7.1.6. QUALITY AUDITS REPORTS	
1	Green Audit Report
2	Energy Audit Report
3	Environment Audit Report

SAKTHI COLLEGE OF ARTS AND SCIENCE FOR WOMEN

ODDANCHATRAM – 624 619

GREEN AUDIT REPORT

2020 – 2021

DEPARTMENT OF ENVIRONMENTAL SCIENCES

Bishop Heber College (Autonomous)

Tiruchirappalli, Tamilnadu – 620 017

CAMPUS GREEN AUDIT

CERTIFICATE

This is to certify that detailed Green Audit of **Sakthi College of Arts and Science for Women, Oddanchatram – 624 619 Tamilnadu** has been successfully conducted. The activities and measures carried out by the College have been verified based on the reports submitted by the College and found to be satisfactory. The College has evolved policies on Environment and Green campus in line with the Sustainable Development Goals. The efforts taken by the members of the faculty, students, support staff and the Management towards creating a strategic change in attaining holistic environmental sustainability is highly appreciated and commended.

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CAMPUS GREEN AUDIT
CGA
CERTIFIED

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Approved Function Area/s : EB(A)

Accredited by

NATIONAL ACCREDITATION BOARD FOR EDUCATION & TRAINING
QUALITY COUNCIL OF INDIA

QCI Office, 6th Floor, ITPI Building, Ring Road, I.P. Estate, New Delhi

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New Delhi.

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PREFACE

An Environmental Audit is a tool comprising a systematic, documented, periodic and objective evaluation of how well a project, organization or equipment is performing with the aim of helping to safeguard the environment. The audit should facilitate management control of environmental practices and assess compliance with policy objectives and regulatory requirements.

A clean and healthy environment aids effective learning and provides a conducive learning environment.

Green audit is an official examination of the effects a college on the environment. It helps to improve the existing practices with the aim of reducing the adverse effects of these on the environment concerned.

Higher Educational Institutions are committed to preserve the environment within the campus through promotion of energy savings, recycling of waste, water use reduction, water harvesting etc.

Green audit visualizes the documentation of all such activities taking stock of the infrastructure of the college, their academic and managerial policies and future plans in the form of an environmental audit report.

Green audit can be a useful tool for a college to determine how and where they are using the most energy or water or resources; the college can then consider how to implement changes and make savings. It can also be used to determine the type and volume of waste which can be used for a recycling project or to improve waste minimization plan. It can create health consciousness and promote environmental awareness, values and ethics. It provides staff and students better understanding of green impact on campus.

Green audit promotes financial savings through reduction of resource use. It gives an opportunity for the development of ownership, personal and social responsibility for the students and teachers. Thus, it is imperative that the college evaluate its own contributions toward a sustainable future. As environmental sustainability is becoming an increasingly important issue for the nation, the role of higher educational institutions in relation to environmental sustainability is more relevant.

The audit process in Sakthi College of Arts and Science, Oddanchatram, Tamilnadu involved initial interviews with management to clarify policies, activities, records and the co-operation of staff and students in the implementation of mitigation measures. Staff and students were given training how to collect the data for the green audit process. This was followed by staff and student interviews, collection of data through the questionnaire-based survey, review of records, observation of practices and observable outcomes. In addition, the approach ensured that the management and staff are active participants in the green auditing process in the college.

The baseline data prepared for the College will be a useful tool for campus greening, resource management, planning of future projects, and a document for implementation of sustainable development of the college. Existing data will allow the college to compare its programs and operations with those of peer institutions, identify areas in need of improvement, and prioritize the implementation of future projects. The green audit reports assist in the process of attaining an eco-friendly approach to the sustainable development of the college.

The results presented in the green audit report will serve as a guide for educating the college community on the existing environment related practices and resource usage at the college as well as spawn new activities and innovative practices. The Green Audit team expects the management to express their commitment to implement the recommendations.

Date: 23 October 2021

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CHAPTER I

INTRODUCTION

"Education is a liberating force, and in our age, it is also a democratizing force, cutting across the barriers of caste and class, smoothing out inequalities imposed by birth and other circumstances" *- so defined Padmabushan Arutchelvar Dr. N. Mahalingam, Chairman, Sakthi Groups.*

Following the great man's footsteps, Dr. K. Vembannan, M.B.B.S., M.S., the Managing Trustee of Sowdamman Charitable Trust is a staunch believer that "Education makes one more humane, independent and perfect. It is the most powerful weapon for upliftment of mankind."

Being a visionary, Dr. Vembannan founded Sakthi College of Arts and Science, Oddanchatram in the year 2009 as a temple of learning. The college functions with the noble aspiration of uplifting the moral and educational standards of the women of the rural area in and around Oddanchatram, Tamil Nadu, Palani. It has the vision of empowering women through value-based education, with special concern for the economically disadvantaged and the first generation learners. The mission of the college is actualized in the institutional goals, administrative policies, academic programmes, co-curricular and extra-curricular activities, staff enrichment initiatives and student support systems. The ethical and moral formation of staff and students is seamlessly woven into the fabric of campus life. Innovation, student-centred modes of teaching and learning, extensive use of technological aids and research-based activities enrich the intellectual life on the campus.

The Institution has been recognized under (2f) and (12b) of the UGC Act. It is affiliated to Mother Teresa Women's University, Kodaikanal. Having started functioning with 129 students in the academic year 2009, it has now reached the strength of 1100 students. The proof of its adherence to standard lies in the milestone achievement of having bloomed well with 11 Under-graduate, 10 Post-graduate and 07 Pre-doctoral (M.Phil.,)

Programmes. The College offers innovative curricula, opportunities for holistic development and a highly disciplined and diversified environment for students to surpass in scholastic, non-scholastic and research pursuits. However, while keeping pace with the changes in higher education at the national and global level, the institution still retains its local flavour and continues to offer value-based education with a special focus on the underprivileged.

The Emblem and Landmark Structures

Fig. 1: The College Emblem

Fig. 2: Magnificient College Entrance

Fig. 3: The Main Block

Fig. 4: View of the Temple and Main Building

SAKTHI VISION

INITIATE INNOVATE, INCULCATE

Sakthi Educational Institution pursues a philosophy of perpetual acquisition of knowledge. Apart from academic curriculum, equally important is our policy to provide value-based education and to bring out the hidden potentials within optimism.

SAKTHI MISSION

"To act as the nurturing ground for young professionals who seek to make their mark and to create a talent pool for various Educational Institutions so that there may be synergistic growth for both"

CHAPTER II

CAMPUS ENVIRONMENTAL AUDIT

Campus Environmental Audit

An Environmental Audit is a tool comprising a systematic, documented, periodic and objective evaluation of how well a project, organization or equipment is performing with the aim of helping to safeguard the environment. The audit should facilitate management control of environmental practices and assess compliance with policy objectives and regulatory requirements. (European Environment Agency, European Commission 1999, Brussels).

Environmental auditing is a systematic, documented, periodic and objective process in assessing an organization's activities and services in relation to:

- Assessing relevant statutory and internal requirements
- Facilitating understanding of good environmental practices
- Promoting good environmental management
- Maintaining credibility with the public/clients
- Raising staff awareness and commitment to departmental environmental policy
- Exploring improvement opportunities
- Establishing the performance baseline for developing good sustainable practices.

Green Audit towards Sustainable Development

Sustainable Development (SD) is one of the biggest challenges of the twenty-first century and there can be no sustainability where educational

institutions (Universities, Institutions of Higher Education, and Schools) promote un-sustainability. In modern society 'No institutions are better situated and more obliged to facilitate the transition to a sustainable future than schools, Colleges and Universities'.

Sustainable Development Goals (SDGs)

The 17 Sustainable Development Goals and 169 targets which has been proposed demonstrates the scale and ambition of this new universal agenda. They seek to build on the MDGs and complete has not been achieved. They seek to realize the human rights of all and to achieve gender equality and the empowerment of all women and Girls. They are integrated and in and indivisible and balance the three dimensions of Sustainable Development: the economic, social and environmental. The Goals and Targets will stimulate action over the next 15 years in areas of critical importance for humanity and the planet.

Fig. 5: SUSTAINABLE DEVELOPMENT GOALS

In spite of a number of SDGs and an ever increasing number of Universities / Institutions of Higher Educations and Schools becoming engaged with the principles and concepts of SD, especially in the developed world, most of them to be traditional in India.

Environmental Audit

Environmental auditing has become a valuable tool in the management and monitoring of environmental and sustainable development programmes. The information generated from audit exercise provides important information to many different stakeholders.

Although seen primarily as a tool in commerce and industry, creative application of environmental auditing techniques can improve transparency and communication in many areas of society where there is a need for greater understanding of environmental and ecosystem interactions. The environmental audit is a systematic process that must be carefully planned, structured and organized. As it is part of a long term process of evaluation and checking, it needs to be a repeatable process which can be readily replicated and can reflect change in both a quantitative and qualitative manner.

Universities and Colleges are regarded as “Small Cities” due to their size, population and the multifarious activities, which have some serious direct and indirect impacts on the local environment.

Campus Green Audit

The campus environmental audit is a common tool that many colleges and universities have employed in recent years. A campus environmental audit is both a summary and a report card for a campus and a way to evaluate where and how resources are being used. An environmental audit is also the first step in being able to quantify whether or not current and/or future environmental efforts are actually making a difference. As such, an environmental audit is the beginning of the sustainability planning process. The results can be used to quantify what kinds of impacts the campus community has on the environment and what steps the college can take to reduce these impacts.

Green Audit

Green Audit is defined as systematic identification, quantification, recording, reporting and analysis of components of environmental diversity. The 'Green Audit' aims to analyse environmental practices within and outside the Institute, which will have an impact on the eco-friendly ambience and sustainable ecosystem. It is a useful tool that can be used to understand existing practices and resource use to highlight the prospects of introducing resource efficiency in the ecosystem. Green audit provides cognizance on scope for improvement of environment and ecosystem of the campus. Thus, it is imperative that Sakthi College of Arts and Sciences for Women, Oddanchatram evaluate its own status on environmental sustainability and contributes towards sustainable future.

Pre Audit Stage

The process of Green Audit started with a pre-audit meeting that has provided an opportunity to reinforce the scope and objectives of the audit. The deliberations focused on the procedures to be followed in conducting the audit. This meeting is an important prerequisite for conducting green audit as it provides the first opportunity to meet and interact with the auditee and deal with any matters of concerns. The meeting was held at Sakthi College of Arts and Sciences for Women, Oddanchatram during October 2021. The audit protocol and audit plan were discussed in detail and a Green Audit team was constituted with a staff adviser and student members.

a) Preliminary literature review of concepts and methodologies related to green audit.

b) Discussion with the management staff on various systems installed in the campus.

c) Awareness creation and interaction with the staff and students on the concept of green audit. Walk through the entire campus to understand the nature of water use, energy use and waste management systems in the campus.

Pre-Audit

Fig. 6: Pre-Audit Discussion with the Principal

Fig. 7: Pre-Audit Meeting with Staff and Students

Commitment of the College

The College has shown the commitment and keen interest towards conducting green audit and encourages green practices. The College is committed towards Education for sustainability and implementation of sustainable strategies, reducing carbon foot print and effective utilization of waste into wealth.

Goals and Objectives

The goal of Green audit is *"Ensuring Environmental Sustainability (EES) through reducing environmental foot print such as carbon, water, food, and land, management and conservation of the natural resource base, and the orientation of Education for Sustainable Development (ESD) by evolving Institutional policies on various environmental attributes in such a manner as to ensure the attainment and continued satisfaction of human needs for present and future generations".*

Objectives:

- To evolve institutional policies on various environmental attributes such as water, waste and sanitation and to assess the patterns of consumption of energy and water
- To measure the quantum of generation of wastes and hazardous substances
- To evaluate the level of awareness among the students regarding environmental resources
- To inculcate the concepts of 5 R principle such as Reduce, Refuse, Recover, Recycle and Repurpose among the stakeholders, thus making the organization as a better steward,

- To implement environmental management strategies so as to reduce overall environmental foot print.

Benefits of the Green Auditing

• More efficient resource management
• To provide basis for improved sustainability
• To create a green campus
• To enable waste management through reduction of waste generation, solid- waste and water recycling
• To create plastic free campus and evolve health consciousness among the stakeholders
• Recognize the cost saving methods through waste minimizing and managing
• Point out the prevailing and forthcoming complications
• Authenticate conformity with the implemented laws
• Empower the organizations to frame a better environmental performance
• Enhance the alertness for environmental guidelines and duties
• Impart environmental education through systematic environmental management approach and Improving environmental standards
• Benchmarking for environmental protection initiatives
• Financial savings through a reduction in resource use
• Development of ownership, personal and social responsibility for the College and its environment
• Enhancement of college profile
• Developing an environmental ethic and value systems in youngsters.
• Green auditing should become a valuable tool in the management

and monitoring of environmental and sustainable development programs of the college.

Modules Campus Green Audit

Campus Green Audit (CGA) is a process of resource management. They are individual modules carried out in a defined interval illustrating an overall improvement or change in the institution over a period of time. The concept of Eco-friendly campus mainly focuses on the efficient use of energy and water; minimize waste generation, economic efficiency and reduction in environmental foot print. All these indicators are assessed in the process of Campus Green Audit. The CGA promotes conservation energy, water and waste management. The audit stages are as follows:

I. Pre-audit Stage

II. Audit Stage

a. Audit for various environmental aspects

b. Checking of documents and evaluation

c. Review of Environmental Policy

d. Review of Programmes or Activities

III. Post-audit Stage

a. Land

b. Energy

c. Water

d. Waste

i. Wastewater

ii. Solid Waste

1. E Waste
2. Biomedical waste

e. Food

f. Campus hygiene

IV. Processing of Data Collection as per the template

a. Development of questionnaire format to identify all water/energy using fixtures/ equipment and examine water or energy use patterns for individual buildings in the campus.

b. Collection of secondary data from compilation of electricity bills, collecting records of pumps, generators, water quality analysis reports, civil and electrical etc.

c. Semi-structured interview with maintenance manager, technicians, plumber and housekeeping staff on current situation and the past trends in water consumption, electricity consumption, waste management, waste generation etc.

V. Data Processing and analysis

The existing trends and patterns in water usage, energy usage and waste generation and management is analyzed in this step from the data collected from the previous step.

VI. Audit Recommendations and Reporting

Recommendation – On the basis of results of data analysis and observations, some steps for reducing power and water consumption were recommended. Proper treatments for waste were also suggested. Use of fossil fuels has to be reduced for the sake of community health.

CHAPTER III

METHODOLOGY

Campus Green Audit Methods

The Campus Green Audit is an exercise that ensure the extent of implementation green policies adopted by the institution. The methodologies for the green audit are as follows:

1. Preparation of Campus Green Audit questionnaire based on the objectives

2. Constitution of Campus Green Audit Team with staff and students for each module

3. Data Collection:

    a. Primary Data collection for each module by respective teams

    b. Secondary Data collection by the team members

    c. Collection of samples, observation, interviews and discussion with various staff members

    d. Steps in primary and secondary data collection

Green Audit Components

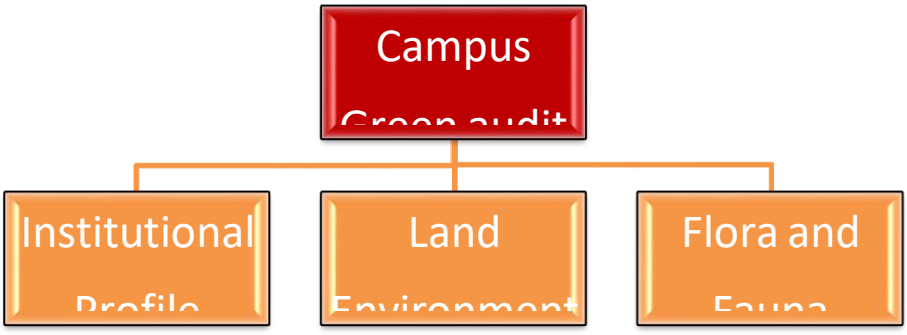


Fig. 8: Green Audit Components

CHAPTER IV

AUDIT STAGE

The Campus Green Audit (CGA) was carried out by the Post Graduate and Research Department of Environmental Sciences, Bishop Heber College (Autonomous), Tiruchirappalli, Tamilnadu. The CGA team constituted by the management during the pre-audit has done extensive data collection covering all the modules of green audit. The Campus Green Audit team comprises of Co-ordinators, Staff in-charge for each module and student volunteers.

4.1 Green Audit Team

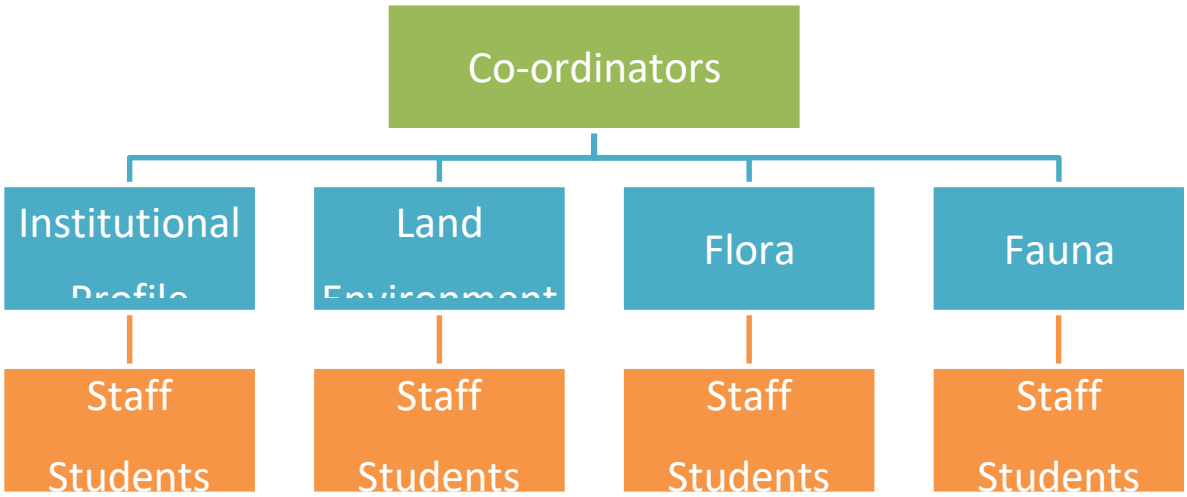


Fig. 9: Campus Green Audit Team

Campus Green Audit Team: 2020-2021 - Assessment Team

Coordinators

S.No.	Name	Designation	Department	Aspect
1.	Dr.S.Porchelvi	Asst. Professor	Physics	Team Head
2.	M.N.Jothi	Asst. Professor	Physics	Air & Noise
3.	G.Jeyajothi	Asst. Professor	Physics	Water
4.	D.Priya Darshini	Asst. Professor	Chemistry	Wastewater
5.	S.Priyanka	Asst. Professor	Chemistry	Solid & E-Waste
6.	R.K.Kowsalya	Asst. Professor	Chemistry	Flora and Fauna
7.	R.Rani	Asst. Professor	Mathematics	Land
8.	S.Sridevi	Asst. Professor	Physics	Campus Hygiene

Air and Noise Team

I	**Environmental Aspects**	**Air and Noise**
	Name of the coordinator	M. N. Jothi
	Designation and Department	Assistant professor, physics

Audit Team –Students /Scholars

S.No	Name of The Students	Class	Department
1.	E.Sowmiya	II.M.SC	Physics
2.	S.Pandi Selvi	II.M.SC	Physics
3.	P.Kavibharathi	III.B.SC	Physics
4.	S.Karthiyayeni	III.B.SC	Physics

Water Audit Team

II	**Environmental Aspects**	**Water**
	Name of the coordinator	G.JeyaJothi
	Designation and Department	Assistant professor, physics

