes of CO_2 emission with less contribution to pollution. This technology has avoided deforestation and soil erosion due to which 36,337 tonnes of wood and 21,173 m^3 of fertile top soil are saved. Cement less fly ash bricks are produced with same structural properties of conventional fly ash bricks that reduce 7.2 tonnes of CO_2 emission with less contribution to pollution.

4.0 WATER MANAGEMENT QUALITY AND CONSERVATION

4.1 Rainwater Harvesting (RWH):

Rainwater Harvesting (RWH) is the practice of collecting water from roof tops, paved or unpaved surface runoffs, storing and distributing rainwater to use it as an alternative source of water. Main advantages of RWH are that the resource is free and has very low contaminant level. For sustainable water resources development of the PMIST Campus,

rainwater harvesting and recycling of the domestic waste water are in addition to the utilization of ground water. The average annual rainfall, calculated from data collected for45 years, is 1314 mm (Vallam Town Panchayat meteorological Station). Quantity of the open area runoff for average rainfall is 88,010 cum. The quantity of roof rainwater 38,527 cum and the quantity of metaled road rainwater 5756 cum. The total quantity is 132,294 cum per annum.

The built-up areas in the main campus at Vallam are around 84,450 Sq.m. This campus is having 22,000 cum capacity percolation ponds to store rainwater and grey water, 10,000 cum capacity pond to store storm water and 1300 cum capacity open well to store rainwater.

Contour Trench

The Campus topography is so designed to have gentle slope contour terrain. By using the slope, created nearly 600 m length, 1m width and 1m depth contour trench at 60metre intervals of 6 Nos. of contour trenches. Since rainwater has been stored in this trench and there by ground water potential is in an enhanced condition.

4.2 Groundwater Resources

Ground water sources for the institute are only from the 7 bore wells of depths vary from104 m to 162 m. Average pumping of water is around 100 cum per hour. Every day about 638 cum (2.32, 870 cum/year) of water is pumped out for domestic purpose. Water required for gardening purpose is 800 cum per day (2, 92,000 cum per annum). Total quantity of water required is 1438 cum per day (5, 24,870 cum per annum). But, only 55% of water is pumped out per day. To arrest the groundwater depletion due to pumping, it is practiced to recycle waste water to compensate the remaining requirements (45%).

4.4 Details of Over Head Water Tank & Sump

Sl.No	Name of Building	Type of Tank	Capacity (lit.)
1.	Periyar TBI	Over Head Tank (RCC) – 2 nos.	20720
2.	Hospital	Sintex Tank	1000
3.	TB -I	Over Head Tank (RCC) – 2 nos.	65630
4.		Sintex tank (RO)	2000
5.		Sump	2230
6.	TB - II	Sintex tank (RO) – 2 nos.	2000
7.		Sump	776970
8.	Education Block	Over Head Tank (RCC)	22120
9.		Sintex tank (RO)	2000

10.	Chakaravarthy Hostel	Over Head Tank (RCC) – 3 Nos.	72620
11.		Sintex tank (RO)	2000
12.		Sump	149320
13.	Millennium Cottage	Sintex tank (RO)	500
14.	Cora Cottage	Sintex tank (RO)	500
15.	Indoor Stadium	Over Head Tank (RCC) – 2 nos.	17000
16.	PKC	Over Head Tank (RCC)	24740
17.		Sintex tank (RO)	2000
18.	Nagammaiyar Hostel	Over Head Tank (RCC) – 2 nos.	35000
19.		Sintex tank (RO)	2000
20.		Sump	104980
21.	Vittobai Hostel	Over Head Tank (RCC) – 2 Nos.	39000
22.		Sintex tank (RO)	2000
23.		Sump	208190
24.	Sorna Renganathan Hostel	Over Head Tank (RCC) – 2 Nos.	60000
25.		Sintex tank (RO)	1500
26.	Staff Quarters	Sintex Tank - 7 Nos.	1000
27.	Bank	Sintex Tank	1000
28.	Architecture	Sintex Tank	5000
29.	Periyar TBI	Over Head Tank (RCC)	5600
30	Hospital	Over Head Tank (RCC)	1000
31	TB -I	Over Head Tank (RCC)	20,000
32		Over Head Tank (RCC)	20,000
33		Sintex tank (RO)	2000
		Sump	16000
34	TB - II	Sintex tank (RO)	1000
35	Education Block	Over Head Tank (RCC)	12600
		Sintex tank (RO)	2000
36	Chakaravarthy Hostel	Over Head Tank (RCC) – 3 Nos.	12,000
		Sump	16000
37	Millennium Cottage	Sintex tank (RO)	500
38	Cora Cottage	Sintex tank (RO)	500
39	Indoor Stadium	Over Head Tank (RCC)	2000
40	PKC	Over Head Tank (RCC)	22000
		Sintex tank (RO)	2000
41	Nagammaiyar Hostel	Over Head Tank (RCC)	6000
		Sump	12000
		Sump	
42	Vittobai Hostel	Over Head Tank (RCC) – 2 Nos.	24,000
		Sintex tank (RO)	2000
43	Sorna Renganathan Hostel	Over Head Tank (RCC) – 2 Nos.	30,000
		Sintex tank (RO)	2000
44	Staff Quarters	Sintex Tank - 8 Nos.	1000
45	Bank	Sintex Tank	1000
46	Architecture	Sintex Tank	5000

