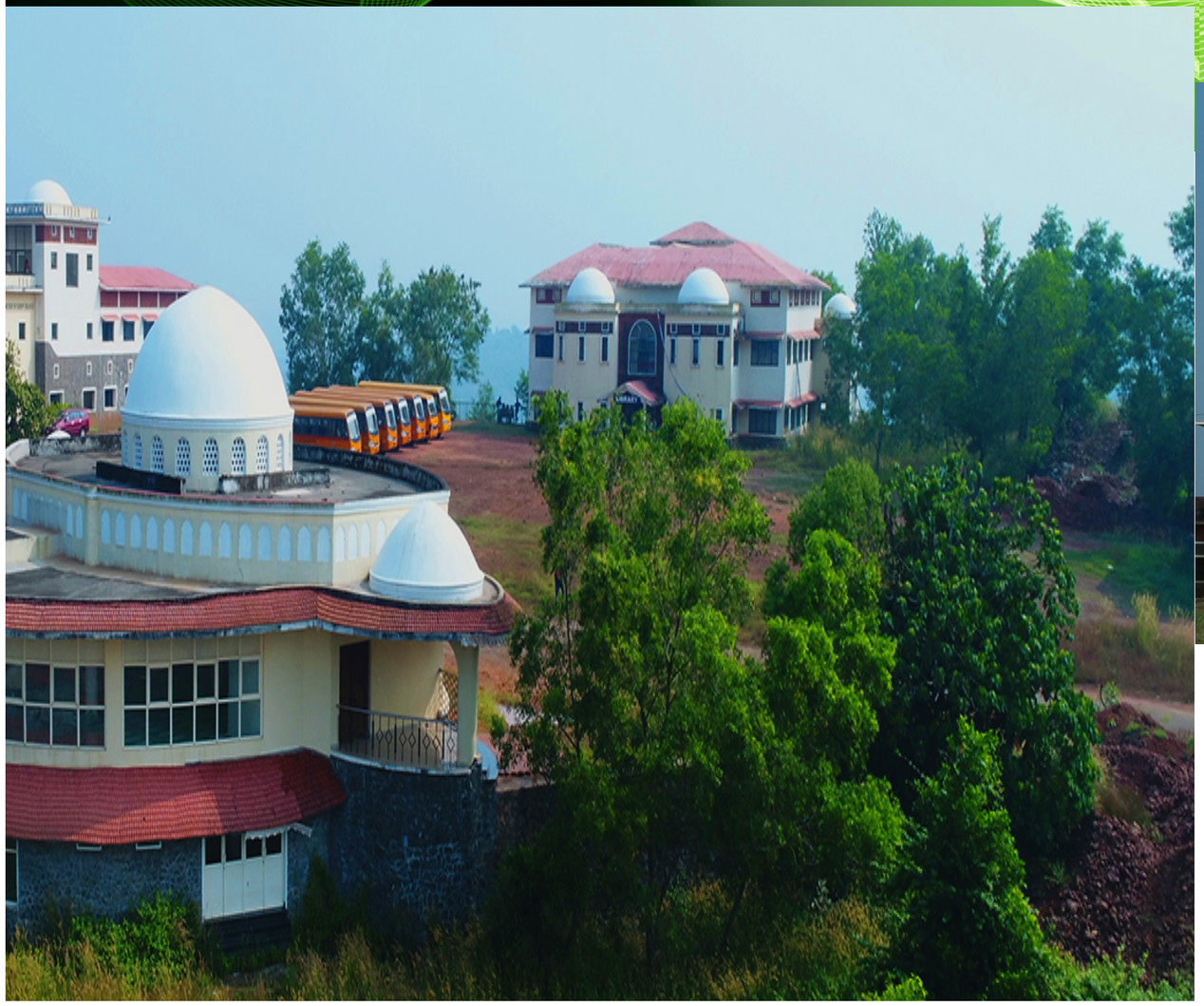
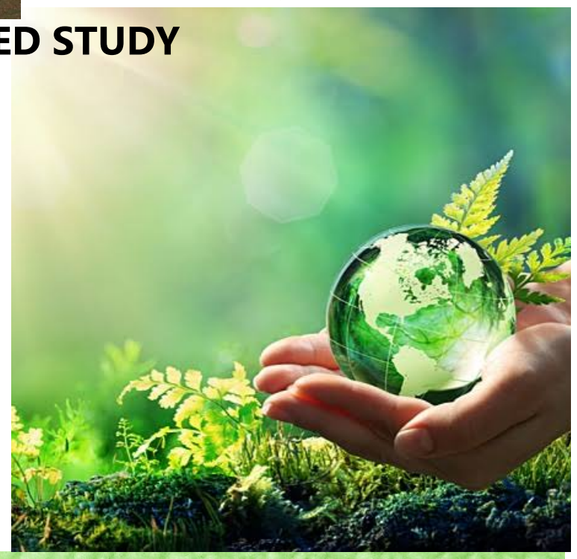


