GREEN AUDIT REPORT prepared for SAHYA ARTS AND SCIENCE COLLEGE, Vellambram in Re survey No: 417/0-3, Ward No:4, Wandoor Panchayath, Malappuram District.

WILDLIFE RESEARCH & CONSERVATION TRUST

GREEN AUDIT REPORT – SAHYA ARTS AND SCIENCE COLLEGE, WANDOOR PANCHAYATH, MALAPPURAM DISTRICT.

Prepared for SAHYA Arts and Science College.

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WILDLIFE RESEARCH & CONSERVATION TRUST

A non-profit public charitable trust- Reg. No. 580/2005 ESTD in 2005, under the Societies Registration Act [No.21/1860]

Consultancy No 04/24/ SAHYA 20.052024

AUDIT CERTIFICATE

PRESENTED TO

SAHYA ARTS AND SCIENCE COLLEGE

Has been assessed by the WRCT for the comprehensive study of institutional working framework, to fulfil the requirement of

GREEN AUDIT

The efforts taken for the biodiversity conservation of the institution have been verified in the report submitted and were found to be satisfactory. The efforts taken by the management and faculty towards all measures taken for the conservation-oriented actions taken in the institution are highly appreciated and found remarkable

Dr. K.S Anoop Das

Dr. Dhanya R

ACKNOWLEDGEMENTS

Wildlife Research and Conservation Trust would like to thank the management of SAHYA Arts and Science College for assigning this important task of Green Audit. We appreciate the cooperation of the team SAHYA Arts and Science College for the completion of the assessment.

Firstly, we thank Dr. (Lt.Cdr.) C.K. Abdul Rabbi Nistar, The Principal, Mr. E Abdul Razak, Manager, Mr. Pappatta Kunhi Mohamed, President, Mr. Shareef Thurakkal, Secretary and for their cooperation and visionary attitude. We would also like to thank Ms. Nataksha N Coordinator IQAC, for her continuous support and guidance. We are also thankful to sAfrahanath PK of Dept of English, staff members who were actively involved while collecting the data and conducting sampling. We are also thankful to the students and non-teaching staff at SAHYA College.

Last but not least, we would like to the management committee for allowing us to evaluate the greenery of the campus. WRCT Green Audit Team has prepared this Green Audit Report for SAHYA based on the surveys.

ABOUT THE COLLEGE

Sahya Arts & Science College campus is located in Wandoor, Malappuram, Kerala, India, under the management of Sahya Pravasi Co-operative Society Limited. Sahya Arts and Science College, has been fostering higher education since its inception in 2013. Following the sanctioning of administrative approval the college, affiliated with the University of Calicut, commenced five undergraduate programs for the academic year 2013-14. With a commitment to evolving into a distinguished institution of higher learning, the college boasts sufficient infrastructure to support its vision. The main college building, which encapsulates a blend of natural beauty and eco-friendliness, stands on a vast expanse of five acres of scenic land, situated five kilometers from Wandoor, by the old railway station in Vellampuram. This serene and expansive setting provides an ideal environment conducive to academic endeavors and the scholarly pursuit of knowledge.

The campus spans ten acres and is encircled by lush greenery and hillocks. The college offers the best setting for learning because of its tranquil mood and picturesque surroundings. The College is committed to making special provisions for integrated and interdisciplinary courses, educating and training human resources for the country's development, initiating appropriate measures for promoting innovation in teaching and learning and paying special attention to improving the social and economic conditions and welfare of the people, especially about their intellectual, academic and cultural development.

CONTEXT OF GREEN AUDIT

Since the academic year 2019–20, all higher education institutions are required by the National Assessment and Accreditation Council, New Delhi (NAAC) to submit an annual Green, Environment, and Energy Audit Report. Green Audit falls under the purview of Criteria 7 of the National Assessment and Accreditation Council (NAAC), an autonomous Indian body that designates educational institutions based on their accreditation results. Furthermore, ensuring that higher education institutions take steps to reduce their carbon footprint and therefore help mitigate global warming is part of their Corporate Social Responsibility.

The management of the College decided to hire a qualified external professional auditor to perform an external environment assessment study in light of the NAAC circular on green auditing. Examining environmental behaviors that affect the atmosphere either directly or indirectly both inside and outside of the campus is the goal of the green audit. The term "green audit" refers to the methodical identification, measurement, documentation, reporting, and analysis of institutional environment components. It was started to examine the actions taken by the institutions whose operations could endanger the environment and the people's health.

The green audit can guide how to enhance the environment's structure and incorporate various elements that can safeguard the environment. This audit focuses on the institution's implementation of the Green Campus, Waste Management, Water Management, Air Pollution, Energy Management, and Carbon Footprint, among other things. Below is a discussion of the principles, organization, goals, analysis tools, methodology, and audit objectives.

INTRODUCTION

Educational institutions are becoming more environmentally conscious these days, and as a result, fresh ideas are being presented to make them eco-friendly and sustainable. Many educational institutions use a variety of approaches to address environmental issues to protect the environment within the building. These approaches include encouraging energy conservation, recycling garbage, reducing water use, harvesting water, and much more.

The institution's operations may have a negative influence on the environment. A green audit is an official assessment of the environmental impact that a college has. The purpose of the Green Audit is to assess the real-world situation on the campus of the organization. A College or college can utilize a green audit to find out where and how they are using the most energy, water, or other resources. From there, the College can decide how to make adjustments and save money. To improve waste minimization plans or for recycling projects, it can also be used to ascertain the type and volume of garbage.

The implementation of mitigation measures and green auditing benefits all institutions, students, and the environment. Additionally, it can raise knowledge of health issues and advance environmental awareness as well as values and ideas. Staff and students have a deeper comprehension of the green impact on the institution. Green auditing maintains cost savings by utilizing fewer resources. It provides a chance for educators and learners to grow in taking responsibility for their own personal and social responsibilities. Primary data collection, a site visit with the college staff, and an evaluation of the policies, procedures, paperwork, and records are all part of the audit process.

EXECUTIVE SUMMARY

To discover and ascertain whether an institution's actions are ecologically sound and sustainable, green auditing is a crucial first step. We have always been honest and productive consumers of the environment. However, excessive use of resources like gasoline, electricity, and water has become ingrained in everyone over time, particularly in urban and semi-urban areas. Is it now appropriate to determine whether our process is using more assets than necessary? Are we making prudent use of our resources?

All of these procedures are standardized by green audit, which also offers an effective method of using natural resources. It is vital to reevaluate the procedures and transform them into green and sustainable ones in the face of resource depletion and climate change. A method for it is provided by green audit. Additionally, it raises a general understanding of environmental sustainability among those employed by the organization.

This is the first attempt to perform a green audit to ensure that the College campus satisfies NAAC requirements. The primary focus of this audit was on greening indicators, such as the campus's carbon footprint, waste management procedures, soil and water quality, vegetation, and power and fossil fuel consumption. To gather information regarding the resources already available on campus and the resource consumption habits of college staff and students, a questionnaire was first distributed.

RELEVANCE OF GREEN AUDIT REPORT

This Green Audit Report embodies an essential evaluation of the environmental practices, sustainability metrics, and the eco-conscious ethos at Sahya Arts and Science College, Wandoor, Kerala. Undertaking this green audit serves an imperative function of aligning with the college's commitment to environmental stewardship and sustainability in higher education.

