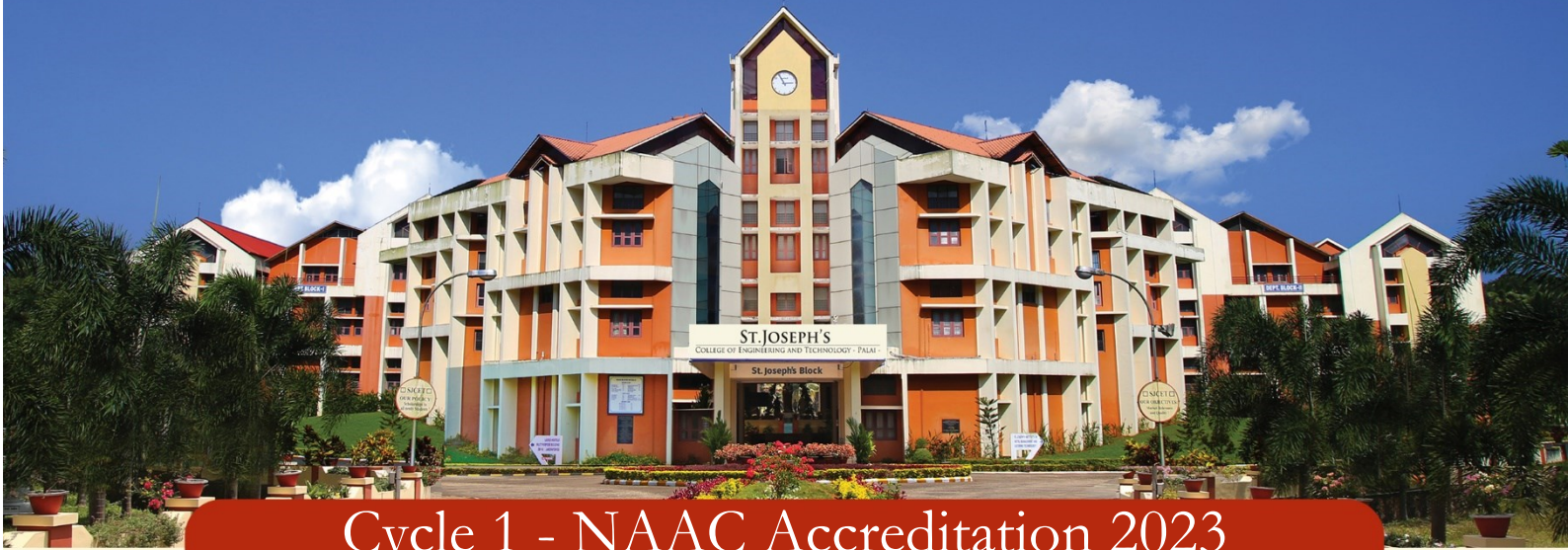




ST. JOSEPH'S

COLLEGE OF ENGINEERING
AND TECHNOLOGY,
- PALAI -

Choondacherry P.O., Palai, Kottayam Pin 686579, Kerala, India
Phone: +91 4822-239700, 239301, 239302
Email: info@sjcetpalai.ac.in • Website: www.sjcetpalai.ac.in



Cycle 1 - NAAC Accreditation 2023

Criterion – 7.1.3

Green and Energy Audit Report

Submitted to:



National Assessment and Accreditation Council



Green & Energy Audit Report

Internal Quality Assurance Cell (IQAC)



Contents

1.0 Introduction

1.1 Background

1.2 Green Audit

1.3 Methodology

2.0 Water Audit

3.0 Energy Audit

4.0 Waste Audit

5.0 Summary of Findings & Recommendations



1.0 INTRODUCTION

1.1 Background

St. Joseph's College of Engineering and Technology, Palai (in short - SJ CET), is a technical educational institution located in a beautiful village Choondacherry and near to Pala town and is affiliated to APJ Abdul Kalam Technological University, Kerala. The college was established in 2002 by the Diocesan Technical Education Trust of the Catholic Diocese of Palai. It was conferred with the status of the minority community institution by the Government of India in 2008, with an area of 58 acres, campus presently offering eight UG and six PG courses. The campus includes administrative block, six academic blocks, library, canteen, two auditoriums, four hostels, chapel and quarters for Principal and staff. The campus has strength of 149 staff, 63 non-teaching staff and 2150 students. The canteen is equipped to provide food for about 300 persons per day. The major water source is well, bore well and rainwater harvesting. The college motto is '*A College With A Difference*'. The lush green gardens and well-designed infrastructure provide the perfect ambience for learning, sharing and development of the students.