ENVIRONMENT AUDIT REPORT

SAFI INSTITUTE OF ADVANCED STUDY
VAZHAYOOR

2019



Executed by

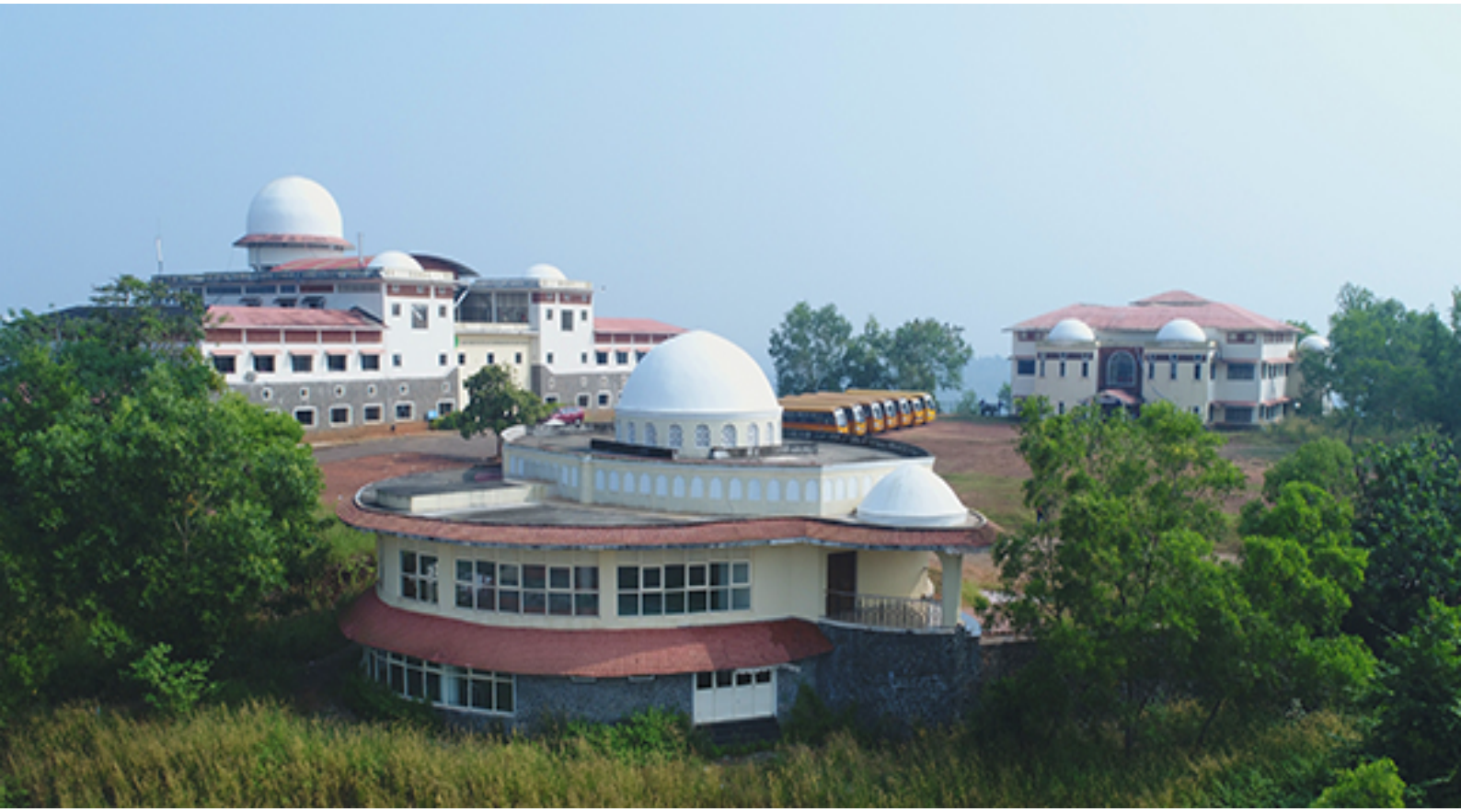
OTTOTRACTIONS
Energy-Engineering-Environment

ENVIRONMENT AUDIT REPORT

SAFI Institute of Advanced Study

VAZHAYUR

2019



OTTOTRACTIONS
Energy-Engineering-Environment

Environment Audit Report
SAFI Institute of Advanced Study

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 SAFI Institute of Advanced Study, Vazhayur. 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.

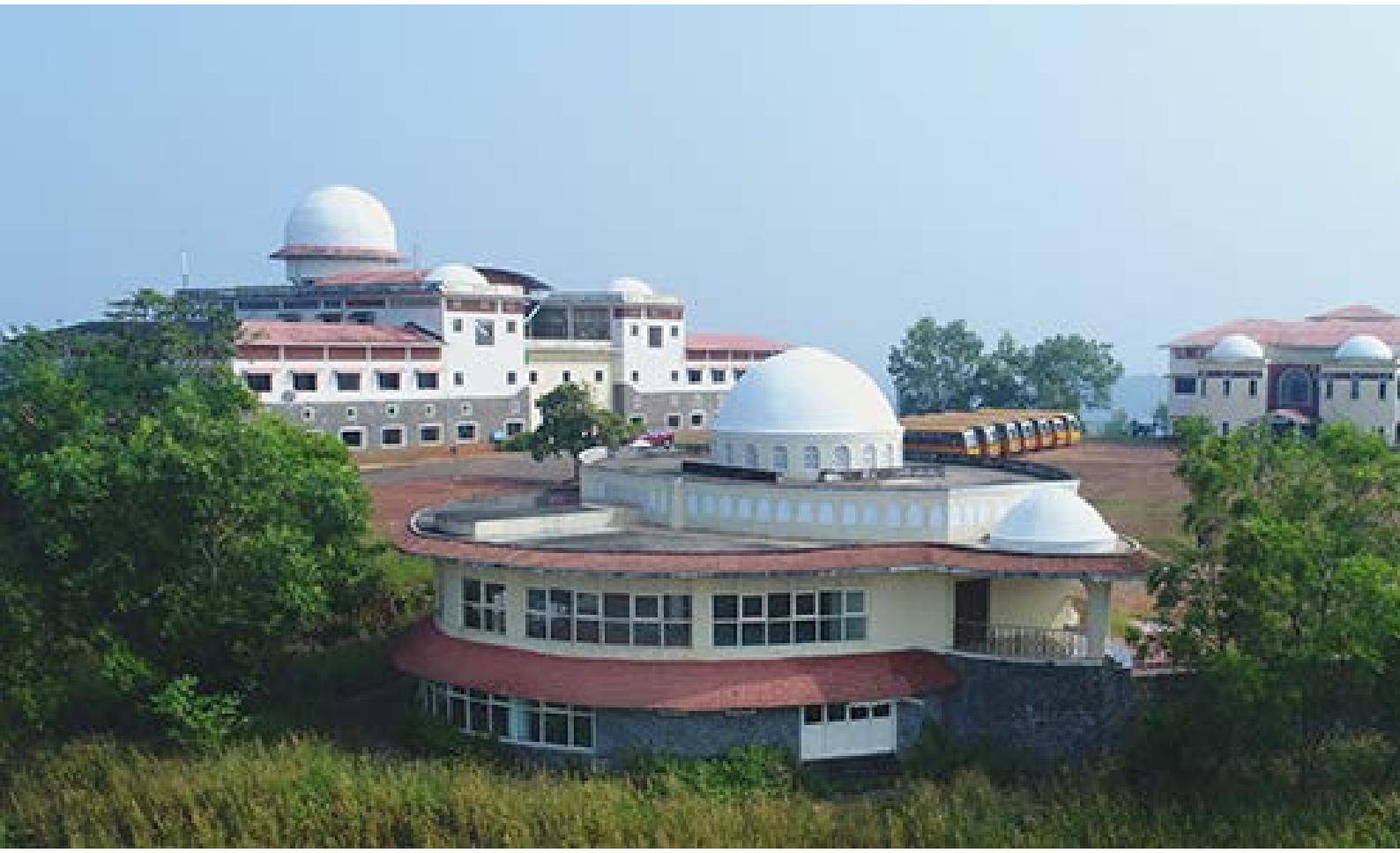
We also take this opportunity to thank the bona-fide efforts of team OTTOTRACTIONS for unstinted support in carrying out this audit.