Audit Team –Students /Scholars

S.No	Name of The Students	Class	Department
1.	V.Hema	I.M.SC	Physics

2.	C.Vinothini	I.M.SC	Physics
3.	R.Vasanthi	III.B.SC	Physics
4.	M.madhubala	III.B.SC	Physics

Waste Water Audit Team

III	**Environmental Aspects**	**Wastewater**
	Name of the coordinator	D.Priya Darshini
	Designation and Department	Assistant professor, Chemistry

Audit Team –Students /Scholars

S.No	Name of The Students	Class	Department
1.	S.Pradeepa	II.M.SC	Chemistry
2.	K.Dhaarani	II.M.SC	Chemistry
3.	M.Shobana	III.B.SC	Chemistry
4.	J.Jeyaprabha	III.B.SC	Chemistry

Solid and E Waste Audit Team

IV	**Environmental Aspects**	**Solid Waste and E Waste**
	Name of the coordinator	S.Priyanka
	Designation and Department	Assistant professor, Chemistry

Audit Team –Students /Scholars

S.No	Name of The Students	Class	Department
1.	R.Dharanisri	II.M.SC	Chemistry
2.	P.Inbalakshmi	II.M.SC	Chemistry
3.	G.Pavithra	III.B.SC	Chemistry
4.	R.Subiksha	III.B.SC	Chemistry

Flora and Fauna Audit Team

V	**Environmental Aspects**	**Flora and Fauna**
	Name of the coordinator	R.K.Kowsalya
	Designation and Department	Assistant professor, Chemistry

Audit Team –Students /Scholars

S.No	Name of The Students	Class	Department

1.	R.Dharanisri	II.M.SC	Chemistry
2.	P.Inbalakshmi	II.M.SC	Chemistry

3.	G.Pavithra	III.B.SC	Chemistry
4.	R.Subiksha	III.B.SC	Chemistry

Land Team

VI	**Environmental Aspects**	**Land**
	Name of the coordinator	R.Rani
	Designation and Department	Assistant Professor, Mathematics

Audit Team –Students /Scholars

S.No	Name of The Students	Class	Department
1.	A.SUHASHINI	II.M.SC	Mathematics
2.	A.SUBASHINI	II.M.SC	Mathematics
3.	AISHWARYA DEVI	III.B.SC	Mathematics
4.	S.SRIRANJANI	III.B.SC	Mathematics

Campus Hygiene Audit Team

VII	**Environmental Aspects**	Hygiene
	Name of the coordinator	S.Sridevi
	Designation and Department	Assistant professor, Physics

Audit Team –Students /Scholars

S.No	Name of The Students	Class	Department
1.	D.Bharathi	I.M.SC	Physics
2.	B.Pavithra	I.M.SC	Physics
3.	S.Narmatha	III.B.SC	Physics
4.	V.Aarthi	III.B.SC	Physics

CHAPTER 5

Institutional Profile

Sakthi College, functions in single shift during the day time. The College has a total strength of **1158** students and staff. The details are given in Table 5.1

Table 1: Total Population of the College (2019 – 2020)

Category	Total
Students	1088
Teaching and Non-Teaching Staff	60
Others (housekeeping, Security and support Staff)	10
Total	1158

Table 2: Student's Strength

Year	Students	Total
2020 – 2021	UG, PG & Research Scholars	1158

Table 3: Staff Strength

Year	Teaching	Non-Teaching	Others	Total (A+B+C)
	(A)	(B)	(C)	
2020 – 21	**50**	**10**	**10**	**70**

Table 4: Summary of Students and Staff

Year	Students& Scholars	Staff			Total
		Teaching	**Non-Teaching**	**Others**	
2020 – 21	1088	50	10	10	1158
Total	1088	50	10	10	1158

Fig. 10: Buildings

Fig. 10.1: Academic Buildings

Fig. 10.2: View of all Buildings

Fig. 10.3: Academic Buildings

Fig. 10.4: Class Room

Fig. 10.5: Play Ground

Fig. 10.6: Library

Fig. 10.7: Class Room

Fig. 10.8: Auditorium

Fig. 10.9: Hostels

Fig. 10.10: Play Ground

CHAPTER 6
LAND AUDIT

Sakthi College of Arts and Science for Women, Oddanchatram has a total land holding of 5.74 acres, of which approximately 33 % of the total area is under green cover. The College is located in a plain flat terrain with green cover augmenting the aesthetic value of the college.

Land Use pattern

The campus has a total area of 5.74 acres (23217.19 Sq.). The Land Use attributes were identified as Built-up / constructed area (6349.00) playground area (9271.00), plantation/open space/garden/green cover (7597.00). The campus has a good road network, Sacred Garden with a family temple, plantation near the hostel area, nice landscape with garden, avenue trees on either side of the road and green cover with trees, shrubs, herbs ornamental plants, interspersed with grass cover.

Table 5: Land Use at a Glance

S. No.	Aspects	:	Acres	Sq. M
1.	Total Land area	:	5.74	23217.19
2.	Play Ground area	:	2.29	9271.00
3.	Plantation / Green area / Open space	:	1.90	7597.00
4.	Built-up / Constructed Area	:	1.57	6349.00
5.	Terrain of the Campus	:	Undulating / Partially Rocky	

Table 6: Land Use Data

S. No.	Categories of Land Use	Acres	Sq. M
1	Play Ground Area	2.28	9271.00
2	Plantation / Green area / Open space	1.90	7597.00
3	Built-up / Constructed Area	1.56	6349.19
		5.74	23217.19

Layout of the campus

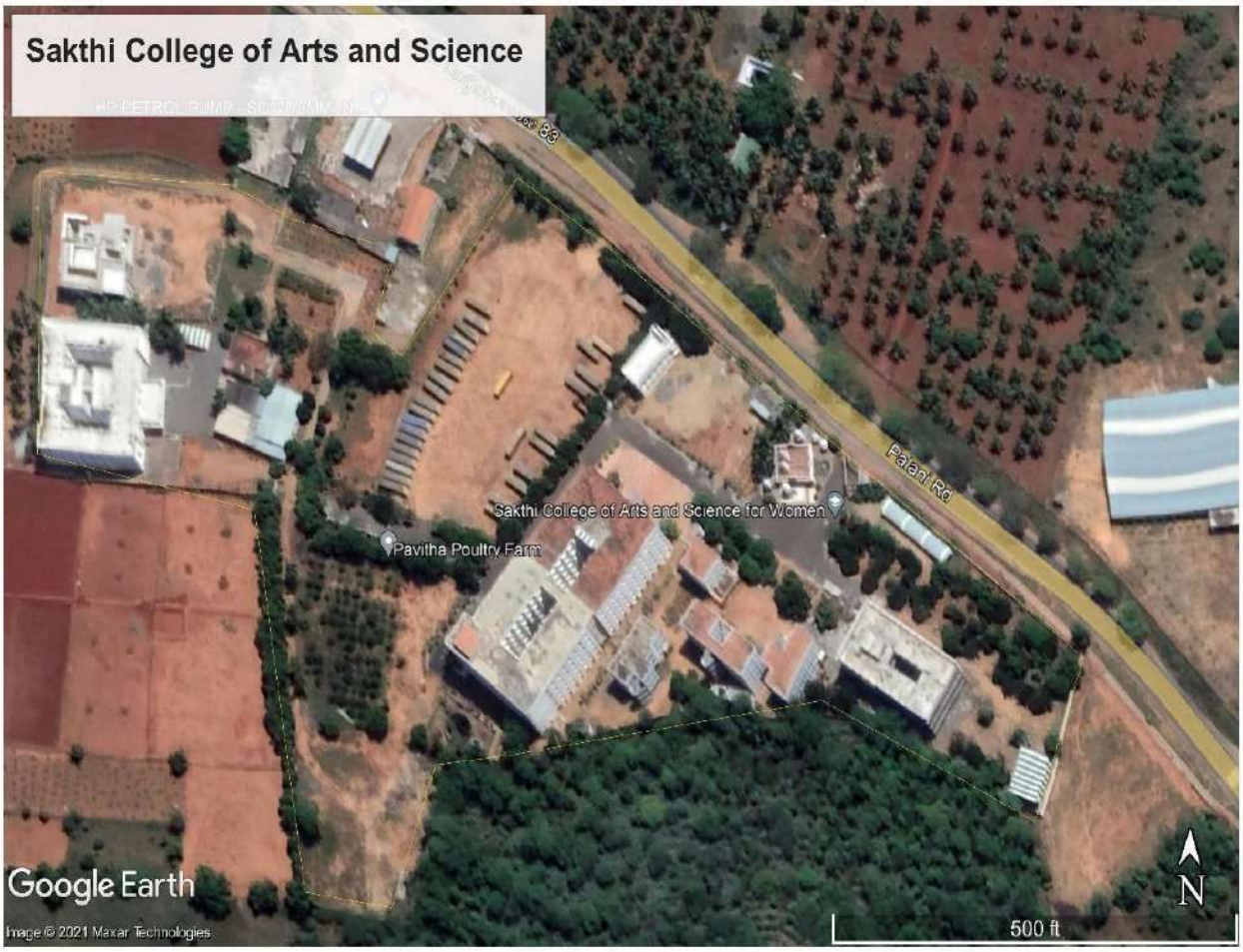


Fig. 11: Campus Layout

TOTAL GREEN COVER

Table 7: Green Cover

Land Use Category	Acre
Plantation / Green area / Open	**1.90**

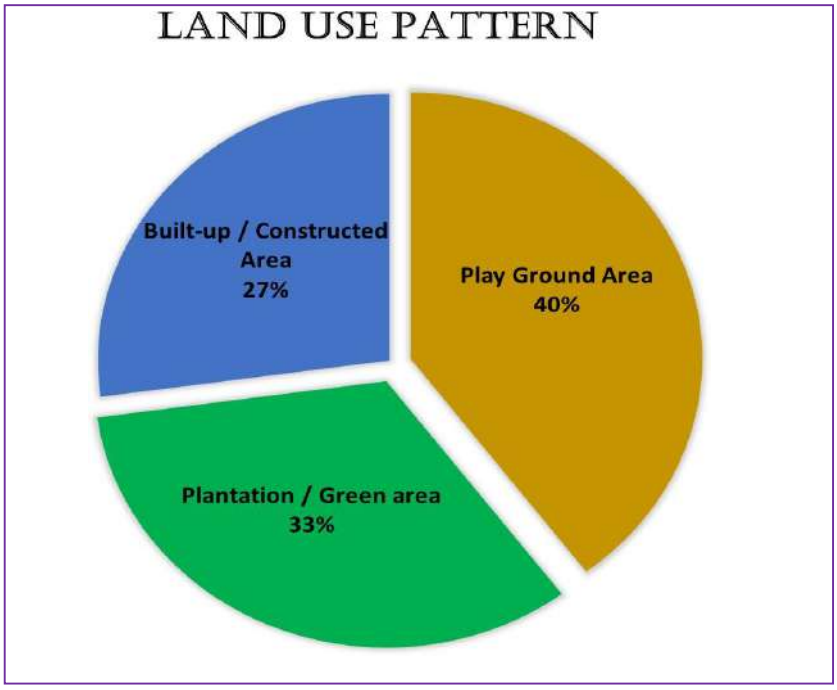


Fig 12: Land Use Pattern showing Green Cover

Observation and Comments

1 The land use attributes include built-up area, playground area, sacred temple garden, plantation, green cover, open space, road network and storm water drains.

2 The campus has a **green cover** of 1.90 acres which include avenue trees, plantation near the hostel (5915 Sq. M), garden with green cover (1682 Sq. M), sacred garden with a temple (670 Sq. M).

3 The campus has a total **built up area** of 1.57 acres i.e., 6349.00 Sq. M. 6 buildings meant for academics (2722.19 Sq. M), hostels (1500 Sq. M), guest house (611.00), cafeteria (112 Sq. M).

4 The **playground area** constitutes 2.29 acres i.e., 9271.00 Sq. M. There are two play grounds, Ground 1 is a small Volley ball court with an area of 1509 Sq. M and Ground 2 is the main ground with an area of 7762 Sq. M.

5 As per the National Forest Policy, 1988 and the new draft National Forest Policy minimum of **one-third** (or **33%)** of **total land area of India** should be under forest cover (fc) or tree cover (tc).

6 The campus complies with the National Forest Policy 1988, and has **33%** green cover with avenue trees, plantation and gardens. The terrain of the campus is undulating and partially rocky, the soil erosion is under control with the planned layout.

7 This implies that the campus has the considerable carbon sequestration potential and stands as a model institution.

CHAPTER 7

CAMPUS BIODIVERSITY

The natural landscape of the University campus includes green vegetation, tree canopy cover, small lentic system and artificial rain water harvesting pond provides a unique environmental setting conducive for a wide range of floral and faunal diversity. Totally 174 species of plants are present in the College campus. The particulars of floral diversity are given in the following Tables and Figures:

Assessment of Flora

Table 8: Floral Species in the Campus

S.No	Common name	Family name	Botanical name	Uses
01	Dyer's oleander	Apocynaceae	*Wrightia tinctoria* (Roxb.) R.Br	The flowers, leaves, fruits and seeds are edible.tinctoria is the most commonly prescribed Siddha herbal medication for skin diseases, in specific psoriasis.
02	Aloe	Asphodelaceae	*Aloe vera* (L.) Burm.f.	Gastroesophageal reflux disease (GERD) is a digestive disorder that often results in heartburn. Aloe vera extract as a cosmetic or topical drug. relief of constipation
03	Indian shot / Canna lily	Cannaceae	*Canna indica* L.,	The tubers can be eaten raw or cooked.the leaves are used to wrap pastries (tamales, humitas, quimbolitos, juanes, etc.). Rhizomes for starch extraction

04	Hibiscus/ China rose	Malvaceae	*Hibiscus rosa-sinensis* L.,	The flowers of Hibiscus rosa-sinensis are edible and are used in salads. he flower is additionally used

				in hair care as a preparation.flowers are dried to use in a beverage, usually tea.
05	Pomegranate	Lythraceae	*Punica granatum* L.,	The pomegranate has been used in natural and holistic medicine to treat sore throats, coughs, urinary infections, digestive disorders, skin disorders, arthritis, and to expel tapeworms.
06	Malabar plum	Myrtaceae	*Syzygium cumini* (L.) Skeels.	The bark is acrid, sweet, digestive, astringent to the bowels, anthelmintic and used for the treatment of sore throat, bronchitis, asthma, thirst, biliousness, dysentery, Diabatic and ulcers. It is also a good blood purifier.
07	Trumpet tree	Bignoniaceae	*Tabebuia aurea* Benth. &Hook.f.	Antimicrobial, for treatment of fever, syphilis, malaria, trypanosomiasis, stomach and bladder disorders, and for tumors.
08	Copperpod, yellow-flamboyant	Fabaceae	*Peltophorum pterocarpum* (DC.) K.Heyne	The wood has a wide variety of uses, including cabinet-making and the foliage is used as a fodder crop. The treatment of several ailments like stomatitis, insomnia, skin troubles, constipation, ringworm, insomnia, dysentery, muscular pains, sores, and skin disorders.
09	Butterfly tree	Fabaceae	*Bauhinia purpurea* L.,	Traditional medicine systems to cure various diseases. This plant has been known to possess antibacterial, antidiabetic, analgesic, anti-inflammatory, anti-diarrheal, anticancerous, nephroprotective and thyroid hormone regulating

				activity.
10	Indian cork tree/ tree jasmine	Bignoniaceae	*Millingtonia hortensis*L.f.	The leaves are used as antipyretic, sinusitis, cholagogue and tonic in folklore medicine. Used as a yellow dyes. Flower buds are used in the treatment of asthma, sinusitis, cholagogue and tonic. The flowers are used in rituals.
11	Scarlet cordia/ Geiger tree	Boraginaceae	*Cordia sebestena* L.,	It is used in traditional medicine for the treatment of gastrointestinal disorders. In this study, we investigated the chemical composition, antibacterial potential,
14	Fig	Moraceae	*Ficus hispida* L.,	Traditionally, different parts of the plant have been used in the treatment of ulcers, psoriasis, anemia, piles jaundice, vitiligo, hemorrhage, diabetes, convulsion, hepatitis, dysentery, biliousness, and as lactagogue and purgative.
15	Spanish cherry/ bullet wood	Sapotaceae	*Mimusops elengi* L.,	The roots are used as diuretic, astringent, cardiotonic and stomachic. Flowers are used as an expectorant and in liver complaints and asthma. Mimusopselengi bark showed antiulcer activity. It is also used to prepare lotion for wounds and ulcers; dried powder is a brain tonic and is useful to relieve cephalagia.
16	White champaca	Magnoliaceae	*Magnolia alba* (DC.) Figlar	It is widely cultivated as an ornamental in Asia, particularly tropical and subtropical regions of China and Southeast Asia for the strongly fragrant

				flowers
17	Indian beech/ Pongame oil tree	Fabaceae	*Millettia pinnata* (L.) Panigrahi *Pongamia pinnata* L.,	Its crude drug for the treatment of tumors, piles, skin diseases, and ulcers. The root is effective for treating gonorrhea, cleaning gums, teeth, and ulcers, and is used in vaginal and skin diseases.
18	Jackfruit Tree	Moraceae	*Artocarpus heterophyllus* Lam.	Its decoction and latex are used in the treatment of asthma, prevent ringworm infection, and heal cracking of the feet. The infusion of mature leaves and bark is supposed to be effective in the treatment of diabetes, gall stones and relieve asthma.Jackfruit may be higher in some vitamins and minerals
19	Indian almond, Malabar almond	Combretaceae	*Terminalia catappa* L.,	Treatment of inflammation diseases, wound healing, allergies, skin related problems, asthma, ulcer, diarrhea, cardiovascular diseases. Seed - raw or cooked. The fruits have a tender skin and a thin layer of subacid juicy flesh.
20	Purple allamanda	Apocynaceae	*Allamanda blanchetii* A.DC.	Treating malaria, jaundice, cough, wounds and constipation, but also shows activity against leukemia and human carcinomamia.
21	Foxtail palm	Arecaceae	*Wodyetia bifurcate* A.K.Irvine	It is a plant of a very high ornamental. the nectarine flesh of the fruit to be edible, although rather flavourless not sweet, but slightly acrid. *Caution*: A blog by a veterinarian reported possible toxicity of fruit to a dog. However, the

				possibility of the fruit being a cicad was raised. Seeds used for making Bodhi beads.
22	Teak	Lamiaceae	*Tectona grandis* L.f.	Teak's high oil content, high tensile strength and tight grain make it particularly suitable where weather resistance is desired. It is used in the manufacture of outdoor furniture and boat decks. It is also used for cutting boards, indoor flooring, countertops and as a veneer for indoor finishings.
23	Pinwheel flower/ crape jasmine	Apocynaceae	*Tabernaemontana divaricate* R.Br.	the traditional folklore medicinal benefits such as an anti-epileptic, anti-mania, brain tonic, and anti-oxidant. The aim of the present study was to evaluate the effect of ethanolic extract of TD leaves on burying behavior in mice.
	American mahogany	Meliaceae	*Swietenia mahagoni* (L.) Jacq.	Traditionally it uses for malaria, hypertension, diabetes and diarrhea, as antipyretic, as bitter tonic and astringent. It is taken orally as a decoction for diarrhoea and dysentery, as a source of vitamins and iron, and as a medicine to induce haemorrhage.
24	Vetiver	Poaceae	*Chrysopogon zizanioides* (L.) Roberty	Vetiver for nerve and circulation problems and for stomach pain. Some women take vetiver to start their periods or to cause an abortion.applied directly to the skin for relieving stress, as well as for emotional traumas and shock, lice, and repelling insects. It is also used for arthritis,

