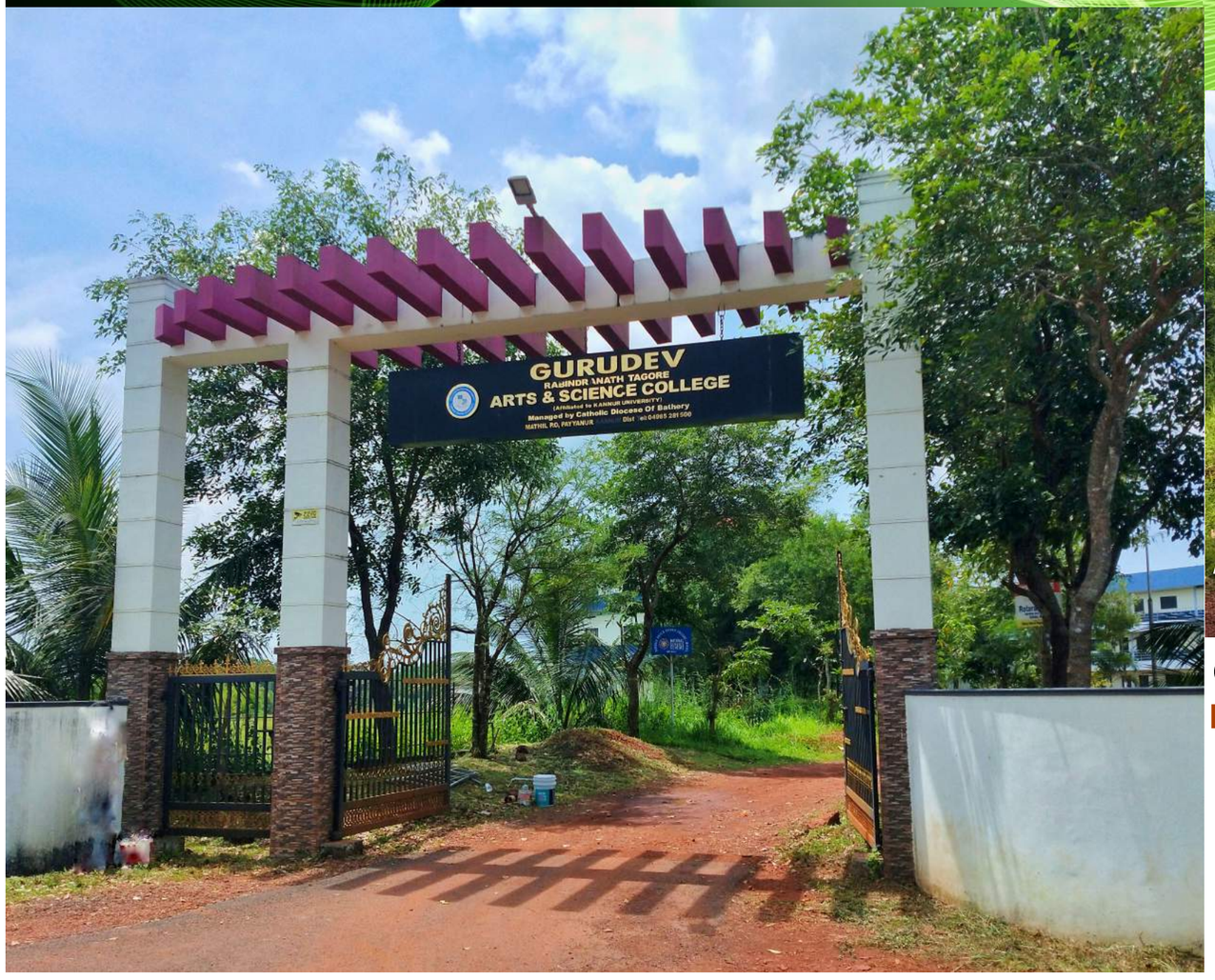
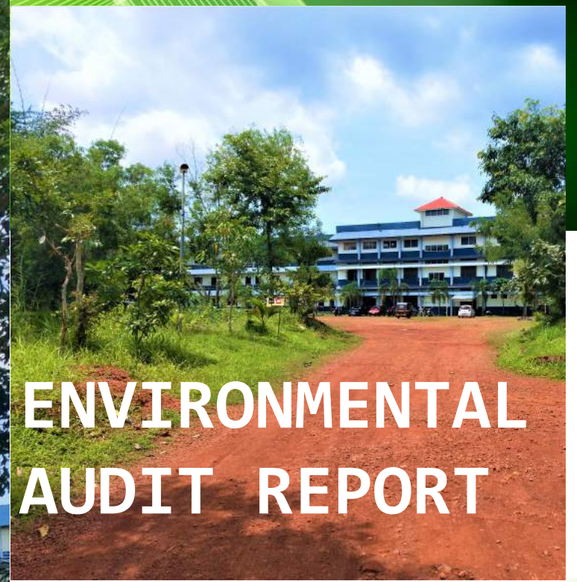




