

# **GREEN AUDIT REPORT**

**2018**



**ALPHONSA COLLEGE**

**ARUNAPURAM P.O., PALA 686 574**

**Prepared by**

**School of Environmental Sciences**

**Mahatma Gandhi University, Kottayam**



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17.12.2018

**GREEN AUDIT CERTIFICATE**

The Green Audit enclosed herewith has been carried out as per the standard recognized procedures authorized for statutory requirements of environmental audits and governance of academic institutions.

Alphonsa college has provided the mandatory information required for assessment that significantly assisted in deriving the audit conclusions. Data collection was done in the sectors such as Energy, Waste, Greening, Carbon footprint and Water use. College records and documents were verified several times to clarify the data received through survey and discussions. The environment samples including water, soil was from various location of the campus were collected and analyzed at School of Environmental Sciences, Mahatma Gandhi University.

Signature and seal

Name and designation

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## **EXECUTIVE SUMMARY**

Eco campus is a concept implemented in many educational institutions, all over the world to make them sustainable because of their mass resource utilization and waste discharge in to the environment. Waste minimization plans for the educational institute are now mandatory to maintain the cleanliness of the campus. To find out the environmental performance of the educational institutions and to analyze the possible solutions for converting the educational campus as an eco-campus the conduction of Green Auditing of institutions is essential. The green auditing of ‘Alphonsa’ College, Pala, enables us to assess the lifestyle, action and its impact on the environment. This is the first attempt to conduct green auditing of this college campus. This audit was mainly focused on greening indicators like consumption of energy in terms of electricity and fossil fuel, quality of soil and water, vegetation, waste management practices and carbon footprint of the campus etc. Initially a questionnaire survey was conducted to know about the existing resources of the campus and resource consumption pattern of the students and staff in the college. In order to assess the quality of water and soil, water and soil samples were collected from different locations of the college campus and analysed for its parameters. Collected data was grouped, tabulated and analyzed. Finally a report pertaining to the environmental management plan with strength, weakness and suggestion on the environmental issue of campus are documented.

## INTRODUCTION

### *About college*

Alphonsa college, Pala, Kottayam District is one of the pioneer institutions for higher education for women in the state of Kerala (Fig. 1). Established in 1964 as a junior college with 400 students and 13 teachers, Alphonsa college has now attained the status of a First Grade Women's College. The institution at present is run under the efficient stewardship of His Excellency Mar Jacob Murickan, the Manager Rev. Dr. Joseph Kollampampil, the Pro- Manager and Rev. Dr. Sr. Gigimol M.G., the Principal.

The fundamental aim of the college is to impart sound learning to young women under circumstances congenial to their all-round development. It encourages the students to aim at excellence not only in academic pursuits, but also in every aspect of human endeavour to achieve perfection.

The students are prompted to strive for academic excellence so that in course of time they may take up suitable careers for the betterment of their lives and also of their families and society at large. The various co-curricular activities of the college especially the extension programmes provide them with a rare social consciousness that motivates them to reach out to their fellowmen particularly the needy and the marginalised.

### **Vision Statement of the College '**

*The perfect woman nobly planned'.*

*To create self-reliant and liberated young women with traditional cultural values and moral integrity, who will be agents of social transformation in their families and society*

**Mission Statement of the College.**

*To equip our students with deep knowledge and globally acceptable skills.*

*To develop values of self-respect, tolerance, discipline, hard work and patriotism. To promote learning that will contribute to women empowerment by enabling women to become self-reliant.*