				stings, and burns.aromatherapy for nervousness, insomnia, and joint and muscle pain.
25	African tulip tree	Bignoniaceae	*Spathodea companulata* P.Beauv.	used for epilepsy and convulsion control, against kidney disease, urethritis, and as antidote against animal poisons
26	Great bougainvillea	Nyctaginaceae	*Bougainvillea spectabilis* Willd.	The aqueous extract and decoction have been used as fertility control among the tribal people. to possess anticancer, antidiabetic, antihepatotoxic, anti-inflammatory, antihyperlipidemic, antimicrobial, antioxidant, and antiulcer properties.
27	Wild date palm	Arecaceae	*Phoenix sylvestris* (L.) Roxb.,	The fruit serves as a tonic and restorative, and is also used as an analgesic to mitigate pain from backache and in the buttocks. In addition, it is widely used as an aphrodisiac, sweetener and diuretic and in the treatment of vomiting, vertigo and unconsciousness.
28	Parijat	Nyctaginaceae	*Nictanthes arbor-tristis* L.,	this plant are anti-helminthic and anti-pyretic besides its use as a laxative, in rheumatism, skin ailments and as a sedative. Dried fruits are taken orally to get relief from cough; decoction of dried flower is given with jaggery as an antifertility agent in females; leaf juice is applied externally on ringworm and other skin diseases. 'Lupin' is a medicine used for pain and inflammation associated

				with musculoskeletal and joint disorders.
29	Butterfly Pea / Sangu poo	Fabaceae	*Clitoria ternatea* L.,	Memory enhancer, nootropic, antistress, anxiolytic, antidepressant, anticonvulsant, tranquilizing and sedative agent. beneficial effects for asthmatics. anti-asthmatic effects.
30	Curry tree	Rutaceae	*Marraya koenigii* (L.) Sprengel	Traditionally as a stimulant and for management of diabetes. The leaves are eaten to treat diarrhoea and dysentery. A leaf infusion is drunk to stop vomiting and to treat fever. A poultice of the leaves is applied to skin eruptions and bruises.
31	Minnie root/ fever root	Acanthaceae	*Ruellia tuberose* L.,	Cracker plant is traditionally used as diuretic, anti-pyretic, analgesic, anti-hypertensive, anthelmentic, abortifacient, emetic, in bladder disease, kidney disorder, bronchitis, gonorrhoea and syphilis.
32	Sacred pepper	Piperaceae	*Piper auritum* Kunth	Young leaves - occasionally cooked and eaten as greens. The leaves become limp as soon as they are picked. The leaves have the flavour and aroma of sarsaparilla. They are used as a flavouring in soups and other dishes. The leaves are wrapped around tamale dough before it is packed in corn leaves and steamed.
33	Sago palm	Cycadaceae	*Cycas revolute* Thunb.	Despite known toxicities, Cycad stems and seeds are used for high blood

				pressure, headaches, congestion, rheumatism and bone pain. Leaves used in the treatment of cancer and hepatoma. Terminal shoots used as astringent and diuretic.
34	Nerium / arali	Apocynaceae	*Nerium oleander* L.,	Despite the danger, oleander seeds and leaves are used to make medicine. Oleander is used for heart conditions, asthma, epilepsy, cancer, painful menstrual periods, leprosy, malaria, ringworm, indigestion, and venereal disease; and to cause abortions.
35	Caterpillar tree	Apocynaceae	*Plumeria alba* L.,	It is often cultivated as an ornamental plant. In Cambodia pagodas especially choose this shrub, with the flowers used in ritual offerings to the deities, they are sometimes used to make necklaces which decorate coffins. In addition, the flowers are edible and eaten as fritters, while the heart of the wood is part of a traditional medical preparation taken as a vermifuge or as a laxative.
36	Trumpet vine	Bignoniaceae	*Tecoma stans* (L.) Juss. ex Kunth	Its provides firewood and charcoal. The wood is used in the construction of buildings and the leaf infusion can be taken orally for diabetes and stomach pains; a strong leaf and root decoction is taken orally as a diuretic, to treat syphilis or for intestinal worms.
37	Hybrid tea rose	Rosaceae	*Rosa hybrid* L.,	Edible roses have been identified as a potential source of antioxidant

				compounds promoting human health.
38	Coconut	Arecaceae	*Cocos nicifera* L.,	Rose water is fragrant, a mild natural fragrance as an alternative to chemical-filled perfumes. Rose water is its strong anti-inflammatory properties. eczema or rosacea.
39	Flame of the woods	Rubiaceae	*Ixora coccinea* L.,	The flowers, leaves, roots, and the stem are used to treat various ailments in folk medicines. juice leaves and the fruit. for dysentery, ulcers and gonorrhea.
40	Roxburgh fig	Moraceae	*Ficus auriculata* Lour.	Roasted figs are taken for diarrhea and dysentery. Root latex is used in mumps, cholera, diarrhea and vomiting. use the leaf for the treatment of diabetes.
41	Royal palm	Arecaceae	*Roystonea regia* (Kunth) O.F.Cook	Ornamental. The seed is used as a source of oil and for livestock feed. Leaves are used for thatching and the wood for construction.
42	Vilvum/ wood apple	Rutaceae	*Aegle marmelos* (L.) Correa	It is anti-inflammatory in nature. Its extracts when applied on the exposed area, help to cure inflammation. Aegle Marmelos leaf juice with honey can prove useful for treating fever. Aegle Marmelos can be used to treat tuberculosis.
43	Flamboyant Tree	Fabaceae	*Delonix regia* (Boj. ex Hook.)	The leaves used to treat constipation, inflammation, arthritis and hemiplagia. The leaves were also used in rheumatism and as purgatives. mature seeds of this plant are eaten. Antinutritional compounds such as tannins, saponins

				and oxalates.
44	Dendulang	Fabaceae	*Dendrolobium umbellatum* (L.) Benth.	*Edible Plant*: Leaves Food (Fruit and Vegetable: The young leaves are sometimes eaten as a vegetable or used as a seasoning. Herb and Spice) *Medicinal*: It is used medicinally for treating gonorrhoea, irregular menstruation, scaly skin, childbirth medicine, as a general tonic.The plant is also used for cattle fodder.
45	Powder puff flower	Fabaceae	*Calliandra haematocephala* Hassk.	Roots used in the treatment of hemorrhoids. Leaf and root used for measles. decoction of the flowers used as blood purifier and tonic. flower, leaf, and bark used for its tranquilizing effect. astroprotective effects in acute gastric lesions induced

Fig. 13: Flora in the Campus

Briefing on Floral Audit by Dr. Anand Gideon

Flora in the Campus











Wrightia tinctoria
APOCYNACEAE

Aloe vera
ASPHODEACEAE

Canna indica
CANNACEAE

Hibiscus rosa-sinensis
MALVACEAE

Punica granatum
LYTHRACEAE

Syzygium cumini
MYRTACEAE

Tabebuia aurea
BIGNONIACEAE

Peltophorum pterocarpum
FABACEAE

Bauhinia purpurea
FABACEAE

Millingtonia hortensis
BIGNONIACEAE

Hibiscus rosa-sinensis
MALVACEAE

Ficus hispida
MORACEAE

Mimusops elengi
SAPOTACEAE

Magnolia alba
MAGNOLIACEAE

Millettia pinnata
FABACEAE

Artocarpus heterophyllus
MORACEAE

Terminalia catappa
COMBRETACEAE

Allamanda blanchetii
APOCYNACEAE

Wodyetia bifurcata
ARECACEAE

Tectona grandis
FABACEAE

Tabernaemontana divaricata
APOCYNACEAE

Swietenia mahagoni
MELIACEAE

Chrysopogon zizanioides
POACEAE

Spathodea companulata
BIGNONIACEAE

Bougainvillea spectabilis
NYCTAGINACEAE

Phoenix sylvestris
ARECACEAE

Nyctanthes arbor-tristis
NYCTAGINACEAE

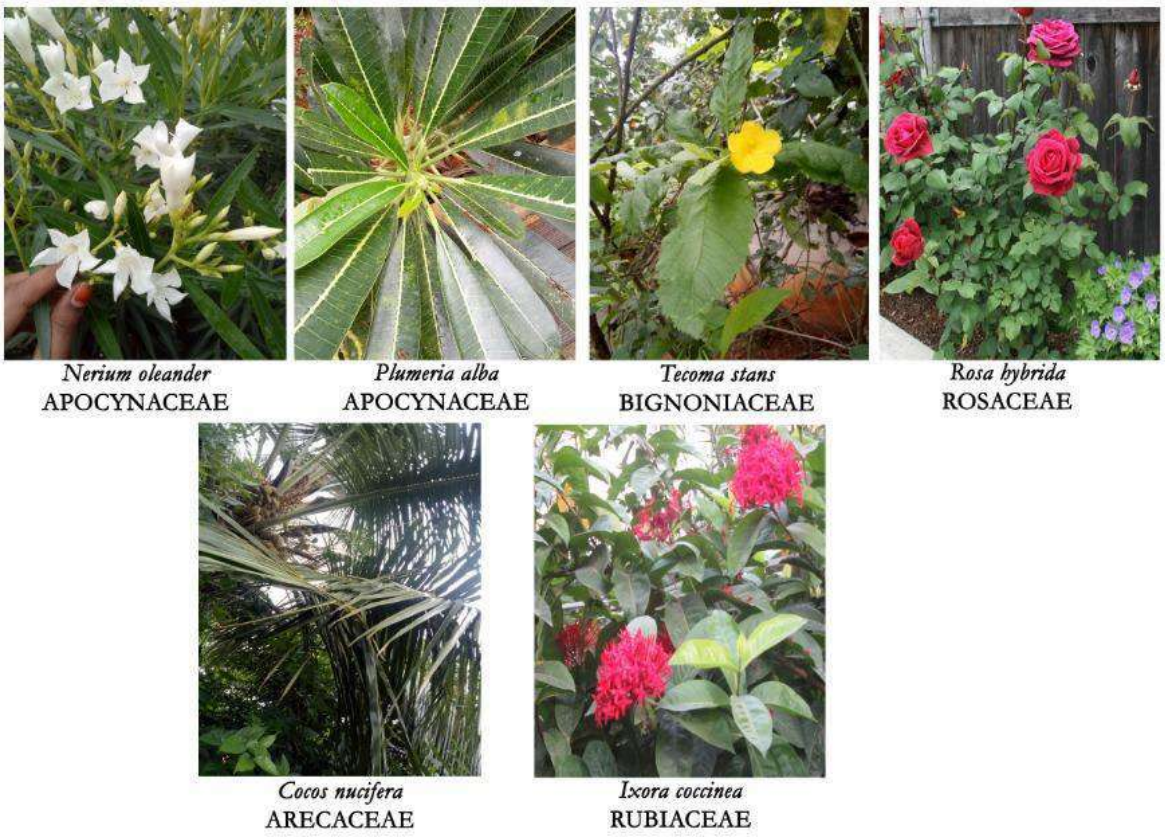
Clitoria ternatea
FABACEAE

Murraya koenigii
RUTACEAE

Ruellia tuberosa
ACANTHACEAE

Piper auritum
PIPERACEAE

Cycas revoluta
CYCADACEAE



Green Cover in the Campus

The campus has a green area of 33% which is fulfills the norms of green area recommended by the National Forest Policy of India, 1988 and is well within the limits.

Tools to Measure Carbon Absorption

Assumptions

1. Number of mature trees in 1 acre = 700
2. Carbon absorption capacity of 700 trees is equivalent to carbon emitted by a speeding car for 26,000 miles
3. 26,000 miles = 41,843 km
4. Average km. covered by a car per litre of petrol is 20 km

5. Total quantity of petrol consumed by the car (41,843/20) = 2092L

Observation and Comments

1. The campus has 27 fully grown trees, the carbon emitted by a car due to consumption of 1 litre of petrol is 2.3 kg CO_2.
2. At this rate the total quantity of carbon emitted by 2092 litres of petrol (2092 × 2.3 kg) = 4812 kg CO_2 or 4.8 tonnes of CO_2.
3. Therefore, the carbon absorption of **one full-grown tree is 4812/27 178.22 kg CO_2.**

The footprint calculation is based on

The standard unit of 1 litre petrol = 2.3 kgCO_2.

Carbon absorption by flora in the Institution

Carbon absorption capacity of one full-grown tree = 178.22 kg CO_2.

1. Therefore the carbon absorption capacity of 27 full-grown trees in the Campus of the Institution (27 × 178.22 kg CO_2) **= 4811.94 kg of CO_2.**

ASSESSMENT OF FAUNA

The animal life of an area is dependent upon the vegetation and there are countless relationships between the species composing an animal community. Fauna assessment involves more problems than flora assessment by virtue of the greater variety of animal types, their mobility and behavior. Faunal assessment provides a basis for determining relative abundance and evaluating commonness or rarity of each species encountered.

In the college campus, the animal survey was conducted along with the plants. The study includes surveys of the animal communities such as aquatic organisms, insects, molluscs, reptiles, fishes, amphibians, birds and

mammals. The details of fauna found in campus are given in the following tables:

Table 9: Diversity of Fauna

S. No.	Faunal Group	No. of Species
	INVERTEBRATA	
1	Annelida	**2**
2	Arthropoda	
	a. Butterfly	**11**
	b. Ants	**07**
	c. Spiders	**04**
3	Mollusca	**03**
	CHORDATA	
4	Fish fingerlings in stagnant pool	**School**
5	Amphibians	**02**
6	Reptiles	**09**
7	Birds	**22**
8	Mammals	**06**

INVERTEBRATA

Table 10: PHYLUM: ANNELIDA

S.NO	Common Name	Scientific Name	Status/schedule
1.	Earth worm	*Perithema posthuma*	Common
2.	Indian earthworm	*Megascolex mauritii*	Common

PHYLUM: ARTHROPODA

Table 11: BUTTERFLY

S.NO	Common Name	Scientific Name	Status/schedule
1.	Plain tiger	*Danaus chrysippus*	Common
2.	Common tiger	*Danaus genutia*	Common
3.	Common sailer	*Neptis hylas*	Common
4.	Common crow	*Euploea core*	Common
5.	Tawny coster	*Acraea violae*	Common
6.	One spot grass yellow	*Eurema andersoni*	Common
7.	Blue tiger	*Tirumala limniace*	Common

8.	Common emigrant	*Catopsilia pomona*	Common
9.	Common blue jay	*Graphium doson*	Common
10.	Common Mormon	*Papilio polytes*	Common
11.	Lime butterfly	*Papilio demoleus*	Common

Table 12: ANT

S.No.	Common Name	Scientific Name	Status
1.	*Fire ant*	*Solenopsis geminata*	Common
2.	*Pillayarerumbu/ Samyerumbu*	*Paratrechina longicornis*	Common
3.	*Ghost ant*	*Tapinomame lanocephalum*	Common
4.	*Carpenter ant*	*Camponotus angusticollis*	Common
5.	*Soo Erumbu*	*Tetrapo nerarufonigra*	Common
6.	*Yellow crazy ant*	*Anoplolepis gracilipes*	Common
7.	*Bug*	*Probergrothissanuinolens*	Common

Table 13: SPIDER

S.NO	Common Name	Scientific Name	Status/schedule
1.	Jumping spider	*Menemerus fulvus*	Common
2.	Grey wall jumper	*Menemerus bivittatus*	Common
3.	Grass cross spider	*Argiope catenulate*	Common
4.	Orb weaver spider	*Argiope anasuja*	Common

Table 14: PHYLUM: MOLLUSCA

S.NO	Common Name	Scientific Name	Status/schedule
1.	Freshwater mussel	*Lamellidens marginalis*	Common
2.	Apple snail	*Pila globosa*	Common
3.	Ariophanta	*Ariophanta bristrialis*	Common

CHORDATA

CLASS: PISCES

Table 15: FISHES: Culture in College Pond

S.NO	Common Name	Scientific Name	Status/schedule
1.	Fish fingerlings	--	Common

Table 16: CLASS: AMPHIBIA

S.NO	Common Name	Scientific Name	Status/schedule
1.	Toad	*Bufo*	Rare
2.	Frog	*Rana hexadactyla*	Common

Table 17: CLASS: REPTILIA

S.No.	Common Name	Scientific Name	Status/schedule
1.	Calotes	*Calotes versicolar*	Common
2.	Varanus	*Varanus varius*	Common
3.	Non poisonous snake	*Lycodon aulicus*	Common
4.	Cobra	*Naja naja*	Common
5.	Krait (Kattu viriyan)	*Bungarus caeruleus*	Common
6.	Rat snake	*Ptyas mucosa*	Common
7.	Chameleon	*Chameleo chameleon*	Rare
8.	Green snake	*Primeresureus gramineus*	Common
9.	Common wall Lizard	*Podarcis muralis*	Common

Table 18: CLASS: AVES (BIRDS)

S.No.	Common Name	Scientific Name	Status/schedule
1.	Brahminy kite	*Halioster indus*	Least concern
2.	Shikra	*Accipiter badius*	Least concern

3.	Rock pigeon	*Columba livia*	Least concern

4.	Spotted dove	*Spilobelia chinensis*	Least concern
5.	Rose ringed Parakeet	*Psittakulla krameri*	Least concern
6.	Asian koel	*Eudymamys scolobaceus*	Least concern
7.	Greater Coucal	*Centropus sinensis*	Least concern
8.	Spotted owlet	*Athene brama*	Least concern
9.	Little Green Bee Eater	*Merops oriental*	Least concern
10.	Indian Roller	*Coracius benghalensis*	Least concern
11.	Hoopoe	*Upupa epops*	Least concern
12.	Black Drongo	*Dierurus macrocerus*	Least concern
13.	Common Mynah	*Acridotherus tristis*	Least concern
14.	House crow	*Corvus splendens*	Least concern
15.	Treepie	*Dendrocitta vagabunda*	Least concern
16.	Jungle babbler	*Argya striata*	Least concern
17.	Indian Robin	*Copsichus fulicatus*	Least concern
18.	White browed wagtail	*Motacilla maderasunbatensis*	Least concern
19.	Purple rumped Sunbird	*Leptocoma zeylonica*	Least concern
20.	House sparrow	*Passer domesticus*	Least concern
21.	Plain prinia	*Prinia inorata*	Least concern
22.	Indian Peafowl	*Pavo cristatus*	Least concern

Table 19: CLASS: MAMMALIA

Sl. No.	Common Name	Scientific Name	IUCN status / Schedule
1	Indian palm squirrel	*Fumambuluspalmarum*	*Lower risk/III*
2	Grey mongoose	*Herpestesedwardsii*	*Lower risk/II*
3	Black naped hare	*Lepusnigricollis*	*Lower risk/III*
4	Indian gerbils	*Tateraindica*	*Lower risk/III*
5	Large bandicoot – rat	*Bandicotaindica*	*Lower risk/III*
6	House rat	*Rattusrattus*	*Lower risk/III*

Observations – Fauna

The fauna observed and recorded in the study area are as follows:

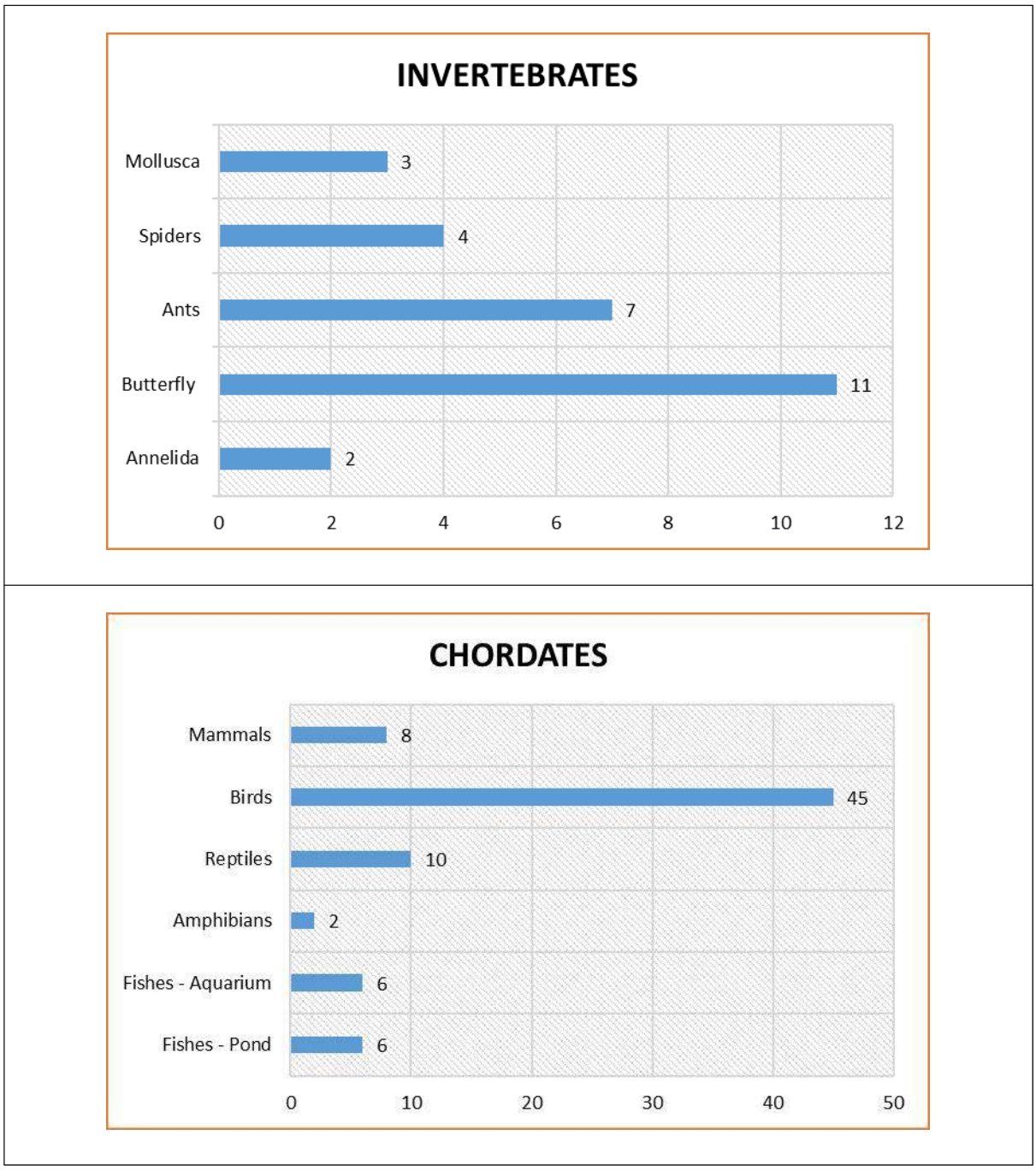


Fig. 14: Diversity of Fauna

Invertebrates

The insects in the study area are interrelated with each other and other organisms. Invertebrates recorded in the study site include 11 species

of butterflies, 7 species of ants, 2 species of annelids, 3 species of molluscans, and 4 species of spiders.

Chordates

The chordates include 6 species of mammals, 22 species of birds, 9 species of reptiles, 2 species of amphibians and fish fingerlings in a stagnant pool of water.

Amphibians

The toads and frogs were the amphibians recorded in the study area. Many of them were seen along the wet areas. Totally 2 species of amphibians were recorded in the study sites.

Reptiles

The reptiles recorded in the study area include lizards, and snakes. Totally 9 species of reptiles were recorded in the study sites.

Birds

Birds play an important role in understanding the ecological balance and its interrelationships. Totally 22 species of birds were recorded in the campus.

Mammals

The mammals present in the study area include Mongoose, Indian palm Squirrel, etc. These mammals are spread over the study area. Totally 6 species of mammals were recorded in the campus.

CHAPTER 8 CONCLUSION

Conclusion

Green Audit is the most efficient way to identify the strength and weakness of environmental sustainable practices and to find a way to solve problem. Green Audit is one kind of professional approach towards a responsible way in utilizing economic, financial, social and environmental resources. Green audits can "add value" to the management approaches being taken by the college and is a way of identifying, evaluating and managing environmental risks (known and unknown). There is scope for further improvement, particularly in relation to waste, energy and water management. The college in recent years considers the environmental impacts of most of its actions and makes a concerted effort to act in an environmentally responsible manner. Even though the college does perform fairly well, the recommendations in this report highlight many ways in which the college can work to improve its actions and become a more sustainable institution.

Observations and Comments Land

8 The land use attributes include built-up area, playground area, sacred temple garden, plantation, green cover, open space, road network and storm water drains.

9 The campus has a **green cover** of 1.90 acres which include avenue trees, plantation near the hostel (5915 Sq. M), garden with green cover (1682 Sq. M), sacred garden with a temple (670 Sq. M).

10 The campus has a total **built up area** of 1.57 acres i.e., 6349.00 Sq. M. 6 buildings meant for academics (2722.19 Sq. M), hostels (1500 Sq. M), guest house (611.00), cafeteria (112 Sq. M).

11 The **playground area** constitutes 2.29 acres i.e., 9271.00 Sq. M. There are two play grounds, Ground 1 is a small Volley ball court with an area of 1509 Sq. M and Ground 2 is the main ground with an area of 7762 Sq. M.

12 This implies that the campus has the considerable carbon sequestration potential and stands as a model institution.

Biodiversity

Flora

1 The campus has a **green cover** of 1.90 acres which include avenue trees, plantation near the hostel (5915 Sq. M), garden with green cover (1682 Sq. M), sacred garden with a temple (670 Sq. M).

2 As per the National Forest Policy, 1988 and the new draft National Forest Policy minimum of **one-third** (or **33%)** of **total land area of India** should be under forest cover (fc) or tree cover (tc).

3 The campus complies with the National Forest Policy 1988, and has **33%** green cover with avenue trees, plantation and gardens. The terrain of the campus is undulating and partially rocky, the soil erosion is under control with the planned layout.

Carbon absorption by flora in the Institution

The campus has 27 fully grown trees, therefore the carbon absorption capacity of 27 full-grown trees in the Campus is (27 × 178.22 kg CO_2) **= 4811.94 kg of CO_2.**

Fauna

Invertebrates

The insects in the study area are interrelated with each other and other organisms. Invertebrates recorded in the study site include 11 species of butterflies, 7 species of ants, 2 species of annelids, 3 species of molluscans, and 4 species of spiders.

Chordates

The chordates include 6 species of mammals, 22 species of birds, 9 species of reptiles, 2 species of amphibians and fish fingerlings in a stagnant pool of water.

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The toads and frogs were the amphibians recorded in the study area. Many of them were seen along the wet areas. Totally 2 species of amphibians were recorded in the study sites.

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The reptiles recorded in the study area include lizards, and snakes. Totally 9 species of reptiles were recorded in the study sites.

Birds

Birds play an important role in understanding the ecological balance and its interrelationships. Totally 22 species of birds were recorded in the campus.

Mammals

The mammals present in the study area include Mongoose, Indian palm Squirrel, etc. These mammals are spread over the study area. Totally 6 species of mammals were recorded in the campus.

Comments

- The campus complies with the prescribed standards of the National Forest Policy, 1988.
- The green initiatives of the campus is good and highly appreciated.
- The Biodiversity in the campus is well maintained through sacred garden, temple with family God and ethically bound students and staff.
- The vacant land in the campus has a good potential for agricultural activity.

Fig. 15: Fauna in the Campus

ANNELIDS


SPIDERS





MOLLUSCA



AMPHIBIANS

	

REPTILES

		
		

AVES

MAMMALS

	
	
	

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SAKTHI COLLEGE OF ARTS AND SCIENCE FOR WOMEN

ODDANCHATRAM – 624 619

ENERGY AUDIT REPORT

2020 – 2021

DEPARTMENT OF ENVIRONMENTAL SCIENCES

Bishop Heber College (Autonomous)

Tiruchirappalli, Tamilnadu – 620 017

CERTIFICATE

This is to certify that detailed **Energy Audit** of **Sakthi College of Arts and Science for Women, Oddanchatram – 624 619, Tamilnadu** has been successfully conducted. The activities and measures carried out by the College have been verified based on the reports submitted by the College and found to be satisfactory. The College has evolved policies on Environment and Green campus in line with the Sustainable Development Goals. The efforts taken by the members of the faculty, students, support staff and the Management towards creating a strategic change in attaining holistic environmental sustainability is highly appreciated and commended.

D.J.S. Anand Karunakaran
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CAMPUS GREEN AUDIT
CGA
CERTIFIED

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Associate Professor & Head
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Date: 23 October 2021

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Category A Projects

ENERGY AUDIT
2020 – 2021

Content Page. No

5. ENERGY AUDIT METHODOLOGY

Tables

List of Figures

ENERGY AUDIT

Introduction

Energy audit has a vital role in the implementation of energy conservation measures. The energy audit enables the institution to meet the Energy efficiency Standards and to reduce carbon foot print. There are several types of energy audits that are commonly performed by energy service personnel or engineers with various degrees of complexity.

Need for Energy Audit

The energy crisis in the present day world has led us to the design of new energy efficient buildings. An energy audit establishes both where and how energy is being used, and the potential for energy savings. It includes a walk-through survey, a review of energy using systems, analysis of energy use and the preparation of an energy budget, and provides a baseline from which energy consumption can be compared over time. An audit can be conducted by an employee of the organization who has appropriate expertise, or by a specialist energy-auditing firm. An energy audit report also includes recommendations for actions, which will result in energy and cost savings. It should also indicate the costs and savings for each recommended action, and a priority order for implementation. As per the Energy Conservation Act, 2001, Energy Audit is defined as the verification, monitoring and analysis of use of energy including submission of technical report containing recommendations for improving energy efficiency with cost benefit analysis and an action plan to reduce energy consumption. (Chandra Prakash et al, 2017).

Electrical Energy Audit

Energy cannot be seen, but we know it is there because we can see its effects in the forms of heat, light and power.

This indicator addresses energy consumption, energy sources, energy monitoring, lighting, appliances, and vehicles. Energy use is clearly an important aspect of campus sustainability and thus requires no explanation for its inclusion in the assessment. An old incandescent bulb uses approximately 60W to 100W while an energy efficient light emitting diode (LED) uses only less than 10 W. 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.

Energy-saving measures and Carbon Footprint Reduction

A carbon footprint is historically the total set of greenhouse emissions caused by an individual event organization or product. It is expressed as CO_2e (Carbon dioxide equivalent) which can broadly be defined as a measure of the greenhouse gas emission that are directly and indirectly caused by an activity or are accumulated over the life stages of a product or service (Wiedman and Minx, 2008; Igbokwe et al 2018)

Intergovernmental Panel on Climate (IPCC) reviewed 18 greenhouse gases with different global warming potential. According to United Nation Framework Convention on carbon dioxide (UNFCCC) and its Kyoto protocol, only Carbon dioxide (CO_2), Methane (CH_4), Nitrous oxide (N_2O), Hydrofluorocarbons (HFCs), Perfluorocarbons (PFCs) and sulphur hexafluoride (SF_6) are considered for the purpose of carbon accounting, with others being regulated elsewhere (Hall and Murray, 2008).

The main elements that generates large amounts of carbon dioxide are fossil fuels (especially oil and coal), through burning them for obtaining energy. Of all greenhouse gases, CO_2 has the largest share. Thus, emissions of other greenhouse gases as stated earlier are converted into units of CO_2 equivalents (CO_2e) using the warming potential related to each gas.

The calculation of carbon footprint in Sakthi College of Arts and Sciencee has been carried out to set a standard on environmental policies and practices, operational platform to achieving a friendly accommodating and sustainable environment in the future (IPCC, 2000).

Electrical Energy Consumption

The Energy Audit Report of the Sakthi College of Arts and Sciencee during the period 2020 -21 are presented in the following section:

Electrical Unit Conversion

- voltage X ampere = Power (V X I = P)
- Unit: (volt X ampere = watt) One electrical Unit = 000W/hour
- *(1000 watt bulb glows 9for an hour or 100 watt bulb glows for 10 hours)*
- Power factor(pf)= [Actual power/ apparent power] X Power Factor

The total consumption of electricity was 4,100 unit for the academic year 2020-21. This includes air conditioners which consume about 12% of net consumed electrical energy.

One electrical unit (EU) equals consumption of 1000 watts per hour (1kWh) and requires 0.538 kg or approximately ½ kg of coal to produce the same.

The total quantity of coal required to produce 4,100 units of electricity (4,100 × 0.538 kg coal) = 2,205.8 kg or ≈ 2.2 ton coal this academic year.

CO_2 emission by coal One kilogram of coal emits 2.86 kg of CO_2, thereby increasing the carbon footprint which in turn contributes to global warming. Therefore, 369 tons of coal consumed indirectly by the Institution through consumption of 4,100 units of electricity led to the emission of (2,205.8 kg of coal × 2.86 kg CO_2) **6,308.6 kg or 6.3 ton of CO_2 into the atmosphere per year.**

Table. 1 Consumption Electrical Energy for first half of theAcademic year 2020 – 21

S.No.	Month & Year	Consumed Unit in KWh
1	April '21	175.00
2	May '21	80.00
3	June '21	90.73
4	July '21	140.27
5	August '21	239.04
6	September '21	393.68
7	October '21	392.68
TOTAL		**2039.24**

Table. 2 Details of UPS and Accumulators

Date Of Install	Capacity	Brand	Batt.Brand	Battery Nos	Battery Capacity	Battery Repalced	UPS Life in Year	Batt Life in Year
10/06/09	5KVA 3 no	kondass	Exide-EL	48	80Ah	16.09.2017	10	8
03/02/12	20KVA 2 no	Numeric power	Exide-EL	30	100Ah	03.08.2018	10	8

Table.3 Total Consumption of Electrical Energy in EU Vs Carbon emission and Carbon footage

Net Unit Consumption 2020-21	Carbon Emission In Ton	CO2 Foot Print In Ton
4,100 (EU)	2.2058	6.3086

The net carbon foot print as CO_2 by electrical energy **= 6.31 ton**

Chart : Historical Data Analysis:

Based on the historical data The electrical energy consumption (2020-21)= **4,100 KWh or EU**

Observation:

- The Power factor is good but need to improve.
- The Load Factor is low could be improve to get the benefits of good Load F actor.
- MD KVA under sanctioned load. There is no load demand

Remedies:

- It is suggested to install a Thyristor 100 kVA A PFC panel with 7.68% - 8.02% detuned reactors.
- Installation of local transformer to extended load near future to a capacity of 110 KVA suggested.
- Install a Maximum Demand Controller

Benefits:

- You will get 3.5 % discount on your basic bill amount by maintaining PF close to Unity.
- Bb achieving Load Factor above 75 % you will get 1% discount for each percent. upto 90% Load factor and total discount will be 15 % on basic value.

By installing Demand Controller you can avoid charges for excess demand. The facility may save Rs. 10,000 (Approx) per month

Conclusion:

The present energy consumption is **4,100 kWh** per annum (during pandemic period approximately). The proposed energy consumption shall be 7,000 kWh per annum (Normal period approximately) which will vary as per the season

Saving Terms:

The saving in terms of monitory benefit will be **2.5 lacs** per annum only (without Roof Top Solar Power Plant) and **3.5 lacs** per annum only (with Off Grid 100 kW ROOF TOP SOLAR POWER **PLANT)**

2. Fuel Consumption Audit

Diesel Consumption

The consumption of 1,12,593 liter of diesel for the academic year 2020-21. 1 liter of diesel weighs 835 gram. Diesel consists for 86.2% of carbon, or 720 gram of carbon per liter diesel. In order to combust this carbon to CO_2, 1920 gram of oxygen is needed. The sum is then 720 + 1920 = 2640 gram or 2.7 kg of CO_2/liter diesel.

Transportation

Table.4 Details of the Annual Fuel Consumption by transportation

Root .No	Km covered / month	Diesel in liter
1	110	687.50
2	82	512.50
3	112	700.00
4	110	687.50
5	96	600.00
6	113	706.25
7	108	675.00
8	88	550.00
9	128	800.00
10	110	687.50
11	130	812.50
12	96	600.00
13	110	687.50
14	90	652.50
TOTAL		**9358.75**

The total consumption of diesel by transportation = 9358.75 liter

Generator Details-

Generator used in the college are three, and used for power generation by diesel as backup power source. The details of generator and average fuel consumption are mentioned in given table.

Table.5 Campus Generator Capacity and Consumable fuel for Backup Electrical Energy

S.No	Specification	Make	Consumption Liter/hr	Duration / hour	Consumption /month
1	15 KVA/ 3 Phase	Kirloskar	3	08	24

Table.6 Campus Annual Consumption of Liquid Fuel

Consumable	Liter/year
Transportation	1,12,305
Generators	288
Total	**1,12,593**

The total consumption during the academic year 2020-21 is 1,12,593 liter and therefore net weight of CO_2 emitted in to the atmosphere 1,12,593 X 2.7 = 3,04,001 Kg or 304 ton.

The total estimated carbon foot print by consumption of liquid fuel is 304 ton

Assessment of CO2 emaciation by LPG

1 liter of LPG weighs 550 gram. LPG consists for 82,5% of carbon, or 454 gram of carbon per liter of LPG. In order to combust this carbon to CO2, 1211 gram of oxygen is needed. The sum is then 454 + 1211 = 1665 gram of CO2/liter of LPG. 1 Kg of LPG = 1.94 liter

Table.7 Monthly consumption of LPG in the campus

S.No	Location	Cylinders /month
1	Hostel	08
2	Canteen	02
TOTAL		**10**

Total No of cylinders 10 X 19 = 190 Kg

Consumed LPG in liters = 190 Kg X 1.94 = 368.6 liters

Emitted quantity of CO_2 = 368.6 X 1.67 = 615.6 Kg **= 0.616 ton**

The total estimated carbon foot print LPG is 0.616 ton

FIRE WOOD

The carbon dioxide released when burning wood (about 1900g CO_2 for each 1000g of wood burnt) is balanced by the fact that this carbon was taken up by the tree from the air when it grew. So this part of the emissions is carbon-neutral. However, many other chemicals are produced when wood is burnt, including one of the most potent greenhouse gases, nitrogen dioxide; although the amounts may be small (200 g of CO2 equivalent per kg of wood burnt), the gas is 300 times more potent as a greenhouse gas than carbon dioxide and lasts 120 years in the atmosphere.

Table.8 Campus Annual Consumption of Fire Wood

S.No	Location	Fire wood /month in Kg
1	Hostel	10,000
	Total	**10,000**

Let 10,000 Kg X 1.9 = 19,000 Kg or 19 ton of CO_2 emitted to the atmosphere

The total estimated carbon foot print by consumption of Firewood is 19; ton

Table.9: The total Carbon foot prints in the campus per year

S.No	CO_2 Emission of Consumption	Quantity in **ton**
1	Electrical Energy	6.31
2	Diesel	304.00
3	LPG	0.62
4	Fire wood	19.00
	TOTAL	**329.93**

The total Carbon foot prints in the campus per year as by emission CO_2 in to the atmosphere per year is 329.93 ton

3. Carbon offset

3.1 Campus Carbon Offset

The following table shows the carbon offset due to energy efficient light fixtures during 2020-21

Table.10 Carbon Offset by energy efficient light Fittings

Energy efficient electrical light fixtures						
S.No.	**Article**	**Replaced Article**	**Quantity**	**Duration/ day in Hour**	**Energy consumed /Day in EU**	
					(Actual)	**(Earlier)**
01	LED (20W)	CFL (40W) Street lights	40	8	6.4	12.8
02	LED (9/12W)	CFL/Tube /(60W)bulbs	40	7	2.52	16.8
				Total	**8.92**	**29.6**

Electrical energy saved 29.6 – 8.92 = 20.68 EU / Day. (Reduction in electrical energy)

The annual carbon Offset

20.68 X 0.538 = 11.126 Kg of coal required

11.126 X 2.86 = 31.82 X 30 X 12 = 11,455.32 or 11.46 ton / year

An amount of 11.46 ton Carbon offset per year in the campus by replacing with Energy efficient electrical light fixtures.