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

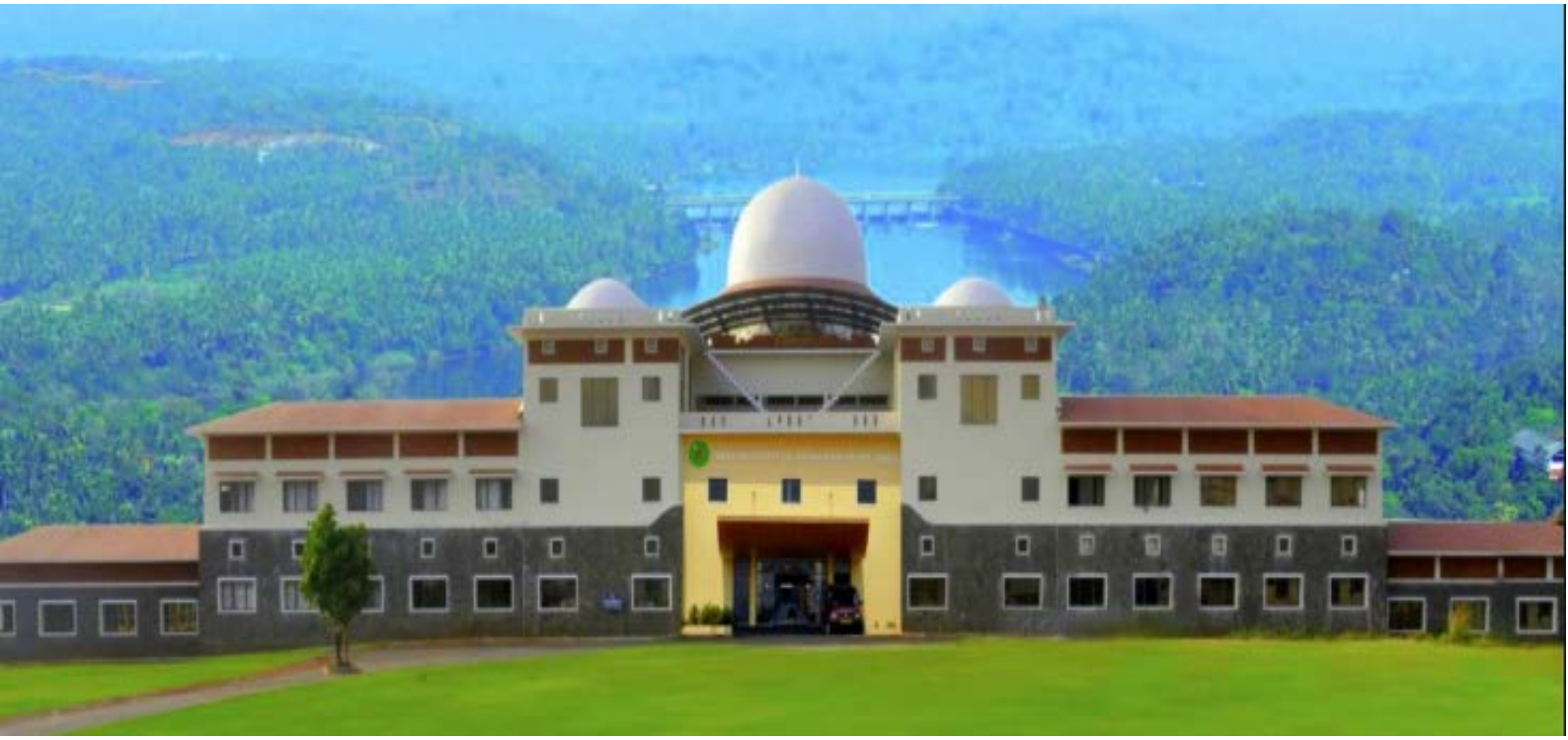
Contents



INTRODUCTION

Ottotractions was asked by the SAFI Institute of Advanced Study , Vazhayoor 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