ENVIRONMENTAL AUDIT REPORT

GURUDEV ARTS & SCIENCE COLLEGE
PAYYANUR

2021

Executed by

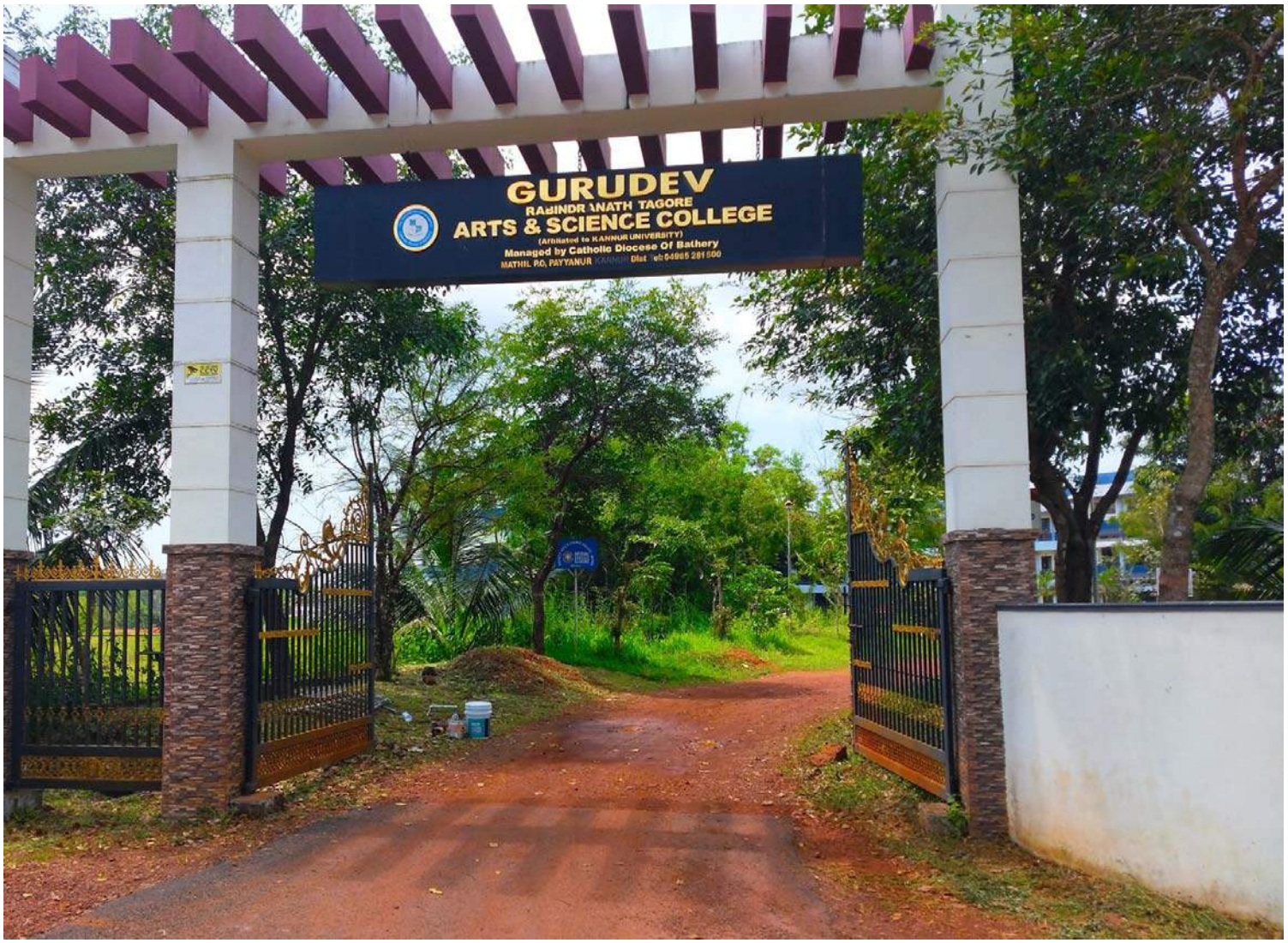
OTTOTRACTIONS
Energy-Engineering-Environment

ENVIRONMENT AUDIT REPORT

GURUDEV COLLEGE OF ARTS & SCIENCE

PAYYANNUR

September 2021



OTTOTRACTIONS
Energy-Engineering-Environment

Environment Audit Report
GURUDEV COLLEGE OF ARTS & SCIENCE
Report No: EA 809
2021- September

Environment Audit Team

Ottotractions

1	Er. Suresh Babu B V,	Accredited Energy Auditor, AEA 33
2	Er. B. Zachariah	Director, Ottotractions
3	Er. Abin Baby,	Project Engineer, Ottotractions
4	Er. Devan J	Project Engineer, Ottotractions

About OTTOTRACTIONS

OTTOTRACTIONS established in 2005, is an organization with proven track record and knowledge in the field of energy, engineering, and environmental services. They are the first Accredited Energy Auditor from Kerala for conducting Mandatory Energy Audits in Designated Consumers as per Energy Conservation Act-2001. Government of Kerala recognized and appreciated **OTTOTRACTIONS** by presenting its prestigious **"The Kerala State Energy Conservation Award 2009"** for the best performance as an Energy Auditor.

Acknowledgment

We were privileged to work together with the administration and staff of Gurudev Arts & Science College, Payyanur. for their timely help extended to complete the audit and bringing out this report.

With gratitude, we acknowledge the diligent effort and commitments of all those who have helped to bring out this report.

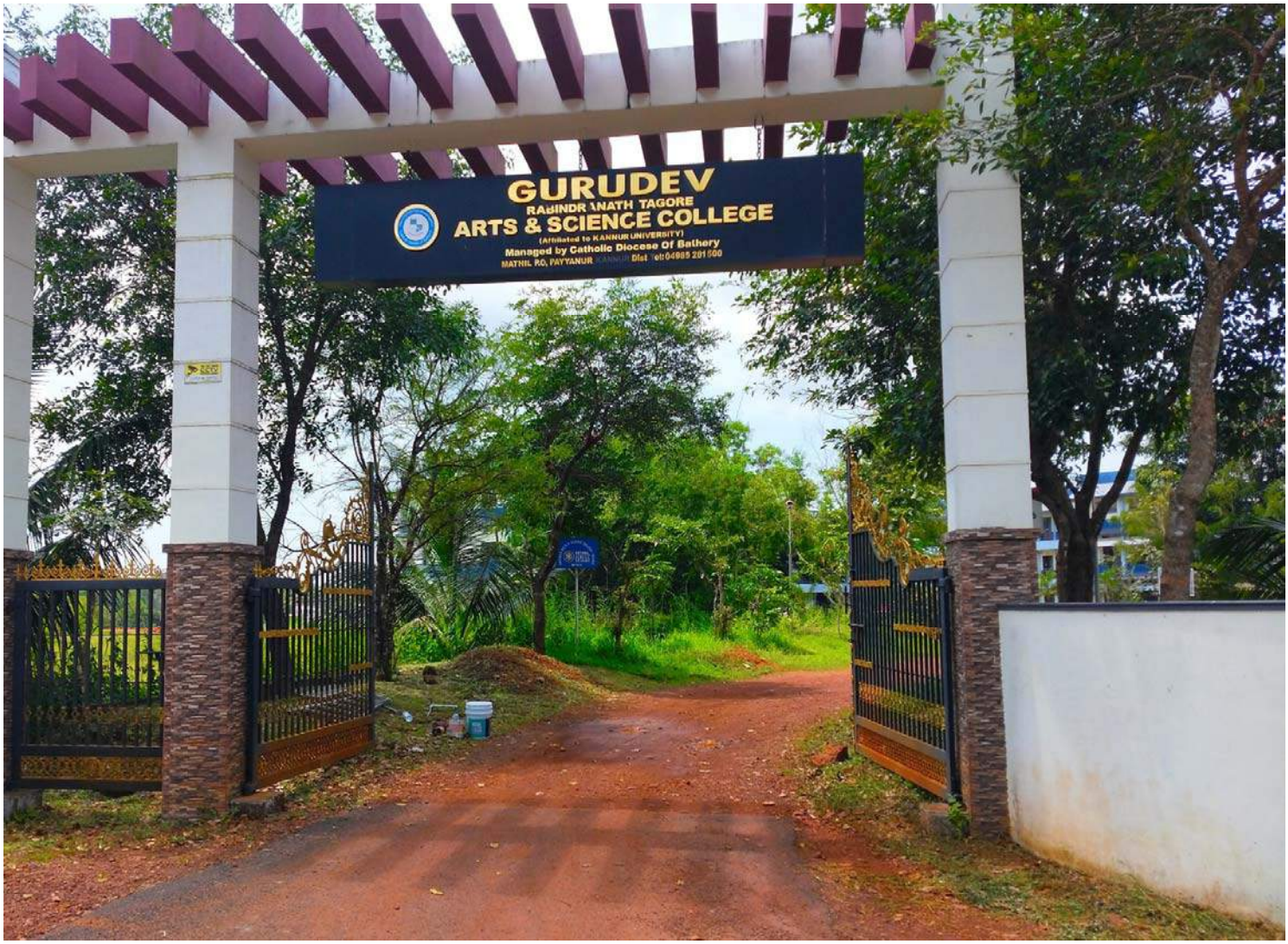
We also take this opportunity to thank the bona-fide efforts of team OTTOTRACTIONS for unstinted support in carrying out this audit.