Table.11 Assessment of carbon foot print in the campus

S.No	**Sources of Carbon Emission and Carbon Footprint**	**Quantity of CO_2 Estimated in ton**
1	Electrical Energy	6.31
2	Diesel	304.00
3	LPG	0.62
4	Fire wood	19.00
TOTAL		**329.93**
Carbon Offset in the campus		
2	Carbon Offset by Energy Efficient lights	-11.46
Net Carbon footprint assessment of the campus		**318.47**

The net assessed Carbon foot prints in the campus for the academic year 2020-21 (emission of $CO_{2)}$ is 318.47 ton

3.2 Carbon offset suggestions

The management of **Sakthi College of Arts and Sciencee is** conscious of this damage to the environment and has been implementing various programs/activities to reduce energy consumption on the one hand and increase green energy sources on the other. They are:

a) Replacing high energy-consuming lighting system with energy-efficient lighting systems.

b) Installation of 100 KVA solar PV power systems which is in process through which analysis of CO_2 reduction is succeeded.

c) Installing energy-efficient lighting system Based on the recommendations of the Electrical Energy consumed last year, the Institution has reduced CO_2 emissions indirectly by replacing high energy-consuming electric bulbs with energy-efficient LED lighting systems by 10% will reduce 29.6 KWh or electrical units per year.

Solar energy is produced by the sun's light - photovoltaic energy offers many benefits that make it one of the most promising energy

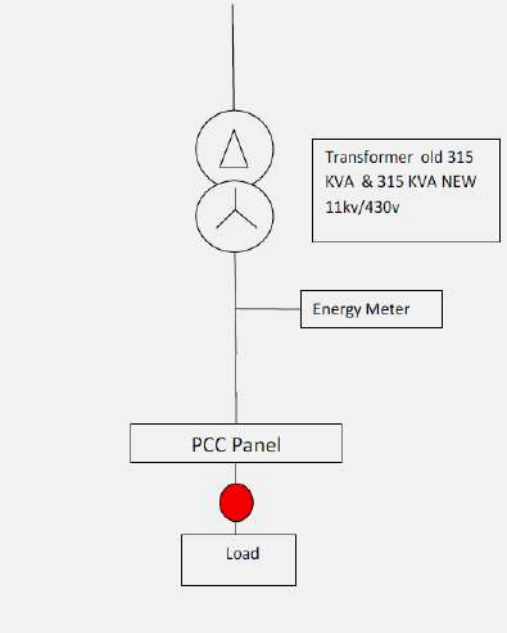
i. Renewable
ii. Inexhaustible
ii. Non- polluting
iv. Avoids global warming
v. Reduces use of fossil fuels
vi. Reduces energy imports
vii. Contributes to sustainable development

The Ministry of New ad Renewable Energy (MNRE), Govt. of India has been promoting the aim to develop and deploy New and Renewable energy for supplementing the energy requirement of the country.

4. Power Quality Observations & Remedies

Site Description.

The detailed Single Line Diagram is available with Sakthi College of Arts and Science . The basic site survey was conducted as per following Single Line Diagram.



Existing Scenario with the Installation under survey

Table.12 Main HT Details

EB Service No.	
Sanctioned Load	60 VA
Phase	3
Voltage on LV side	433 V
Voltage on HV side	11 KV
Amperes on LV	333.3
Amperes on LV	13.12

Bus Bars

In the campus each block is split into power line and lighting line and provided with LT Panels respectively. The bus bar configurations are given below

i. **Mains 2' x 1.5'**

ii. **LT Panels 2' X 1', 2'X 0.5, 2 X 0.25'**

IEEE-519-1992 Consideration and Value for Plant under survey

The said standard id applicable at the PCC (Point of Common Coupling). In above mentioned SLD at Survey Point no.1 is the point of coupling.

As per the standards; the harmonic limits are to be considered at PCC Recommended Limits for these ratios as per IEEE-519-2014 are as here under.

Table. 13 IEEE-519-1992 Consideration and Value for Plant undersurvey

Maximum Harmonic Current Distortion in Percent of IL					
Individual Harmonic Order (Odd Harmonic)					
Isc//L TDD	<11	11<h<17	17<h<23	23<h<35	35<h
<20* 5.0	4.0	2.0	1.5	0.6	0.3
20<50 8.0	7.0	3.5	2.5	1.0	0.5
50<100 12.0	10.0	4.5	4.0	1.5	0.7
100<1000 15.0	12.0	5.5	5.0	2.0	1.0
>1000 20.0	15.0	7.0	6.0	2.5	1.4
Even harmonic are limited to 25% the odd harmonic limits above					
Current distortions that result in a offset, e.g. half –wave convertes are not allowed					
*All power generation equipment is Limited to these values of current distortion. regardless of actual/sc//L					
Where /sc =maximum short-circuit current at PCC /L =maximum demand load current (fundamental frequency component) at PCC. TDD =Total demand distortion (RSS).harmonic current distortion in% of maximum demand load current (15 or 30 min demand). PCC =Point of common coupling.					

Voltage Distortion Limits

Bus Voltage at PCC Voltage THD (%)	Individual Voltage Distortion (%)	Total Distortion
69 kv and below	3.0	5.0
69.000 kV through 161kv	1.5	2.5
161.001 kV and above	1.0	1.5
Note: High-voltage systems can have up to 2.0% THD where the cause is an HADC terminal that will attenuate by the time it is tapped for a user.		

Table.14 Voltage Current and Harmonic Values

RMS Voltage Values							
	Phase R-Y	Phase Y-B	Phase R-B	Phase R-N	Phase Y-N	Phase B-N	Ph N-G
Min Value	464.66	468.49	468.61	268.93	269.07	271.30	0.24
Ave Value	464.77	468.61	468.70	268.97	269.13	271.37	0.25
Max Value	464.82	468.73	468.77	269.01	269.18	2671.42	0.27

RMS Current Values				
	Phase R	Phase Y	Phase B	Neutral
Min Value	10.05	6.79	4.73	7.90
Ave Value	10.25	6.97	4.98	7.99
Max Value	10.45	7.15	5.22	8.09

PEAK Current Values				
	Phase R	Phase Y	Phase B	Neutral
Min Value	25.03	19.32	16	23.54
Ave Value	25.81	20.45	17.23	24.48
Max Value	26.68	21.83	18.67	25.55

	HARMONIC LEVEL IN %					
	Phase R	Phase Y	Phase B	Phase N	As per IEEE in %	As per MSEDCL in %
Voltage	0.85	0.90	1.1	230	Up to 5%	Up to 5 %
Current	40	45	75	105	Up to 10 %	Up to 10 %

Frequency	
Max	50.02
Avg	50.02
Min	50.02

Observations

1. Due to unbalanced and non linear load condition in each phase, harmonics in neutral is 230% and 105% in voltage and current respectively.
2. 3rd and 7th harmonic is present in the system. This is observed due to SMPS ie computer load & electronic ballasts.
3. Current in Neutral is 14.5 amp and 80 amp to maximum level.
4. Voltage harmonics are under permissible limits of MSEDCL and IEEE norm, while the Current harmonics are above the ideal values and these harmonics were induced through machinery.
5. Spikes are observed, no spike protection is provided to the system.
6. Overall Voltage supplied by grid is on HIGHER SIDE.

Remedies

1. For Harmonics of 7th order the APFC panel (automatic power factor control) of 50 KVA with 7.68% detuned reactors and 525v capacitors with thyristerised switching is to be installed.

2. For harmonics of 3rd and 9th order the earthing is to be done .The detailed specification is given below.

- Make proper earthing as per IEC 60364-5-54 to meter as well as control panels.
- It is suggested to install new earthing system the details are as below:
- Make OBO Betterman, Germany
- Length of Earth electrode: 1250 mm, Diameter of earth electrode: 14.2mm. Tested as per IEC 60364-5-54.
- Earth conductivity enhancing mineral compound of 5KG
- Total quantity required = 03 no. set (80 KVA) .(3 X 80 = 240KVA)

3. Install a Spike Protection Device, for protection from sudden high current spike which occurs due to high voltage. This is to be installed next to Energy Meter; also in each control panel.

The Specification for SPD is as follows

I. For protection against the Lightening surge and Surge through power lines (HT),

- Combi controller = 1 nos. to be connected to transformer LT side. Technology : MOV for L to N and SG for N to PE, Normal line voltage 230/ 400 v, 50Hz.
- Impulse current (10/350 micro sec), 7 KA and 25 KA.
- Response time < 25 nano seconds.
- Voltage protection level 900 volts & 1200 volts.

II. For protection against internal surges.

- Surge Controller = 4 nos. to be installed at each floor east and west side.
- Technology : MOV for L to N and SG for N to PE, Normal line voltage 230/ 400 v, 50Hz.
- Nominal discharge current 8/20 micro sec. = 20 KA & 50 KA.
- Voltage protection level = 1300v and 1200 volt.
- Response time less than 20 nano sec.

Effect on system

1. Circuit will be free from harmonic current.
2. The voltage regulation will be good, which results in low maintenance and saving in units also.
3. Neutral Current will be minimizing so very negligible amount of current will be there.

5. Energy Audit Methodology

Electrical Distribution System:

Scope of Work:

- To study existing electrical distribution system
- Measure/ Record the 12 hrs Load distribution
- To suggest various energy efficient measures with first order cost benefit analysis.

Methodology:

A. Census :

1) Find out the electrical normal & emergency loading.
Type of tariff

- Rating of installed transformer
- General hygiene as per standard maintenance practices
- Operating hrs data were collected from respective person

B. Indoor Lighting

Scope of work

- To study the existing lighting scenario of facility & verify the building data
- To find out the performance of lighting fixture
- To calculate the ILER (Lux/ watt/ m2) & compare lux with the bench mark /prevailing std in the facility.
- To suggest various energy efficient measures with first order cost benefit analysis

Censes

- Upto 80% of the lighting fixture were inspected for following
- No.of light installed & no of light working.
- Type of lights, General hygiene as per std maintenance practices
- Operating hrs data were collected from respective person.

Computer

Scope of work :

- To study existing computer at facility and verify the billing data.
- To Find out the power drawn.
- To compare the power drawn with the bench mark or prevailing standard in the facility.

- To identify the causes of deviation in the performance & suggest recommendation for corrective actions.
- To suggest various energy efficient measures with the first order cost benefit analysis.

Methodology

Census:

- Up to 80% of the computers printers & faxes were inspected for following.
- No of computers printers & faxes installed.

Scope of work:

- To study existing pumping system at facility and verify the billing data.
- To carry out analysis.
- To Find out the performance of the pumping system.
- To compare the operating efficiency with the bench mark or prevailing standard in the facility.
- To identify the causes of deviation in the performance & suggest recommendation for corrective actions.
- To suggest various energy efficient measures with the first order cost benefit analysis.
-

Methodology

Census:

- All water pumps were audited for following.
- Total no of pumps installed.

Report Writing

A detailed report of all the outcomes

i. Observations
ii. Remedies
iii. Census
iv. Data Collections
v. Data Processing
vi. Data Analysis
vii. Results
viii. Summery
ix. Suggestions and
x. Conclusions are repotted in defined format for documentation and further references

Figurative representation of campus assessment

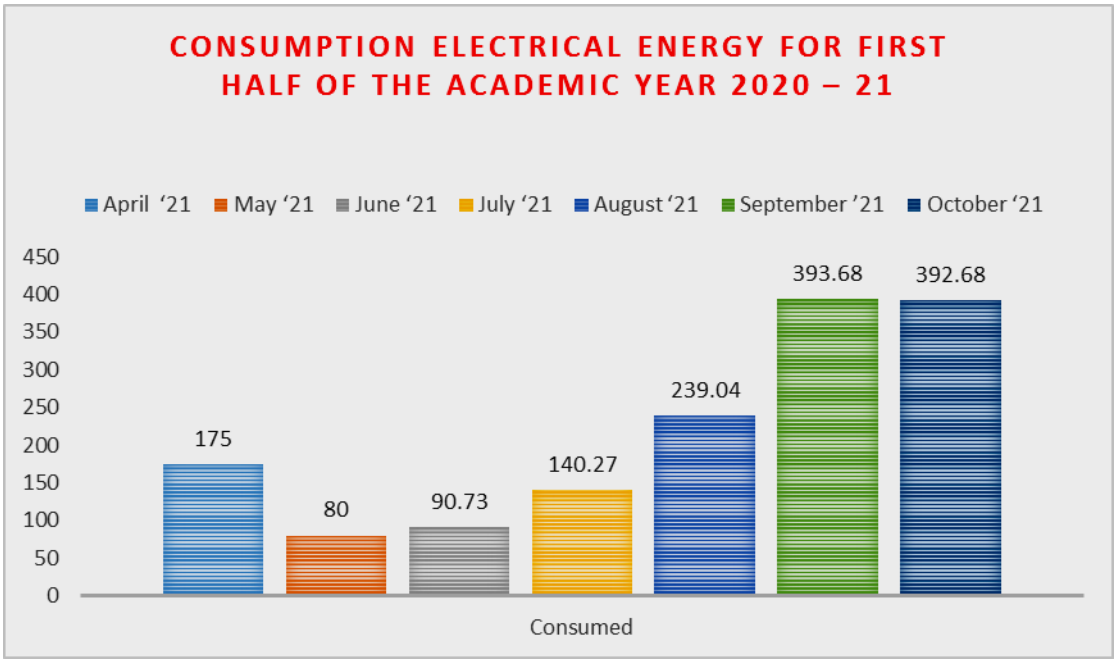


Fig.1 Electrical energy consumption minth wise for the first halfof the acadcimic year 2020-21

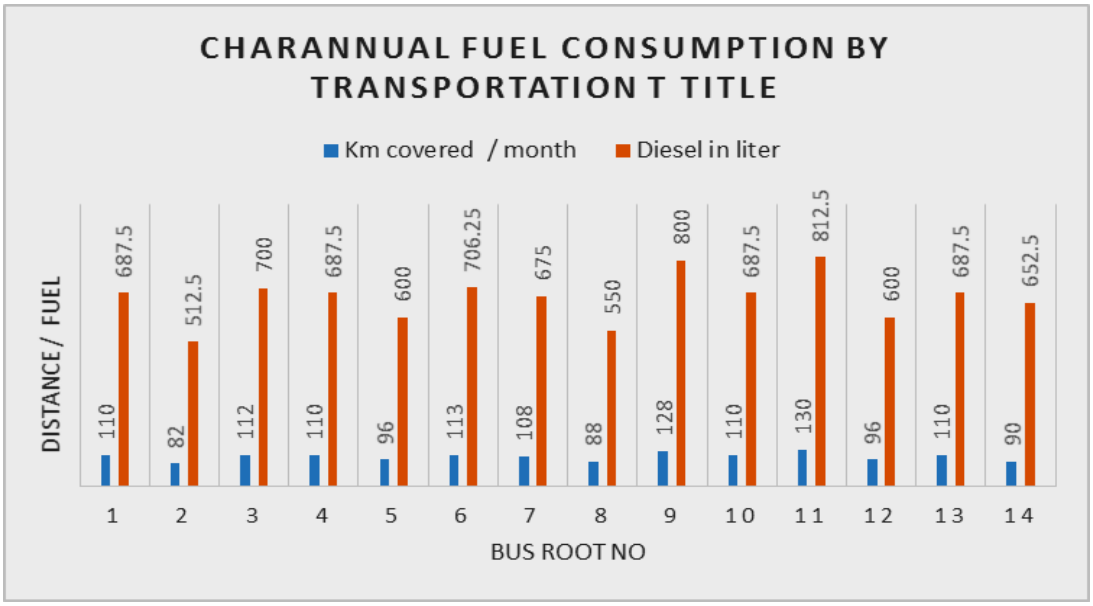


Fig.2 Details of the distance covered and annual fuel consumption by transportation for the academic year 2020 – 21

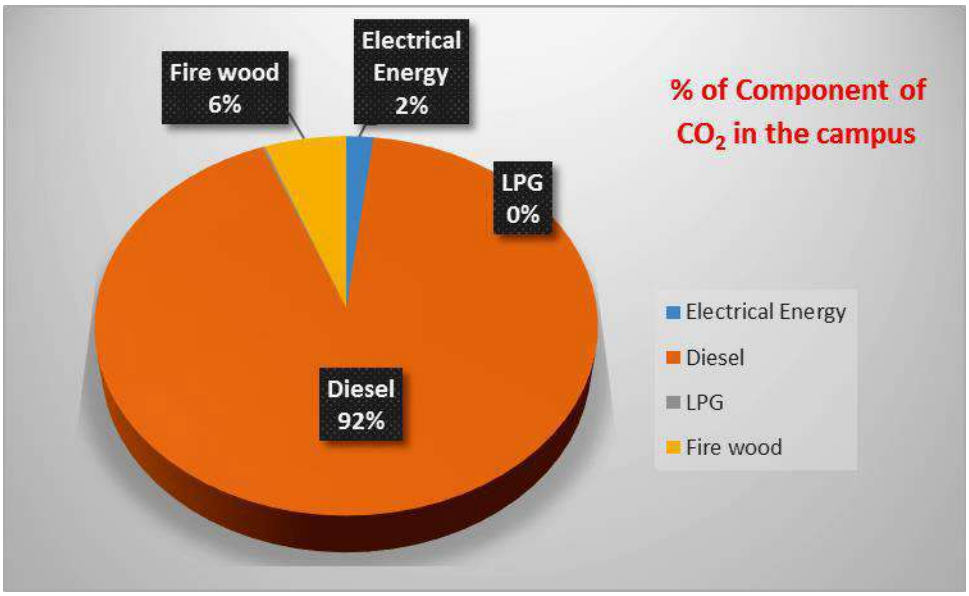


Fig.3 The Net component of Carbon foot prints in the campus inthe academic year 2020-21

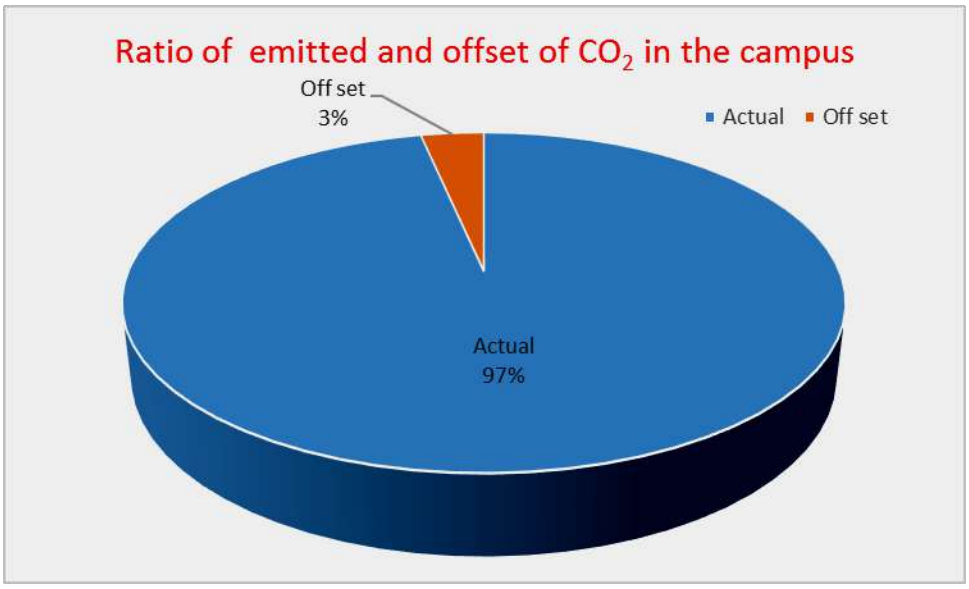


Fig.4 The proposition of carbon offset to net emmission of CO_2

SAKTHI COLLEGE OF ARTS AND SCIENCE FOR WOMEN

ODDANCHATRAM – 624 619

ENVIRONMENT AUDIT REPORT

2020 – 2021

PREPARED BY

DEPARTMENT OF ENVIRONMENTAL SCIENCES

Bishop Heber College (Autonomous)

Tiruchirappalli, Tamilnadu - 620 017

CERTIFICATE

This is to certify that detailed **Environment Audit** of **Sakthi College of Arts and Science, Dindigul, Tamilnadu** has been successfully conducted. The activities and measures carried out by the College have been verified based on the reports submitted by the College and found to be satisfactory. The College has evolved policies on Environment and Green campus in line with the Sustainable Development Goals. The efforts taken by the members of the faculty, students, support staff and the Management towards creating a strategic change in attaining holistic environmental sustainability is highly appreciated and commended.