4.5 Sump & Over Head Water Tank – Quantity Details

Tanks and Sumps Details with quantity at our Institute premises.

1.	TB - I	2-OHT	65.63 m^3	65630 litres
2.	TBI	2-OHT	20.72 m^3	20720 litres
3.	Hospital	Sintex	0.25m^3	250 litres
4.	Architecture	OHT	22.12m^3	22120 litres
5.	Chakkaravarthy Hostel	OHT-3	72.62m^3	72620 litres
		Sintex	10m^3	10000 litres
6.	Knowledge Centre	OHT	24.74m^3	24740 litres
7.	PKC -E	Sintex	5m^3	5000 litres
8.	Indoor stadium	OHT (O) -2	17m^3	17000 litres
9.	Nagammaiyar Hostel	OHT-2	35m^3	35000 litres
10.	Vittobai Hostel	OHT-2	39m^3	39000 litres
		TOTAL	312.03m^3	**3,12,080 litres**

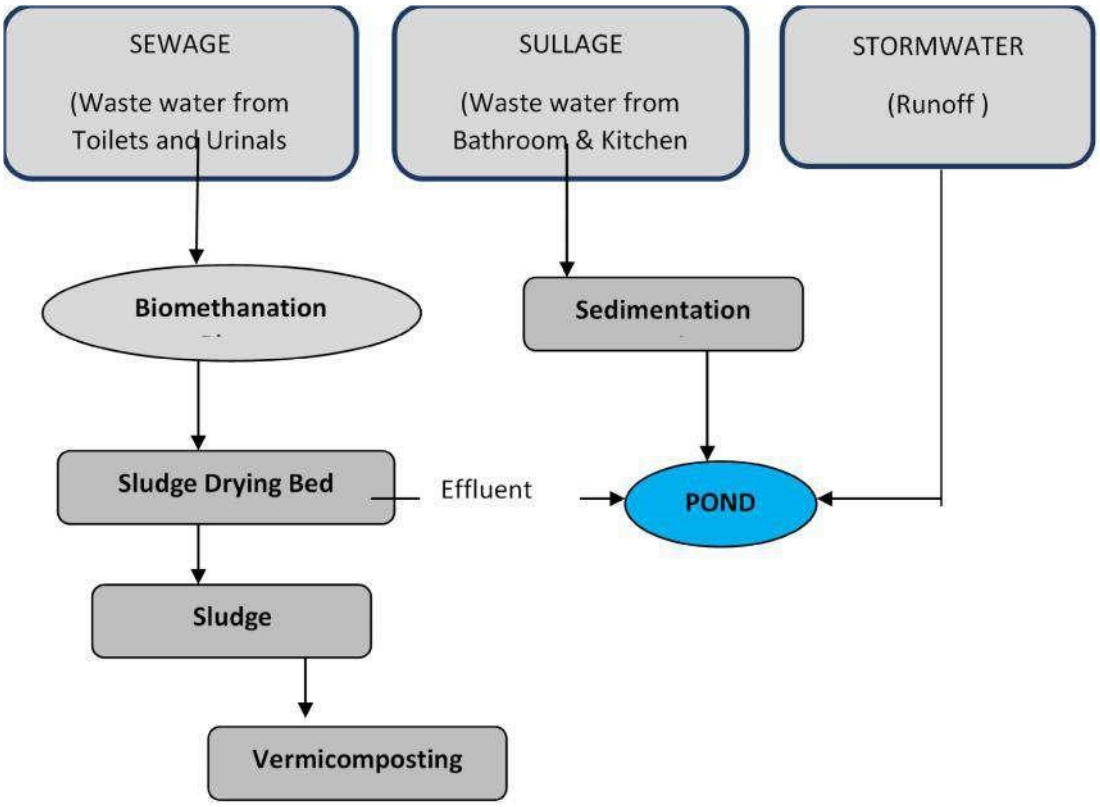
4.6 SUMP Details:

1.	Chemistry Lab	22.23 m^3	22230 litres
2.	TB - I	776.97 m^3	776970 litres
3.	B.Ed. block	20.7m^3	20700 litres
4.	Chakkaravarthy Hostel	149.32m^3	149320 litres
5.	Nagammaiyar Hostel	104.98m^3	104980 litres
6.	Vittobai Hostel	208.19m^3	208190 litres
		Total	**12,82,390 litres**

05. WASTEWATER MANAGEMENT

This campus is having 22,000 cum capacity percolation ponds to store rainwater and grey water, 10,000 cum capacity pond to store storm water and 1300 cum capacity open well to store rainwater.

The existing wastewater system in the institute is as shown below



5.1 Details of Toilet Facilities

Sl.No.	Description	Floor	No. of Rooms	No. of Toilets	Total
1.	Vittobai Hostel	Ground	24	24	**108**
		First	28	28	
		Second	28	28	
		Third	28	28	
2.	Sorna Renganathan Hostel	Ground	16	16	**126**
		First	26	52	
		Second	26	52	
		Third	11	22	
3.	Nagammiyar Hostel	Ground	63	65	**191**
		First	63	63	
		Second	63	63	
4.	Chakkaravarthy Hostel	Ground	37	24	**166**
		First	37	27	
		Second	37	27	
		Third	37	27	
		Fourth	37	27	
		Staff Room & Guest House	17	34	
5.	Technology Block- I			48	**48**
6.	Technology Block -II			37	**37**
7.	Architecture Block			24	**24**
8.	Education Block			10	**10**
9.	Canteen			10	**10**
10.	PKC			83	**83**
11.	Indoor Stadium			6	**6**
12.	Periyar TBI			32	**32**
				Total	**841**

Grey water refers to domestic wastewater originating from bathrooms (bathing and clothes washing) and kitchens (utensils washing). With minimal treatment, grey water can be repurposed for uses such as toilet flushing, gardening, and floor cleaning. At the institute, with a population of approximately 2,300 individuals, daily water usage is around 130 cubic meters, generating about 96.4 cubic meters of grey water per day (35,186 cubic meters annually).

The grey water is collected from all buildings through a network of well-laid 150 mm diameter PVC conduits, spanning a total length of 3,258 meters. To complement this system, a 950-meter-long open channel has been constructed to collect stormwater. Both grey water and stormwater are directed into a sedimentation tank, where settleable solids are removed.

After sedimentation, the water is stored in a 20,000 cubic meter capacity percolation pond. This reclaimed water is then pumped and utilized for irrigating the campus's extensive plantations, including bamboo, coconut trees, and lawns, supporting sustainable water management practices.