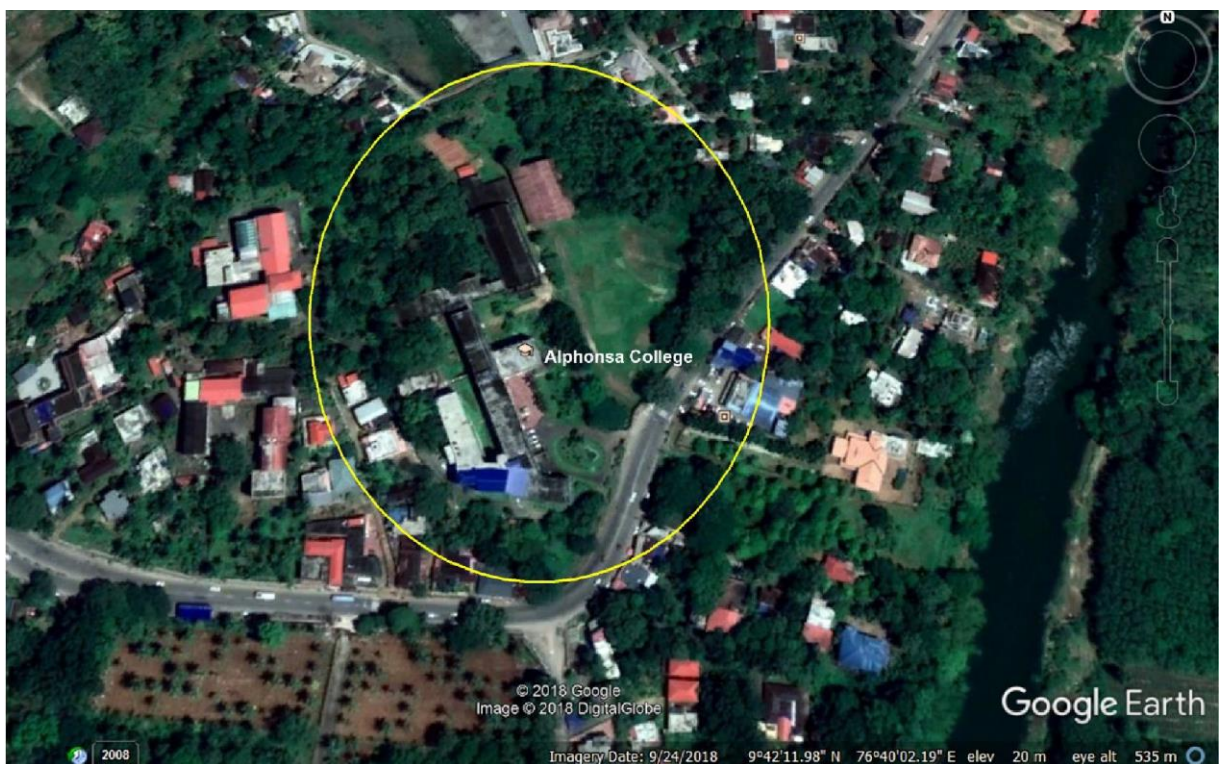


Fig. 1 Location of Alphonso College

*Courses offered by the College*

<b>P G Courses – 6</b>			
Aided Courses	M.Sc. Zoology	M.A English	M.A Political Science
Self-Financing	M.Sc. Chemistry	M.A English	M.Sc. Clinical Nutrition and Dietetics
<b>U G Courses – 13</b>			
Aided Courses	B.A English	B.A Economics	B.A History
	B.Sc. Physics	B.Sc. Botany	B.Sc. Zoology
	B.Sc. Physics (Voc.)	B.Sc. Chemistry	B.Sc. Mathematics
Self-Financing	B.Com	B.Sc. Clinical Nutrition and Dietetics	
	B.Voc. Fashion Technology		
	B.Voc. Sports Nutrition and Physiotherapy		

*The student and faculty strength of the college is listed below:*

No of students		1912
No of teachers		88
No of Non-teaching staffs		25
Gents	14	
Ladies	2011	
Total		2025



**Physical Structure**

The college is located on about 9.5 acres of land. The built-up area of the college is 7.9 acres

Departments	16
Laboratories	13
Conference halls	4
Libraries	1 main library+ department libraries
Auditorium	1
Canteens	1

**OBJECTIVES OF GREEN AUDIT**

The main aim objectives of this green audit is to assess the environmental quality and the management strategies being implemented in Alphonsa College, Pala. The specific objectives are:

1. To assess the quality of the water and soil in the Alphonsa college campus
2. To monitor the energy consumption pattern of the college
3. To quantify the liquid and solid waste generation and management plans in the campus.
4. To assess the carbon foot print of the college
5. To assess whether the measures implemented by Alphonsa College have helped to reduce the Carbon Footprint.
6. To impart environment management plans to the college
7. Providing a database for corrective actions and future plans.
8. To assess whether extracurricular activities of the Institution support the collection, recovery, reuse and recycling of solid wastes.
9. To identify the gap areas and suggest recommendations to improve the Green Campus status of the Alphonsa College.

## TARGET AREAS OF GREEN AUDITING

Green audit forms part of a resource management process. Although they are individual events, the real value of green audit is the fact that they are carried out, at defined intervals, and their results can illustrate improvement or change over time. Eco-campus concept mainly focuses on the efficient use of energy and water; minimize waste generation or pollution and also economic efficiency.

All these indicators are assessed in the process of “Green Auditing of this educational institute”. Eco-campus focuses on the reduction of contribution to emissions, procure a cost effective and secure supply of energy, encourage and enhance energy use conservation, promotes personal action, reduce the institute’s energy and water consumption, reduce wastes to landfill, and integrate environmental considerations into all contracts and services considered to have significant environmental impacts. Target areas included in this green auditing are water, energy, waste, green campus and carbon footprint.

### **Auditing for Water Management**

Water is a natural resource; all living organisms depend on water. While freely available in many natural environments, in human settlements potable (drinkable) water is less readily available. Groundwater depletion and water contamination are taking place at an alarming rate. Hence it is essential to examine the quality and usage of water in the college. Water auditing is conducted for the evaluation of facilities of raw water intake and determining the facilities for water treatment and reuse. The concerned auditor investigates the relevant method that can be adopted and implemented to balance the demand and supply of water.