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CAMPUS GREEN AUDIT
CGA
CERTIFIED

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NABET QCI

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Approved Function Area/s : EB(A)

Accredited by

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Category A Projects

(vide AC MOM III, 2010

New Delhi.

SA- 270th AC Meeting February 28 ,2020_Rev.01*)*

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PREFACE

An Environmental Audit is a tool comprising a systematic, documented, periodic and objective evaluation of how well a project, organization or equipment is performing with the aim of helping to safeguard the environment. The audit should facilitate management control of environmental practices and assess compliance with policy objectives and regulatory requirements.

A clean and healthy environment aids effective learning and provides a conducive learning environment.

Green audit is an official examination of the effects a college on the environment. It helps to improve the existing practices with the aim of reducing the adverse effects of these on the environment concerned.

Higher Educational Institutions are committed to preserve the environment within the campus through promotion of energy savings, recycling of waste, water use reduction, water harvesting etc.

Green audit visualizes the documentation of all such activities taking stock of the infrastructure of the college, their academic and managerial policies and future plans in the form of an environmental audit report.

Green audit can be a useful tool for a college to determine how and where they are using the most energy or water or resources; the college can then consider how to implement changes and make savings. It can also be used to determine the type and volume of waste which can be used for a recycling project or to improve waste minimization plan. It can create health consciousness and promote environmental awareness, values and ethics. It provides staff and students better understanding of green impact on campus.

Green audit promotes financial savings through reduction of resource use. It gives an opportunity for the development of ownership, personal and social responsibility for the students and teachers. Thus, it is imperative that the college evaluate its own contributions toward a sustainable future. As environmental sustainability is becoming an increasingly important issue for the nation, the role of

higher educational institutions in relation to environmental sustainability is more relevant.

The audit process in Sakthi College of Arts and Science involved initial interviews with management to clarify policies, activities, records and the co-operation of staff and students in the implementation of mitigation measures. Staff and students were given training how to collect the data for the green audit process. This was followed by staff and student interviews, collection of data through the questionnaire-based survey, review of records, observation of practices and observable outcomes. In addition, the approach ensured that the management and staff are active participants in the green auditing process in the college.

The baseline data prepared for the College will be a useful tool for campus greening, resource management, planning of future projects, and a document for implementation of sustainable development of the college. Existing data will allow the college to compare its programs and operations with those of peer institutions, identify areas in need of improvement, and prioritize the implementation of future projects. The green audit reports assist in the process of attaining an eco-friendly approach to the sustainable development of the college.

The results presented in the green audit report will serve as a guide for educating the college community on the existing environment related practices and resource usage at the college as well as spawn new activities and innovative practices. The Green Audit team expects the management to express their commitment to implement the recommendations.

Date: **23 October 2021**

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CHAPTER I

INTRODUCTION

"Education is a liberating force, and in our age, it is also a democratizing force, cutting across the barriers of caste and class, smoothing out inequalities imposed by birth and other circumstances" *- so defined Padmabushan Arutchelvar Dr. N. Mahalingam, Chairman, Sakthi Groups.*

Following the great man's footsteps, Dr. K. Vembannan, M.B.B.S., M.S., the Managing Trustee of Sowdamman Charitable Trust is a staunch believer that "Education makes one more humane, independent and perfect. It is the most powerful weapon for upliftment of mankind."

Being a visionary, Dr. Vembannan founded Sakthi College of Arts and Science, Oddanchatram in the year 2009 as a temple of learning. The college functions with the noble aspiration of uplifting the moral and educational standards of the women of the rural area in and around Oddanchatram, Tamil Nadu, Palani. It has the vision of empowering women through value-based education, with special concern for the economically disadvantaged and the first generation learners. The mission of the college is actualized in the institutional goals, administrative policies, academic programmes, co-curricular and extra-curricular activities, staff enrichment initiatives and student support systems. The ethical and moral formation of staff and students is seamlessly woven into the fabric of campus life. Innovation, student-centred modes of teaching and learning, extensive use of technological aids and research-based activities enrich the intellectual life on the campus.

The Institution has been recognized under (2f) and (12b) of the UGC Act. It is affiliated to Mother Teresa Women's University, Kodaikanal. Having started functioning with 129 students in the academic year 2009, it has now reached the strength of 1100 students. The proof of its adherence to standard lies in the milestone achievement of having bloomed well with 11

Under-graduate, 10 Post-graduate and 07 Pre-doctoral (M.Phil.,) Programmes. The College offers innovative curricula, opportunities for holistic development and a highly disciplined and diversified environment for students to surpass in scholastic, non-scholastic and research pursuits. However, while keeping pace with the changes in higher education at the national and global level, the institution still retains its local flavour and continues to offer value-based education with a special focus on the underprivileged.

The Emblem and Landmark Structures

Fig. 1: The College Emblem

Fig. 2: Magnificient College Entrance

Fig. 3: The Main Block

Fig 4 View of the Temple and Main Building

SAKTHI VISION

INITIATE INNOVATE, INCULCATE

Sakthi Educational Institution pursues a philosophy of perpetual acquisition of knowledge. Apart from academic curriculum, equally important is our policy to provide value-based education and to bring out the hidden potentials within optimism.

SAKTHI MISSION

"To act as the nurturing ground for young professionals who seek to make their mark and to create a talent pool for various Educational Institutions so that there may be synergistic growth for both"

CHAPTER II

CAMPUS ENVIRONMENTAL AUDIT

Campus Environmental Audit

An Environmental Audit is a tool comprising a systematic, documented, periodic and objective evaluation of how well a project, organization or equipment is performing with the aim of helping to safeguard the environment. The audit should facilitate management control of environmental practices and assess compliance with policy objectives and regulatory requirements. (European Environment Agency, European Commission 1999, Brussels).

Environmental auditing is a systematic, documented, periodic and objective process in assessing an organization's activities and services in relation to:

- Assessing relevant statutory and internal requirements
- Facilitating understanding of good environmental practices
- Promoting good environmental management
- Maintaining credibility with the public/clients
- Raising staff awareness and commitment to departmental environmental policy
- Exploring improvement opportunities
- Establishing the performance baseline for developing good sustainable practices.

Green Audit towards Sustainable Development

Sustainable Development (SD) is one of the biggest challenges of the twenty-first century and there can be no sustainability where educational

institutions (Universities, Institutions of Higher Education, and Schools) promote un-sustainability. In modern society 'No institutions are better situated and more obliged to facilitate the transition to a sustainable future than schools, Colleges and Universities'.

Sustainable Development Goals (SDGs)

The 17 Sustainable Development Goals and 169 targets which has been proposed demonstrates the scale and ambition of this new universal agenda. They seek to build on the MDGs and complete has not been achieved. They seek to realize the human rights of all and to achieve gender equality and the empowerment of all women and Girls. They are integrated and in and indivisible and balance the three dimensions of Sustainable Development: the economic, social and environmental. The Goals and Targets will stimulate action over the next 15 years in areas of critical importance for humanity and the planet.

Fig. 5: SUSTAINABLE DEVELOPMENT GOALS

In spite of a number of SDGs and an ever increasing number of Universities / Institutions of Higher Educations and Schools becoming

engaged with the principles and concepts of SD, especially in the developed world, most of them to be traditional in India.

Environmental Audit

Environmental auditing has become a valuable tool in the management and monitoring of environmental and sustainable development programmes. The information generated from audit exercise provides important information to many different stakeholders.

Although seen primarily as a tool in commerce and industry, creative application of environmental auditing techniques can improve transparency and communication in many areas of society where there is a need for greater understanding of environmental and ecosystem interactions. The environmental audit is a systematic process that must be carefully planned, structured and organized. As it is part of a long term process of evaluation and checking, it needs to be a repeatable process which can be readily replicated and can reflect change in both a quantitative and qualitative manner.

Universities and Colleges are regarded as "Small Cities" due to their size, population and the multifarious activities, which have some serious direct and indirect impacts on the local environment.

Campus Green Audit

The campus environmental audit is a common tool that many colleges and universities have employed in recent years. A campus environmental audit is both a summary and a report card for a campus and a way to evaluate where and how resources are being used. An environmental audit is also the first step in being able to quantify whether or not current and/or future environmental efforts are actually making a difference. As such, an environmental audit is the beginning of the sustainability planning process. The results can be used to quantify what kinds of impacts the

campus community has on the environment and what steps the college can take to reduce these impacts.

Green Audit

Green Audit is defined as systematic identification, quantification, recording, reporting and analysis of components of environmental diversity. The 'Green Audit' aims to analyse environmental practices within and outside the Institute, which will have an impact on the eco-friendly ambience and sustainable ecosystem. It is a useful tool that can be used to understand existing practices and resource use to highlight the prospects of introducing resource efficiency in the ecosystem. Green audit provides cognizance on scope for improvement of environment and ecosystem of the campus. Thus, it is imperative that Sakthi College evaluate its own status on environmental sustainability and contributes towards sustainable future.

Pre-Audit Stage

The process of Green Audit started with a pre-audit meeting that has provided an opportunity to reinforce the scope and objectives of the audit. The deliberations focused on the procedures to be followed in conducting the audit. This meeting is an important prerequisite for conducting green audit as it provides the first opportunity to meet and interact with the auditee and deal with any matters of concerns. The meeting was held at Sakthi College during October 2021. The audit protocol and audit plan were discussed in detail and a Green Audit team was constituted with a staff adviser and student members.

a) Preliminary literature review of concepts and methodologies related to green audit.

b) Discussion with the management staff on various systems installed in the campus.

c) Awareness creation and interaction with the staff and student on the

concept of green audit. Walk through the entire campus to understand the nature of water use, energy use and waste management systems in the campus.

Commitment of the College

The College has shown the commitment and keen interest towards conducting green audit and encourages green practices. The College is committed towards Education for sustainability and implementation of sustainable strategies, reducing carbon foot print and effective utilization of waste into wealth.

Goals and Objectives

The goal of Green audit is *"Ensuring Environmental Sustainability (EES) through reducing environmental foot print such as carbon, water, food, and land, management and conservation of the natural resource base, and the orientation of Education for Sustainable Development (ESD) by evolving Institutional policies on various environmental attributes in such a manner as to ensure the attainment and continued satisfaction of human needs for present and future generations".*

Objectives:

- To evolve institutional policies on various environmental attributes such as water, waste and sanitation and to assess the patterns of consumption of energy and water
- To measure the quantum of generation of wastes and hazardous substances
- To evaluate the level of awareness among the students regarding environmental resources

- To inculcate the concepts of 5 R principle such as Reduce, Refuse, Recover, Recycle and Repurpose among the stakeholders, thus making the organization as a better steward,
- To implement environmental management strategies so as to reduce overall environmental foot print.

Benefits of the Green Auditing

• More efficient resource management
• To provide basis for improved sustainability
• To create a green campus
• To enable waste management through reduction of waste generation, solid- waste and water recycling
• To create plastic free campus and evolve health consciousnessamong the stakeholders
• Recognize the cost saving methods through waste minimizing and managing
• Point out the prevailing and forthcoming complications
• Authenticate conformity with the implemented laws
• Empower the organizations to frame a better environmental performance
• Enhance the alertness for environmental guidelines and duties
• Impart environmental education through systematic environmental management approach and Improving environmental standards

• Benchmarking for environmental protection initiatives
• Financial savings through a reduction in resource use
• Development of ownership, personal and social responsibility for the College and its environment
• Enhancement of college profile
• Developing an environmental ethic and value systems in youngsters.
• Green auditing should become a valuable tool in the management and monitoring of environmental and sustainable development programs of the college.

Modules Campus Green Audit

Campus Green Audit (CGA) is a process of resource management. They are individual modules carried out in a defined interval illustrating an overall improvement or change in the institution over a period of time. The concept of Eco-friendly campus mainly focuses on the efficient use of energy and water; minimize waste generation, economic efficiency and reduction in environmental foot print. All these indicators are assessed in the process of Campus Green Audit. The CGA promotes conservation energy, water and waste management. The audit stages are as follows:

I. Pre-audit Stage

II. Audit Stage

a. Audit for various environmental aspects

b. Checking of documents and evaluation

c. Review of Environmental Policy

d. Review of Programmes or Activities

III. Post-audit Stage

a. Land

b. Energy

c. Water

d. Waste

i. Wastewater

ii. Solid Waste

1. E Waste
2. Biomedical waste

e. Food

f. Campus hygiene

IV. Processing of Data Collection as per the template

a. Development of questionnaire format to identify all water/energy using fixtures/ equipment and examine water or energy use patterns for individual buildings in the campus.

b. Collection of secondary data from compilation of electricity bills, collecting records of pumps, generators, water quality analysis reports, civil and electrical etc.

c. Semi-structured interview with maintenance manager, technicians, plumber and housekeeping staff on current situation and the past trends in water consumption, electricity consumption, waste management, waste generation etc.

V. Data Processing and analysis

The existing trends and patterns in water usage, energy usage and waste generation and management is analyzed in this step from the data collected from the previous step.

VI. Audit Recommendations and Reporting

Recommendation - On the basis of results of data analysis and observations, some steps for reducing power and water consumption were recommended. Proper treatments for waste were also suggested. Use of fossil fuels has to be reduced for the sake of community health.

CHAPTER 3

METHODOLOGY

Methods

The data pertaining to various aspects of the environment were collected from primary and secondary sources as per the work sheets given below:

Work sheets

Work Sheet 1 - WATER AUDIT

Table 1: Campus Water Profile

No. of Municipal water connections	:	
No. of Sumps	:	
No. of Storage tanks	:	
No. of Bore wells	:	
Average annual rainfall	:	
No. of Rainwater Harvesting Structures	:	

Table 2: Storage Tanks in the College

S.No.	Location of the Tank	Dimension of the Tanks(M)			Capacity in m^3	No Of tanks In each Location	Total Capacity in Litres
		L	B	H			
1.							
2.							

Table 3: Number and Location of Bore Wells

Sl. No.	Location of the Bore well (Geo-coordinates)	Type of Pump Used (Hp)	Depth of the Borewell	Average depth of the water table
1				
2				

Table 4: Water consumption

Sl. No.	Unit	Population	Water Consumption (L)	Percapita consumption
1	Academics			
2	Hostels			

WORK SHEET 2: LAND AUDIT

Table 5: Land at a Glance (Area in Sq. M).

1.	Total Land area of your College	:	
2.	Open space	:	
3.	Plantation / Green area	:	
4.	Built-up / Constructed Area	:	
5.	No. of Buildings in the campus	:	
6.	Total No. of floors in buildings	:	
7.	Roof Top area	:	
8.	Terrain of the Campus	:	**Plain / Rocky / Undulating**
9.	Ground area	:	
10.	Parking Area	:	

Table 6: Classification Scheme for Land Use Analysis of Built Up Area

Level I	Level II
1. Built-up Area	Dense Moderate Sparse

Table 7: Land Use Data

Categories of Land Use	**Area in Sq. Metres**
Open space and Plantation	
Build up area	
Total	

Table 8: Total Green Cover

S. No.	**Block**	**Place**	**m^2**
1	A	Ground coverage area	m^2
2	B1	Green landscaped area on ground	m^2
3	B2	Play area that has grass on ground	m^2
4	B	Green area on ground (B1 + B2)	m^2
5	C	Play area that is paved/concrete on ground	m^2
6	D	surface parking area	m^2
7	E	Service area on Ground	m^2

Ideally the green area on the ground should be 33% of the total site area,, out of which 15 % should be from green landscape area on ground.

Table 9: Built-Up Area of the Campus

S. No.	Block	Place	Area unit
1	A	Roof and terrace area	m^2
2	B	Green cover on exposed roof and terrace	m^2
3	C	Total built-up / constructed area	m^2
4	D	total number of floors (excluding ground floor)	m^2

WORK SHEET 3

Table 10: Wastewater Discharge from the campus

S. No.	Buildings	Quantity of Water Consumption	Quantity of Wastewater generated in Litres (80%) of water consumption
1.	**Academic**		
	A		
	B		
	C		
2.	**Hostels**		
	A		
	B		
	C		

WORK SHEET 4

Table 11: Waste Audit

S. No.	Does your College segregate solid waste?		Yes		No
	If yes, who segregates the waste atsource?	✓	x	No. of staff	
1.	Students, Teachers and all the staff				
2.	Housekeeping staff (Sweeper)				
3.	Gardner				
4.	Rag Pickers				
5.	Other				
6.	How many categories does your college segregate waste into?	1	2	3	> 3
7.	If your college segregates waste into more than three categories,mention the categories: Dry | Wet | Biodegradable /Non-Biodegradable | E-Waste | Glass | Styrofoam				

Table 12: Biodegradable /Wet waste

S. No.	How much waste does your College generate?	Quantity of solid waste generated (monthly average in kg)
1.	Garden / horticulture waste	
2.	Kitchen waste -------Raw	
3.	Kitchen waste ------Cooked	
4.	Wet waste from classroom etc.	
5.	Total amount of waste	

6.	Per capita waste generation	

Table 13: Dry / Recyclable waste

S. No.	How much waste does your College generate?	Quantity of solid waste generated (Monthly average in kg)
1.	Plastic	
2.	Paper	
3.	Wood or classroom furniture	
4.	Glass	
5.	Metal	
6.	Thermocol	
7.	Tetra packs	
8.	Total amount of waste	
9.	Per capita waste generation	

Table 14: Domestic Hazardous Waste

S. No.	How much waste does your College generate?	Quantity of solid waste generated (monthly average in kg)
1	Hazardous and toxic waste (Paints, Lab waste, etc.)	
2	Oil from diesel generator sets	
3	Total amount of waste	
4	Per capita waste generation	

Table 15: Types of E-Waste

S. No.	Item	Total no. of Items	BEE Star Rating	Working condition	Non-Working condition
1.	TVs				
2.	VCR or DVD players				
3.	Refrigerators and freezers				
4.	Washing machines				
5.	Air conditioners				
6.	Water/Room heaters				
7.	Microwaves /Ovens				
8.	Toasters				
9.	Electric kettles				
10.	Personal computers				
11.	Laptop computer				
12.	Notebook / Pad computes				
13.	Printers				
14.	Copying equipment (Xerox)				
15.	Projectors				
16.	Digital Whiteboards				
17.	Calculators/Fax/Telex				
18.	Telephones				
19.	Mobiles / Mobile Batteries				
20.	Induction cookers				
21.	Batteries condemned				
22.	Bulbs - tube lights and others				

Table 16: Total Quantity of E-Waste

S. No.	How much waste does your College generate?	Quantity generated (monthly average in kg)
1	E-Waste	

Please submit the following supporting documents:

- Certificate of disposing e-waste from authorized dealer/dismantler.