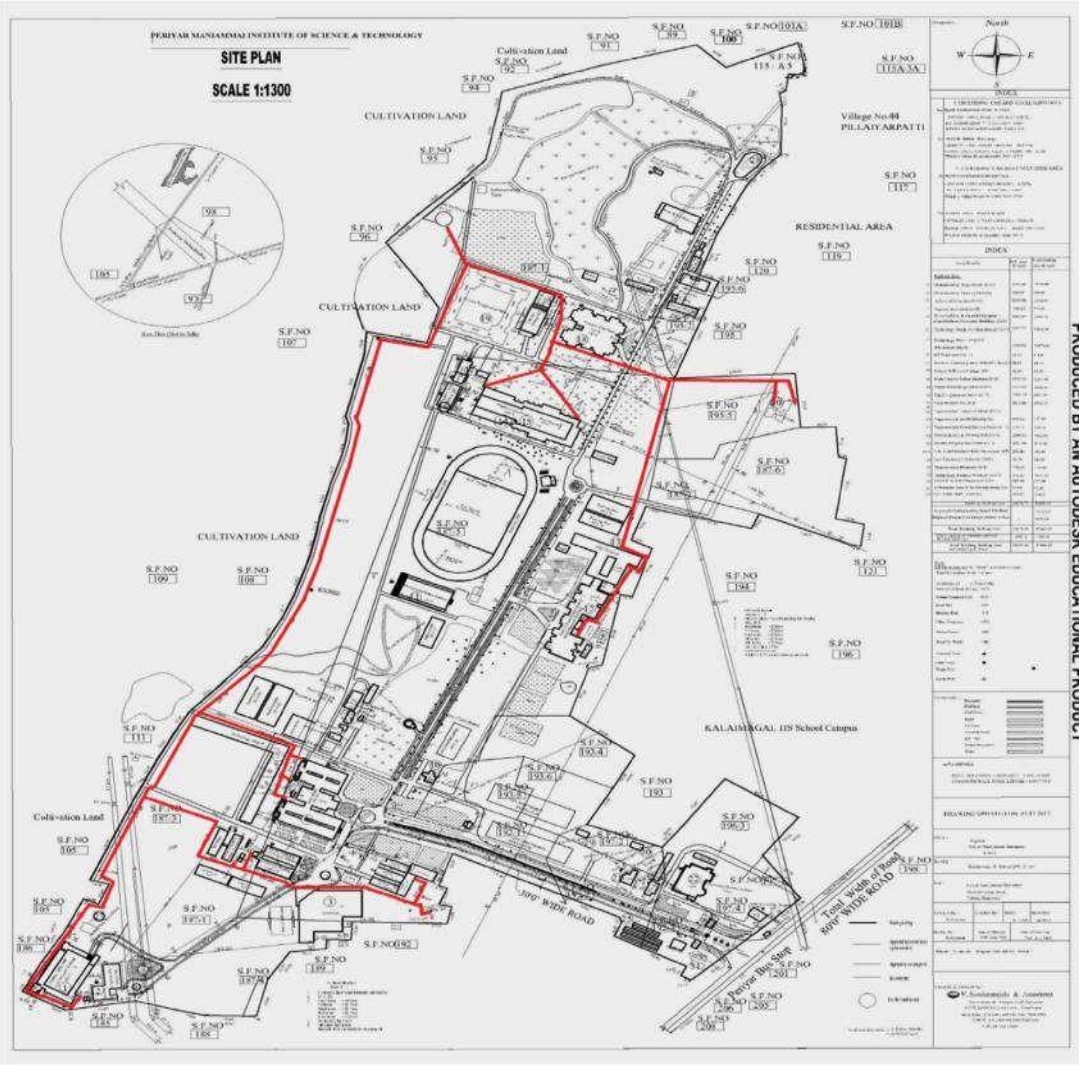


Fig 3.1 Waste water lines plotted in red in Institute layout

6.0 AIR QUALITY (CO_2, Temperature and Relative Humidity of various buildings)

S.NO.	PLACES	CO_2 PPM	RELATIVE HUMIDITY	TEMPERATURE
1	TB-1 (EEE) LAB.	521	58.9	27.2
2	Transportation Lab	474	52.9	28.4
3	Civil HOD Room	397	51.6	31.6
4	Concrete Lab	521	47.1	27.2
5	Geotechnical Engg. Lab	839	58.6	28.3
6	Strength of Materials Lab	625	54.3	28.4
7	Electrical Machine Lab	617	58.1	27.3
8	EDC Lab	479	55.4	30.1
9	M & I LAB	477	53.4	30.5
10	Valluvar Hall	552	48.4	33.7
11	Main Office	484	58.3	27.8
12	VC Office	549	51.8	28.5
13	GIS Lab	722	58.3	31.0
14	Bio- Tech. Lab	529	55.2	28.7
15	Registrar Office	786	52.5	28.6
16	Control System Lab	407	47.4	30.4
17	Bio Process Lab	544	53.7	28.6
18	Chemistry Lab	599	51.3	29.1
19	Physics Lab	622	52.4	29.3
20	TB-1 302	455	49.4	30.4
21	Civil Engg. Staff Room	777	53.7	28.3
22	Maths Dept. Staff Room	806	53.5	30.2
23	Director CSAS Room	461	53.8	31.5
24	Administrative Office	504	53.4	28.6
25	Arch Studio-1	508	60.5	29.7
26	Studio-2	495	52.1	29.5
27	Canteen	544	51.1	29.0
28	Academic Affair Office	459	51.6	28.4
29	Library	575	49.5	34.2
30	CSE Lab 208	813	45.7	30.0
31	CSE Lab 207	792	51.1	28.6
32	Indoor Stadium	889	51.2	32.0
33	Substation	507	47	30.9
34	Aerospace Lab	483	47.1	31.2
35	Mechanical Lab	486	49.6	31.4
36	Generator Room	587	47.5	32.7

Using Digital Indoor Air Quality meter the Co_2 level, Relative Humidity, Temperature and Pressure at different points in the premises were measured and given below:

- **Co_2 level :** Min – 397 ppm ; Max.– 889 ppm (*As per ASHRAE, above 1000ppm CO_2 – requires adjustment of building's ventilation system)*
- **Relative Humidity (RH) :** Min – 45 % ; Max.– 60 %

  (As per ASHRAE Standard, indoor humidity levels to be maintained between 30 -65 percent for optimum comfort).
- **Temperature:** Min – 28.3˚ C ; Max.– 34˚ C

  (*As per ASHRAE Standard, recommended temperature ranges termed "comfortable" are 22.8 to 26.1°C in the summer and 20.0 to 23.6°C in the winter).*

7.0 SOLID WASTE GENERATION AND MANAGEMENT