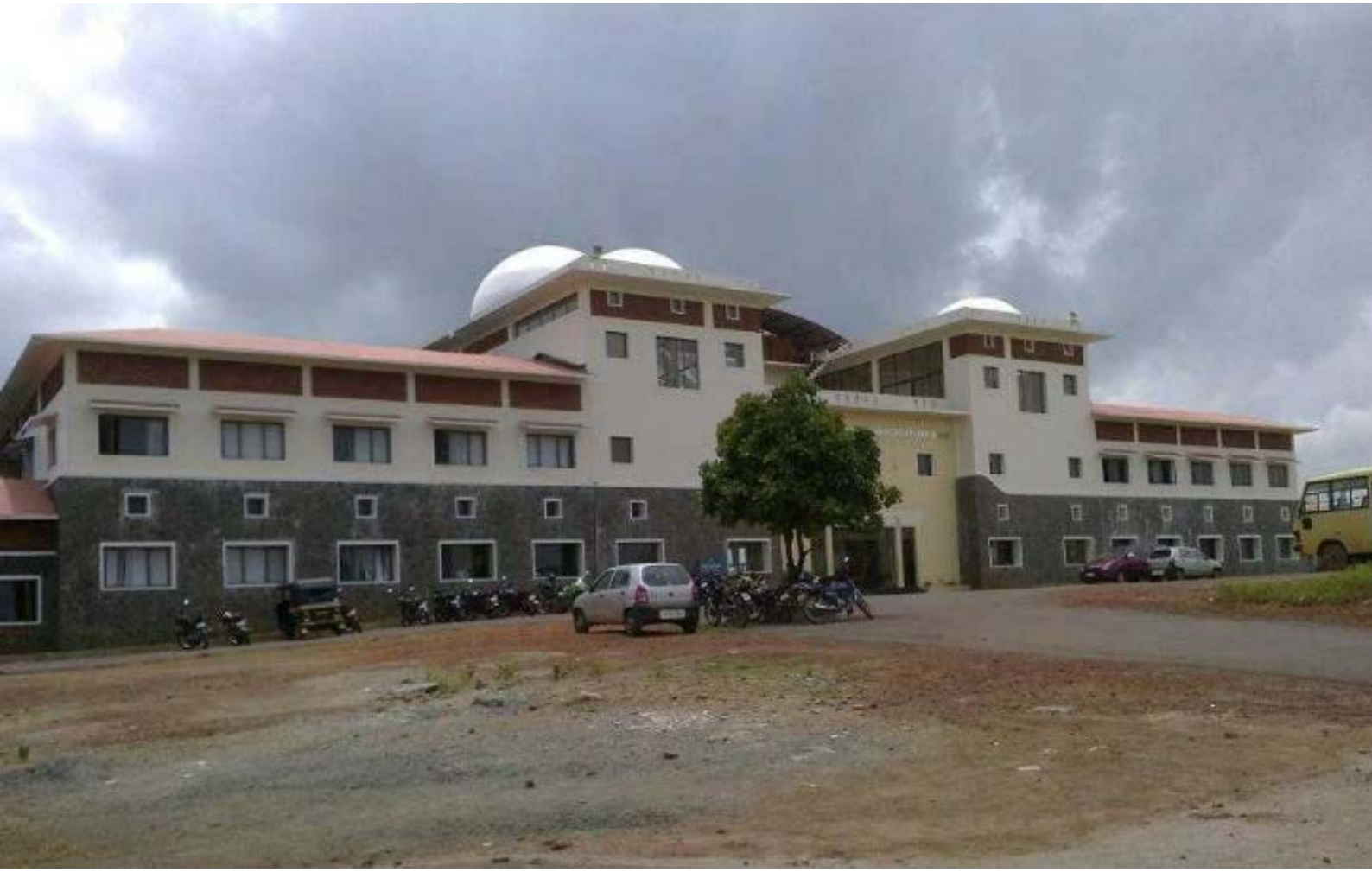
SAFI Institute of Advanced Study (SIAS) is a centre for research and higher education founded in August 29, 2005. It is the academic wing of Social Advancement Foundation of India (SAFI). SIAS is partly residential and is located on a vast campus, 22 Kms away from Calicut City towards Calicut Airport. Along with the management, a dynamic team of teachers and scientists contribute significantly to the fulfillment of the academic programmes. The Institute is housed in a sprawling building in a lush green backdrop and serene and picturesque environment.

SAFI Institute of Advanced study (SIAS) provides rich avenues of teaching, learning and research with excellent infrastructure. SIAS envisages total personality development and generation of manpower capable of providing leadership and direction at the cutting edge in science and technology as well as management, commerce and other areas of humanities studies.

SOCIAL ADVANCEMENT FOUNDATION OF INDIA (SAFI) is a non-profit, registered charitable trust, which came into existence in September 2001. The trust is constituted by educationists, philanthropists and social activists, with the objective of taking up academic and research programmes in the frontier areas of science and technology and humanities in order to produce highly proficient manpower. SAFI is committed to generating skilled manpower capable of providing leadership and direction in the areas of science & technology, commerce, management, information technology, arts and other spheres of studies. SAFI envisages setting up of a Deemed to be University in due course. SAFI Institute of Advanced Study is an endeavour in this direction.

Occupancy Details	
Particulars	2018-19
Total Students	1111
Staffs	91
Total Occupancy of the college	1202

Total student strength of the campus is 1111. 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 is 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.