Table 1.1 Key facts about the site

Name of the Project	St. Joseph College of Engineering and Technology, Palai
Address	SJ CET, Palai, Choondacherry P.O, Bharanganam, Kottayam. PIN 686579, Kerala, India.
Average Annual Rainfall	3000mm
Water Source	Well, Bore well, Rain water harvesting, Natural ponds
Waste Treatment System	2 Nos of Biogas Plant
Average daily water demand	~200 kilo litres
Average daily energy demand	~1850 kWh
Average daily waste produced	~490 kg



ST. JOSEPH'S

COLLEGE OF ENGINEERING
AND TECHNOLOGY,
- PALAI -

SJCET Palai Campus Layout



Figure 1.1. Location of St. Joseph College, Palai



1.2 GREEN AUDIT

Green Audit is a process of systematic identification, quantification, recording, reporting and analysis of components of environmental diversity of various establishments. It aims to analyze environmental practices within and outside of the concerned sites, which will have an impact on the eco-friendly ambience. Green audit can be a useful tool for a college to determine how and where they are using the most energy or water and other 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. If self-enquiry is a natural and necessary outgrowth of a quality education, it could also be stated that institutional self-enquiry is a natural and necessary outgrowth of a quality educational institution. 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 prevalent. The rapid urbanization and economic development at local, regional and global level has led to several environmental and ecological crises. On this background it becomes essential to adopt the system of the Green Campus for the institutes which will lead for sustainable development and at the same time reduce a sizable amount of atmospheric carbon-di-oxide from the environment. The National Assessment and Accreditation Council, New Delhi (NAAC) has made it mandatory that all Higher Educational Institutions should submit an annual Green Audit Report. Moreover, it is part of Corporate Social Responsibility of the Higher Educational Institutions to ensure that they contribute towards the environment.

Commitment of the College Management

SJCET has shown the commitment towards nature to maintain a green and absolutely clean campus. College is very much dedicated to preserve the eco-systems and live in harmony with nature. Institution has the policy to use only wooden furniture in the college and hostels. College is ready to encourage all green activities and planned to conduct green audit every year. It was decided to promote all activities that are environment friendly such as awareness programs on the environment, campus farming, planting more trees on the campus etc., after the green auditing. The management of the college was willing to formulate policies based on green auditing report.



Scope and Goals of Green Auditing

A clean and healthy environment aids effective learning and provides a conducive learning environment. There are various efforts around the world to address environmental education issues. Green Audit is the most efficient and ecological way to manage environmental problems. It is a kind of professional care which is the responsibility of each individual who are the part of economical, financial, social, environmental factor. It is necessary to conduct green audit in college campus because students become aware of the green audit, its advantages to save the planet and they become good citizen of our country. Thus Green audit becomes necessary at the college level. A very simple indigenized system has been devised to monitor the environmental performance of St. Josephs College of Engineering and Technology, Palai. It comes with a series of questions to be answered on a regular basis. This innovative scheme is user friendly and totally voluntary. The aim of this is to help the institution to set environmental examples for the community, and to educate the young learners.

Benefits of Green Auditing

- For providing a framework for enhanced sustainability.
- To build a green campus.
- To enable waste management through reduction of waste generation & water recycling.
- To create plastic free campus.
- 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.
- Benchmarking for environmental protection initiatives.
- Financial savings through a reduction in resource use.
- Development of 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.