We thank our consultants, engineers and backup staff for their dedication to bring this report.

Thank you.

B V Suresh Babu
Accredited Energy Auditor
AEA 33, Bureau of Energy Efficiency

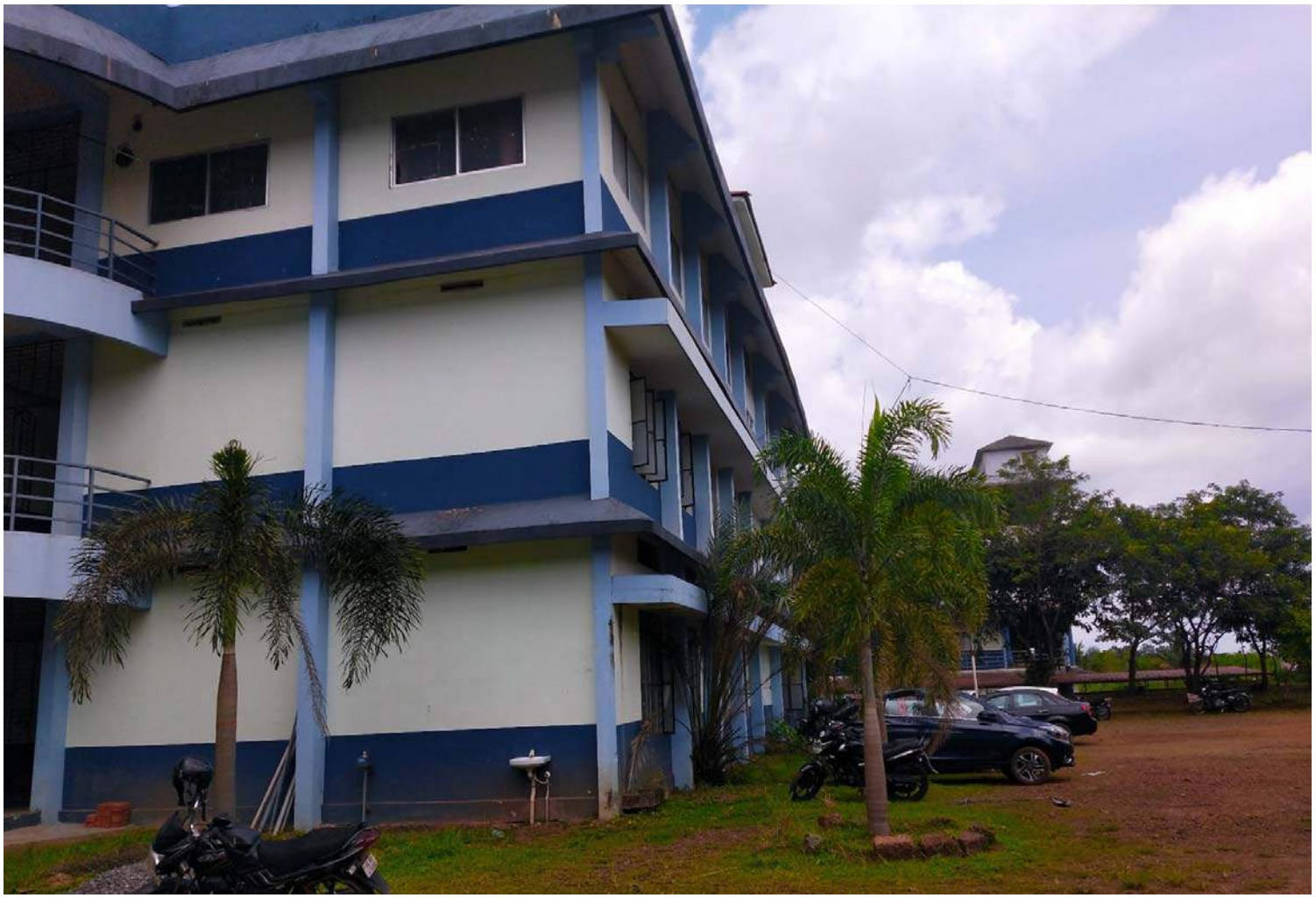
Contents



INTRODUCTION

Ottotractions was asked by the Gurudev Arts & Science College, Payyannur to carry out an environmental audit of their campus building.

Each section contains recommendations for improvements relating to environmental issues, which are consolidated in the action plan in section 4.