Degradable Waste Generation	
SAFI INSTITUTE OF ADVANCED STUDY	
	2018-19
Total Occupancy	1202
Waste generated in kg /day	24.04
Waste generated in kg /Yr	3173.28

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

SAFI INSTITUTE OF ADVANCED STUDY	
	2018-19
Total Occupancy	1202
Waste paper generated in kg /day	0.24
Waste plastic generated in kg /day	0.36
Waste paper generated in kg /Yr	52.89
Waste plastic generated in kg /Yr	79.33

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	Approx. number
		Trees	224
		Ornamental	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
Total number of trees	182
Carbon sequestrated by trees in the campus (tCO2e)	1.52

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.	Malayalam name	Scientific name	English name	No:
1	പേഴ്	Careya arborea	Ceylon oak	2
2	ഏഴിലം പാല	Alstonia scholaris	Devil's tree	3
3	വെള്ളമരുത്	Terminalia paniculata	Flowering Murdah	4
4	ചന്ദനം	Santalum album	East Indian sandalwood	3
5	പൂവരശ്	Thespesia populnea	Portia tree	2
6	മുള്ളുവേങ്ങ	Bridelia retusa	Spinous Kino tree	5
7	ഇരുൾ / കടമരം	Xylia xylocarpa	Burma Ironwood	6
8	മട്ടി	Ailanthus triphysa	Maharukh	2
9	മഹാഗണി	Sweitenia macrophylla	Mahogany	4
10	താന്നി	Terminalia bellarica	Belliric myrobalan	6
11	മഞ്ചാടി	Adenanthera pavonina	Red bead tree	10

12	ഗുൽമോഹർ	Delonix regia	Royal poinciana	12
13	വേങ്ങ	Ptreocarpus marsupium	Malabar kino	5
14	നെന്മേനി വാക	Albizia lebbeck	Siris tree	6
15	കല്ലരയാൽ	Ficus arnottiana	Indian rock fig	7
16	വട്ട / ഉപ്പൂത്തി	Macaranga peltata	Macaranga	6
17	ചൂണ്ടപ്പന	Caryota urens	Solitary fishtail palm	9
18	വങ്കണ	Carallia brachiata	Freshwater mangrove	5
19	പേര	Psidium guajava	Guava	4
20	വെള്ളീട്ടി	Dalbergia lanceolaria	Bastard rosewood	3
21	കൃഷ്ണകിരീടം	Clerodendrum paniculatum	Pagoda plant	2
22	ചെമ്പരത്തി	Hibiscus rosa-sinensis	Hibiscus	12
23	റോസ്	Rosa chinensis	Rose	10
24	സീതപ്പഴം	Annona squamosa	Sugar apple	8
25	വലിയ അത്തി	Ficus auriculata	Elephant ear fig tree	5
26	വെള്ളില	Mussaenda frondosa	Schizomussaenda	6
27	എടല / കരിവെട്ടി	Olea dioica	Indian olive	5
28	കാറ്റാടി	Casuarina equisetifolia	Beef wood	2
29	കശുമാവ് / പറങ്കിമാവ്	Anacardium occidentale	Cashew tree	3
30	കണ്ണാംപൊട്ടി/ കല്ലരം	Sapium insigne	Tuning fork tree	3
31	ഈന്ത്	Cycas circinalis	Queen sago	5
32	കൂവളം	Aegle marmelos	Indian bael	6
33	ഊദ്	Aquilaria malaccensis	Agarwood tree	3
34	ചെറുഞാവൽ	Syzigium caryophyllatum	South Indian plum	2
35	പൂവം	Schleichera oleosa	Lac tree	2
36	കുരികിൽ വള്ളി	Connarus paniculatus	Connarus vine	1
37	മലതാങ്ങി	Abutilon theophrasti	Buttonweed	5
38	കുനൻപാല	Tabernaemontana alternifolia	Alternate-leaved crape jasmine	3
39	തെങ്ങ്	Cocos nucifera	Coconut tree	20
40	മാഞ്ചിയം	Acacia mangium	Mangium	3
41	മന്ദാരം (വെള്ള)	Bauhinia acuminata	Dwarf white bauhinia	2
42	മണിമരുത്	Lagerstroemia speciosa	Pride of India	1
43	ഗുൽമോഹർ	Delonix regia	Royal poinciana	1
44	ആര്യവേപ്പ്	Azadirachta indica	Neem	3
45	ലക്ഷ്മിതരു	Simarouba glauca	Paradise tree	1
46	ഉങ്ങ്	Millettia pinnata	Indian beech	3
47	കണിക്കൊന്ന	Cassia fistula	Golden shower tree	2
48	മാവ്	Mangifera indica	Mango tree	5

49	ഇലഞ്ഞി	Mimusops elangi	Spanish cherry tree	3
50	മിൽക്ക് ഫ്രൂട്ടി	Chrysophyllum olviforme	Milk fruit tree	3
51	പ്ലാവ്	Artocarpus heterophyllus	Jackfruit tree	6
52	ഈന്തപ്പന	Phoenix dactylifera	Date palm	4
53	സുബാബുൽ പീലിവാക	Leucaena leucocephala	River tamarind	3
54	ബുദ്ധമുള	Bambusa ventricosa	Buddha's bamboo	3
55	പെൻസിൽ മുള			8
56	അയ്യമ്പന	Ayapana triplinervis	Water hemp	5
57	പനിക്കൂർക്ക	Coleus aromaticus	Mexican mint	6
58	രാമച്ചം	Chrysopogon zizanioides	Vetiver	3
59	ചിറ്റരത്ത	Alpinia calcarata	Snape ginger	6
60	കൃഷ്ണ തുളസി	Ocimum tenuiflorum	Holy basil	3
61	എരുക്ക്	Calotropis gigantea	Giant milkweed	3
62	വാതംകൊല്ലി	Justicia gendarussa	Willow-leaved Justicia	2
63	കരിനൊച്ചി	Vitex negundo	Chaste tree	2
64	ഞാവൽ	Syzigium cumuni	Jamun	2
65	ആടലോടകം	Adathoda vasica	Malabar nu	4
66	കറിവേപ്പ്	Murraya koenigii	Curry leaf tree	6
67	ചെറുനാരകം	Citrus limon	Lemon	6
68	മുഞ്ഞ	Premna serratifolia	Headache tree	3
69	സർവ്വസുഗന്ധി	Pimenta dioica	Allspice	2
70	നായ്ക്കുമ്പ	Pogostemon quadrifolius	Pogostemon grass	1
71	മാതളം / റുമ്മാൻ	Punica granatum	Pomegranate	3
72	മുള്ളിലം	Zanthoxylum rhetsa	Indian prickly ash	4
73	കാവളം	Sterculia foetida	Java olive	3
74	ചേര്	Holigarna arnottiana	Black varnish tree	2
75	സിന്ദൂരമരം	Mallotus philippensis	Kamala tree	1
76	ഓടമുള	Ochlandra travancorica	Elephant grass	5
77	ശംഖുപുഷ്പം (നീല)	Clitoria ternatea	Asian pigeonwings	6
78	ശംഖുപുഷ്പം (വെള്ള)	Clitoria ternatea alba	White Asian pigeonwi	9