1.3 METHODOLOGY

The purpose of the green audit of St. Josephs College of Engineering and Technology, Palai is to ensure that the practices followed in the campus are in accordance with the Green Policy adopted by the institution. The methodology include: preparation and filling up of questionnaire, physical inspection of the campus, observation and review of the document, interviewing responsible persons and data analysis, measurements and recommendations. The green audit is conducted by 'Haritha Keralam Mission', Thiruvananthapuram. Mission Haritha Keralam aims to ensure that no havoc is wrecked to our Water sources, Earth, Air, Soil and Water. The mission also assures water opulence in its sources in the purest and pristine form with a perennial availability. Under this scheme the production of safe and non-toxic food products is another domain. The mission aims to take measures at the grass root level to combat challenges like climate change, global warming, water pollution, disruptions in the weather patterns. It is a public-centric Mission designed to be implemented under the stewardship of the local self-governing bodies encompassing voluntary organizations, NGOs, social activists, environmentalists, students, youths and other discerning individuals and groups.

The methodology adopted for this audit was a three step process comprising of:

1. **Data Collection** – In preliminary data collection phase, exhaustive data collection was performed using different tools such as observation, survey communicating with responsible persons and measurements.

Following steps were taken for data collection:

- The team went to each department, centres, Library, canteen etc.
 - Data about the general information was collected by observation and interview.
2. **Data Analysis** - Detailed analysis of data collected with the standards.
 3. **Recommendation** – On the basis of results of data analysis and observations, Grade is awarded to the institute based on the score achieved.



Site Inspection and Audit

Green audit forms part of a resource management process. Although they are individual events, the real value of green audits is the fact that they are carried out, at defined intervals, and their results can illustrate improvement or change over time. Eco-campus concept mainly focuses on the efficient use of energy and water; Minimize waste generation or pollution and also economic efficiency. All these indicators are assessed in process of “Green Auditing of educational institute”. Eco-campus focuses on the reduction of contribution to emissions, procure a cost effective and secure supply of energy, encourage and enhance energy use conservation, promotes personal action, reduce the institute’s energy and water consumption, reduce wastes to landfill, and integrate environmental considerations into all contracts and services considered to have significant environmental impacts.

St. Josephs College of Engineering and Technology, Palai has got a score of 85 which makes the college in B- grade category. The auditing agency (Haritha Keralam Mission) has suggested with different remark to improve the current grade to higher grade. The college has adopted the ‘Green Campus’ system for environmental conservation and sustainability. There are main three pillars i.e. zero environmental foot print, positive impact on occupant health and performance and 100% graduates demonstrating environmental literacy. The goal is to reduce, energy and water use, while creating atmosphere where students.

Follow Up Action and Plans

The base of any green audit is that its findings are supported by documents and verifiable information. The audit process seeks, on a sampled basis, to track past actions, activities, events, and procedures to ensure that they are carried out according to systems requirements and in the correct manner. Green audits form a part of a process. Although they are individual events, the real value of green audits is the fact that they are carried out, at defined intervals, and their results can illustrate improvement or change over time. Although green audits are carried out using policies, procedures, documented systems and objectives as a test, there is always an element of subjectivity in an audit. The essence of any green audit is to find out how well the environmental organisation, environmental management and environmental equipment are performing. Each of the three components are crucial



in ensuring that the organisation's environmental performance meets the goals set in its green policy. The individual functioning and the success of integration will all play a role in the degree of success or failure of the organisation's environmental performance.

Green Audits are exercises which generate considerable quantities of valuable management information. The time and effort and cost involved in this exercise is often considerable and in order to be able to justify this expenditure, it is important to ensure that the findings and recommendations of the audit are considered at the correct level within the organisation and that action plans and implementation programs result from the findings.

Audit follow up is part of the wider process of continuous improvement. Without follow-up, the audit becomes an isolated event which soon becomes forgotten in the pressures of organisational priorities and the passing of time.

The green audit assists in the process of testing performance in the environmental arena and is fast becoming an indispensable aid to decision making in a college. The green audit reports assist in the process of attaining an eco-friendly approach to the sustainable development of the college. St. Josephs College of Engineering and Technology, Palai has got a B-grade certificate with a score of 85. The results presented by 'Haritha Keralam Mission' in the green auditing 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. A few recommendations are added to curb the menace of waste management using eco-friendly and scientific techniques. This may lead to the prosperous future in context of Green Campus and thus sustainable environment and community development. It has been shown frequently that the practical suggestions, alternatives, and observations that have resulted from audits have added positive value to the audited organisation. An outside view, perspective and opinion often helps staff who have been too close to problems or methods to see the value of alternative approaches. A green audit report is a very powerful and valuable communications tool to use when working with various stakeholders who need to be convinced that things are running smoothly and systems and procedures are coping with natural changes and modifications that occur.