Who collects your e-waste, when not in working condition?

- Scrap dealer
- Taken back by manufacturer / vendor
- Authorized dealer
- Authorized dismantler

How Does Your College Dispose of Waste?

What is the final destination for waste that is disposed of externally from your college? (No points should be given here as dumping waste in landfills are not sustainable practices.)

- Open dumping
- Designated dumping site
- Landfill site

Please upload the following supporting documents on GSP audit portal:

- Picture of housekeeping staff disposing different types of solid wastes.
- Does your college burn waste? ☐ Yes ☐ No
- If yes,

a) Where does your College burn waste?

  - Inside the College / Outside the College

b) What kind of waste is burnt / incinerated?

- Horticultural / Plastic / Tyre / Paper

Table 17: Biomedical Waste

S. No.	How much waste does your College generate?	Quantity of solid waste generated (monthly average in kg)
1	Biomedical waste such as Syringes, band aids, expired medicines etc.	
2	Per capita waste generation	

Table 18: Sanitary Waste

S. No.	How much waste does your College generate?	Quantity of solid waste generated (monthly average in kg)
1	Sanitary waste	
2	Per capita waste generation	

Table 19: C & D Waste

S. No.	How much waste does your College generate?	Quantity of solid waste generated (monthly average in kg)
1	Construction and Demolition waste	
2	Per capita waste generation	

WASTE COLLECTION

Table 20: Waste Collection Points in your College

Area	Total No. of Waste collection points	No. of waste collection points with no bin	No. of waste collection points with one bin (mixed waste)	No. of waste collection points with one bin (for only dry waste)	No. of waste collection points with two bins (wet &dry)	No. of waste collection points with three bins or more)
Classrooms						
Playgrounds						
Common area (e.g. reception, corridors)						
Staff room						
Laboratory						
Canteen						
Clinic/sick room						
Library						
Toilets						
Others						
Total						

Tool tip: collection points are the areas where dusting have been placed.

Table 21: Total Quantity of Waste Treated

S. NO.	Type of Waste	Quantity of waste recycled per month (in Kg, frequency may differ)
1	Garden waste/horticulture waste	
2	Kitchen waste - Raw	
3	Kitchen waste - Cooked	
4	Wet waste from classrooms etc.	
5	Plastic	
6	Paper	
7	Wood, class room furniture	
8	Glass	
9	Metal	
10	Thermocol	
11	Tetra packs	
12	Hazardous and toxic waste (paints, lab waste etc.	
13	Oil from diesel generator sets.	
14	E - waste	
15	Biomedical waste such as syringes, Band-Aids, expired medicines etc.	
16	Sanitary waste	
17	Construction and demolition (C&D)Waste	
18	Total (in Kilograms)	

Table 22: Waste Recycling Practices followed in College

S. No.	Category Waste	Local Scrap collector	Authorized dealer	Dumped at a designated community site	Internal Procedure
1	**Paper** (e.g. used notebooks, used examination papers, subscription newspaper and magazines)				
2	Plastic (e.g. Broken, unusable)				
3	Horticultural waste				
4	E-Waste (e.g. broken, unusable computers)				
5	Hazardous waste				
6	Wood, glass, metal				
7	Biomedical Waste (e.g. waste from nurse room in College such as Band-Aids, syringes..)				

CHAPTER 4

AUDIT STAGE

The Campus Environment Audit was carried out by the Post Graduate and Research Department of Environmental Sciences, Bishop Heber College (Autonomous), Tiruchirappalli, Tamilnadu. The audit team constituted by the management during the pre-audit has done extensive data collection covering all the modules of green audit. The Campus Green Audit team comprises of Co-ordinators, Staff in-charge for each module and student volunteers.

4.1 Campus Green Audit Team

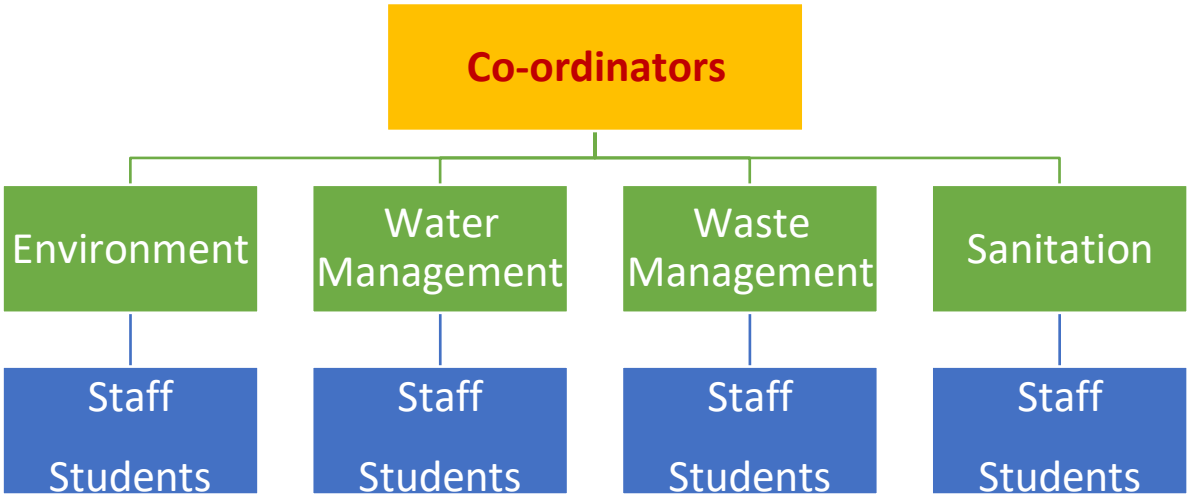


Fig. 6: Campus Environment Audit Team

CHAPTER 5 POST AUDIT STAGE

Post audit

The Campus Environment Audit relies upon findings supported by documents and information. The essence of green audit is to express the environmental policy, environmental organization, environmental management and environmental sustainability. The individual functioning of these components ensure a holistic environmental sustainability.

The Post Audit Stage of the Campus Green Audit comprises of the following environmental components, its baseline information, identification of impacts and strategies for environmental management:

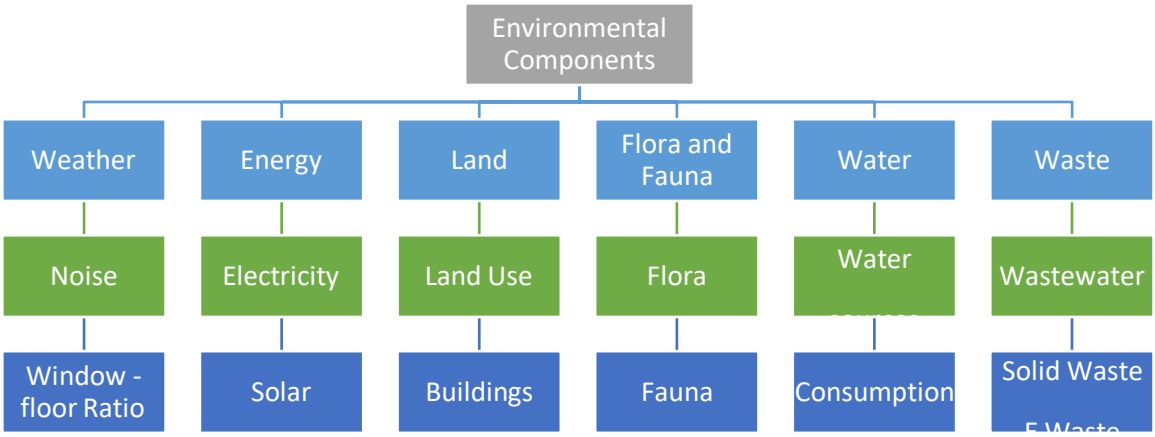


Fig. 7: Environmental Components

Climate

Reddiarchatram area falls under **tropical climate**. The period from April to June is generally hot and dry. The average temperature varies from 26 to 41° C. The humidity is relatively high in the mornings and varies between 65 and 85%.

The temperature in Reddiarchatram ranges from a maximum of 41 °C to a minimum of 26 °C during summer and a maximum of 26 °C to a

minimum of 20 °C during winter. Dindigul receives rainfall with an average of 812 mm (32.0 in) annually. The Southwest monsoon, with an onset in June and lasting up to August, brings scanty rainfall. Bulk of the rainfall is received during the North East monsoon in the months of October, November and December.

The area falls under tropical climate. The period from April to June is generally hot and dry. The average temperature varies from 26 to 41°C. The humidity is relatively high in the mornings and varies between65 and 85%. While in the afternoons it varies between 40 and 70%. Reddiarchatram Firkas receives rainfall from southwest monsoon (June - September), northeast monsoon (October -December) and non-monsoon periods (January -May). The area receives the major rainfall from northeast monsoon and the normal annual rainfall is 885.83mm

Ambient Noise Quality Monitoring

The word noise is defined as unwanted sound that creates annoyance and interferes in conversation disturbs sleep and teaching-learning process, reduce work efficiency, causing stress and challenge to public health and it is a silent killer problem growing day-by-day. Almost all the educational institutes are located near the busy places such as bus-stand, market area, highways/busy roads etc. Therefore, these educational institutes suffer from noises and hence disturbing in school activities like teaching, learning and discussion session.

The ambient noise levels recorded around the College is given in Table 23. The noise standards in educational institutes (maximum allowable noise) such as an area within 100 m from educational institute as prescribed by **TNPCB** are given below.

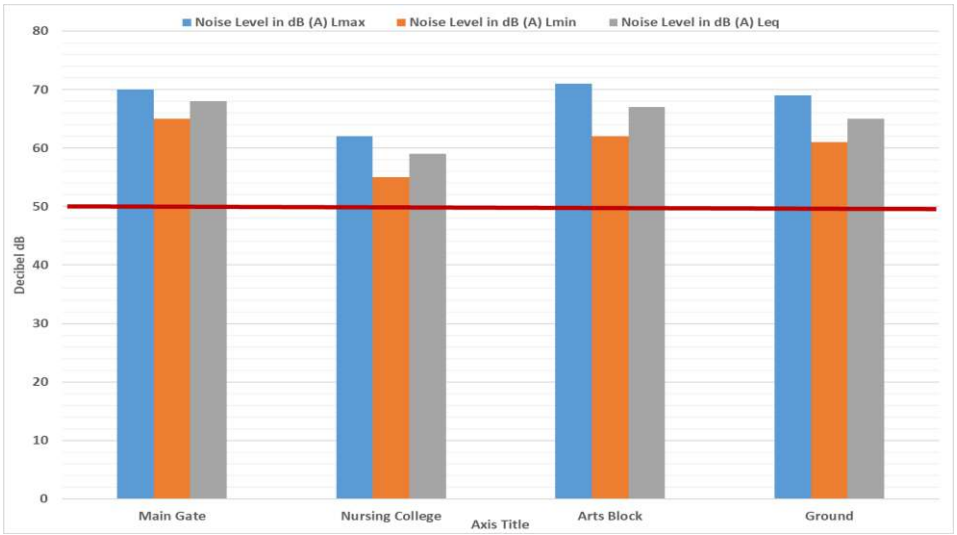
Table 23: Ambient Noise Levels around the College

S. No.	Location	Noise Level in dB (A)		Leq
		L_{max}	L_{min}	
1	**Main Gate**	70	65	68
2	**Nursing College**	62	55	59
3	**Arts Block**	71	62	67
4	**Ground**	69	61	65
Noise Limits in Silence Zone 50 dB(A)				

(Permissible noise level: Outdoor-Below 55 dB (A) & Classroom-35-45 dB (A)

As per **Indian standards** the desirable **noise** pollution for **educational institutions** and hospitals during daytime is 50 dbA. **Noise levels** were measured with a **sound** level meter at 10 points 2 each in north, East, West and South (8- 10 am, 12-2 pm, and 3-5 pm) over two cycles of measurements. The noise levels in all the locations are above the desirable limits which is due to the vehicular movement.

Fig. 8: Ambient Noise Levels



Window - Floor Ratio

Building occupants can enjoy an aesthetically pleasing indoor environment with less lighting energy required if sufficient daylight is available. Effective use of daylight is essential in achieving a sustainable building design (Al-Tamimi *et al*, 2016).

The openings for natural light may range from 10%-100% of the floor area. A study by Al-Tamimi and Syed Fadzil, (2012) suggested an upper limit because in the tropical context, too much light may not be desirable because it can introduce heat and glare problems.

Windows and doors are an important aspect of any house design. They are required for physical and visual connections, but their interaction with heat gain/loss and natural ventilation make them and their design critical to a home's good passive design.

A window-to-floor ratio provides a rough rule of thumb for determining optimum areas of window in relation to the floor area of a room or house. As with all rules of thumb it should only be used as a starting point for a design and firmed up by a skilled designer and computer modeling. This helps in accounting for the complexity of the thermal interactions in a building.

In any house, window type, area, orientation and shading should be jointly considered in order to effectively control the heat gain and heat loss of a building. They will be dependent on the opportunities of the site and the climate it is located in, and should be shaped further by the construction method employed. In temperate climates, higher levels of exposed thermal mass will enable greater areas of windows.

As a general guide, the total **window** area should be less than 25 per cent of the total **floor** area of the house. Most of the **windows** should be located to the north where good solar access is easiest to manage, with minimal amounts on the east and west façade.

Internal environment quality (IEQ) research has understandably focused on the readily measurable aspects of: heat, light, sound and air quality, and although impressive individual sense impacts have been identified, Kim and de Dear, (2012) argue strongly that there is currently no consensus as to the relative importance of IEQ factors. (Fadzi, Tamimi, 2009; Carmody *et al*, 2004, Philips, 2013).

Window - to - Floor ratio of the Class rooms and other rooms have been calculated and are within the norms.

Table 24: Percentage of Floor Area Ventilated

1	2	3	4	5	6	7	8	9		10
17.57	18.16	18.71	20.23	22.4	23.07	25.76	28.77	35.72		38.87

Observation and Comments

1 Ventilation in rooms of different buildings is good and complies with the standards.
2 All the rooms receive optimum lighting.
3 Noise levels were above the desirable limits throughout the campus.
4 Green belt along the periphery of the campus should be established.

CHAPTER 6

WATER

Water use by individuals and institutions is not generally regulated, even though many parts of the country are experiencing droughts or water shortages. Regardless of the region's climate, it is important to conserve water, as groundwater supplies are increasingly depleted and polluted. By cutting back the volume of wastewater and runoff generated by the campus the pollutants entering the local waterways and regional body of water can be cut down.

Campus Population

A college campus contains administrative offices, libraries, class rooms, research rooms, laboratories, food services or cafeteria, guest rooms, recreational and sport facilities, halls, hostels, parking lots pavements, roads, wilderness areas. These are the units of the college campus that constitutes a college community. The units of a campus have been broadly grouped under academic facilities and accommodation facilities. The hostels and the guestrooms come under accommodation facilities, whereas the remaining units will form the academic facilities. The academic and accommodative facilities become functional only in the presence of the students and faculty. They are the backbones of a functional educational institution. All facts of the campus community are critical in facing environmental challenges.

Table 25: Campus Population - Students, Research scholars and Staff

S. No.	Year	Students	Staff			Total
			Teaching	Non-Teaching	Others	
1.	2020 - 21	1088	50	10	10	1158
	Total	1088	50	10	10	1158

Thus the students and faculty including non-teaching staff constitute the campus population. The average population in ICW campus is 2662 inclusive of students and staff.

Sources

The water source of the campus could be classified as local panchayat water supply and Ground water. The panchayat water is being used for potable purposes whereas the ground water is used for all other purposes.

Consumption of Water

The average percapita water consumption of water in academic unit is 75 lpcd with average consumption of 614925 litres.

Table 26: Total Water Demand

	Description	Population/area m2	Domestic Litres per Head per Day		Flushing Litres per Head per Day		Total Water Consumption LPCD	Total Water Requirement (KLD)	WW generation (KLD)
			Demand/Head/Day	Total	Demand/Head/Day	Total			
1	**Staff**	60	25	1500	20	720	2220	22.20	1.89
2	**Students**	1088	25	27200	20	21760	48960	489.60	41.62
3	**Hostel**	10	90	900	45	450	1350	13.50	0.38
		1158		**29600**	**-**	**22930**	**52530**	**525.30**	**43.89**
Total Water Demand say KLD				**296.00**	**-**	**229.30**	**525.30**	**525.30**	**43.89**

Source: Central Ground Water Authority, India

Table 27: Water Consumption - Academics

S. No.	Year	Students	Staff/ Others	Total	Total Water consumption in Litres	Consumption of Water (lpcd)
1.	2020 - 21	1088	70	1158	93798	81.00

Sources of Water Supply

- The sources of water supply for the campus are from 3 bore wells.
- Water is used for drinking purpose, toilets and gardening.
- Total water requirement is 525.30 KLD.
- A total quantum of 93798 liters per day of water is consumed for various purposes after storage in 5 overhead storage tanks.
- The average depth of the bore wells are 1000 feet with available water table at 120 feet.
- The horse power of the motors used for pumping are 5 hp, 7.5 hp & 10 hp.
- Per capita consumption of water is 81 lpcd which slightly above the rural Indian average.

Water Quality Assessment

Safe drinking water is supplied to the students both in the academic buildings and hostels using water purifiers. In order to test the quality of the water samples potable water and ground water samples were collected and tested for selected parameters. The results shows that all the parameters are within the limits except total hardness and calcium which are higher than the permissible limits of BIS.

However, the results shows that the RO unit in the college and hostel are not in good condition and should be maintained properly. There is no reduction in hardness calcium, magnesium and other ions. Hence, either the RO unit should be attended immediately.

Table 28: Results of Water Analysis

S. No.	Parameters	College Bore	RO	Hostel Bore	Hostel RO	BIS- Std (mg/L)
1.	pH	7.77	7.72	7.47	7.60	**6.5-8.5**
2.	EC (µ Mho)	1196.00	1226.00	1168.00	1168.00	
3.	TDS (mg/L)	598.00	563.00	584.00	584.00	**500-2000**
4.	Alkalinity (mg/L)	50.00	50.00	60.00	60.00	**250**
5.	TH (mg/L)	630.00	670.00	635.00	635.00	**600**
6.	Ca (mg/L)	200.40	210.42	230.46	220.44	**200**
7.	Mg (mg/L)	29.16	35.23	14.58	20.65	**100**
8.	Cl (mg/L)	95.71	120.53	124.07	124.07	**250-1000**
9.	Fl (mg/L)	0.42	0.06	0.32	0.43	**1-1.5**
10.	Phosphate(mg/L)	0.04	0.03	0.02	0.04	**0.1**
11.	Nitrate (mg/L)	1.20	1.30	2.30	2.10	**200**
12.	BOD (mg/L)	3.24	1.64	3.24	3.24	**30**
13.	COD (mg/L)	16.00	8.00	16.00	8.00	**250**
14.	DO (mg/L)	7.30	7.69	7.70	6.40	

Rain Water Harvesting

Rainwater harvesting is an important environment friendly approach. It is a Green Practice having double benefit of keeping the groundwater level undisturbed and charging the aquifer. Rainwater and run-off water, stored in a planned way, can save the earth from soil erosion and flood and recharge the aquifers to increase the groundwater level.

The objectives are to increase recharge of groundwater by capturing and storing rainwater, by rainwater harvesting from rooftop run-offs and to store the water for gardening & washing purpose.