The relevance of conducting such a comprehensive green audit at Sahya College is multifaceted. It provides a systematic approach to assess the efficiency of resource usage on campus, measure the ecological impact of its operations, and highlight the relationship between the college and its surrounding natural environment. The audit offers a detailed understanding of the college's carbon footprint, waste management, energy conservation, water resource utilization, and biodiversity. It is vital for:

Enhancing Environmental Performance: By identifying current performance benchmarks, the green audit serves as a guide to further enhance the college's environmental sustainability and performance outcomes.

Compliance and Governance: The audit ensures that the college adheres to environmental regulations and governance standards, mitigating legal risks and reinforcing ethical accountability.

Educational Opportunities: As an educational institution, the audit provides an invaluable learning experience for the students, enriching their academic pursuits with practical insights into sustainability.

Informed Decision Making: The insights generated through the green audit inform strategic planning and decision-making, aligning campus operations with the best practices in environmental management.

Community Engagement: By showcasing the college's commitment to a green future, the audit fosters a culture of environmental awareness and engagement amongst students, staff, and the wider community.

Resource Optimization: The audit identifies areas where resources can be used more effectively, leading to significant cost savings and operational efficiencies.

Benchmarking and Progress Tracking: It allows the college to set benchmarks in sustainability and track progress against the established goals, ensuring continuous improvement.

Positive Institutional Image: The commitment to conducting a green audit and acting upon its findings enhances the college's reputation as a responsible and forward-thinking institution.

Through this Green Audit Report, Sahya Arts and Science College pledges to not only continue its legacy of academic excellence but to also nurture a green and sustainable campus that contributes positively to the global environmental efforts.

METHODOLOGY - SUMMARY

Identification of vegetation about the natural flora and crops was conducted through reconnaissance field surveys and onsite observations in the core and buffer zones. The plant species identification was done based on the reference materials and also by examining the morphological characteristics and reproductive materials i.e. flowers, fruits and seeds. The faunal elements (animal species) of the core and buffer zone were identified by direct sightings or indirect evidence viz. pug marks, skeletal remains, feathers, scats and droppings etc. (Jayson and Easa 2004). Standard binocular was used for the observations. The authenticity of faunal elements occurrence was confirmed by interaction with the local people. Avifauna identification was done with pictorial descriptions of published literature. Information about the existence of any migratory corridors and paths was obtained from local inhabitants. The status of each faunal element was determined and the wildlife schedule category was ascertained as per the IUCN-Red Data Book and Indian Wildlife (Protection) Act, 1972.

The plot method is used in the floral documentation in the core and buffer zones. For trees (10x10-m), shrubs (5x5-m) and herbs (1x1-m) plots were taken. Birds and butterflies were mainly focused during faunal assessment, transect method was employed for birds and butterflies. A transect is a path along which one counts and records the occurrence of an individual for study. A straight-line walk covering desired distance, within a period of one hour to 30 minutes was carried out in the proposed region. Bird species were recorded during the hours of peak activity 0700 to 1100 Hrs and 1430 to 1730 Hrs (Bibby et al. 2000). Direct observations and bird calls were used for bird documentation. The same transects were used for counting butterflies. Opportunistic observations were made for Amphibians, reptiles and odonates. The presence of mammals was recorded by direct and indirect signs. All possible transects were taken for birds and butterflies. Birds and butterflies were classified into species level. Recorded bird species were

identified at the species level using standard books (Ali & Ripley 1987, Grimmett et al., 2016).

Sampling

A stratified simple random sampling procedure was employed to obtain a sample from the study area. The study area was further stratified into different land-use/ecosystems

Sampling Size

Keeping in mind both the random sampling technique and covering all land use patterns for the study following sampling locations were chosen depending on the area of the proposed site.

Timing of Study

The study was carried out during morning and evening hours, to cover the different activity phases for important species such as time resting, feeding, hunting, and daily movements.

Observations from Sampling

The various observations relating to flora and fauna species are discussed in detail below, in separate sections.

Equipment/ References Used

- Canon Mark III Camera with 50-500mm lens– Snap shots taken
- Leica Binoculars (8x20) to spot/identify species
- IUCN Red Data Book – https://www.iucnredlist.org/species
- Ornithological/Entomological/Herpetological/Mammalian catalogues and pictorial descriptions from various authors and sites followed for species identification

Standard protocols were followed for fauna and flora surveys are as follows.

PART I FIELD SAMPLING TECHNIQUES

Observational methods- Mammals

We employed two types of observational methods for the recording of mammals: (1) direct observations, and (2) recording occurrences such as holes, markings, scats, hairs and spines (Menon 2003). Photographs, including a scale reference, were used for identification confirmations, and localities were recorded with a handheld GPS unit. Sometimes indigenous knowledge (especially from locals) was also used to prepare a preliminary list of species and/or help with the identification of signs.

Visual Encounter Survey (VES) - reptiles and amphibians

VES is a time-constrained sampling technique (Campbell and Christman, 1982; Corn and Bury, 1990). It needs a systematic search through an area or habitat for a prescribed period (Campbell and Christman, 1982). The result of VES is measured against the time spent on the search. VES technique is one of the simplest methods and an appropriate technique for both inventory and monitoring Herpetofauna (Heyer et al. 1994).

Transect walk – Birds

Five transect lines with varying length (100m-300m) and fixed width (2m) were laid which cuts through the core and peripheral areas of the proposed region. The transect surveys were conducted from 0700 to 1100 hours and 1430 to 1730 hours (Bibby et al. 2000). All avifauna found along these transects were recorded for analysis of the data. Counts were conducted while there was no heavy rain, mist or strong wind.

Modified Pollard Walk – for Butterflies

The Modified Pollard Walk (Pollard 1977, 1993, Walpole 1999) using fixed width transect walk method was employed to investigate butterfly spatial distribution, diversity and abundance at the different survey sites as used in previous studies on tropical butterflies.

Multiple Stage Quadrat – Vegetation

A range of habitat or vegetation structure variables were measured using the standard sampling protocol called Multiple Stage Quadrat (Sykes and Horrill 1977). Sampling took place in all those areas, which occupied an area with the major corners temporarily demarcated with colour ribbons. Each site was located in the field with a compass and clinometer and subsequently latitude, longitude and elevation of the plot were recorded with a handheld Global Positioning System (Garmin 12XL).

FLORA

Each of the plots has been examined for representative flora on randomly sampled quadrats for trees (10x10-m), shrubs (5x5-m) and herbs (1x1-m) depending upon prevailing geographical conditions and bio-diversity aspects of the study area.

PART II DATA ANALYSIS

Because of differing sample sizes from landscapes, species diversity, richness and evenness were calculated using the statistical package– Species Diversity & Richness (SDR) programme (Pisces Conservation LTD). For comparisons of mean species diversity among the sites program BioDiversity Pro (McAleece et al. 1997) was used. We estimated diversity in terms of species richness and evenness, as well as using the Shannon-Weaver index, which combines richness and abundance into a single measure (Magurran 1988).