Common Recommendations from Haritha Keralam Mission

- Adopt an environmental policy for the college
- Establish a purchase policy for environmental friendly materials
- Conduct more seminars and group discussions on environmental education
- Students and staff can be permitted to solve local environmental problems
- Renovation of cooking system in the canteen to save gas
- Establish water, waste and energy management systems

2.0 WATER AUDIT

A water audit is a systematic review of a site to identify opportunities to improve its water use efficiency. The site may be a public water utility, facility (institutional or commercial properties like malls, office, schools etc.) or a household. Audit recommendations are developed based on surveys and assessments of water-using hardware, fixtures, equipment, landscaping, and management practices at the site. Water audit involves tracking, assessing and validating all components of flow from the site of withdrawal or treatment through the water distribution system and into the consumer's properties. Water auditing examines the major areas of water use, including human consumption, personal hygiene & sanitation, washing, cleaning, laundry, gardening etc. Water auditing is an on-going process and rarely stays consistent in a site or system over time. Therefore, in order to gauge progress from adopted water conservation and cutbacks, water audit should be performed on a regular basis. In addition, it provides convincing overview of the water use trends, effectiveness of conservation measures and potential cost and water savings.

2.1 WATER SUPPLY

Around 200 kilo litres of water is used in the campus daily. Source of water for the entire campus is wells, bore wells, natural ponds and rain water harvesting.



Figure 2.1 Bore well

2.2 WATER USE DIAGRAM

The various blocks of SJ CET campus such as Mother Theresa block, Einstein block, Newton block, St. John Paul block, store, chapel, St. Francis hall, library, canteen, St. Thomas hostel, St. Augustine hostel, St. Alphonsa Hostel, Seminar halls, Staff quarters were surveyed in this study with the questionnaire developed based on literature review and observations and discussions during the pre-audit phase. Figure 2.2 shows the water usage by various activities of SJ CET campus based on the survey. It can be seen that Gardening (15%), toilet flushing (3%), Bathing (15%), Washing clothes (15%), Cooking (10%), Dishwashing (10%), and Wash basin (4%) are the activities that dominates water usage. There were no leakages that were observed or reported during the audit exercise at SJ CET.

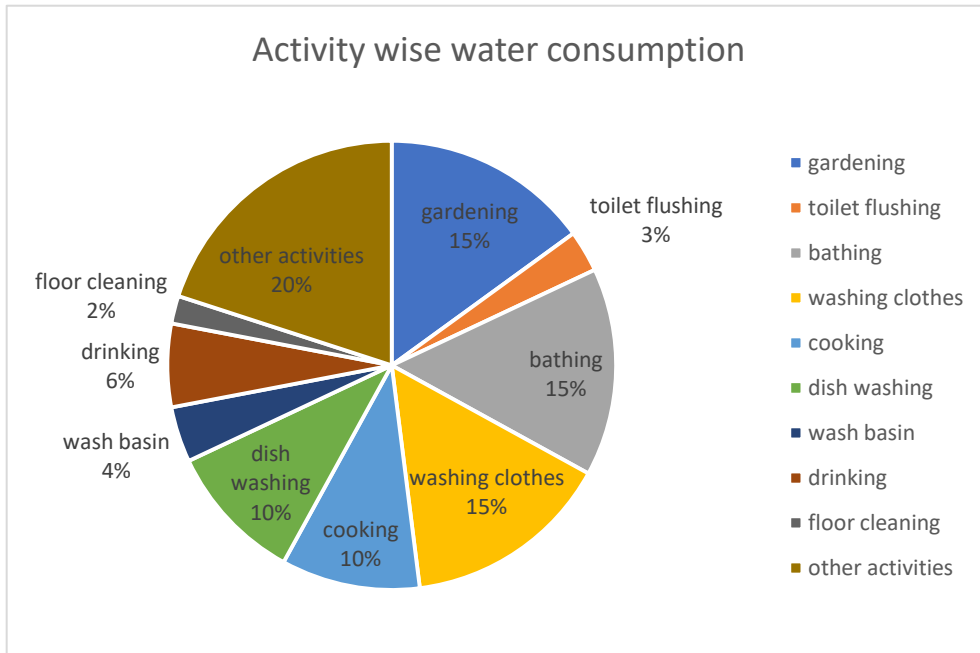


Fig 2.2 Composition of total water use at SJ CET (in percentage)

3.0 ENERGY AUDIT

The Energy Audit was conducted to know the usage trends of electricity in the Campus. Solar power and KSEB supply are being used in the campus. Recently 100KWA solar power generation station was added to the facility and greatly facilitated for reduction in the usage of KSEB power. Arrangements are there for giving the campus generated electricity to the KSEB Network by the name of Wheeling to the Grid.