The 4R concept –REDUCE, REUSE, RECYCLE, RECOVER is being experimented with the solid waste collected in the campus. The wastes are segregated and composting of degraded materials in the process. To promote research and encourage young researchers National and International Level conferences are regularly hosted every year in collaboration with various agencies. Solid waste is segregated at source and recycled with focus on waste to wealth

- Periyar TBI possess a Paper recycling unit called Periyar Paper Re-processing Unit
- Sources for the paper recycling unit are retrieved from our Institute and reinforcing materials (cotton waste) are added to strengthen the quality of the paper.
- Two tonnes of paper/ year are produced by recycling because of this, 8.5 $m^3$of wood pulp is saved.

Solid waste is segregated at source by using 3 colored bins and using naturallygrown bamboo bins instead plastics

7.1 Details of Garbage Bin Location

Sl.No.	Description	Floor	No. of Dustbin	Total
1.	Vittobai Hostel	Ground	56	**286**
		First	56	
		Second	56	
		Third	56	
		Common	6	
2.	Nagammaiyar Hostel	Ground	10	**10**
3.	Chakkaravarthy Hostel	Ground	8	**40**
		First	8	
		Second	8	
		Third	8	
		Fourth	8	
		Fifth	8	
4.	Technology Block- I			**50**
5.	Technology Block -II			**14**
6.	Architecture Block			**15**
7.	Education Block			**5**
8.	Canteen & Store			**10**
9.	PKC			**31**
10.	Indoor Stadium			**2**
11.	Periyar TBI			**5**
12.	Pathway (Tricolour Coded Bins)		10	**30**
			Total	**498**

The Biomethanation plant in Periyar Maniammai Institute of Science & Technology is multifeed with the following feeds like cattle dung, night soil, vegetable waste and food waste. The gas producing capacity of the digester is 500cum per day. The human waste collected from all buildings through 200 mm diameter PVC pipe. The total length of laid pipe line is 4250 m to the plant. The volume of gas produced will generate 60 KWe of electricity. This will not only generate significant quantity of Biogas but also generate the digested material about 120 metric tons in year a used as a high grade soil conditioner for in house and locals atnormal cost. The Digester is of 16.2m diameter and 5.7m height. Quantity of feeding requiredper day is 10 tons. Nearly 2960 cum per year of waste water is generated from this plant. The waste water collected is also used for recycling and reusing after treatment.