BACKGROUND

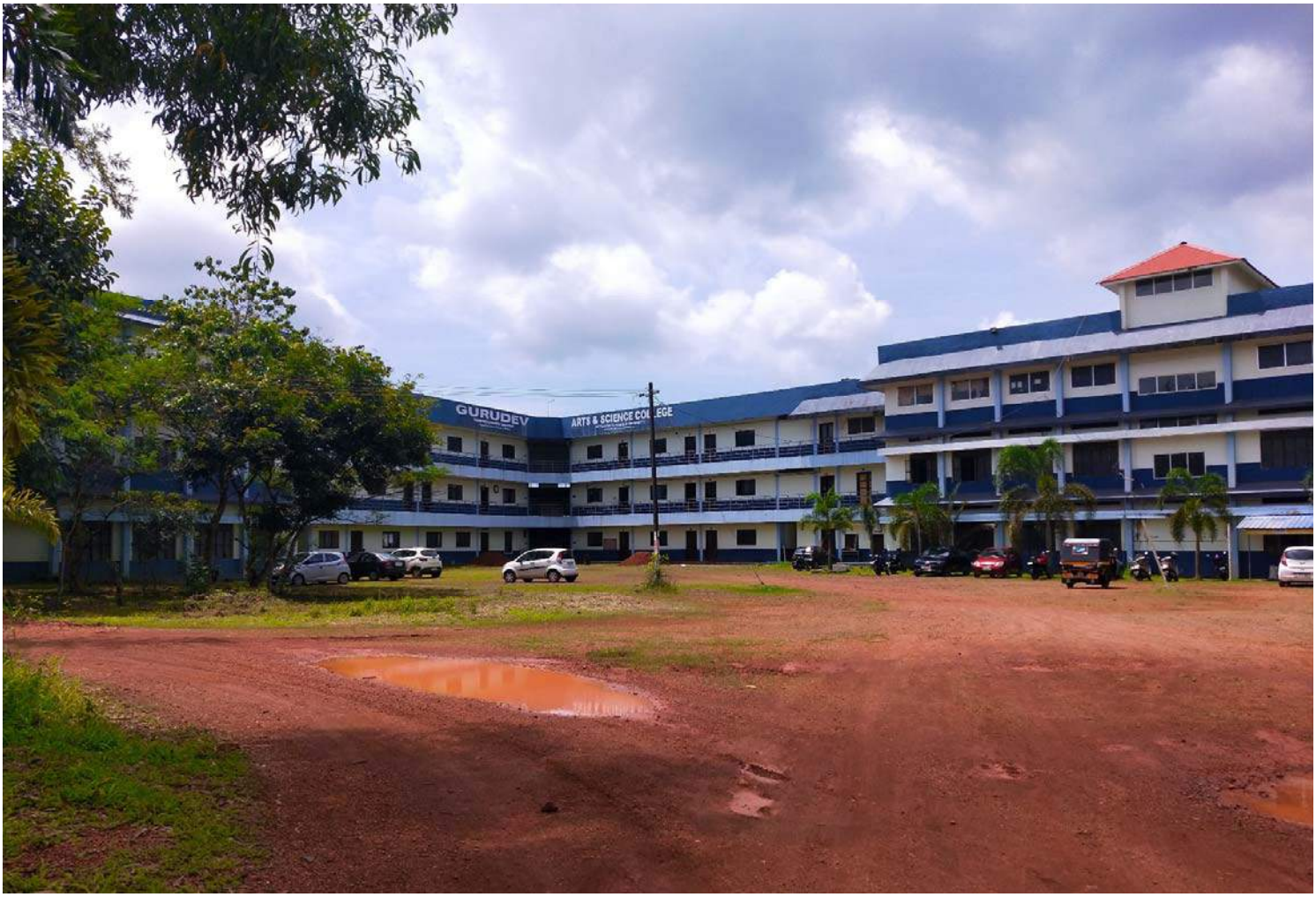
Gurudev Arts and Science College was established in the year 2002 at Mathil, and is affiliated to Kannur University. It is one of the most Reputed Catholic Colleges managed by Corporate Educational Agency of the Catholic Diocese of Sulthan Bathery, Wayanad. His Excellency Most. Rev. Dr. Joseph Mar Thomas is the Manager and Patron of this college.

Started with two UG courses, the glory of Gurudev Arts and Science College reaches hither to with 12 UG courses and 4 PG courses by securing enthralling victories and progress in both curricular and co-curricular fields throughout its journey. Now it imparts the silver light of knowledge to more than thousands of students who belong mainly to the rural areas of Kannur, Kasaragod and other Districts and thereby fulfills the higher education dreams of thousands of people and became an integral part in the overall development of these areas. Excellence in educational performance and ethics in social norm shave marked the wonderful reputation of our institution. The college marches forward with enhanced vigor and vitality upholding the motto 'Lighted to Lighten'.

Gurudev Arts and Science College was established in the year 2002. It was founded by Gurudev Educational and Charitable Trust' Mr. M.V.Purushothaman was the founder chairman. The college has a humble beginning only with two UG courses. After the initial year of functioning at Payyanur in Safa Marva Tower, the college shifted to its own building atop the scene hill whirl, in the middle of Mathil town in 2003. More UG courses started and the college became one of the top most colleges affiliated to Kannur University within a short span of time.

Occupancy Details			
Particulars	2018-19	2019-20	2020-21
Total Students	1298	1298	1298
Staffs	77	77	77
Total Occupancy of the college	1375	1375	1375

Total student strength of the campus is 1298. For calculating per capita carbon emission estimation, the student strength is taken into account.



ENVIRONMENTAL ISSUES

This section is broken down into the following different areas: waste, water, energy, resource and materials use and procurement. A final 'other' section is also included for any additional issues.

1.1. Waste

The way communities generate and manage their waste plays an absolutely key role in their ability to use resources efficiently. All buildings contain bins for both general waste and mixed recyclables (plastic bottles, card, cans and paper). On average each floor in the

buildings areas has its own general waste bin and one recycling bin. When the bins are emptied by the cleaning staff. Bins are marked and kept in different colors for identification, however in some locations throughout the building it was unclear which bins were for which waste streams.

There are four basic ways in which campus can do plastic recycling collection services for plastic bottles and containers – curbside, drop-off, buy-back or deposit/refund programs. The first, and most widely accessible, collection method is curbside collection of recyclables. The campus is installed bins to collect plastic bottles and single use plastics. SGC has given a proper awareness on plastic waste problems and they are discouraging the students or teachers to carry plastics to the campus. The ECO club is very active in the campus and do a verity of programs to build awareness on waste management. The reports on different activities of the club are attached as technical supplement of this report.

The major concern of waste management will be focused on the solid waste produced by the campus. Solid wastes produced in the campus are mainly of three types, food waste, paper waste, and plastic waste. Food wastes produced in the campus are mainly by two means. The vegetable wastes produced in the kitchen during the food preparation. The food waste produced by the students and staffs of the campus after the consumption of meals.

Solid degradable Waste Generation			
GURUDEV COLLEGE OF ARTS & SCIENCE			
	2018-19	2019-20	2020-21
Total Occupancy	1375	1375	1375
Waste generated in kg /day	27.5	34.375	11
Waste generated in kg /Yrs.	3630	4537.5	1452

Burning plastics shall be strictly restricted inside the campus. Burning plastic and other wastes releases dangerous substances such as heavy metals, Persistent Organic Pollutants, and other toxics into the air and ash waste residues. … Such pollutants contribute to the development of asthma, cancer, endocrine disruption, and the global burden of disease.