Fig 3. Solar power plant

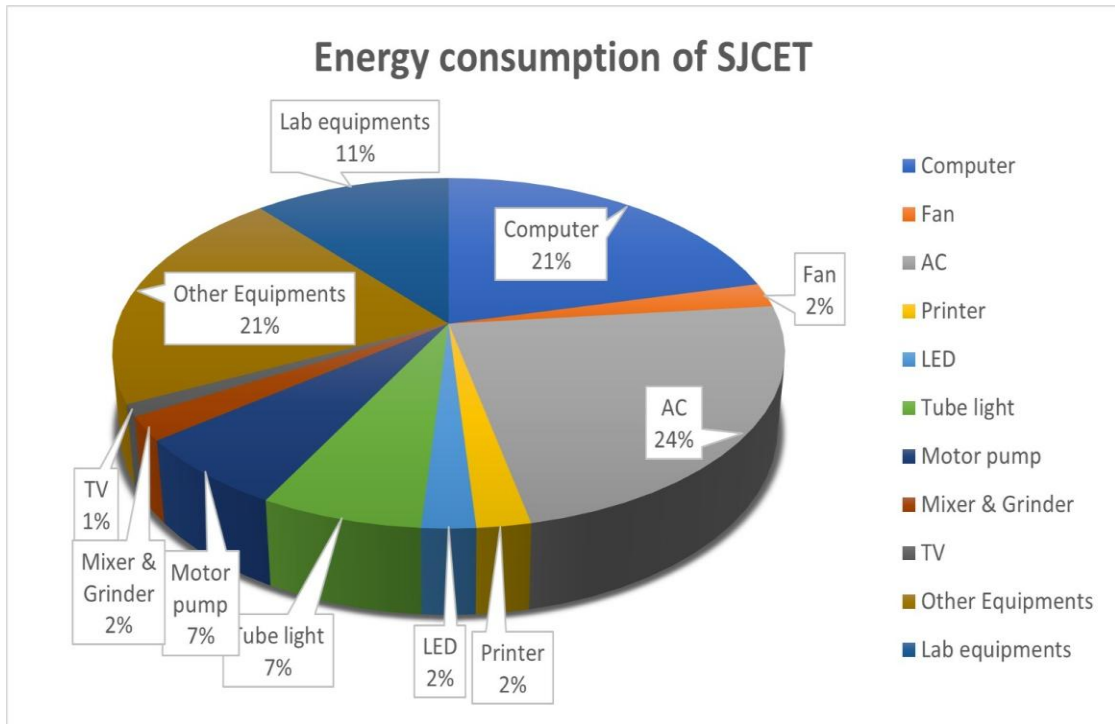


Methodology

- ~ Collection of data on the available electrical appliances in the campus.
- ~ Collection of data on Current rating of the appliances.
- ~ Availability of Electrical power in the campus including solar power.
- ~ Possibility of reducing leakages etc.
- ~ Possibility of substituting low power rating appliances during replacement time.

Energy consumption status of the campus

S. No.	Electrical Components	Average units used per month	Percentage	Average units used per year
1.	Air Conditioner 11tonx 6Nos 3 ton x 66Nos	11534 kWh	21.36	126900 kWh
2.	Computer PC's 500 Nos	10449 kWh	19.35	115000 kWh
3.	Fan 2000 Nos	988 kWh	1.83	10868 kWh
4.	LED 100 Nos	118 kWh	0.22	1300 kWh
5.	Fluorescent Tube 1000 Nos	3126 kWh	5.79	35000 kWh
6.	Mixer and Grinder 10 Nos	1161 kWh	2.15	12000 kWh
7.	Motor Pump 7Nos	3602 kWh	6.67	43000 kWh
8.	Fridge 40 Nos	2030 kWh	3.76	22300 kWh
9.	TV 60 Nos	756 kWh	1.40	8300 kWh



4.0 WASTE AUDIT

Waste audit encompasses the entire spectrum of waste collection, segregation, reuse, recycle, incineration and landfill. Appropriate suggestions and justifications would be put forth to improve the efficiency of the system as a whole.