Shannon-Wiener Index is defined and given by the following function:

$H=\sum[(pi)\times\ln(pi)]$

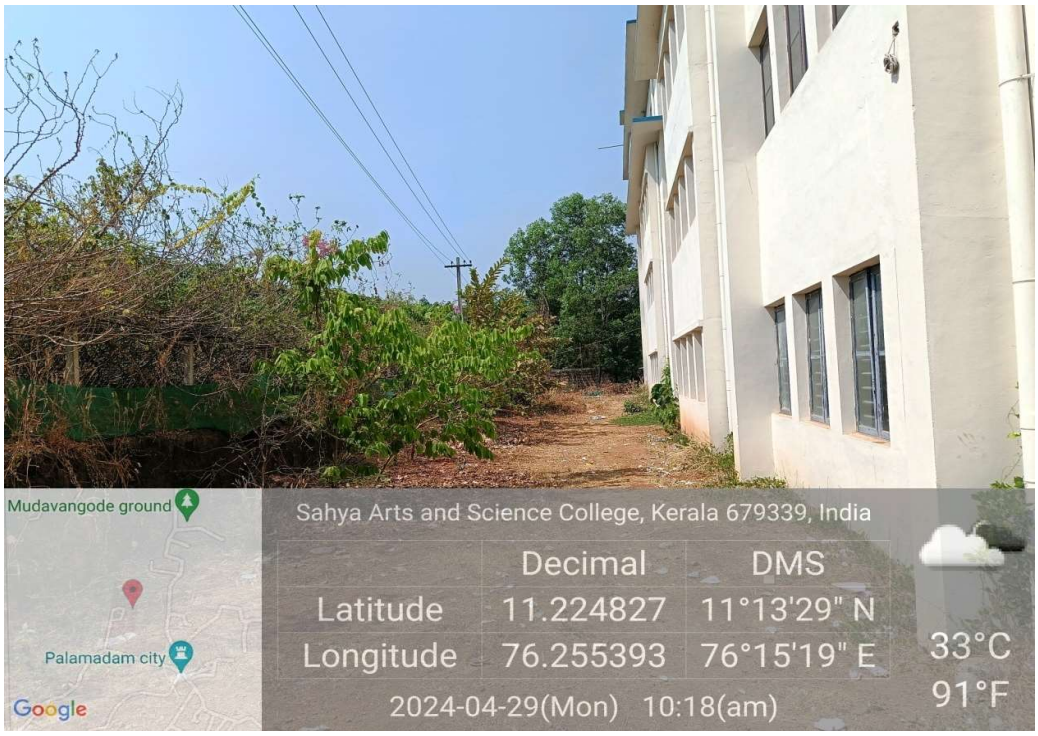
Where –

- pi = proportion of total sample represented by species ii. Divide no. of individuals of species I by the total number of samples.
- S = number of species, = species richness
- Hmax=ln(S) Maximum diversity possible

- E = Evenness = H/Hmax

To examine the association between vegetation compositions across different plots, the Bray–Curtis index of similarity (Bray and Curtis 1957; expressed equivalently as dissimilarity by subtraction from 100) was calculated pairwise for all sites from pooled data for vegetation adopted from Clarke and Warwick (1994).

Figures 1-2- Image showing the campus and surrounding vegetation



Figures 3-4. Image showing the campus and surrounding vegetation

Figures 5-6- Image showing the campus and surrounding vegetation

Figures 7-8. Image showing the campus and surrounding vegetation

Figures -9-10 Well maintained campus

Figure 11- Views of the campus

Figure 12-13- Views of the campus

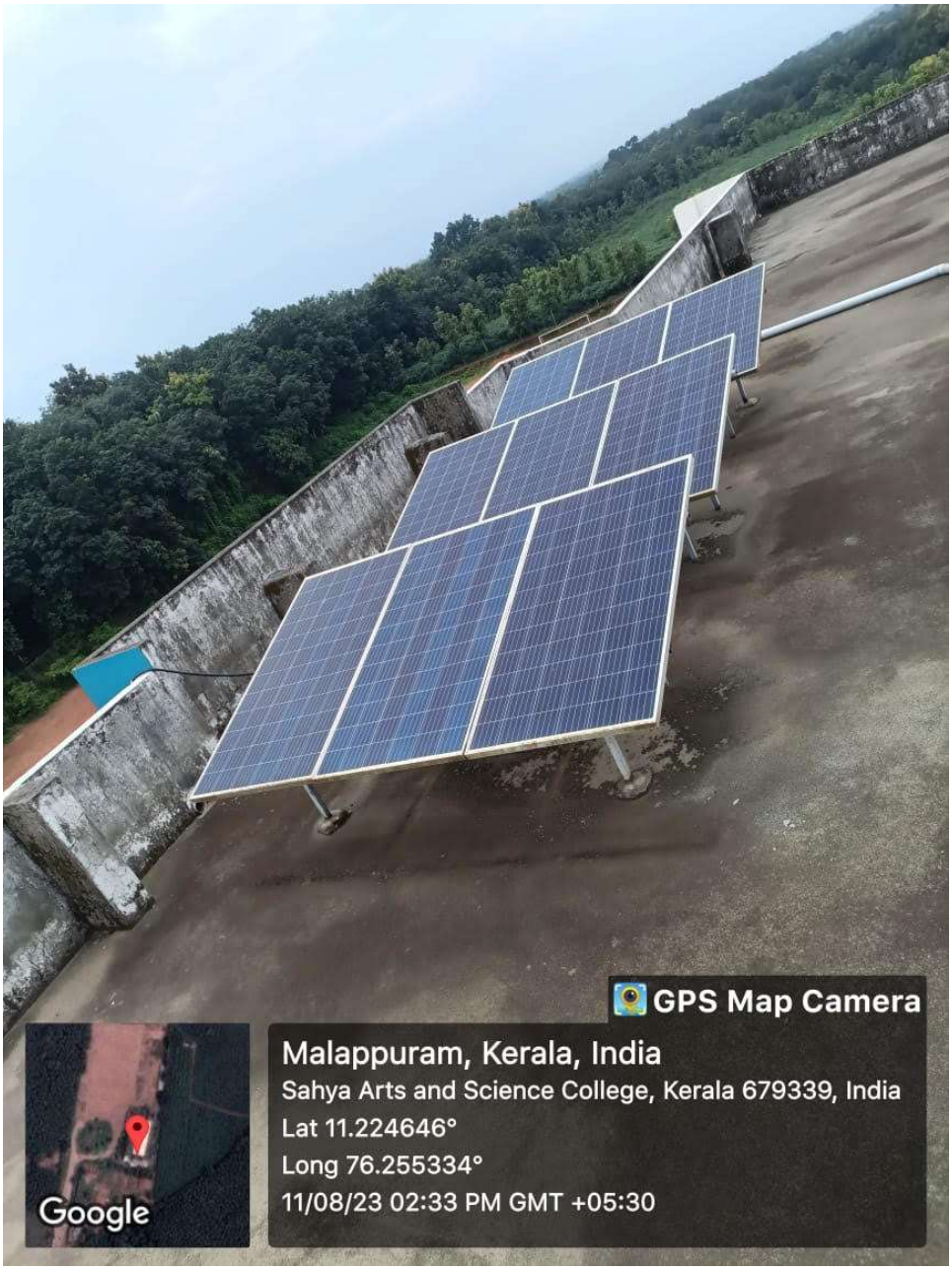

GPS Map Camera
Malappuram, Kerala, India
Sahya Arts and Science College, Kerala 679339, India
Lat 11.224646°
Long 76.255334°
11/08/23 02:33 PM GMT +05:30
Google