Solid non degradable Waste Generation			
GURUDEV COLLEGE OF ARTS & SCIENCE			
	2018-19	2019-20	2020-21
Waste paper generated in kg /day	1375	1375	1375
Waste plastic generated in kg /day	0.28	0.31	0.14
Waste paper generated in kg /Yrs.	0.41	0.46	0.21
Waste plastic generated in kg /Yrs.	60.50	67.22	30.25
Normalisation Value for solid waste is 0.06			

WASTE MINIMIZATION AND RECYCLING

1	Does your institute generate any waste? If so, what are they?	Yes, Solid waste Canteen waste, paper, plastic, Horticulture Waste etc
2	What is the approximate amount of waste generated per day? (In Kilograms/month) (approx.)	Bio Non- Hazardous Others Degradable Biodegradable
3	How is the waste generated in the institute managed? By	Reuse of one side printed Paper for internal communication. Sewage water is discharged to public Sewer. Kitchen waste is used to generate manures. Two types of Waste bins are provided at campus for biodegradable and non-biodegradable waste.
	1 Composting	In-house
	2 Recycling	In-house
	3 Reusing	In-house
	4 Others (specify)	
4	Do you use recycled paper in institute?	Yes
5	Do you use reused paper in institute?	Yes
6	How would you spread the message of recycling to others in the community? Have you taken any initiatives? If yes, please specify.	Number of awareness programs through ECO Club
7	Can you achieve zero garbage in your institute? If yes, how?	Not yet achieved. Possible through waste management plan.

Green Cover Audit

1	Is there a garden in your institute?	Yes
2	Do students spend time in the garden?	Yes

3	Total number of Plants in Campus	Plant type Trees Ornamental	Approx. number 1608 Not estimated
4	Number of Tree Plantation Drives	Yes, Through ECO club	
5	Number of Trees Planted in Last FY.	NA	
	Survival Rate		80%

All the activities including energy consumption and waste management have their equivalent carbon emission and they positively contribute to the carbon footprint of the campus. Carbon sequestration is the reverse process, at which the emitted carbon dioxide will get sequestrated according to the type of carbon sequestration employed. Even though there are many natural sequestration processes are involved in a campus, the major type of sequestration among them is the carbon sequestration by trees.

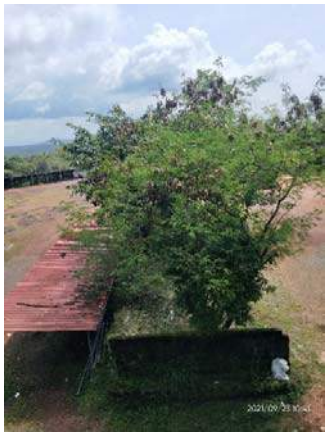
Trees sequestrate carbon dioxide through the biochemical process of photosynthesis and it is stored as carbon in their trunk, branches, leaves and roots. The amount of carbon sequestrated by a tree can be calculated by different methods. In this study, the volumetric approach was taken into account, thus the details including CBH (Circumference at Breast Height), height, average age, and total number of the trees, are required. Details of the trees in the campus compound are given in the Table. Detailed table is included in the technical supplement.

Carbon Sequestration			
Particulars	2018-19	2019-20	2020-21
Total number of trees	128	130	135
Carbon sequestrated by trees in the campus (tCO2e)	0	0	0.00

Carbon sequestrated by a tree can be found out by using different methods. Since this study is employed the volumetric approach, the calculation consists of five processes.

- Determining the total weight of the tree
- Determining the dry weight of the tree
- Determining the weight of carbon in the tree
- Determining the weight of CO_2 sequestrated in the tree
- Determining the weight of CO_2 sequestrated in the tree per year

Carbon sequestrated by each species of trees in the campus compound is given in the Table. Detailed calculation results are listed out in the tables provided in the technical supplements of 'Carbon sequestration'.



List of Trees in the Campus (above 15 cms growth)			
Sl No	Name	Botanical	Number
1	Mango	Mangifera indica L	6
2	Teak	Tectona grandis	2
3	Bottle palm	Roystonea regia	18
4	Coconut Palm	Cocos nucifera	73
5	Acacia	Acacia auriculiformis	34
6	Cashew nut	Anacardium occidentale)	2
7	Kanikonna	Cassia fistula	1
8	Persian silk tree	Albizia julibrissin	2
9	Amla tree	Phyllanthus emblica L	2
10	Castilla	Castilla elastica	3
11	Sindeva tree		3
12	Handy rubber tree	Hevea brasiliensis	2

3.1.1 ENERGY

a. Electricity

The total emission of the carbon dioxide per student is 45.16kg per year (2019-20). Emission reduction plans were prepared to bring the existing per capita carbon footprint to zero or below so as to bring the campus a carbon neutral or carbon negative campus. This can be achieved in many ways but, every alternate plan must be in such a way that, it must fulfill the actual purpose of each activity that is considered.

Here, three major methods are taken in to account as the plans for reducing the carbon emission of the campus.

- Resource optimization
- Energy efficiency
- Renewable energy
- Electricity Consumption

Base Line Energy Data				
GURUDEV COLLEGE OF ARTS & SCIENCE				
		2018-19	2019-20	2020-21
1	Electricity KSEB (kWh)	53262	63994	8400
2	Electricity Solar - Off grid (kWh)	0.00	0.00	0.00
3	Electricity (KSEB + Off grid) kWh	53262	63994	8400
4	Electricity Grid Tied (kWh)	0.00	0.00	0.00
5	Diesel (L)	590.59	397.98	45.00
6	LPG (kg)	1178.00	1292.00	266.00
7	Biogas (kg)	0.00	0.00	0.00

Occupancy Details			
Particulars	2018-19	2019-20	2020-21
Total Students	1298	1298	1298
Staffs	77	77	77
Total Occupancy of the college	1375	1375	1375

GURUDEV COLLEGE OF ARTS & SCIENCE													
Location		LIGHTS					FAN			IT			AC
		T8	T12	LED TUBE	LED SQUARE	LED BULB	CF	WF	EF	PC	Printer	Scanner	1.0
2ND	S12	2					3						
	S118 & S13	2					4						
	S14						2						
	S15					1	2						
	Dept of commerce & management	3					3						
	S11,S10,S9,S8,S7,S6,S1,S2,S3	18					27						
	Microbiology Lab	16					3						
Total		**41**	**0**	**0**	**0**	**1**	**44**	**0**	**0**	**0**	**0**	**0**	**0**
IST	Classroom 1-7	7					14						
	F3						3						
	Chemistry Dept+Lab	5							3				
	F2	1					2						
	F1	2					2						
	F7					1	2						
	F8			1			2						
	F9	2		2			4						
	F10	3					2						1
	F11 F12			2			4						
	F13							1					
	F19	2					2						
	F18	1					2						
	Physics Lab	6					6						
	F16		1				2						
	F17		1				2						
Total		**2**	**2**	**5**	**0**	**1**	**49**	**1**	**3**	**0**	**0**	**0**	**1**