### **Auditing for Energy Management**

Energy conservation is an important aspect of campus sustainability which is also linked with carbon foot print of the campus. Energy auditing deals with the conservation and methods to reduce its consumption related to environmental degradation. It is therefore essential that any environmentally responsible institution examine its energy use practices.

### **Auditing for Waste Management**

Human activities create waste, and it is the way these wastes are handled, stored, collected and disposed of, which can pose risks to the environment and to public health. Pollution from waste is aesthetically unpleasing and results in large amounts of litter in our communities which can cause health problems. Solid waste can be divided into three categories: bio-degradable, non-biodegradable and hazardous waste. Bio-degradable wastes includes food wastes, canteen waste, wastes from toilets etc. Non-biodegradable wastes include what is usually thrown away in homes and schools such as plastic, tins and glass bottles etc. Hazardous waste is waste that is likely to be a threat to health or the environment like cleaning chemicals, acids and petrol. Unscientific management of these wastes such as dumping in pits or burning them may cause harmful discharge of contaminants into soil and water

supplies, and produce greenhouse gases contributing to global climate change respectively. Special attention should be given to the handling and management of hazardous waste generated in the college. Bio-degradable waste can be effectively utilized for energy generation purposes through anaerobic digestion or can be converted to fertilizer by composting technology. Non-biodegradable waste can be utilized through recycling and reuse. Thus the minimization of solid waste is essential to a sustainable college. The auditor diagnoses the prevailing waste disposal policies and suggests the best way to combat the problems.

### **Auditing for Green Campus Management**

Trees play an important ecological role within the urban environment, as well as support improved public health and provide aesthetic benefits to cities. In one year, a single mature tree will absorb up to 48 pounds of carbon dioxide from the atmosphere, and release it as oxygen. The amount of oxygen released by the trees of the campus is good for the people in the campus. So while you are busy studying and working on earning those good grades, all the trees in campus are also working hard to make the air cleaner for you.

### **Auditing for Carbon Footprint**

Burning of fossil fuels (such as petrol) has an impact on the environment through the emission of greenhouse gases into the atmosphere. The most common greenhouse gases are carbon dioxide, water vapour, methane, nitrous oxide and ozone. Of all the greenhouse gases, carbon dioxide is the most prominent greenhouse gas, comprising 402 ppm of the Earth's atmosphere. The release of carbon dioxide gas into the Earth's atmosphere through human activities is commonly known as carbon emissions. Vehicular emission is the main source of carbon emission in the campus, hence to assess the method of transportation that is practiced in the college is important.

## **METHODOLOGY ADOPTED**

The methodology adopted to conduct the Green Audit of the Institution had the following components

### **Onsite Visit**

Four day field visit was conducted by the Green Audit Team . The key focus of the visit was on assessing the status of the green cover of the Institution, their waste management practices and energy conservation strategies etc. The sample collection (water, soil) was carried out during the visits. The water samples from two open wells and two tap water sources were taken and soil samples from three different places of the campus was collected. The sample collection, preservation, and analysis were done in the scientific manner as prescribed by the standard procedures.

### **Focus Group Discussion**

The Focus Group discussions were held with the nature club, bird club, Bhoomithrasena Club members, staff members and the management focusing various aspects of Green Audit. The discussion was focused on identifying the attitudes and awareness towards environmental issues at the institutional and local level.

### **Energy, waste management and Carbon foot print analysis Survey**

With the help of teachers and students, the audit team has assessed the energy consumption pattern and waste generation, disposal and treatment facilities of the college. The monitoring was conducted with a detailed questionnaire survey method.

## Survey forms

### 1. Water management

SL NO	PARAMETERS	RESPONSE	REMARKS
1	Source of water		
2	No of Wells		
3	No of motors used		
4	Horse power – Motor		
5	Depth of well –Total		
6	Water level		
7	Number of water tanks		
8	Capacity of tank		
9	Quantity of water pumped every day		
10	Any water wastage/why?		
11	Water usage for gardening		
12	Waste water sources		
13	Use of waste water		
14	Faith of waste water from labs		
15	Whether waste water from labs mixed with ground water		
16	Any treatment for lab water		
17	Whether any green chemistry method practiced in labs		
18	No of water coolers		

2.

19	Rain water harvest available?		
20	No of units and amount of water harvested		
21	Any leaky taps		
22	Amount of water lost per day		
23	Any water management plan used?		
24	Any water saving techniques followed?		