3.1.1 ENERGY

a. Electricity

The total emission of the carbon dioxide per student is 92.44 kg per year (2021). 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		
SAFI INSTITUTE OF ADVANCED STUDY		
		2018-19
1	Electricity KSEB (kWh)	117271
2	Electricity Solar - Off grid (kWh)	0.00
3	Electricity (KSEB + Off grid) kWh	117271
4	Electricity Grid Tied (kWh)	0.00
5	Diesel (L)	260.00
6	LPG (kg)	855.00
7	Biogas (kg)	0.00

Occupancy Details	
Particulars	2018-19
Total Students	1111
Staffs	91
Total Occupancy of the college	1202

Sl. No	Location	LIGHT					FAN			IT			AC		
		T8	T12	CFL	LED TUBE	LED BULB	CF	WF	EF	PC	Scanner	Printer	1.5	2 tr	3 tr
1	105			1			4								
2	108						2		1						
3	109			2			4								
4	110			2			6								
5	111			1			2								
6	112			1			2								
7	114			5			8								
8	115			2			2								
9	118		2				2								
10	121			1			4								
11	122			1			4								
12	130			3			2								
13	131			4			6		2						
14	133			1			8								
15	136		1				2						1		
16	201		2	2			2								
17	202			1			4								
18	203			2			6								
19	205			2			2								
20	208-A			1			2								
21	209			1			4								
22	210			1			6								
23	211						2								
24	211b						2								
25	212			2			2								
26	214						3								
27	308			2			3								
28	307						1								
29	305						2								
30	304						1								
31	303						4								
32	302						2								
33	301						2								
34	101		1	2			2			3		1	1		
35	102		2	2			2			3		4	1		
36	103		2	1			2			1		2	1		
37	104		2	1			2						1		
38	106		3	3			6			31			2		

39	107			2			2			2		1			
40	126			3			2		1	1		1			
41	MB lab		5	6			8			2		1	1		
42	store		1	2			1								
43	BT lab		4	4			8								
44	instrument lab		7	6			4			2			2		
45	sickroom			2			1								
46	MCJ lab			1			2			11		1			
47	208		2	1			2			1		1			
48	ft lab		6	1			10			1		1			
49	chemistry lab			4			8								
50	boys bathroom														
51	ladies bathroom														
52	staff washroom														
53	aud 2			6			5								
54	aud 1			4			5								
55	213			1			2		1	1		1			
56	security room														
57	confrence hall		4	8			8						4		
58	Conf. bedroom			2			1						1		
59	principal		1	2			2			1		1	1		
60	306			1			1			1		1			
61	gents bathroom														
62	ladies bathroom														
63	reception								1	2		1			
64	GF main loby								1						
65	micro loby			6											
66	ladies lobby			10											
67	bt lobby			4											
68	first floor lobby			18					1						
69	II floor lobby			9											
70	COO office			6			3			1		1	1		
71	SAFI Office		2						2	2		2			
72	LIB-REFRENCE			12			6								

73	Digital library			10			6			18					
74	lib entrance														
75	Lib - server						1								
76	lib lobby			10			4			1					
77	lib bathroom			6											
78	IS staff room		2				1			1		1			
79	seminar hall		5	2					7						
80	lib - 301			2			2								
81	lib - 302			12			5						4		
82	lib - 304			1			2								
83	lib - staff room econ						2			1					
84	lib- 201		4				4								
85	lib 202						3								
86	lib- eco-bathroom														
87	lib -B-hindi			1			2								
88	lib-B - bathroom														
89	lib- B - 101			1			4								
	TOTAL	0	58	213	0	0	239	0	17	87	0	21	21	0	0
	W		40	20			80		60	100		140	1200		
		0	2320	4260	0	0	19120	0	1020	8700	0	2940	25200	0	0

During the energy audit filed studies, 58 Numbers T12 were identified, which is considered as inefficient. 213 CFLs were found during the audit. The detailed energy efficiency projects are given in the respective chapters of this report.