		9											
GND	Computer Lab					4	5			18			
	G15 G14 G17 G13 G12	10					10						
	PG Lab, Chemistry	5							4				
	G9 G8 G7	3					6						
	G1 G2	2					4						
	Bio Chemistry Lab	13					5						
	Dept of English	1					1						
	Store	1					1						
	Library	6		4		8	9			1			
	Auditorium				12	3	13	2	4				
	Snehalaya Ladies hostel(32 rooms)	48					48						
Total		**89**	**0**	**4**	**12**	**15**	**102**	**2**	**8**	**19**	**0**	**0**	**0**

During the energy audit filed studies, 2 Numbers T12, 159 T-8 lamps identified, which is considered as inefficient. 17 LED bulbs and 21 LED tubes were found during the audit. The detailed energy efficiency projects are given in the respective chapters of this report.

GURUDEV COLLEGE OF ARTS & SCIENCE		
Sl. No	**Location**	Avg. Lux
1	F2	89
2	F1	78
3	F7	46
4	F8	74
5	F9	59
6	F10	68
7	F11 F12	73
8	F13	79
9	F19	78
10	F18	75
11	G9 G8 G7	89
12	G1 G2	78
13	Bio Chemistry Lab	59
14	Dept of English	78
15	Store	88
16	Library	86
17	Auditorium	87

18	Snehalaya Ladies hostel	88

RESOURCE OPTIMISATION

The effective use of resources can limit its unnecessary wastage. Optimal usage of the resources (such as fuels) can save the fuel and can also reduce the carbon emission due to its consumption. This technique can be effectively implemented in the 'transportation' and 'waste' sectors of the campus.

WASTE MINIMISATION

Optimal utilization of paper and plastic stationaries can reduce the frequency of purchase of items. This can reduce the unnecessary wastage of money as well as the excess production of waste. In the case of food, proper food habits and housekeeping practices can optimize its usage.

Currently, they taking an appreciable effort to reduce the unnecessary production of wastes. But the campus still has opportunities to reduce the generation of waste and can improve much more. Resource optimization can be effectively implemented in all type of waste generated in the campus and the campus can expect about 50% reduction the total waste produced.

ENERGY EFFICIENCY

Energy efficiency is the practice of reducing the energy requirements while achieving the required energy output. Energy efficiency can be effectively implemented in all the sectors of the campus.

FUELS FOR COOKING

The campus can install a solar water heater to rise the water temperature to a much higher level, then it has to consume only very less amount of thermal energy for preparing the same amount of food. This can make a positive benefit to the campus by saving money, energy and can reduce the carbon emission of the campus due to thermal energy consumed for cooking.

TRANSPORTATION

Energy efficiency of the transportation sector is mainly depended on the fuel efficiency of the vehicles used. Here mileage of the vehicle (kmpl - Kilometers per Litre) is calculated to assess the fuel efficiency of the vehicle. Percentage of closeness is the ratio of actual mileage of the vehicle to its expected mileage. If the percentage of closeness of mileages of each vehicle is greater than that of its average, then the efficiency status of the vehicle is considered as 'Above average' and else, it is considered as 'Below average'

Renewable Energy

After analyzing the historical and measured data the following projects are proposed to make the campus carbon neutral. The projects are from energy efficiency and renewable energy. The further additions in the green cover increase will also give positive impact in the carbon mitigation.

Executive Summary					
Consolidated Cost Benefit Analysis of Energy Efficiency Improvement Projects					
GURUDEV COLLEGE OF ARTS & SCIENCE					
Sl No	Projects	Investment	Cost saving	SPB	Energy saved
		(Lakhs Rs)	(Rs)/Yr	Months	kWh/Yr
1	Energy Saving in Lighting by replacing existing 41 No's T8 Lamps to 20W LED Tube in Ground Floor	0.12	0.040	37.11	164
2	Energy Saving by replacing existing 54 No's in-efficient ceiling fans with Energy Efficient Five star fans in Ground Floor	1.17	0.64	22.13	2627
3	Energy Saving in Lighting by replacing existing 29 No's T8 Lamps to 20W LED Tube in First Floor	0.09	0.23	4.64	928
4	Energy Saving in Lighting by replacing existing 2 No's T12 (55W) Lamps to 18 W LED Tube in First Floor	0.01	0.02	4.52	177
5	Energy Saving in Lighting by replacing existing 4 No's CFL(15W) Lamps to 9W LED BULB in First Floor	0.004	0.01	9.26	58
6	Energy Saving by replacing existing 49 No's in-efficient ceiling fans with Energy Efficient	1.07	0.21	59.62	2383

	Five star fans in First floor				
7	Energy Saving in Lighting by replacing existing 41 No's T8 Lamps to 20W LED Tube in Second Floor	0.12	0.01	100.00	164
8	Energy Saving by replacing existing 44 No's in-efficient ceiling fans with Energy Efficient Five star fans in Second Floor	0.96	0.19	59.62	2140
9	Energy Saving in Lighting by replacing existing 48 No's T8 Lamps to 20W LED Tube in Hostel	0.14	0.02	100.00	192
10	Energy Saving by replacing existing 48 No's in-efficient ceiling fans with Energy Efficient Five star fans in Second Floor	1.04	0.21	59.62	2335
	Total	4.73	1.57	45.65	11167
(The saving are projected as per the assumed operation time observed based in the discussions with the plant officials. The data of saving percentages are taken from BEE guide books and field measurements.)					