7.2 E WASTE MANAGEMENT

E-Waste for short - or Waste Electrical and Electronic Equipment (WEEE) - is the term used to describe old, end-of-life or discarded appliances using electricity. It includes computers, consumer electronics, fridges etc which have been disposed of by their original users.

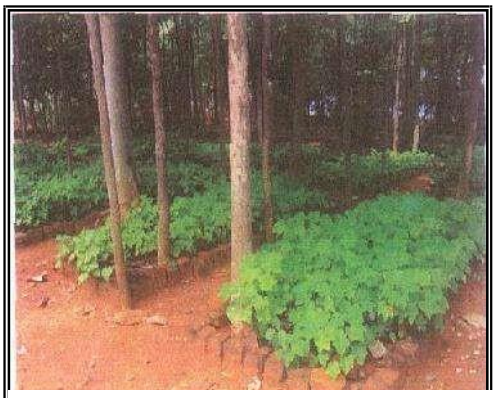
7.3 GREEN CAMPUS

The institute has area of 46964 Sq.m which has been transformed into a land of thick foliages, green vegetation 1618 Nos. of bamboo trees, 38,441 Nos. of other variety of trees such as Azadirachtaindica (neem), Ponganiapinnata (pongai), Pterocarpusindices (vengai), Albizialebbeek (vaagai), Casuarinauqisetifolia (casuarinas), Pterocarpus sandalinus (red sandals), Tacfonagranules (teak), etc. which were developed from waste water usage) and a technology-hub, energy efficient, pollution-free, zero waste and well-laid campus with an ambience for learning from barren and dry wasted land.

Green Foliage of the Campus

Establishment of Periyar Herbarium to introduce the 250 species of medicinal plants, Germplasm collection for medicinal plants to use the TBI. National mission on Bamboo application (NMBA) Project — Planting of bamboo seedlings 10 acres for demonstration plot

Timber Tree



Bio-Diesel plant Jatropha

- Seedlings are supplied at nominal price to individuals, farmers and for industrial green cover. Consultancy for industries, one public sector undertaking and private owners has been taken up.

Cultivation of Bambosa Bamboo

Medicinal Plants

- Every year, the Periyar Research Organization for Bio-Technic and Eco-System (PROBE) conducts a two-day national seminar concentrating mainly on revival of profitable farming practices for sustainable development

- Technical and entrepreneurial assistance is given to enterprising youth to establish rural industries. Industrious youth are identified and training is given to them to motivate entrepreneurship skills in them. Need-based training programmes are also conducted for those who opt for such skills.

8.0 GREEN PRACTICES

The following activities carried out in campus clearly prove that we are marching towards Clean Development Mechanism (CDM) and carbon footprint initiative.

Varieties of species and medicinal plants have been produced with the help of Tissue Culture (TC) techniques and quality seedlings produced by TC plant hardening centre.

Plants produced by Tissue Culture

a) Green Foliage

PMIST campus has around 4,500 shrubs and plant varieties, 26,000 native trees. Such thick foliage of vegetation releases oxygen of 8.4 tonnes per day and CO_2 absorption is around 1.6 tonnes per day.

PMU students walking in the shadows of trees

b) Bamboo Cultivation

Bamboo grove cultivated in the University requires one-tenth of the water compared to paddy cultivation and retains ground water. It has the survival of 40 years as a standing crop. Each bamboo clump liberates 850 grams of O_2 per day whereas the requirement of a single person per day is only 800 grams of O_2. Bamboo farm of 10 acres is developed inside the Institute campus in order to give training to the farmers. Bamboo minimizes Carbon-di-Oxide and generates up to 35% more Oxygen than equivalent stand of other trees.