Waste Generation in the Campus

The waste generated in the campus varies from paper, plastic, cloth, glass, food and sanitary items and its sources respective to each building. The waste is collected by the responsible persons from each location and is segregated by them. Food waste and other sources of waste are the Hostel kitchen and Canteen. The waste generated from various activities in the campus are as below.



Monthly Waste Generated

S. No.	Waste Type	Total Weight in Kg Per Month	Percentage Weight	By
1.	Food Waste, Kitchen wastes	10531	71.64	
2.	Newspapers/mixed papers	2042	13.89	
3.	Plastics	607	4.13	
4.	Glass, Cloth, Wood, Other types	406	2.76	
5.	E- Waste	1114	7.58	
	Total	14700	100	

Sources of wastes

S. No	Source	Types
1.	Hostels	Paper, plastics, cloth, electronic items, leather, rubber, sanitary.
2.	Canteen	Food Waste, Plastic wrappers, Plastic covers
3.	Central Kitchen	Food Waste, Plastic wrappers and covers
4.	Academic Blocks	Papers, Plastic wrappers, metal pieces
5.	Campus streets	Garden trimmings, papers



Frequency of Waste Collection from Various Sources

S. No.	Source	Frequency Of Collection
1.	Academic Block	Once a day
2.	Kitchen	Twice in a day
3.	Campus streets	Once in a day
4.	Library etc	Once in week

Waste Management Method

Waste Management Method	
Type	Method
Paper Waste	Resale
Food waste	To pig farm, compost pit etc
Combustible Waste	Composting, Incineration of Hazardous waste
Recyclable Waste	Resale

Details of Incinerator

Details of Incinerator	
Capacity	2.20m x 1.70m x 3.10m Furnace, Chimney = 21m
Frequency of working	Once in a fortnight
Power Source	Electricity

Details of Biogas plant

Details of Biogas plant	
Capacity	2 nos at St. Thomas Hostel, One at St. Alphonsa Hostel
Frequency of working	Once in a week
Maximum usage hours	5 hours



Fig 4. Biogas plant

5.0 SUMMARY OF FINDINGS AND RECOMMENDATIONS

1. Audit recommendations for potential water saving

Based on the information collected and observations, the following can be recommended to reduce water use and increase its efficiency.

- Replacement of single flush cisterns with dual flush cisterns-At present the toilet commodes have 10 litre flush which can be replaced with 3/6 litres or 2/4 litres dual flush cisterns. Dual flush WCs operate on a split button with the user having the option of which one to use. Usually the smaller button operates the shorter flush of 3 litres which is adequate for flushing liquid waste, while the larger button is for 6 litres flush for more substantial waste. This can reduce water use by around 30-40%.
- Additional water recharging facilities can be created in the Campus.

2. Audit recommendations for potential Energy saving

- Good light ventilation and Air ventilation to classrooms without air conditioning system to avoid the use of tube lights and minimize the use of ceiling fans at high speed. Currently most of the classrooms are having window curtains. Avoid using curtains to facilitate entry of sunlight.



- It is recommended that fluorescent lamps in corridors and toilets may be replaced with CFL or LED light at the end of utility period of currently installed fluorescent lamps as it consumes much less energy compared to fluorescent lamps.
- Install ceiling fans in faculty rooms which currently have only air conditioning system. Use air conditioners only during summer.

3. Audit recommendations for potential Waste Management

- Since a large amount of food waste is generated in the canteen, installation of a biogas plant can be a better solution for waste disposal as well as energy recovery.
- Install proper waste management system
- Reuse paper or one side papers of draft prints

Verified availability of this report at SJ CET towards commitment and continual improvement program for Environment Management System implementation, Stage1 audit conducted on 29-Mar-23 and 30-Mar-23.



Tomcee Thomas