Water Conservation Activities

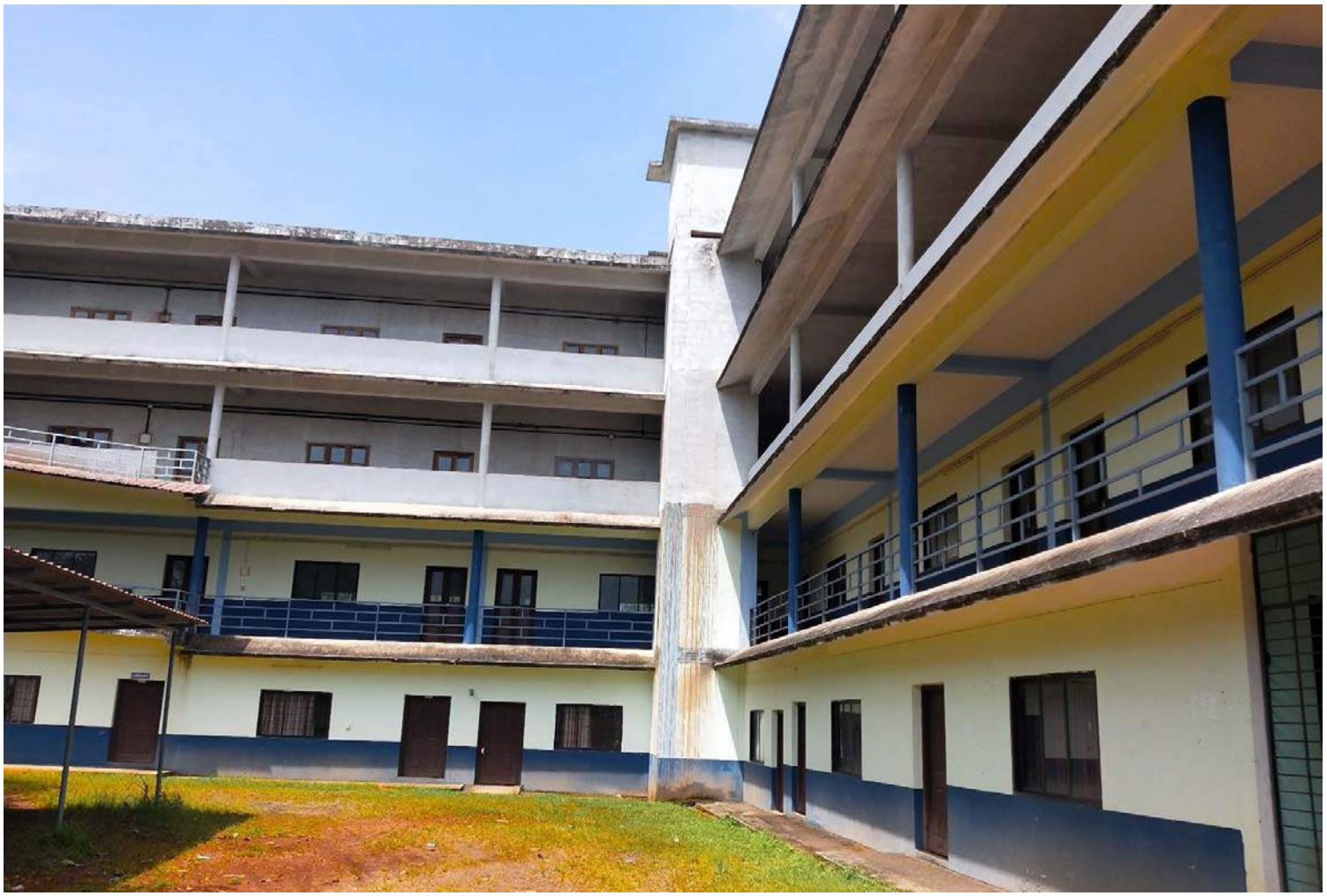
List four uses of water in your institute	Basic use of water in campus: 1. Drinking – Ground Water 2. Gardening – Rain water 3. Kitchen and Toilets – 4. Others –
How does your institute store water? Are there any water saving techniques followed in your institute?	Overhead Water Tanks and Sumps installed for storage of water. Water conservation are in place
If there is water wastage, specify why and How can the wastage be prevented / stopped?	No
Record water use from the institute water meter for six months (record at the same time of each day). At the end of the period, compile a table to show how many litres of water have been used.	No logbooks are available

Does your institute harvest rain water?	Yes
Is there any water recycling system?	Yes

General Environmental Awareness Questioner

Are you aware of any environmental Laws pertaining to different aspects of environmental management?	Yes
Does your institute have any rules to protect the environment? List possible rules you could include.	Yes
Dose Environmental Ambient Air Quality Monitoring conducted by the Institute?	Yes
Dose Environmental Water and Wastewater Quality monitoring conducted by the Institute?	Yes
Dose stack monitoring of DG sets conducted by the Institute?	Yes
Is any warning notice, letter issued by state government bodies?	No
Dose any Hazardous waste generated by the Institute? If yes explain its category and disposal method	Yes
Are you aware of any environmental Laws pertaining to different aspects of environmental management?	Yes
Does your institute have any rules to protect the environment? List possible rules you could include.	No
Does housekeeping schedule in your campus?	Yes
Are students and faculties aware of environmental cleanliness ways? If Yes Explain	Yes
Dose Important Days Like World Environment Day, Earth Day, and Ozone Day etc. eminent in Campus?	Yes
Dose Institute participated in National and Local Environmental Protection Movement?	Yes
Dose Institute has any Recognition/certification for environment friendliness?	Yes
Dose Institute using renewable energy?	Yes
Dose Institution conducts a green/environmental audit of its campus?	Yes
Has the institution been audited / accredited by any other agency such as NABL, NABET, TQPM, NAAC etc.?	Yes