### Energy audit

Room No. / name	Electrical device/ items	Number	Power	usage time (hr/day)

Item: Bulbs (CFL, incandescent, LED); A/c, fan, computer, instruments

### 3. Waste management

**Approximate quantity of waste generated per day (in kg)**

<i>Office</i>				
Approx	Biodegradable	Non - biodegradable	Hazardous	Others
<1Kg				
2-10Kg				
>10Kg				



<i>Laboratories</i>				
Approx	Biodegradable	Non - biodegradable	Hazardous	Others
<1Kg				
2-10Kg				
>10Kg				

<i>Canteen/kitchen</i>				
Approx	Biodegradable	Non - biodegradable	Hazardous	Others
<1Kg				
2-10Kg				
>10Kg				

### **Total strength of students , teachers, and Non teaching staffs**

No of Students		
No of Teachers		
No of Non teaching staffs		
Gents		
Ladies		
Total		

### **How the waste generated in the college is managed?**

A)Composting/ Vermicomposting	Yes/ No	Remark
B)Recycling		
C)Reusing		
D)Other ways		

**Waste generated in the college?**

E-waste		
Hazardous waste		
Solid waste		
Dry leaves		
Canteen waste		
Liquid waste		
Glass		
Unused equipment		
Napkins		
Others (specify)		

<b>Do you use recycled paper in college ?</b>	
<b>Any waste management methods used ?</b>	

**10. Carbon foot print analysis**

- 1 Total number of vehicles used by the stakeholders of the college.(per day)
- 2 No of cycles used
- 3 No of two wheelers used (average distance travelled and quantity od fuel and amount used per day)
- 4 No of cars used (average distance travelled and quantity od fuel and amount used per day)
- 5 No of persons using public transportation
- 6 No of persons using college conveyance
- 7 No of generators used per day
- 8 Amount of fuel used
- 9 Number of LPG cylinders used in canteen/labs
- 10 Use of any other fossil fuels in the college
- 11 Any suggestion to reduce the use of fuel

## AUDIT STAGE

Green auditing in **Alphonsa college, Pala** began with the assessment of the status of the green cover of the Institution followed by waste management practices and energy conservation strategies etc. The team monitored different facilities at the college, determined different types of appliances and utilities (lights, taps, toilets, fridges, etc.) as well as measuring the usage per item (Watts indicated on the appliance or measuring water from a tap) and identifying the relevant consumption patterns (such as how often an appliance is used) and their impacts. The staff and learners were interviewed to get details of usage, frequency or general characteristics of certain appliances.

Data collection was done in the sectors such as Energy, Waste, Greening, Carbon footprint and Water use. College records and documents were verified several times to clarify the data received through survey and discussions. The environment samples including water, soil were from various location of the campus were collected and analyzed at School of Environmental Sciences, Mahatma Gandhi University.

## GREEN AUDIT REPORT

### **Water Quality assessment**

Water samples from four different locations were collected and analyzed for its quality parameters. The samples includes two well water which are the main water source of the college campus and two tap water samples which is used for canteen and drinking water cum cooler systems. The samples were collected, preserved and transported to school of Environmental Sciences and analyzed for various physio-chemical parameters. The major parameters analyzed include dissolved oxygen, acidity, alkalinity, chloride, hardness, pH, conductivity, total dissolved solids and salinity. The results are presented in the Table 1 The results are comparable with the values of drinking water standards prescribed by different agencies.

**Table 1. Results of water quality**

Parameters	Well water 1	Well water 2	Tap water 1	Tap water2	Standard value (BIS)
Dissolved Oxygen (mg/l)	6.72	6.4	7.36	7.8	6-8
Acidity (mg/l)	56	22	22	10	200
Alkalinity (mg/l)	16	24	18	16	200
Chloride (mg/l)	27.7	21.83	36.72	15.88	250
Hardness (Total)	Nil	Nil	Nil	Nil	200
Conductivity ( $\mu$ s)	143.3	99	179	95.6	
pH	4.7	5.09	5.13	5.46	6.5-8.5
Total Dissolved Solids (ppm)	102	70	127	69	500
Salinity (ppt)	0.097	0.069	0.118	0.067	
Total coliform	Nil	Nil	Nil	Nil	0
Fecal coliform	Nil	Nil	Nil	Nil	0

### Water Management

The source of water used in the College are two wells present in the campus. These wells are recharging with rainwater from the roof. A total of 18000L of water is pumped out from the well every day (Table 2). Wastage of water from the lab is reduced by adopting microscale analysis. An average of 3,60,000 L of water is used by the College per month.

**Table 2.**

SL NO	PARAMETERS	Response	Remarks
1	Source of water	Well	
2	No of Wells	2	
3	No of motors used	3	
4	Horse power – Motor	5HP-2 1HP-1	
5	Depth of well –Total	12m - well no:1 15m- well no: 2	
6	Water level	8m - well no:1 12m- well no: 2	
7	Number of water tanks	8	
8	Capacity of tank	2000 L-3 3000 L-2 1000L -1 6000L-1	
9	Quantity of water pumped every day	18000L	
10	Any water wastage/why?	Nil	
11	Water usage for gardening	500L/day	
12	Waste water sources	Lab, canteen	

13	Use of waste water	Nil	
14	Fate of wastewater from labs	After neutralization waste water is kept in a large covered pit	
15	Any wastewater treatment for lab water	No	
16	Whether any green chemistry method practiced in labs	“Micro scale analysis “is implemented for chemistry students	
17	Rain water harvest available?	yes	
18	No of units and amount of water harvested		
19	Any leaky taps	Nil	
20	Amount of water lost per day	Nil	
21	Any water management plan used?	Water management audit conducted	
22	Any water saving techniques followed?	Nil	
23	Are there any signs reminding peoples to turn off the water?	Yes	

### Soil Quality assessment

Soil samples were collected from four locations of the campus and analysed for the basic parameters. The results are tabulated and presented in the table 3.