Figure 14. Google Earth image of the campus

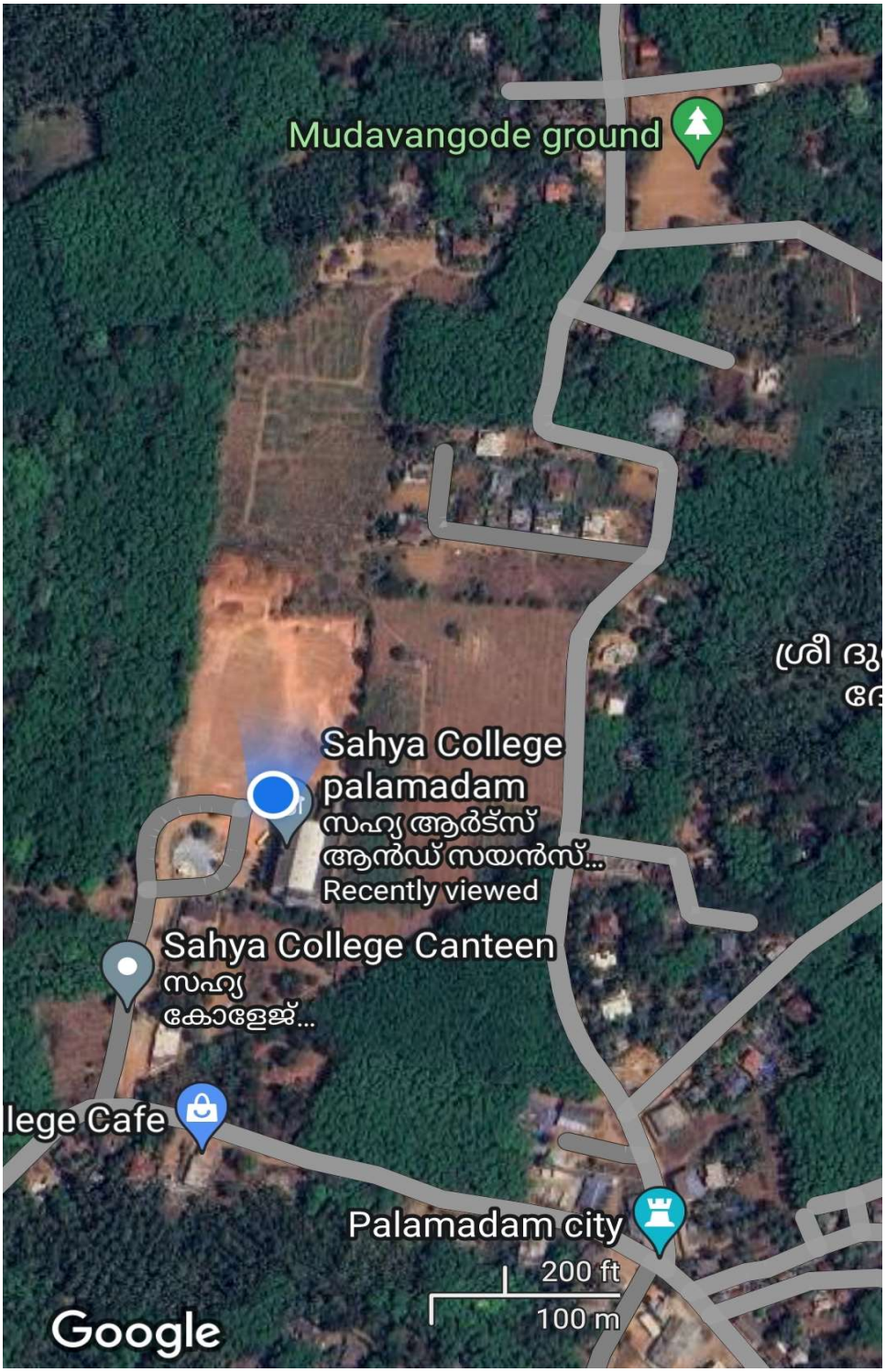
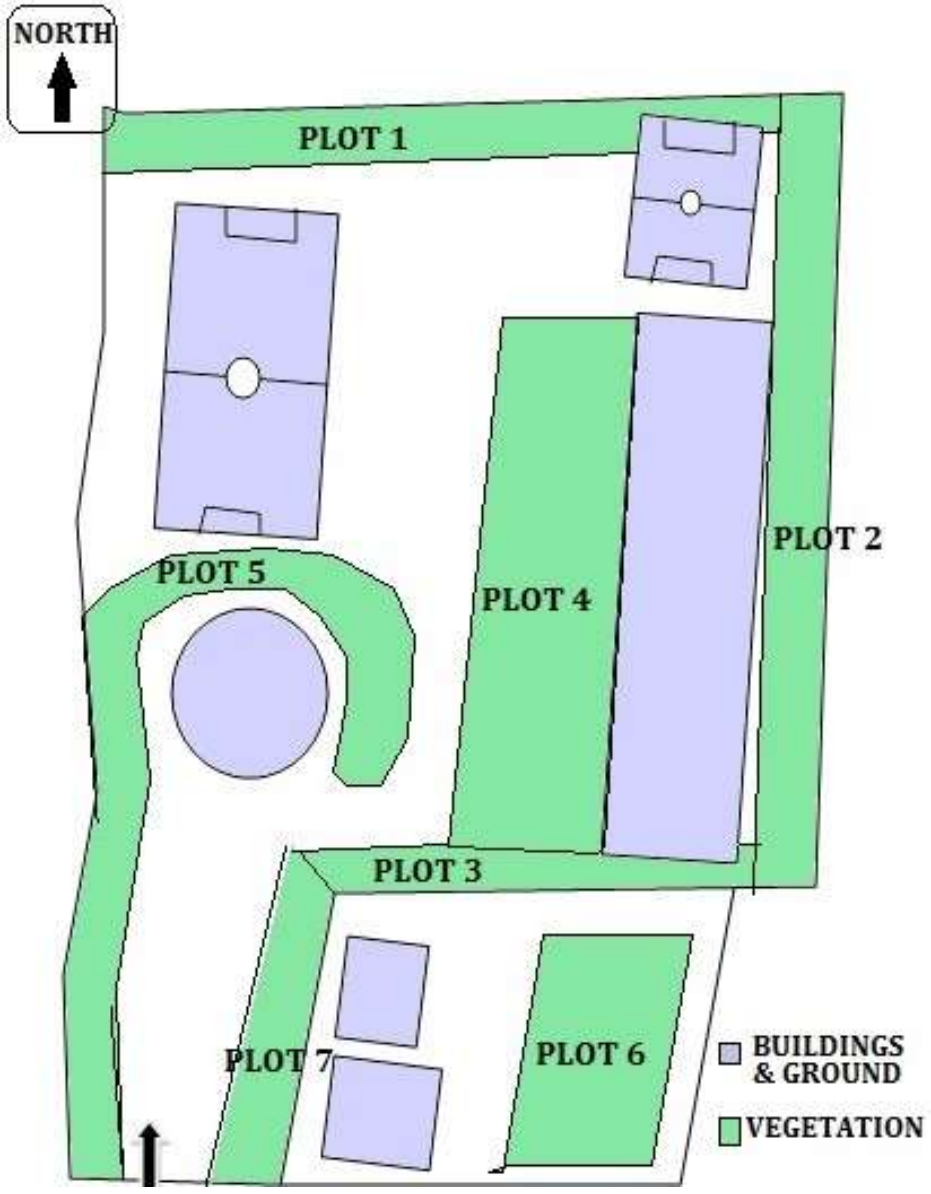


Figure 15. Schematic map of the areas where vegetation plots are laid



FINDINGS/RESULTS

The assessment was carried out during the summer season. The inspection day was quite alright with respectable weather. The details of the flora and fauna observed are given below.

Species Richness of Mammals

The assessment carried out within the proposed area including the buffer. The survey team reported three species of mammal, two individuals of *Funambulus palmarum* Indian Palm Squirrel (Table 1) were reported.