A view of Bamboo garden in our campus

One acre of bamboo sequesters 25 tonnes of CO_2 /year. Apart from this, bamboo based home products are produced in the campus as substitute for plastics. These products are green and eco-friendly, stood as one of the important green practices. As one of our green practices, many important meetings are conducted in the bamboo groove which reduces the air conditioned hall electricity consumption and also feels good.

c) Farm Activities

In one of our adopted villages namely Aachampatti we have established a farm has a very thick foliage of around twenty thousand timber trees like red sanders, rose wood, teak and vengai and native fruit trees like coconut, mango, jackfruit, sappota and medicinal plants like amla and aloevera. To guard this agri-farm, an ideal bio-fence like 'Sudan' shrubs is planted. The coconut yields obtained here are in surplus, that we use it in the hostel and also put out for sales. Generally, coconut groves require plenty of water but due to our effective irrigation systems, the water usage is minimal. Periyar Bio-farm is a development of team work of agriculturists, farmers and technocrats and has created job opportunities too many people in the surrounding areas.

The land and socio-economic values of the surrounding areas have excessively increased from Rs.12, 500 per acre to Rs.10 lakhs per acre over a period of 15 years. Technical knowhow is disseminated to the nearby farms at Aachampatti for a betterment of their farms. Water conservation is also adopted by means of drip irrigation, check dams and soil erosion control. Two rainwater collection ponds serve as water storage and as a source of drinking water for grazing animals.

Aachampatti Farm

d) Organic Culture

The farm is completely grown by organic vegetation. Organic manure like **vermicompost** is used.

Vermicompost yard in our campus

Vermicompost Bags

Earth worms Eisenia Foetida

Highly efficient systems such as micro-irrigation and mulching technology are practised. Best fittings like efficient single lever taps, toilet flush tanks and double plumbing are used in the campus.

Mulching Technology

Micro Irrigation

e) Rainwater Harvesting Pond

After the blooming of Periyar Maniammai Institute of Science and Technology in thislaterite arena, not even a single drop of rainwater is being wasted in the educational campus. Traditionally, rainwater harvesting has been practiced in arid and semi-arid areas, and has provided drinking water, water for campus use, livestock, and small irrigation. It is the best way to recharge groundwater levels in and around Periyar Maniammai Institute of Science and Technology.

Rainwater harvesting systems are the needs of the hour that many educational institutions, industries, houses must install the harvesting tanks. Water harvesting in this campus presents as an exemplary technique. Rainwater from rooftops of buildings is collected and fed into the collecting sumps located in four different places of Periyar Maniammai Institute of Science and Technology. Surplus water from the earth surface is collected and fed into two water storage ponds. Water from the sewage, from the buildings and constructions (hostels and institutional buildings) is utilized after proper treatment. The rainwater thus harvested and collected in the sumps is directly used as irrigation water for botanical gardens by suitable sprinklers in the campus. The recharged groundwater through deep bore well is utilized for all institutional needs and construction of buildings and laboratories. Similarly, the sewage water after treatment is not at all wasted but is utilized for watering the ornamental plants and lawns.

Thus, the entire water needs of the Institute are satisfied from the rain fed subsoil resources and no external water supply is drawn from any other source.

Rain water Harvesting Pond (4250m^3)

Percolation Pond (2 TMC)

Sustainable Institutions of India (SII): Green Institutional Ranking Result

Periyar Maniammai Institute of Science & Technology has applied Green Institutional Ranking. The institute has been awarded with **"Green Institutional Ranking" in Gold Band across India from Sustainable Institutions of India (SII) organization** under R. World Institutional Ranking (R.WIR). This award explores the strength of the Institution and Comprehensive overview of the Environmental and Sustainable activities of the Institution. Further, PMIST aims for achieving Carbon Neutral through its Environmental promotional activities.

09. GREEN AUDIT RECOMMENDATIONS

01. WATER MANAGEMENT

The Management needs to consider the low –flow faucets, automatic faucets, and/or faucet aerators as the replacement for the existing conventional taps.

The management needs to install the metering arrangement to measure the water drawn from its main water sources.

College can undertake determination of water footprint and calibrate its specific water consumption with the established National and International Norms.

02. RENEWABLE ENERGY

The college needs to chalk out long term strategy towards carbon neutrality and install renewable electricity generation (solar PV) to offset emissions of grid- b a s e d electricity generation.