**Table 3**

Parameter	Location 1 (fruit garden)	Location 2 (ground)	Location 3 (Teak plantation)	Location 4 (Butterfly garden)
pH	7.3	7.1	7.5	7.3
Total Kjeldhal Nitrogen (mg/kg)	2.7	2.6	2.3	1.9
Total organic carbon (%)	1.4	1.1	1.2	1.4
Phosphate (mg/kg)	0.2	0.1	0.05	0.6

**Energy Audit Report**

Table 4 shows the energy consumption pattern of the college for a month. The college has consumed an average of 9515.15 kW/hr electricity in a month and the one year electricity bill amount was 1,97,090/-.

Table 4

Sl No	Electrical appliances/instruments	Number	Power (W)/unit	Total power (W)	kW	Operation /day	kW/hr	No of days in month	Total consumption per month
1	CFL	63	14	882	0.882	4	3.528	25	88.2
2	TUBE	272	38	10336	10.336	4	41.344	25	1033.6
4	LED BULB	97	9	873	0.873	4	3.492	25	87.3
5	LED TUBE	42	20	840	0.84	4	3.36	15	50.4
6	PROJECTOR	10	280	2800	2.8	1	2.8	25	70
7	SPEAKERS	36	10	360	0.36	1	0.36	25	9
8	FAN	233	60	13980	13.98	4	55.92	20	1118.4
9	COMPUTER	140	250	35000	35	4	140	20	2800
10	LAPTOPS	10	50	500	0.5	4	2	20	40
11	PRINTERS	2	60	120	0.12	1	0.12	20	2.4
12	PHOTOSTAT MACHINE	6	650	3900	3.9	2	7.8	15	117
13	SCANNER	1	50	50	0.05	0.5	0.025	15	0.375
14	UPS	3	1000	3000	3	12	36	20	720
15	INDUCTION	1	2000	2000	2	0.25	0.5	15	7.5
16	A/C	2	7000	14000	14	1	14	15	210
17	REFRIGERATOR	7	150	1050	1.05	24	25.2	30	756
18	TABLE FAN	2	55	110	0.11	2	0.22	25	5.5



19	MIXER GRINDER	2	750	150 0	1.5	2	3	15	45
20	OVEN	3	1500	450 0	4.5	2	9	10	90
22	CENTRIFUGE	2	850	170 0	1.7	0.25	0.425	8	3.4
23	AUTOCLAVE	1	1700	170 0	1.7	1	1.7	4	6.8
24	ULTRASOUND	1	700	700	0.7	0.25	0.175	5	0.875
25	LAMINAR FLOW	1	600	600	0.6	1	0.6	15	9
26	EXHAUST FAN	1	32	32	0.032	4	0.128	25	3.2
27	IRON BOX	2	2000	400 0	4	0.25	1	15	15
28	SEWING MACHINE	6	100	600	0.6	4	2.4	25	60
29	COLOUR BULB	13	60	780	0.78	1	0.78	5	3.9
30	INCUBATOR	2	40	80	0.08	4	0.32	25	8
31	DISTILLATION UNIT	1	1000	100 0	1	1	1	12	12
32	SANITARY NAPKIN INCINERATOR	6	1200	720 0	7.2	1	7.2	25	180

### Waste management

Waste management is important for an eco friendly campus. In a college different types of wastes are generated, its collection and management are very challenging. The following data provide the details of the waste generated and the disposal method adopted by the college.