Species Richness of Reptiles

Reptiles recorded from the site were two individuals of *Psammophilus dorsalis* one individual of *Ptyas mucosa* and three individuals of *Calotes versicolor* (Table 2).

Species Richness of Birds

The species of birds were recorded based on actual sightings and calls along the five transects within the proposed site. **Twenty-eight** (**28**) species of birds were listed while surveying along the four transects line. **Six** (**6**) species was identified through call and the rest with direct sightings (Table 3).

Species Richness of Butterflies

Twenty-two (**22**) species of butterflies were recorded from the study site. The list of observed species is provided in the Table (4).

Fauna recorded from the project site

Table 1: List of Mammals recorded in the study area

Sl. No	Scientific name	Common name	Status	Count	Remark
1	*Funambulus palmarum*	Indian Palm Squirrel	LC	2	

Table 2: List of Reptiles recorded in the study area

Sl. No	Scientific name	Common name	Status	FN count	AN count
1	*Psammophilus dorsalis*	South Indian rock agama	LC	2	0
2	*Calotes versicolor*	Garden lizard	LC	1	3
3	*Ptyas mucosa*	Indian rat Snake	LC	1	0

Table 3: List of Birds recorded in the study area

Sl. No.	Scientific name	Common Name	Status	FN count	AN count
1	*Gallus sonneratii*	Grey Junglefowl	LC	2	0
2	*Spilornis cheela*	Crested serpent eagle	LC	0	1
3	*Haliastur indus*	Brahminy Kite	LC	1	0
4	*Corvus splendens*	House Crow	LC	2	2
5	*Spilopelia chinensis*	Spotted dove	LC	2	2
6	*Copsychus saularis*	Oriental Magpie Robin	LC	3	2
7	*Saxicoloides fulicatus*	Indian Robin	LC	2	1
8	*Dendrocitta vagabunda*	Rufous Treepie	LC	2	2
9	*Centropus sinensis*	Greater coucal	LC	1	2
10	*Acridotheres tristis*	Common Myna	LC	2	2
11	*Turdoides striata*	Jungle Babbler	LC	2	4
12	*Turdoides affinis*	Yellow billed Babbler	LC	4	5
13	*Chloropsis aurifrons*	Golden-fronted Leafbird	LC	2	1

14	*Pycnonotus jocosus*	Red-whiskered Bulbul	LC	2	3
15	*Pycnonotus cafer*	Red-vented Bulbul	LC	2	2
16	*Acritillas indica*	Yellow-browed Bulbul	LC	1	1
17	*Psilopogon viridis*	White-cheeked barbet	LC	0	2
18	*Pericrocotus speciosus*	Scarlet Minivet	LC	2	4
19	*Ptyonoprogne concolor*	Dusky crag martin	LC	2	2
20	*Merops orientalis*	Green bee eater	LC	1	3
21	*Oriolus xanthornus*	Black-hooded Oriole	LC	2	1
22	*Cyornis tickelliae*	Tickell's blue flycatcher	LC	3	4
23	*Dicrurus macrocercus*	Black Drongo	LC	2	2
24	*Dicrurus paradiseus*	Greater racket-tailed Drongo	LC	3	1
25	*Leptocoma zeylonica*	Purple-rumped Sunbird	LC	1	1
26	*Cinnyris asiaticus*	Purple sunbird	LC	2	1
27	*Orthotomus sutorius*	Tailorbird	LC	2	3
28	*Lonchura striata*	White-rumped Munia	LC	5	4

Table 4: List of Butterflies recorded in the study area

Sl. No.	Scientific name	Common Name	Status	FN count	AN count
1	*Papilio polymnestor*	Blue Mormon	LC	2	1
2	*Troides minos*	Southern Birdwing	LC	1	3
3	*Pachliopta*	Common Rose	LC	2	1
4	*Delias eucharis*	Common Jezebel	LC	2	2
5	*Graphium*	Tailed Jay	LC	2	2
6	*Graphium sarpedon*	Bluebottle	LC	1	0
7	*Eurema hecabe*	Common grass yellow	LC	3	4
8	*Eurema blanda*	Three spot Grass yellow	LC	2	2
9	*Euploea core*	Common Crow	LC	1	2
10	*Catopsilia Pomona*	Common Emigrant	LC	2	2
11	*Hypolimnas bolina*	Great Eggfly	LC	1	2
12	*Acraea terpsicore*	Tawny Coster	LC	2	4
13	*Neptis hylas*	Common Sailer	LC	3	2
14	*Junonia iphita*	Chocolate Pansy	LC	2	4
15	*Ypthima huebneri*	Common Four ring	LC	4	2
16	*Tirumala limniace*	Blue Tiger	LC	1	4
17	*Ariadne merione*	Common Castor	LC	2	3
18	*Danaus chrysippus*	Plane Tiger	LC	2	4
19	*Danaus genutia*	Common Tiger	LC	2	5
20	*Loxura atymnus*	Yamfly	LC	2	1
21	*Leptosia nina*	Psyche	LC	6	5
22	*Junoina lemonias*	Lemon Pansy	LC	1	2

PART II

Vegetation characteristics

The place is with average vegetation, located at plane area with laterite type of soil covered land. Only less vegetation can be noted within the campus and nearby areas.

Table 5. List of trees observed from the study area

No:	Scientific Names	Family	Local Name	No. of Individuals
1	*Tectona grandis*	Verbenaceae	Thekk	7
2	*Macaranga peltata*	Euphorbiaceae	Vatta	9
3	*Ailanthus triphysa*	Simaroubaceae	Matti	2
4	*Racosperma mangium*	Mimosaceae	Manjium	19
5	*Phyllanthus emblica*	Euphorbiaceae	Nelli	1
6	*Averrhoa carambola*	Oxalidaceae	Star fruit	1
7	*Psidium guajava*	Myrtaceae	Pera	5
8	*Mangifera indica*	Anacardiaceae	Maav	3
9	*Pongamia pinnata*	Fabaceae	Ungu	3
10	*Ficus auriculata*	Moraceae	Athi	1
11	*Swietenia mahagoni*	Meliaceae	Mahagony	3
12	*Azadirechta indica*	Meliaceae	Aryaveppu	8
13	*Lagerstroemia speciosa*	Lythraceae	Poomaruth	18
14	*Simarouba glauca*	Simaroubaceae	Lakshmitharu	5
15	*Eugenia sp.*	Myrtaceae	Red eugenia	22
16	*Ficus sp.*	Moraceae	Ornamental ficus	12
17	*Cassia fistula*	Fabaceae	Kanikkonna	3
18	*Callistemon citrinus*	Myrtaceae	Bottle brush	1
19	*Albizia lebbeck*	Mimosaceae	Nenmenivaka	1
20	*Tamarindus indicus*	Fabaceae	Puli	1
21	*Ficus benghalensis*	Moraceae	Aal	1
	Total			126

Table 6. List of trees observed and the Number of individuals

Sl. No.	Species	No of individuals in each plot							
		1	2	3	4	5	6	7	Total
1	*Tectona grandis*	6	0	0	0	1	0	0	7
2	*Macaranga peltata*	0	6	0	0	0	3	0	9
3	*Ailanthus triphysa*	0	2	0	0	0	0	0	2
4	*Racosperma mangium*	0	2	8	1	3	5	0	19
5	*Phyllanthus emblica*	0	0	0	0	1	0	0	1
6	*Averrhoa carambola*	0	0	1	0	0	0	0	1
7	*Psidium guajava*	0	5	0	0	0	0	0	5
8	*Mangifera indica*	0	0	0	3	0	0	0	3
9	*Pongamia pinnata*	0	0	2	1	0	0	0	3
10	*Ficus auriculata*	0	0	0	0	1	0	0	1
11	*Swietenia mahagoni*	0	0	1	2	0	0	0	3
12	*Azadirechta indica*	0	0	7	1	0	0	0	8
13	*Lagerstroemia speciosa*	0	3	0	0	6	4	5	18
14	*Simarouba glauca*	0	1	4	0	0	0	0	5
15	*Eugenia sp.*	0	0	0	0	11	0	11	22
16	*Ficus sp.*	0	0	2	6	4	0	0	12
17	*Cassia fistula*	0	0	1	1	0	0	1	3
18	*Callistemon citrinus*	0	0	1	0	0	0	0	1
19	*Albizia lebbeck*	0	0	0	0	0	0	1	1
20	*Tamarindus indicus*	0	0	0	1	0	0	0	1
21	*Ficus benghalensis*	0	0	0	1	0	0	0	1
	Total								126

Table 11.GBH Details of trees in the proposed site.