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 - Kilometres 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

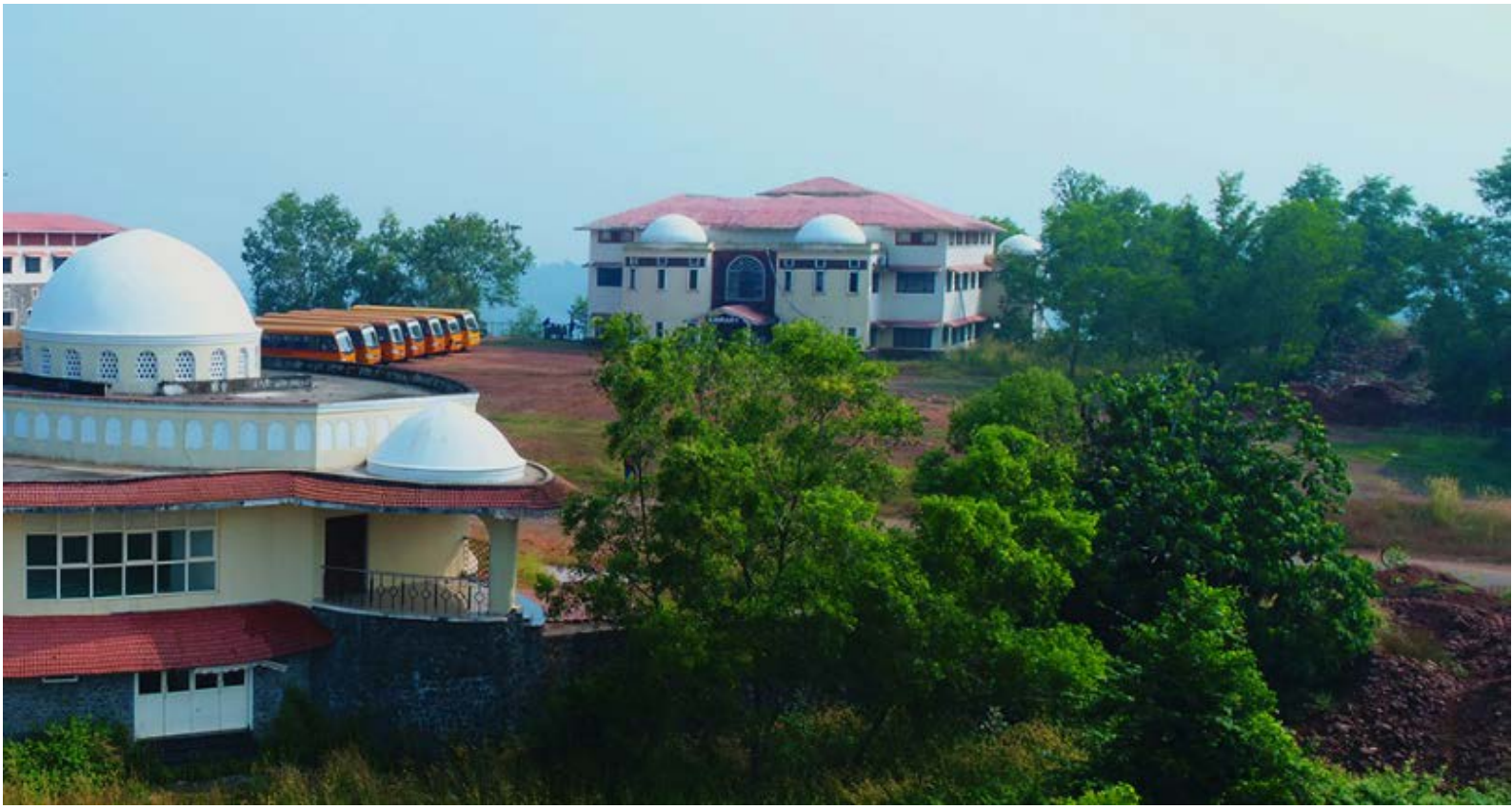
After analyzing the historical and measured data the following projects are proposed to make the campus carbon neutral. The projects are from energy efficiency and renewable energy. The further additions in the green cover increase will also give positive impact in the carbon mitigation.

Executive Summary					
Consolidated Cost Benefit Analysis of Energy Efficiency Improvement Projects					
SAFI INSTITUTE OF ADVANCED STUDY					
Sl No	Projects	Investment (Lakhs Rs)	Cost saving (Rs)/Yr	SPB Months	Energy saved kWh/Yr
1	Energy Saving in Lighting by replacing existing 58 No's T12 (55W) Lamps to 18 W LED Tube	0.17	0.254	8.23	3172
2	Energy Saving in Lighting by replacing existing 213 No's CFL(15W) Lamps to 9W LED BULB	0.23	0.15	18.53	1897
3	Energy Saving by replacing existing 239 No's in-efficient ceiling fans with Energy Efficient Five star fans	5.98	0.86	83.12	10782
	Total	6.38	1.27	36.63	15850.46
(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.)					
Cost Benefit Analysis of Renewable Energy Efficiency Projects					
5	Installation of 100 kWp Solar Power Plant	75.00	10.22	88.06	127750
6	Installation of 15Kg/day Biogas plant	0.2	0.26	9.39	5647
	Total	75.20	10.48	48.73	133397

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	No
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
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