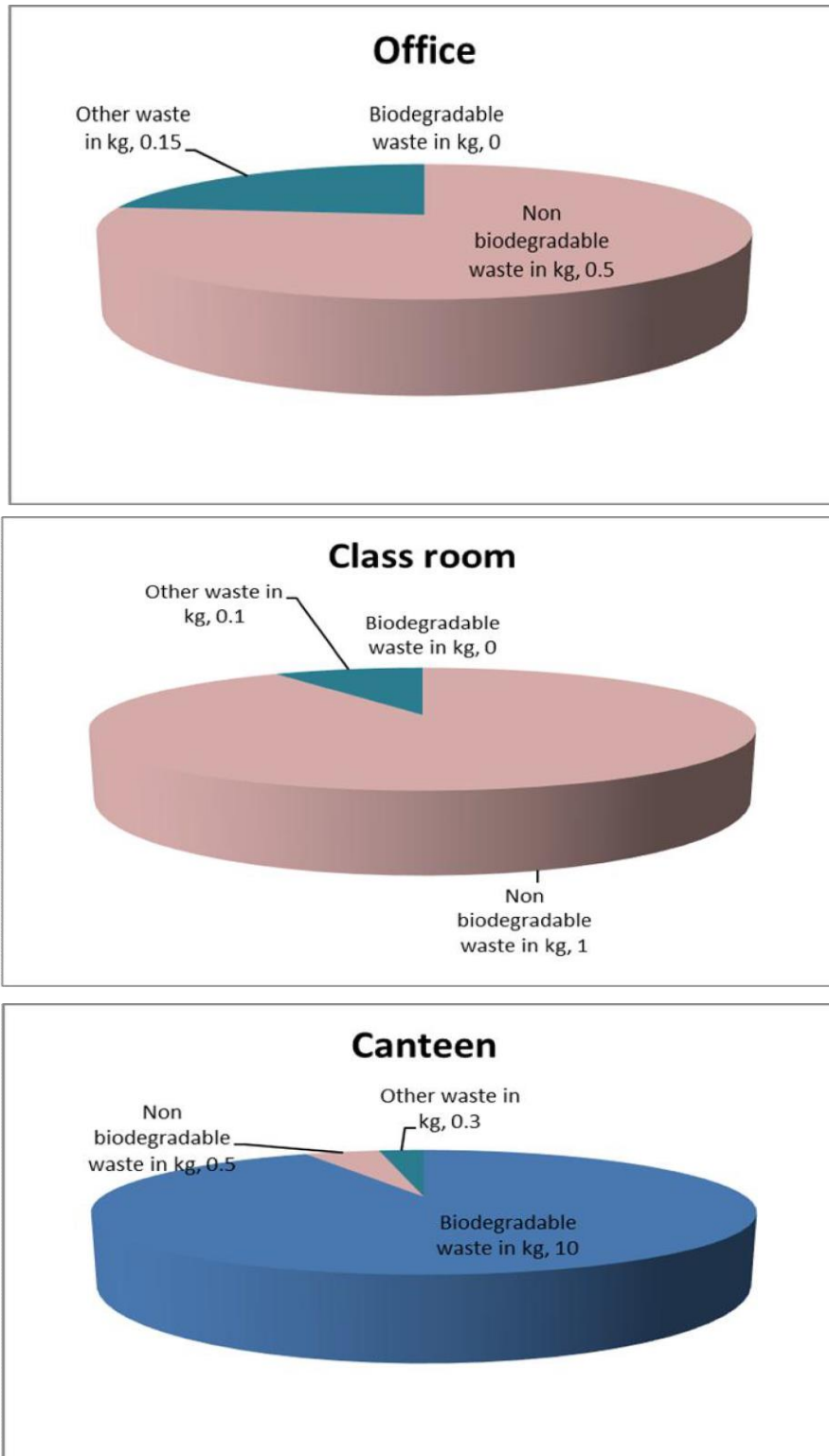
**Total number of stakeholders in the college: 2025**

**Total number of building ( Class rooms, canteen, office, auditorium, library etc ): 36**

**Table 5. Different types of waste generated in the college and their disposal**

<b>Types of waste</b>	<b>Particulars</b>	<b>Disposal method</b>
E-Waste	Computers, electrical and electronic parts	Direct selling
Plastic waste	Pen, Refill, Plastic water bottles and other plastic containers, wrappers etc	Direct selling
Solid wastes	Damaged furniture, paper waste, paper plates, food wastes	Reuse after maintenance energy conversion
Chemical wastes	Laboratory waste	Neutralise with water
Waste water	Washing, urinals, bathrooms	Soak pits
Glass waste	Broken glass wares from the labs	Direct selling
Sanitary Napkin	-	Napkin Incinerators

**Fig. 2 Per day waste generation in class rooms, offices and canteen**



***Waste management Practices adopted by the college***

For the last few years, college is following zero organic waste protocol throughout the campus. The food waste generated by the students and staffs are taken by them to their own home, so that, minimum waste is generated inside the campus. In addition, the organic waste generated in the canteen is used as feed for biogas plant and the biogas is used as fuel in college canteen. Vegetable waste and other leaf litters were used to fed in the vermi-compost pit and the resulting vermin-cast is used as manure in the garden. The chemicals from the laboratories are disposed in a sealed tank along with water, so that the chemicals undergo neutralization with the water.