		GBH in cm.					
Sl No	**Species**	**<20**	**20-40**	**40-60**	**60 - 80**	**80>**	**Total**
1	*Tectona grandis*	**1**	**6**	**0**	**0**	**0**	7
2	*Macaranga peltata*	**2**	**7**	**0**	**0**	**0**	9
3	*Ailanthus triphysa*	**1**	**1**	**0**	**0**	**0**	2
4	*Racosperma mangium*	**10**	**4**	**5**	**0**	**0**	19
5	*Phyllanthus emblica*	**0**	**1**	**0**	**0**	**0**	1
6	*Averrhoa carambola*	**1**	**0**	**0**	**0**	**0**	1
7	*Psidium guajava*	**5**	**0**	**0**	**0**	**0**	5
8	*Mangifera indica*	**1**	**2**	**0**	**0**	**0**	3
9	*Pongamia pinnata*	**1**	**2**	**0**	**0**	**0**	3
10	*Ficus auriculata*	**0**	**1**	**0**	**0**	**0**	1
11	*Swietenia mahagoni*	**2**	**1**	**0**	**0**	**0**	3
12	*Azadirechta indica*	**3**	**5**	**0**	**0**	**0**	8
13	*Lagerstroemia speciosa*	**11**	**7**	**0**	**0**	**0**	18
14	*Simarouba glauca*	**4**	**1**	**0**	**0**	**0**	5
15	*Eugenia sp.*	**22**	**0**	**0**	**0**	**0**	22
16	*Ficus sp.*	**12**	**0**	**0**	**0**	**0**	12
17	*Cassia fistula*	**3**	**0**	**0**	**0**	**0**	3
18	*Callistemon citrinus*	**1**	**0**	**0**	**0**	**0**	1
19	*Albizia lebbeck*	**0**	**0**	**1**	**0**	**0**	1
20	*Tamarindus indicus*	**0**	**1**	**0**	**0**	**0**	1
21	*Ficus benghalensis*	**0**	**0**	**1**	**0**	**0**	1
							126

Table 12. List of Herbs observed from the study area

Sl. No	Species	Family	Local name
1	*Urena lobata*	Malvaceae	Oorppam
2	*Ageratina adenophora*	Asteraceae	Appa
3	*Alternanthera brasiliana*	Amaranthaceae	Cheera chedi
4	*Curculigo orchioides*	Hypoxidaceae	Nilappana
5	*Axonopus compressus*	Poaceae	Buffalo grass
6	*Blumea sps.*	Asteraceae	Grass
7	*Brachiaria sp.*	Poaceae	Grass
8	*Dipteracanthus prostratus*	Acanthaceae	Velipadakkam
9	*Chromolaena odorata*	Asteraceae	Communist pacha
10	*Eragrostis sp.*	Poaceae	
11	*Euphorbia hirta*	Euphorbiaceae	Nila paala
12	*Leucas aspera*	Lamiaceae	Thumba
13	*Mimosa pudica*	Mimosaceae	Thottavaadi
14	*Mitracarpus hirtus*	Rubiaceae	Thaval
15	*Pennisetum polystachyon*	Poaceae	Pothapullu
16	*Peperomia pellucida*	Piperaceae	Mashithandu
17	*Phyllanthus amarus*	Phyllanthaceae	Keezharnelli
18	*Scoparia dulcis*	Scrophulariaceae	Kallurukki
19	*Stachytarpheta jamaicensis*	Verbenaceae	Narivalan
20	*Tridax procumbens*	Asteraceae	Odiyancheera
21	*Microstachys chamaelea*	Euphorbiaceae	
22	*Naregamia alata*	Meliaceae	Nilanarakam
23	*Cleome viscosa*	Capparaceae	Kattukaduku

Table 13. List of shrubs observed from the study area

Sl. No	Species	Family	Local name
1	*Duranta erecta*	Verbenaceae	Duranta
2	*Lantana camara*	Verbenaceae	Kongini
3	*Urena lobata*	Malvaceae	Oorppam
4	*Clerodendrum infortunatum*	Verbenaceae	Peruk
5	*Helicteres isora*	Sterculiaceae	Idampiri valampiri
6	*Leea indica*	Leeaceae	Choriyantali
7	*Hyptis suaveolens*	Lamiaceae	Naattapoochedi
8	*Tabernaemontana sp.*	Apocynceae	Nandhyarvattam

Table 14. List of Climbers observed from the study area

Sl. No			
1	*Cajanus scarabaeoides*	Fabaceae	Kattumuthira
2	*Centrosema molle*	Fabaceae	Kattupayar
3	*Ichnocarpus frutescens*	Apocynaceae	Palvalli
4	*Cyclea peltata*	Menispermaceae	Padathali
5	*Getonia floribunda*	Combretaceae	Pullani
6	*Hemidesmus indicus*	Periplocaceae	Naruneendi
7	*Mukia maderaspatana*	Cucurbitaceae	Mindamindikka
8	*Ipomoea obscura*	Convolvulaceae	Thiruthali
9	*Mikania micrantha*	Asteraceae	Dhritharashtra pacha
10	*Passiflora foetida*	Passifloraceae	Thoppapazham
11	*Pothos scandens*	Arecaceae	

Table 15. Site-specific native tree species to be planted in the campus

Sl.No.	Scientific name	Common name
1	*Macaranga peltata*	Vatta
2	*Morinda pubescens*	Manjapavatta
3	*Butea monosperma*	Plash
4	*Syzygium cumini*	Njaval
5	*Cassia fistula*	Kanikkonna
6	*Trema orientalis*	Pottama
7	*Mangifera indica*	Mavu
8	*Terminalia paniculata*	Maruth
9	*Artocarpus heterophyllus*	Plavu
10	*Azadirechta indica*	Veppu
11	*Lagerstroemia speciosa*	Poomaruth

Few of the other rejuvenating plants would probably check the sound and air pollution are as follow,

Sl.No.	Scientific name of the shrub	Common name
1	*Memecylon sps.*	Kashaavu
2	*Bambusa bambos*	Bamboo
3	*Murraya paniculata*	Maramulla
4	*Bambusa vulgaris*	Yellow bamboo
5	*Bambusa tuldoides*	Buddha Belly Bamboo
6	*Thyrsostachys oliveri*	Bamboo
7	*Mussaenda frondosa*	Vellila
8	*Briedalia stipularis*	Cheriya nattam
9	*Desmodium sp.*	Golden desmodium
10	*Bambusa striata*	Yellow bamboo
11	*Dendrocalamus strictus*	Illi