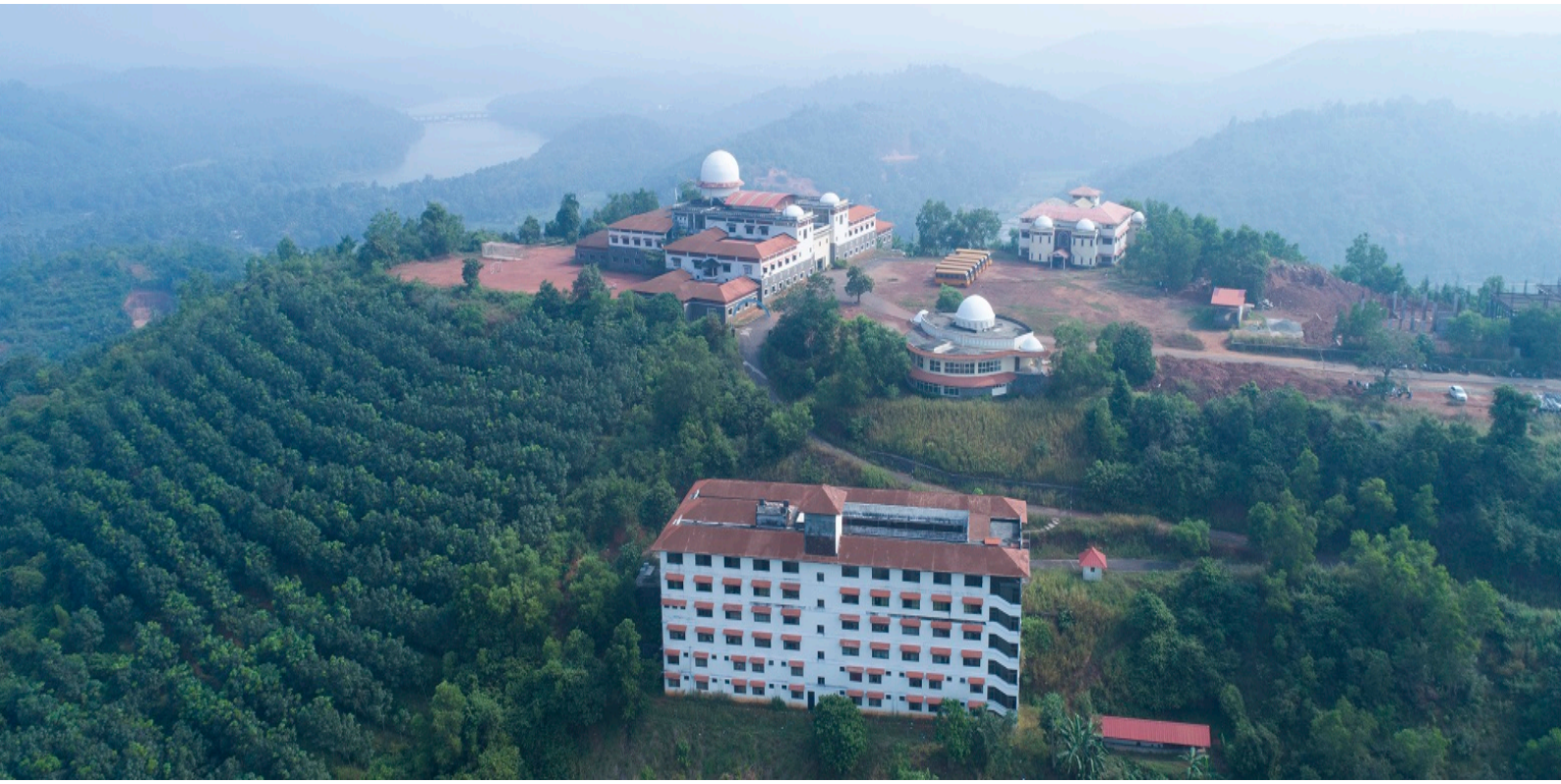
Best Practices and Initiatives	
Renewable Energy	Yes
Solar Power Plant	
Energy Audit and Green Audit Conducted	
Biogas Plant installed	
Biodiversity Conservation	Yes
Green Cover	
Tree Plantation Drives	Yes
ECO clubs	
Ground Water Recharge	Yes
Rain Water Harvesting System.	
Pollution Reduction Public 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) ink and 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 set up 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 waste so all staff are aware of the legal requirements. At the very least, environmental information should be included in the induction pack.
7. It is strongly recommended that environmental information is also given to students and staff during induction. It is particularly important for them to be aware of what waste they can dispose on site and where the 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 a way 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 waste rules 2016.
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 set up for monitoring, implementation of action plans and continual improvement.

Carbon Foot Print							
Sl. No.	Particulars	2018-19	tCO2e	2019-20	tCO2e	2020-21	tCO2e
1	Electricity (kWh)	117271	92.64	134850	106.53	84428	66.70
2	Diesel (L)	260.00	0.83	240.00	0.77	80.00	0.26
3	LPG (kg)	0.00	0.00	0.00	0.00	80.00	0.12
4	Biogas (m3)	0.00	-	0.00	-	-	-
5	Degradable Waste in kg/yr.	3173.28	2.00	4544.10	2.86	1689.60	1.06
6	Paper Waste in kg/yr	52.89	0.03	67.32	0.04	35.20	0.02
7	Plastic Waste in kg/yr	79.33	0.03	100.98	0.03	52.80	0.02
Total Carbon Foot Print tCO2e/yr			95.53		110.23		68.18

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 (Amended 2010)
- The Petroleum Act: 1934 – The Petroleum Rules: 2002
- The Central Motor Vehicle Act: 1988 (Amended 2011) and The Central Motor Vehicle
- Rules:1989 (Amended in 2005)
- Energy Conservation Act 2010.
- The Water [Prevention & Control Of Pollution] Act – 1974 (Amended 1988) & the Water (Prevention & Control of Pollution) Rules – 1975
- The Water [Prevention & Control Of Pollution] Cess Act-1977 (Amended 2003) and Rules- 1978
- The Air [Prevention & Control Of Pollution] Act – 1981 (Amended 1987) The Air (Prevention & Control of Pollution) Rules – 1982
- The Gas Cylinders Rules – 2016 (Replaces the Gas Cylinder Rules – 1981
- E-waste management rules 2016
- Electrical Act 2003 (Amended 2001) / Rules 1956 (Amended 2006)
- The Hazardous Waste (Management and Handling and Trans-boundary Movement) Rules, 2008 (Amended 2016)
- The Noise Pollution Regulation & Control rules, 2000 (Amended 2010)
- The Batteries (Management and Handling) rules, 2001 (Amended 2010)
- Relevant Indian Standard Code practices

TECHNICAL SUPPLEMENTS