## Green Campus

Total number of plant species identified 42 Total number of plants in the campus 286

**Table 6. List of plants in the campus**

Sl No	Common/local name	Scientific Name	No of trees
1	Akki	<i>Blighia sapida</i>	3
2	American Mahagony	<i>Swietenia mahagoni</i>	61
3	Arali	<i>Nerium oleander</i>	1
4	Asoka Chethi	<i>Saraca asoca</i>	1
5	Bamboo	<i>Bambusa vulgaris</i>	6
6	Bidi leaf tree	<i>Bauhinia racemosa</i>	4
7	Cactus	<i>Cactaceae</i>	1
8	Caesalpinia	<i>Caesalpinia</i>	4
9	Chamba	<i>Syzygium javanica</i>	1
10	Coconut	<i>Cocos nucifera</i>	10
11	Coffe	<i>Coffea arabica</i>	2
12	Crescentia Cujuta	<i>Crescentia kujete</i>	1
13	Cury Leaves	<i>Murraya koenigii</i>	2
14	Elennji	<i>Mimusops elengi</i>	1
15	Gooseberry	<i>Ribes uva-crispa</i>	2
16	Guava	<i>Psidium guajava</i>	6
17	Henna	<i>Lawsonia inermis</i>	2
18	Indian banyan	<i>Ficus benghalensis</i>	1
19	Indian tulip tree	<i>Thespesia populnea</i>	3

20	Jackfruit Tree	<i>Artocarpus heterophyllus</i>	12
21	Kanikonna	<i>Cassia fistula</i>	1
22	Kuappana	<i>Corypha umbraculifera</i>	1
23	Lemon	<i>Citrus limon</i>	1
24	Mango Tree	<i>Mangifera indica,</i>	7
25	Mangosteen	<i>Garcinia mangostana</i>	1
26	Maruthu	<i>Terminalia arjuna</i>	4
27	Moringa	<i>Moringa oleifera</i>	2
28	Mulberry	<i>Morus alba</i>	5
29	Musa	<i>Musa</i>	4
30	Neem	<i>Azadirachta indica</i>	2
31	Panineer chamba	<i>Syzygium jambosa</i>	6
32	Papaya	<i>Carica papaya</i>	6
33	Podocarpus	<i>Podocarpus</i>	1
34	Powder Puff	<i>Calliandra brevipes</i>	1
35	Rambutan	<i>Nephelium lappaceum</i>	1
36	Sappota	<i>Manilkara zapota</i>	3
37	Tamarindus	<i>Tamarindus indica</i>	1
38	Teak	<i>Tectona grandis</i>	85
39	Thuja	<i>Thuja occidentalis</i>	1
40	Thuja	<i>Thuja</i>	1
41	Vaka (Gulmohar)	<i>Delonix regia</i>	5
42	Vatta	<i>Macaranga peltata</i>	10

### **Campus farming**

The college has started a novel venture of cultivation of fruit trees in a 30 cent area of the campus. In addition Organic vegetable farm, medicinal plant garden were also properly maintained outside the campus.

### **Routine Green Practices**

Every year college celebrates World Environment Day, World Water Day and Ozone Day in the campus. The main focus of these programmes was to provide awareness to the students about the importance of the environment, its conservation and sustainable use of environmental resources. The programmes are conducted through seminars, poster presentation, quiz competition debates etc.

### Carbon Foot Print Analysis

1. Total number of vehicles used by the stakeholders of the college : 10
2. Number of cycles used                    0
3. No: of two wheelers used            8  
Average distance travelled: 10 km  
Average quantity of fuel used : ½ Ltr
4. No: of cars used                            21  
Average distance travelled : 425 km/21 km= 20 km  
Average quantity of fuel used : 1 Ltr
5. No: of persons using public transportation : 700
6. No: of persons using college conveyance : ----
7. No: of generators used per day : 1 (140 KVA Kirlosker) (Using **20 hrs / Month**)
8. Amount of fuel used                        : 60 Ltr
9. No: of LPG cylinders used in canteen/ Labs : 13
10. Use of any other fossil fuels in the college : Using firewood in the college canteen
11. Any suggestion to reduce the use of fuel :-----



## **SUGGESTIONS AND RECOMMENDATIONS**

### **Water Management**

The water sources are safe in terms of contamination. The students are taking back the food waste as per the zero waste management strategy of the college. It helped in reducing the consumption of water for washing.