Table16. Descriptive statistics of the vegetation sampled

Sample	Mean Individuals	Standard Deviation	Standard Error	Total Individuals	Total Species	Maximum
Sample 1	0.286	1.309	0.286	6	1	6
Sample 2	0.905	1.758	0.384	19	6	6
Sample 3	1.286	2.305	0.503	27	9	8
Sample 4	0.81	1.436	0.313	17	9	6
Sample 5	1.286	2.741	0.598	27	7	11
Sample 6	0.571	1.469	0.321	12	3	5
Sample 7	0.857	2.575	0.562	18	4	11

Table 17. Simpson diversity index of the vegetation sampled

Index	Sample 1	Sample 2	Sample 3	Sample 4	Sample 5	Sample 6	Sample 7
Simpsons Diversity (D)	1	0.175	0.162	0.14	0.225	0.288	0.425

Figure 17. Simpson diversity index of the vegetation sampled

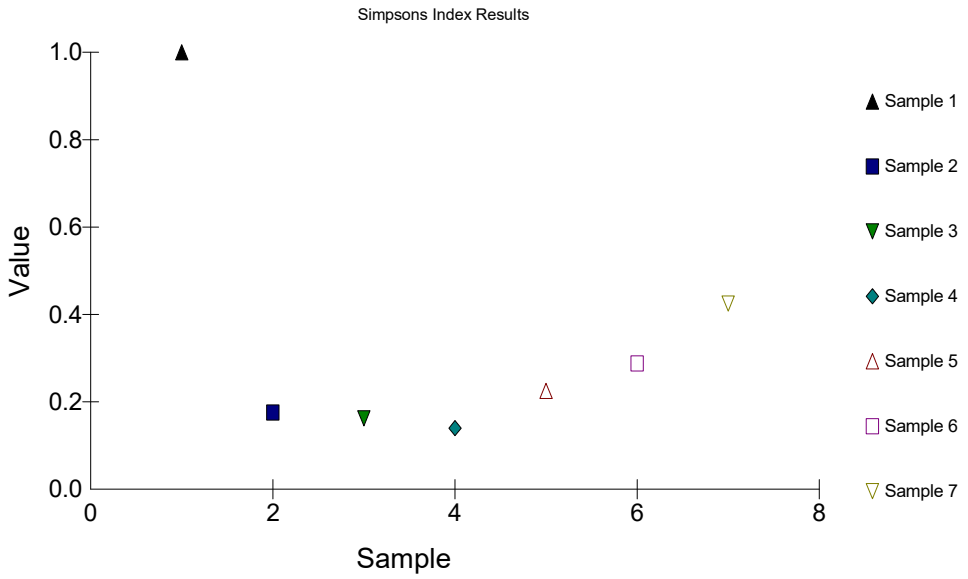


Figure 18. Bray Curtis Cluster diagram to show the similarity of trees at different sampling locations

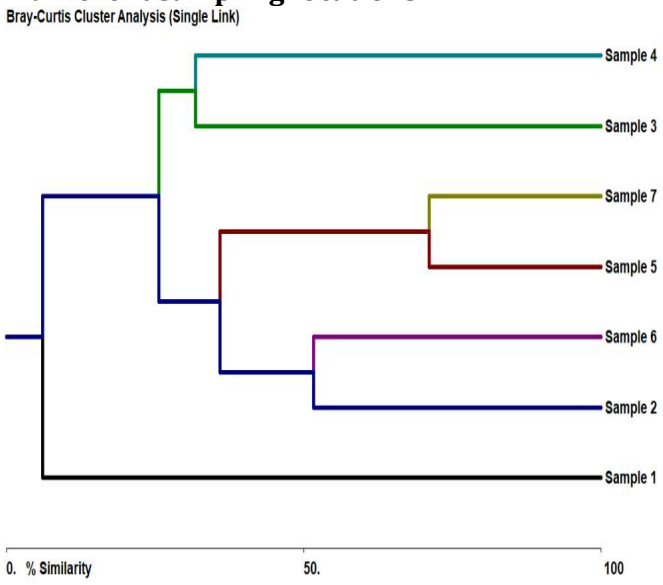


Table 19. Noise intensity measurements observed from different areas of the campus

Sl No.	Study area	Minimum (DB)	Maximum (DB)
1	Classroom 1	57.6	75
2	Classroom 2	57.5	75
3	Classroom 3	61.5	64
4	Classroom 4	54	67
5	Classroom 5	54	65
6	Generator	72	81

GREEN INITIATIVES BY THE CAMPUS

- **Solid Waste Management**
  - Waste management is done by composting and landfills
  - Biodegradation of plastic waste is considered one of the best practices of the college
  - Colourd bins are used to collect different types of wastes
  - One sided used paper is re-used for internal assessment and working.
  - There is a ban on single-use plastic and plastic crockery on the campus.
- **Renewable Energy**
  - A solar power plant of capacity 3 KW is installed on the building roof.
- **Tree Plantation Drives**
  - Several tree plantation drives were carried out in the current year on the Campus.
  - Plants survival rate is around 85%

Table 20. Different types of waste generated in the college and their disposal

Types of waste	Particulars	Disposal method
E-Waste	Computers, electrical and electronic parts	On a contract with an agency named LOGON Systems which is renewed annually
Plastic waste	Pen, Refill, Plastic water bottles and other plastic containers, etc	Haritha Karma Sena
Solid wastes	Damaged furniture, paper waste, paper plates, food wastes	Reuse after maintenance energy conversion
Chemical wastes	Laboratory waste	Neutralise with water
Wastewater	Washing, urinals, bathrooms	Soak pits
Glass waste	Broken glass wares from the labs	Direct selling
Sanitary Napkin	Dispencers	Napkin Incinerators

ROUTINE GREEN PRACTICES

The college observes Ozone Day, World Water Day, and World Environment Day on campus each year. These programs' primary goal was to raise students' knowledge of the value of the environment, its preservation, and the sustainable use of its resources. The programs are delivered through debates, quiz competitions, poster presentations, and seminars, among other methods. The college has an NSS and nature club to promote an environmental awareness programme. They actively maintain a Medicinal Garden which consists of several plants. (Figures are provided)

SUGGESTIONS AND RECOMMENDATIONS

1. One of the creative ways to address the present problems with ecological and environmental degradation is to document and gather extensive information about the flora and fauna on campus. Including the different stakeholders in the green audit, survey could satisfy the need to raise awareness about various environmental issues.

2. The biodiversity listed by the IUCN made it easier to comprehend the biological state of the campus's habitats. The campus is home to these trees. These trees could be encouraged to develop and be conserved.

3. Selective afforestation of native plant species should be encouraged as the campus develops ecologically and sustainably in the future.

4. Concentrated efforts might be made to create butterfly host plants and bird forage plants, which would draw additional seedlings to the campus and serve as an ecological location for geography, biology, and other students. Indeed, to prevent the campus from frequently drying out, the earth needs to be nurtured and maintained.

5. The Kerala State Biodiversity Board can assist the panchayath in promoting the construction of a butterfly garden.

6. Kerala Haritha Mission can initiate "*Pacha Thuruthu* (Green islands)" programme to create and restore campus vegetation with native plants

7. To keep the data current, the biodiversity audit survey needs to be carried out every five years. Because each tree is marked, it is simple to determine how each one is doing in terms of growth, survival, and other factors.