The College has a large rain water harvesting pit near the canteen, the entire campus has a good drainage pattern and the terrain is undulating, the campus rain water harvesting is practiced.

Calculation

The rain water collected in an area can be calculated as per the following formula:

Total rain water collected in litres	=	mean annual rainfall in mm x area in m² x runoff factor
Mean Annual rainfall in Reddiarchatram Firka	=	886 mm
Runoff Coefficient	=	0.8

Ref:
Plan on Artificial Recharge to Groundwater and Water Conservation in Reddiarchatram Firka, Dindigul Taluk, Dindigul District, Tamil Nadu by Central Ground Water Board South Eastern Coastal Region Rajaji Bhawan, Besant Nagar Chennai 30 . 2009
cgwb.gov.in/AR/AR-PLans/Tamil%20Nadu/Dindigul%_final9.pdf

members for a period of four months.

A Guide to Techniques of Water conservation and Management, UNDP India 2008

Table 29: Rainwater collected in campus

S. No.	Building	Roof Top Area (Sq. M)	Runoff factor	Rain water in Litres	Rain water in cu.m
1.	Academic	2722.19	0.8	1929488.27	1929.49
2.	Hostel	1500.00	0.8	1063200.00	1063.20
3.	Guest house	611.00	0.8	433076.80	433.08
4.	Canteen	112.00	0.8	79385.60	79.39
	Total	4945.19	0.8	3505150.67	350.51

Total rainwater collected through the roof top of the campus is 350.51 cu.m.

Observation and Comments

1. The percapita consumption of water is 81 lpcd in the academic buildings
    a. The Indian average per capita consumption of potable water for rural area is 70 - 80 lpcd and urban / semi urban area is 120 - 135 lpcd.
2. The per capita consumption is well within the Indian average.
3. The campus has 4 storage tanks which are spatially distributed in the campus and is adequate for the students in the campus.
4. The results of water quality assessment shows that the water quality parameters are within the standard limits prescribed by Bureau of Indian Standards (BIS) except Total hardness and calcium.
5. Both campus and building Rainwater harvesting is practiced.
6. Total quantity of rain water collected is 350.51 cu. m

CHAPTER 7

WASTE

AUDIT

Waste

The sustainable development requires that the generation of waste is avoided, or where it cannot be avoided, that it is reduced, re-used, recycled or recovered and only as a last resort treated and safely disposed.

Wastewater

Water is an important element for all living organisms. Water is so essential that without water human cannot survive. Most of the reactions which occur in the living cells and the non-living environment involve the medium of water. Man uses water for various purposes; it includes drinking, cooking, bathing, washing, heating, air-conditioning, industrial processing, power generation and other recreational purposes. (Nandakumar, 1988).

Once the water is used, it becomes a waste because of the various impurities mixed with the water which changes the quality of water. In other words, water becomes waste water which may be defined as "combination of the liquid-or water-carried waste removed from residences, institutions, commercial and industrial establishments, together with such groundwater, surface water, and storm water as may be present" (Metcalf & Eddy, 1991). The components of the waste water depend on the community which may include the following:

1. **Domestic (also called sanitary) wastewater:** Waste water discharged from residences and from commercial, institutional, and similar facilities.

2. **Industrial waste water:** Waste water in which industrial wastes predominate.

3. **Infiltration /inflow:** Water that enters the sewer system through

indirect and direct means. Infiltration is extraneous water that enters

the sewer through leaking joints, cracks and breaks, or porous walls. Inflow is the storm water that enters the sewer system from storm drain connections (catch basins), roof leaders, foundation and basement drains, or through manhole covers.

4. **Storm water:** Runoff resulting from rainfall.

The untreated waste water, if allowed to accumulate, leads to the production of large qualities of malodorous gases, and also cause diseases through the pathogenic microorganisms. It can stimulate the growth of aquatic plants and also contains toxic compounds. For these reasons, the immediate and nuisance-free removal of waste water from its sources of generation, followed by treatment and disposal is not desirable but also necessary.

Wastewater Generated from the Campus

The total quantum of wastewater generated from the campus is depicted in the Figure 7.1.

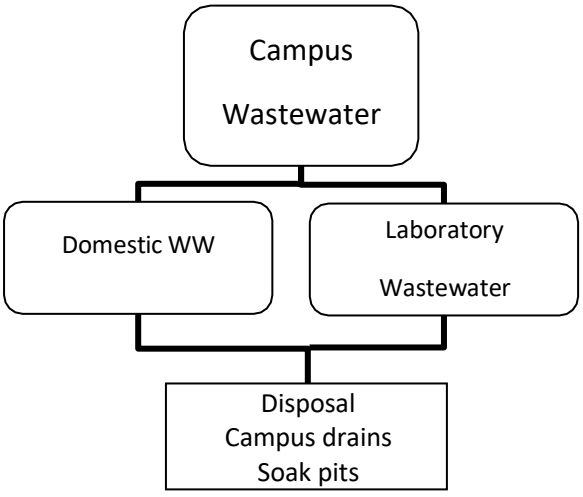


Fig. 9: Quantity of Wastewater

Wastewater generated in the campus are reused for gardening purposes.

Solid Waste

Solid waste substances are those materials which become waste after short period of their use as newspapers packing wrappers etc., different types of cans, bottles, broken glass wares plastic containers, polythene bags, ashes and domestic garbage. These discarded solid substances after their uses are variously called as Refuse, Garbage, Rubbish solid waste etc.

Solid waste, often called the third pollution after air and water pollution is that material which arises from various human activities and which is normally discarded materials from the urban community as well as the more homogenous accumulation of other wastes.

Waste is the raw material located at a wrong place. It can be converted into useful products by making use of appropriate processing technologies. Many of the waste are at presently reused in uneconomic manner or left completely unutilized causing great hazards to the human environment.

Table 30: Biodegradable Waste

S. No	Type of Waste Generated in the Campus	Quantity of solid waste generated (Monthly averagein kg.)
1	Garden/ horticulture waste	95 Kg/ Mon
2	Kitchen waste - Raw	60 Kg/ Mon
3	Kitchen waste - Cooked	45 Kg/ Mon
4	Wet waste from Classroom etc.,	0.5 Kg/ Mon
5	Total amount of waste	190.50 Kg/ Mon

Table 31: Dry / Recyclable waste

S. No	Type of Waste Generated in the Campus	Quantity of solid waste generated (Monthly average in kg.)
1	Plastic	0.85 Kg/ Mon
2	Paper	115 Kg/ Mon
3	Wood or Classroom Furniture	Reused for other purposes
4	Glass	NIL
5	Metal	1.2 Kg/ Mon
6	Thermocol	NIL
7	Tetra packs	Not used in the campus

Table 32: Domestic Hazardous Waste

S. No	Type of Waste	Quantity of solid waste generated (Monthly average inkg.)
1	Hazardous and Toxic Waste (Paints, Lab waste etc.,)	Paints- taken away by contractors Lab wastes - incinerated
2	Oil from Diesel Generator sets	Negligible
3	Total amount of waste	NIL

Table 33: E-Waste

S. No	Type of waste	Quantity of solid waste generated (Monthly average in kg.)
1	E waste	3

Biomedical Waste

Biomedical wastes generated from the departments of chemistry and zoology is discharged as per the schedule of Biomedical Waste (Handling

and management) Rules, 2016. Handling of live specimens is stopped and

only virtual dissections are implemented in the department of zoology. Laboratory wastewater from the department of Chemistry and zoology are neutralized and discharged in to the common drainage systems of the campus.

Table 34: Biomedical Waste

S. No	Type of Waste	Quantity of solid waste generated
1.	Biomedical waste	Negligible
2.	Sanitary Waste	16 kg / Month
3.	Construction Demolition waste	Reused

Table 35: Waste Recycling Practices followed in College

S. No	Category Waste	Dumped at a designated Community Site/ Internal Procedure
1	Paper	Collected in collection room & sold to vendors
2	Plastic	Local scrap dealer
3	Horticultural Waste	Vermicompost
4	E-Waste	Local scrap dealer
5	Hazardous waste	Laboratory wastes incinerated
6	Wood, Glass, Metal	Collected in collection room & sold to vendors
7	Biomedical Waste	Cotton & Incinerated

Observation and Comments

1. The wastewater generated in the campus is 79645 litres which is normal
2. Biodegradable waste generated per month is negligible, dry waste 190.50 Kg/ Mon. Sanitary waste generation is 16 kg/month. The campus does not produce hazardous waste.
3. The quantity of solid wastes generation are within the limits as per the MSWM Rules, 2000.

CHAPTER 8

FOOD AUDIT

Eat good Food for good Health

Good food is all around us. For generations, Indians have incorporated biodiversity in their daily food-using millets instead of wheat or rice, eating vegetables sourced from forests rather than farms, eating local food, and changing their diet with changing seasons.

- India is one of the biodiversity-rich countries and home to nearly 12 per cent of the world's plant species. People in the biodiversity-rich areas have an immense understanding of the plants that grow around them. Each region of the country has its special cuisine based on the plants available in the area.

- Many bio-diverse foods have medicinal properties. They are rich in micronutrients, help people fight disease and keep them healthy in changing seasons. It was for food that people protected their environment. When crops were cultivated, they were grown naturally, without the use of agrochemicals. In rural areas, people often do not have to buy food and this provides nutrition security. There is some evidence that people living in places where food is available in traditional sources are healthier.

- Access to good food has decreased drastically. Most traditional food cannot be stored and it is difficult to market them. People no longer have access to forests and kitchen gardens are fast disappearing, particularly in urban areas. In many places, environmental damage has decimated the biodiversity.

Child Health and Food Policy

Food has been at the centre of policy debate in India for many years, as more than 20 per cent of the country's population suffers from under nourishment. India ranks 97th out of 118 countries in the 2016 Global Hunger Index and has further pushed to 102nd out of 117

qualifying countries in 2019 with a score of 30.3. India suffers from a level of hunger that is serious.

https://www.globalhungerindex.org/results.html

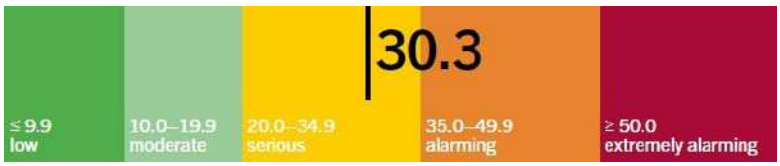


Fig. 10: Global Hunger Index - India

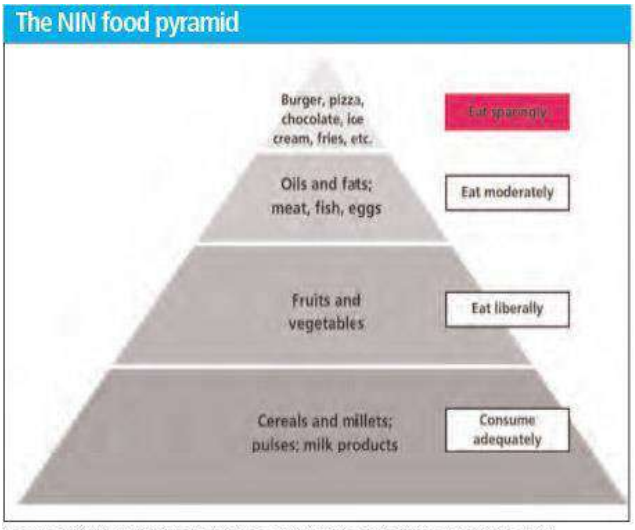
It ranks 120thamong 128 countries with data on under nutrition during 2009-13; 30.7 per cent of the country's children are underweight (an improvement from 43.5 per cent in 2005-06). Data from targeted studies show an alarming trend. The HUNGaMA (Hunger and Malnutrition) report covering 112 worst-performing districts in nine states tells us that 42 per cent children are underweight, 58 per cent are stunted and 11.4 are 'wasted' by the age of 24 months.

Meanwhile, childhood obesity is also alarmingly on the rise globally as well as in India. The International Obesity Task Force (IOTF) of WHO estimates that 10 per cent of children aged 5-17 years worldwide are overweight.

India therefore faces a peculiar crisis that spans both ends of the spectrum of nutritional disorders—while 30.7 per cent of the country's children are underweight, according to the International Association for the Study of Obesity's world map of obesity, overfeeding is evident as overweight and obesity has been recently on the rise and is present in 20.6 per cent boys and 18.3 per cent girls in India.

Given India's dubious distinction of carrying the twin burden of under nutrition and overfeeding, we need to be extra cautious. In a bid to beat hunger, we are losing out to the deadly parasite of ultra-processed

food, without realizing how harmful it actually is. Yes, craving for ultra-processed food is a global epidemic.



Source: Dietary Guidelines for Indians, 2011, National Institute of Nutrition (NIN)

Recommended Daily Allowance (RDA) for a 10- to 12-year-old moderately active child

Nutrient/energy	RDA
Energy (E)	2,100 kilocalorie*
Sugar	Up to 30 g
Total visible fat	35 g [~15%E]
Saturated fatty acids (SFA)	Up to 8% E
Trans-fatty acids (TFA)	< 1% E
Salt	5 g
Protein	34g/day
Carbohydrates	130g/day

kote: *Average for calculation purpose [2,190 kcal for a boy weighing 34.3 kg and 2,010 kcal for a girl weighing 35 kg]; calorie calculation; 1 g of fat=9 kcal; 1g of protein = 4 kcal
Source: Dietary Guidelines for Indians, 2011, National Institute of Nutrition

Fig. 11: Food Pyramid and Recommended Daily Allowance

Table 36: Food Categorization for College Canteen Policy

GREEN	**Always on menu**	Vegetables and legumes, fruits, grain (cereal) foods; mostly whole grain and/or high in fibre, learn meat, egg, fish etc.
YELLOW	**Select carefully** Approach should be greening, small portion size and reduced frequency.	Baked vegetable-based snacks, Ice creams, milk-based ices and dairy desserts etc.
RED	**Not on menu** Banned from Colleges as they are high in fat, salt and sugar.	Energy drinks, carbonated and other sweetened beverages, fried packaged foods, chocolates, potato fries

The fat of the matter:

The highest level of total fat was found in an Indian snack (Haldiram'saaloobhujia): 37.8 gm/100 gm of the sample (Centre for Science and Environment)

- Trans-fat content was the highest in french fries (8.1 per cent of the total fat), followed by instant noodles (4.6 percent of the total fat) and potato chips (4.5 per cent of the total fat).
- Salt content was the highest in instant noodles (3.7 gm/100 gm of sample). Eating a packet of instant noodles, therefore, will cover about half of the daily salt quota. The salt content is not declared by the companies on the label
- The highest level of carbohydrates was detected in Top Ramen noodles at 73.3 gm per 100 gm.

Table 37: Food Items Served in the College

S. No.	Packaged Food Items	Flavours / variants available	Variants	No. of items sold /Day
1	Savoury snacks and similar packaged food like chips, and Haldirams.	9	Bourbon, Milk bikis, Marie gold, Good Day, Treat, Oreo, Cake, Little heart, 50-50	100
2	Potato fries and burgers	Nil		
3	Confectionery (Chocolates, Candies, gums)	8	Chocolaes, Dairy milk, Miky bar, Munch, Kitkat, 5 Star, Perk, Candies and Gums	150
4	Ice cream	5	Gulfi, Cone Cone, Orange, Grapes, Vennila	10
5	Carbonated beverages	Nil		
6	Sugar sweetened non-	2		50

	carbonated beverages			
7	Packages / bottles Maza/lassi/flavoured milk	5		50
8	Packaged / bottled energy drinks	Nil		

Table 38: VARIETIES OF TRADITIONAL INDIAN FOOD ITEMS (Especially Non-Packaged) Served in the College

S. No.	Traditional Indian Snacks	Number of servings
1	Samosas	65
2	Idli/Dosa and Sambhar	45
3	Pavbhaji	Nil
4	Momos	22
5	Others/Chapathi	25

Fig. 12: Food Items Served in the College

Table 39: TRADITIONAL INDIAN BEVERAGE ITEMS

S. No.	Traditional Indian beverages	Number of plates
1	Lemon / Orange / Pomegranate Juice	20
2	Sweet lassi	10
3	Salted buttermilk	15
4	Tea	55
5	Coffee	30

Balanced Diet

According to the 'Dietary Guidelines for Indians, 2011' of the National Institute of Nutrition (NIN), a balanced diet is one that provides all nutrients in required amounts and proper proportions. It should provide around 50-60 per cent of the total calories from carbohydrates, about 10-15 per cent from proteins and 20-30 per cent from both visible and invisible fat. In addition, it should provide other non-nutrients such as dietary fibre and antioxidants that bestow positive health benefits.

Observations and comments:

1. Food and beverage items served in the college canteen are traditional and prepared and served in hygienic manner.

CHAPTER 9

CONCLUSION AND RECOMMENDATIONS

Conclusion

Environment Audit is the most efficient way to identify the strength and weakness of environmentally sustainable practices and to find a way to solve problem. Green Audit is one kind of professional approach towards a responsible way in utilizing economic, financial, social and environmental resources. Green audits can "add value" to the management approaches being taken by the college and is a way of identifying, evaluating and managing environmental risks (known and unknown).

There is scope for further improvement, particularly in relation to waste, energy and water management. The college in recent years considers the environmental impacts of most of its actions and makes a concerted effort to act in an environmentally responsible manner. Even though the college does perform fairly well, the recommendations in this report highlight many ways in which the college can work to improve its actions and become a more sustainable institution.

Observations

Campus Green audit is a guide to assess environmental quality and creating strategies for change. Some of the very salient observations and important strategic changes to be implemented in the college are as follows:

1 Ventilation in rooms of different buildings is good and complies with the standards.
2 All the rooms receive optimum lighting.
3 Noise levels were above the desirable limits throughout the campus.
4 Green belt along the periphery of the campus should be established.
5 As per **Indian standards** the desirable **noise** pollution for **educational institutions** and hospitals during daytime is 50 dbA.

6 The percapita consumption of water is 81 lpcd in the academic buildings. The Indian average per capita consumption of potable water for rural area is 70 - 80 lpcd and urban / semi urban area is 120 - 135 lpcd.

7 The per capita consumption is well within the Indian average.

8 The campus has 4 storage tanks which are spatially distributed in the campus and is adequate for the students in the campus.

9 The results of water quality assessment shows that the water quality parameters are within the standard limits prescribed by Bureau of Indian Standards (BIS) except Total hardness and calcium.

10 Both campus and building Rainwater harvesting is practiced.

11 Total quantity of rain water collected is 350.51 cu. m

12 The wastewater generated in the campus is 79645 litres which is normal

13 Biodegradable waste generated per month is negligible, dry waste 190.50 Kg/ Mon. Sanitary waste generation is 16 kg/month. The campus does not produce hazardous waste.

14 The quantity of solid wastes generation is within the limits as per the MSWM Rules, 2000.

15 Food and beverage items served in the college canteen are traditional and prepared and served in hygienic manner.

Recommendations

1) The principles of Reduce, Reuse and Recycle can be encouraged among the students, teachers, non-teaching staff, support staff and all the stakeholders of the College.

2) For an effective recycling of wastepaper, a paper recycling unit may be established.

3) E waste and laboratory waste management plan should be developed and implemented.

4) Maintenance of water tanks and RO plants should be done regularly.

5) Butterfly garden may be developed to arouse appreciation towards floral and faunal diversity.

6) Trees and plants can be named with its common name and scientific name wherever possible. *(Avoid nailing name tags)*

7) Total Replacement of CFL with LED. Donate used Tube lights and CFL to educational institutions in need.

8) Conduct quarterly Campus Environmental Audit for water, energy and waste.

CHPATER 10

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