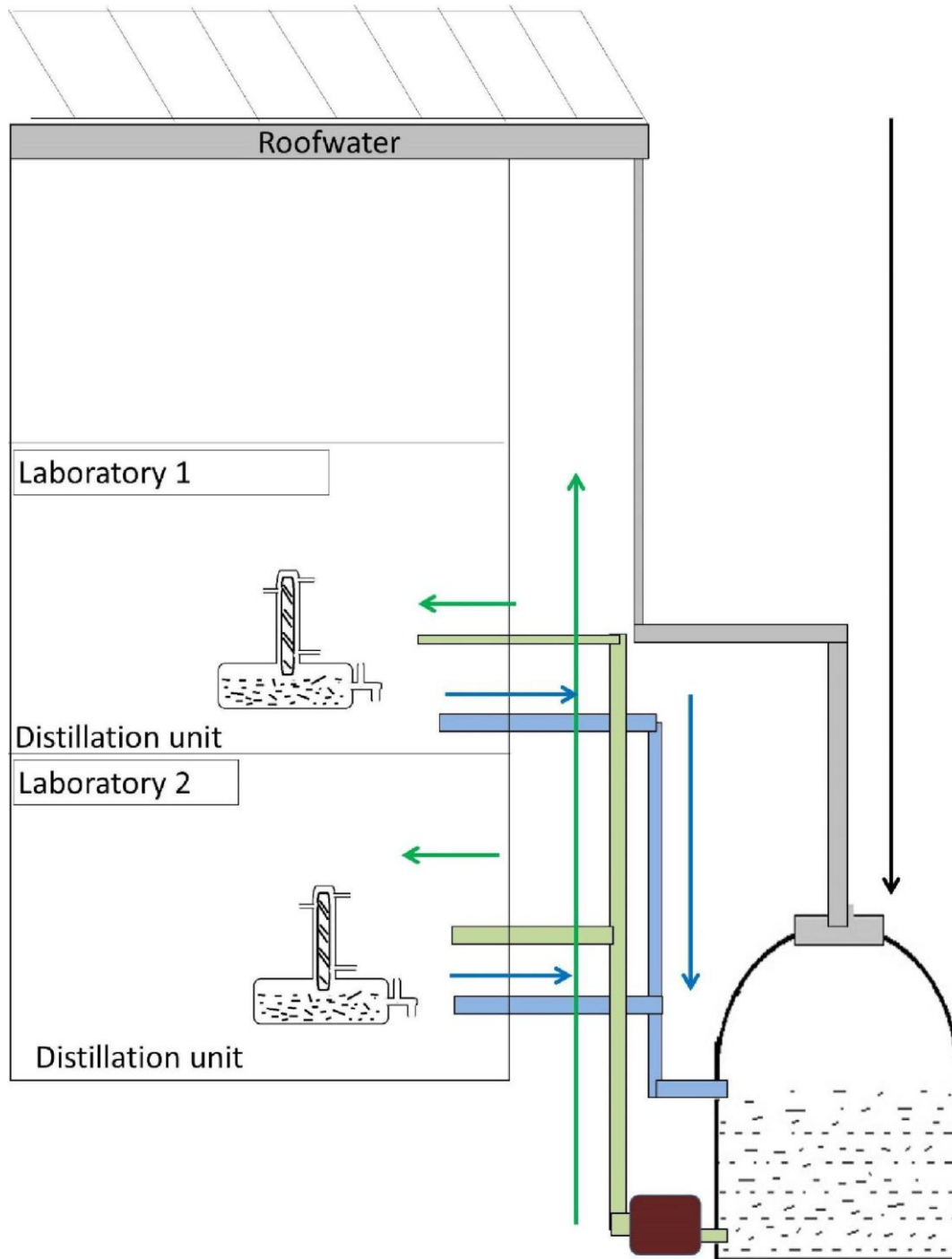
The wells can be recharged with rainwater from rooftops of new buildings. The area of the rooftop is 33108.68m<sup>2</sup>. Approximately 102532 m<sup>3</sup> of water can be harvested from the roof area of the new building.

Rainwater for laboratory purposes – Construction of a 10000L rainwater harvesting tank can satisfy the need of the laboratory , especially in distillation units where water is lost as coolant. The rainwater from the harvesting tank can be used as source water as well as coolant for the distillation unit. The rain water can also be used as a source for drinking water. The coolant water can be recycled through a separate plumbing system .

The capacity of the distillation unit in the college is 1 L / hour. The amount of water used as coolant for 1L of distilled water is 60L. Annually, the unit requires approximately 1500L of water as coolant and this much water can be saved with the construction of the harvesting tank.

The BMC club can arrange awareness programmes for water conservation. There should be proper monitoring of water consumption patterns in the campus. BMC can also conduct water quality monitoring during specific intervals.

The canteen waste can also be subjected to aerobic composting by setting-up a few composting yards in the campus. This will provide a chance for the students to learn by seeing and operating such compost yards by themselves. Also a good practice of managing their own waste ( from lunch box) instead of carrying them back home they can be trained in operating the compost yard ,by using their lunch time waste to produce good organic manure.



**Fig. 3 Schematic diagram of water harvesting and its utilisation**

## **Energy management**

The energy audit recommend to avoid the use of more energy consuming electrical appliances and to replace with more environment friendly and energy efficient appliances (for example five stars rated Air conditioner) in the college. The potential of renewable energy sources have to be explored. As the college has a very large roof area for installing solar panels so that it can be effectively used for generating power. The college has started steps in installing the solar panels for office.

It is recommended to install the following solar powered appliances in the campus;

- Solar powered water heater and cooker in the college canteen
- Solar powered street lights and LED display board

## **Green Campus**

In order to increase the carbon credit and greenery of the campus, it is recommended to plant more indigenous and evergreen / fruit trees inside the campus.

## **Waste Management**

- Try to avoid the use of plastic in the campus, and to encourage the use of biodegradable materials as alternatives. Try to achieve the goal of a plastic free campus.
- Leaf litter from the campus can be effectively used for aerobic/vermicomposting, so that the composted material can also be used as good manure.
- Recycle the paper waste instead of incinerate or burning