7. In terms of contamination, the water sources are safe. The pupils are taking small steps that have assisted in cutting down on the amount of water used for washing. It is possible to replenish the wells with rainwater collected from building rooftops.

8. Rainwater collected for lab use- Building a 10,000-liter rainwater

harvesting tank can meet laboratory requirements, particularly in distillation plants where coolant leaks. The distillation unit's coolant and source water can both be obtained from the rainwater collected in the collecting tank. The coolant water can be recycled through a separate plumbing system.

9. The BMC club can organize activities to raise awareness of water conservation. Water use habits on campus should be closely observed. Furthermore, BMC can periodically check the water quality.

10. By establishing a few composting yards on campus, it is also possible to aerobically compost the trash from the canteen. This will provide the students with an opportunity to see and manage such compost yards independently, which will help them learn.

CONCLUSION

This audit encompasses thorough interactions and collaborative dialogues with key members of the faculty and staff, addressing a spectrum of environmental concerns. The campus Eco Club plays an instrumental role in promoting the efficient use of resources. The campus landscape covers 60% of the total area, with 55% being verdant with vegetation. The college is acutely aware of the environmental ramifications of its activities and is actively engaged in adopting eco-friendly practices.

While the college already demonstrates commendable environmental initiatives, there is room for further improvement to advance sustainability efforts. It is crucial to undertake new initiatives, such as implementing a plant distribution and adoption scheme, and to consider increasing the capacity of the solar power facility. Moreover, the installation of water meters across every building or block and the generation of water balancing reports are strongly recommended to strengthen the campus's sustainable development.

Figure 19. Incinerator at campus

Figure 20 Colored Bins for waste disposal

Figure 21 Tree planting drives at campus

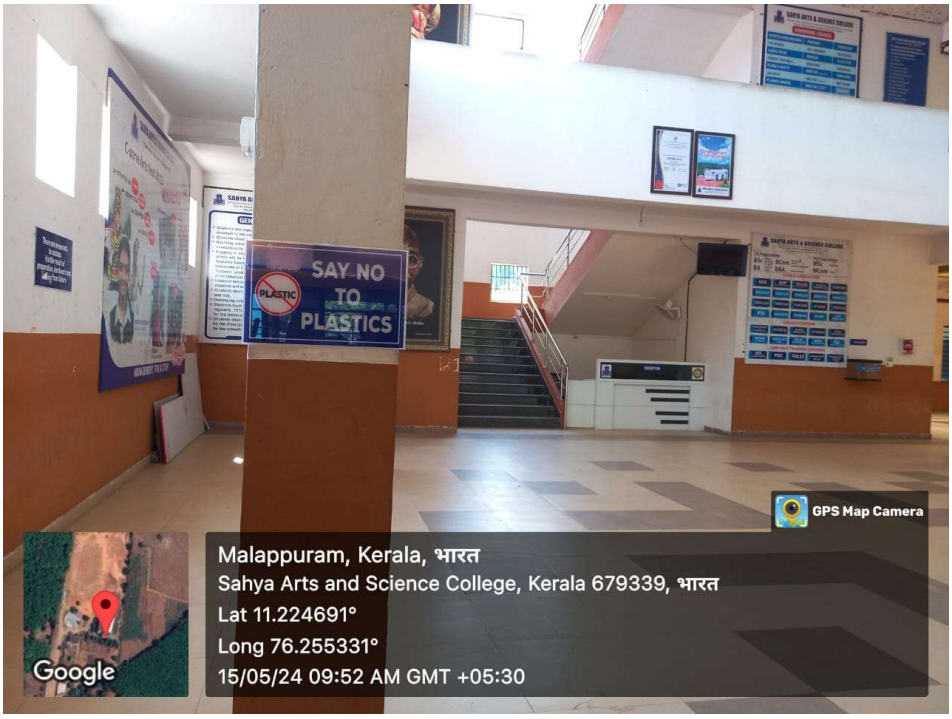


Figure 22. Boards to remind the sustainable practices at campus

Figure 23. Boards to remind the sustainable practices at campus

Figure 24. Boards to remind the sustainable practices at campus

Figure 25. Soakpit at campus

Figure 25. Birdbath at campus

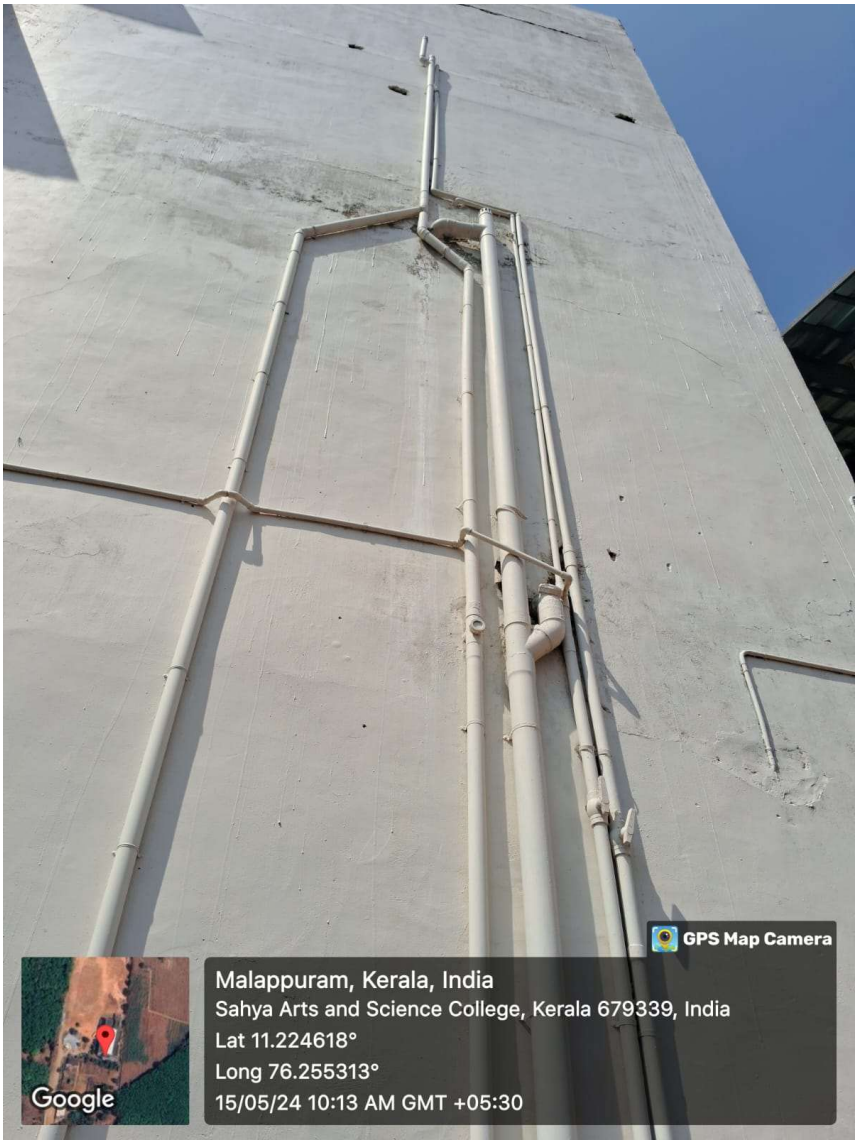


Figure 25. Soakpit recharger at campus

Figure 26. Napkin dispencer at campus

Figure 27. Solar Panels at roof top

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IMPORTANT LAWS RELATED TO THE ENVIRONMENT

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 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)

Bio Sketch of Authors

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