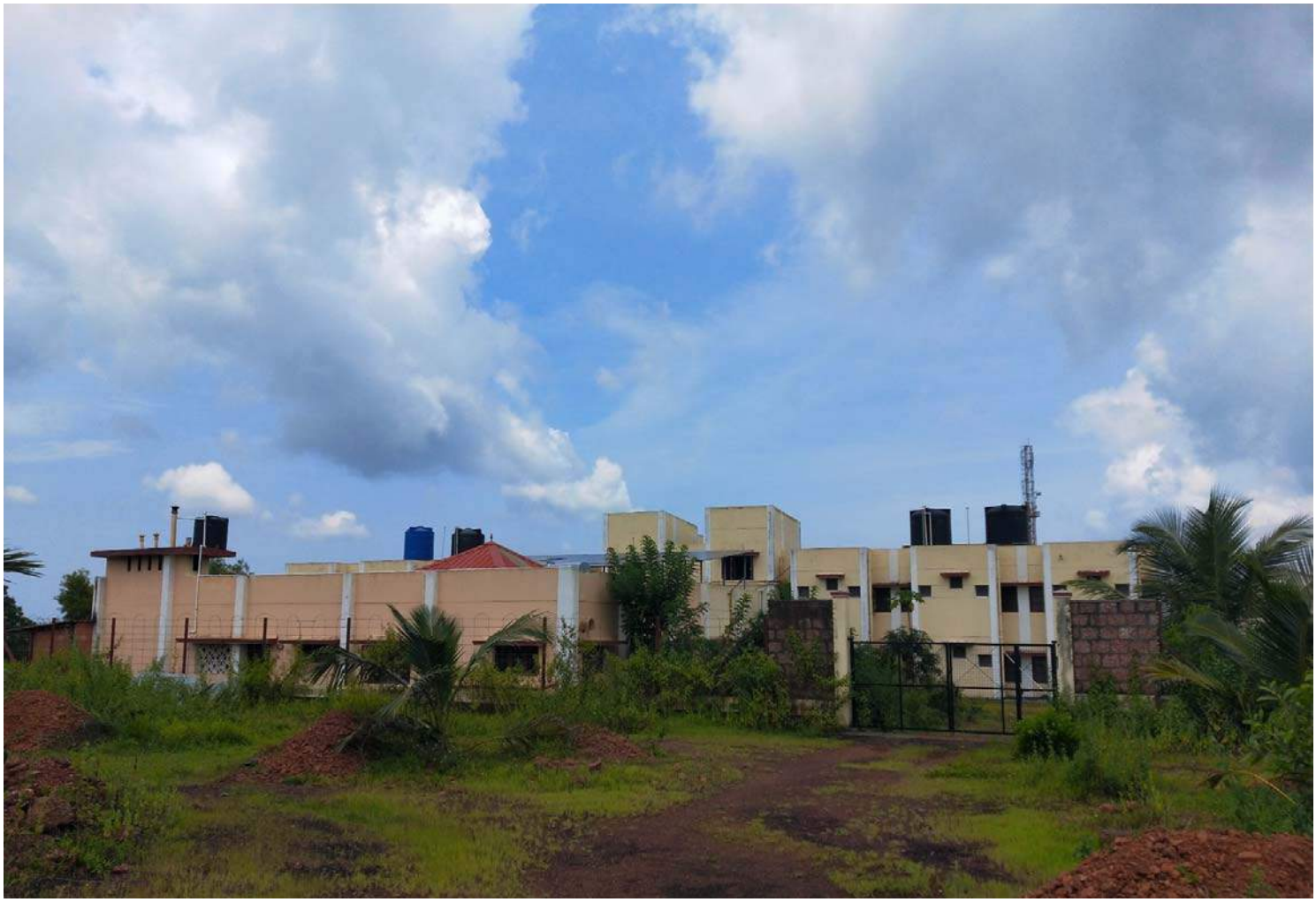
Best Practices and Initiatives	
Renewable Energy	No
Solar Power Plant	
Energy Audit and Green Audit Conducted	
Biogas Plant installed	
Biodiversity Conservation	Yes
Green Cover	
Tree Plantation Drives	Yes
ECO clubs	
Ground Water Recharge	Yes
Rain Water Harvesting System.	
Pollution Reduction Public Transportation	Yes
E Waste Management	Yes
Connected to authorized recycler	
Solid Waste Management	Yes
Lifting of garbage from campus on alternate day by Municipal Corporation.	
Adoption of Village	Yes
CSR	
Water Conservation	Yes
Energy Conservation	Yes



RECOMMENDATIONS

1. Implement a utility monitoring program.
    - Allocate staff to carry out meter readings for electricity, waste and water on regular basis
    - Add monitoring data to spreadsheet so results can be viewed graphically
    - Compare with the utility bills meter readings in order to ensure accuracy;

2. Consider adopting and implementing a sustainable procurement policy which takes into account the whole life cycle of a product, and make sure environmental issues are written into tenders when contracting out.
3. Consider trialing recycled paper again – many recycled brands today, such as Evolve, are just as good as virgin paper.
4. Trial the use of re-manufactured (i.e., Refilled) in toner cartridges rather than purchasing new ones.
5. Consider producing some designated 'environmental' pages on the intranet to make it easier for staff to find environmental information. If possible, a discussion forum could be setup to allow easy internal communications and staff to make suggestions for environmental improvements.
6. Environmental training could be formalized and carried out for all staff. It does not have to be too long or onerous, providing it covers key points, particularly in relation to wastes of all staff are aware of the legal requirements. At the very least, environmental information should be included in the induction pack.
7. Itisstronglyrecommendedthatenvironmentalinformationisalsogiventostudents and staff during induction. It is particularly important for them to be aware of what waste they can dispose on site and where they can dispose of it, and what waste streams they must take away with them.
8. Consider implementing an environmental management system to incorporate all improvements and monitoring requirements. It does not need to be a complex system certified to any particular standard, merely away of ensuring that baselines are set and progress is measured. Formation of Environment Policy and communicated to all faculties and other staff.
9. Plan for Zero Waste Campus Project
10. E-waste monthly inventory be maintained at campus as per E wasterules2016.
11. Water Meter should be installed at institute for monitoring of water consumption per capita.
12. Increase in Environmental promotional activities for spreading awareness at campus.
13. Environment/Green committee formation for regulating eco-friendly initiatives at campus premises and periphery.



CONCLUSION

This audit involved extensive consultation with all the campus team, interactions with key personnel on wide range of issues related to Environmental aspects. The audit has identified several observations for making the campus premise more environmental friendly. The recommendations are also mentioned with observations for the team to initiate actions.

However, there is scope for further improvement, particularly in relation to waste minimization and energy monitoring. By implementing a basic environmental management system, current good practice can be formalized and a framework can be setup for monitoring, implementation of action plans and continual improvement.

The audit team observed that the overall site is maintained well from environmental perspective. There is no major observations but few things are important to initiate urgently are waste management records by monthly inventory of hazardous waste, rainwater harvesting recharge; water balance cycle and periodic inspection of buildings; environment policy and initiation of composting at campus.

References

- The Environment [Protection] Act– 1986(Amended 1991) &Rules-1986(Amended2010)
- The PetroleumAct:1934–The PetroleumRules:2002
- The Central Motor Vehicle Act: 1988 (Amended2011) and The Central Motor Vehicle
- Rules:1989(Amendedin2005)
- Energy Conservation Act2010.
- The Water [Prevention & Control Of Pollution] Act–1974 (Amended1988)& the Water(Prevention & Control of Pollution) Rules– 1975
- The Water [Prevention &ControlOfPollution] CessAct-1977(Amended2003) and Rules-1978
- The Air [Prevention &Control Of Pollution] Act– 1981(Amended1987) The Air(Prevention & Control of Pollution) Rules– 1982
- The Gas Cylinders Rules–2016 (Replaces the Gas Cylinder Rules– 1981
- E-waste management rules2016
- Electrical Act 2003(Amended 2001)/ Rules1956(Amended2006)
- The Hazardous Waste (Management and Handling and Trans-boundary Movement) Rules,2008 (Amended2016)
- The Noise Pollution Regulation & Controlrules,2000(Amended2010)
- The Batteries (Management and Handling) rules,2001(Amended 2010)
- Relevant Indian Standard Code practices