Sathyabama Institute of Science and Technology

Waste Audit

June 2025-May 2026

Prepared by

Centre for Waste Management

Audited by

ENVIRO WORKS
Complete Environment Solutions

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EXECUTIVE SUMMARY

Environmental , Energy Audit and Management has become a fundamental responsibility of higher educational institutions, which play a significant role in promoting resource recycling for environmental protection and sustainable development. By integrating waste management practices into academic, research, and administrative activities, institutions contribute to national and global sustainability goals while fostering environmental awareness among students and stakeholders.

The Audit was conducted to evaluate the institution's effectiveness of its resource management practices and identify opportunities for continuous improvement. The audit examined various aspects of campus sustainability, including green cover management, water conservation, waste management, biodiversity conservation and environmental awareness programmes.

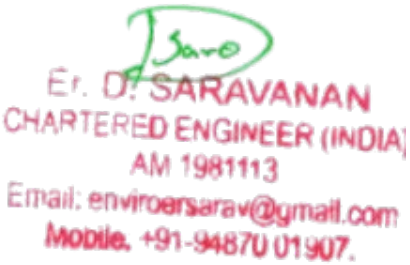
The Waste Audit involved a comprehensive assessment of the institution's waste management practices through field inspections, stakeholder interactions, review of institutional records, questionnaire-based surveys, and evaluation.

The findings indicate that Sathyabama Institute of Science and Technology has established a strong foundation for sustainable campus management through its extensive green cover, conservation of natural ecosystems, wastewater recycling, composting initiatives, rainwater harvesting, renewable energy adoption, environmental research activities, and active participation of students and faculty in sustainability programmes. The institution has also demonstrated its commitment to environmental protection through awareness programmes, outreach activities, research collaborations, and innovative projects that promote circular economy principles and responsible resource utilization.

The baseline information generated through this audit provides a valuable framework for monitoring environmental performance, benchmarking sustainability initiatives, and planning future green campus developments. The recommendations presented in this report are intended to further strengthen the institution's environmental management practices, improve resource

efficiency, and support continuous progress towards achieving long-term sustainability objectives.

Overall, the Waste Audit reaffirms Sathyabama Institute of Science and Technology's commitment to environmental excellence and sustainable campus development. Continued implementation of the recommended measures will further enhance the institution's environmental performance while creating a healthier, resource-efficient, and environmentally responsible learning environment for present and future generations.



CHAPTER 1

INTRODUCTION

1.1 About Sathyabama Institute of Science and Technology

Sathyabama Institute of Science and Technology is one of India's premier multidisciplinary institutions, recognized for its excellence in higher education, research, innovation, and societal development. Since its establishment under Section 3 of the University Grants Commission (UGC) Act, 1956, the institution has consistently maintained high academic standards while fostering innovation, sustainability, and global engagement.

The institution offers a wide spectrum of undergraduate, postgraduate, doctoral, and research programmes across Engineering, Science, Technology, Law, Dental Sciences, Pharmacy, Nursing, Management, Arts and Science, and Allied Health Sciences. Its academic ecosystem is supported by highly qualified faculty, modern pedagogical practices, advanced laboratories, research centres, and state-of-the-art infrastructure that promote interdisciplinary learning and research excellence.

Sathyabama Institute of Science and Technology has been accredited with the highest **'A++' Grade** by the National Assessment and Accreditation Council (NAAC), reflecting its commitment to academic quality, research productivity, innovation, and institutional governance. The university continuously adopts contemporary teaching methodologies, outcome-based education, digital learning platforms, and industry-oriented curricula to prepare students for global careers.

The institution has earned significant recognition at both national and international levels. It has consistently secured a position among the leading universities in India in the National Institutional Ranking Framework (NIRF) and has received prestigious rankings from globally recognized agencies such as Times Higher Education (THE) and QS World University Rankings. Furthermore, Sathyabama has been acknowledged among the country's leading institutions for innovation through the Atal Ranking of Institutions on Innovation Achievements (ARIIA).

Research forms one of the core strengths of the institution. Sathyabama has established collaborations with reputed national and international universities, research organizations,

industries, and government agencies, enabling the execution of several multidisciplinary research projects in emerging areas of science and technology. The institution has successfully completed numerous sponsored research programmes funded by national and international organizations, contributing significantly to scientific advancement and technological innovation.

A landmark achievement in the institution's journey was the successful launch of **SATHYABAMASAT**, developed in collaboration with the Indian Space Research Organisation (ISRO), demonstrating its capability in advanced research and space technology. Such accomplishments exemplify the institution's dedication to promoting innovation, entrepreneurship, and research that address real-world challenges.

Under the visionary leadership of its management, Sathyabama Institute of Science and Technology continues to create an inclusive academic environment that nurtures excellence, creativity, ethical values, and social responsibility. The institution remains committed to producing globally competent graduates while actively contributing towards sustainable development through education, research, innovation, and community engagement.

1.1.1 Vision

Be a leading multidisciplinary University, producing world class talents to address global challenges

1.1.2 Mission

- **To attain excellence in Education and Research through effective collaboration with Industries and other International/National organisations**
- **To consistently remain an attractive ecosystem for students and employees, a hub of innovation for researchers and an incubating platform for entrepreneurs**
- **To create an inclusive environment that caters to all forms of diversity**
- **To engage in outreach and community development activities, creating an impact on the society**

1.1.3 Objectives of the Institution

The institution is dedicated to developing competent professionals equipped with technical knowledge, ethical values, leadership qualities, and social responsibility. Its primary objectives are to:

- Deliver quality education that meets global academic and industrial standards.
- Foster scientific inquiry, critical thinking, innovation, and entrepreneurship.
- Promote interdisciplinary research addressing national and global challenges.
- Encourage lifelong learning, professional excellence, and continuous skill development.
- Develop socially responsible graduates committed to sustainable development and community welfare.
- Strengthen collaborations with industries, research organizations, and international institutions to enhance academic and research excellence.

1.1.4 Core Values

Sathyabama Institute of Science and Technology upholds the following core values that guide all academic, research, and administrative activities.

Integrity

The institution maintains the highest standards of ethics, transparency, accountability, honesty, and professionalism in all its academic, research, and administrative practices.

Excellence

The institution strives for excellence through quality education, innovative teaching methodologies, impactful research, and continuous institutional improvement.

Innovation

Innovation is encouraged across all disciplines by promoting creative thinking, research-driven solutions, entrepreneurship, and technology development.

Sustainability

The institution is committed to environmental conservation and sustainable development through responsible resource management, green campus initiatives, renewable energy adoption, and environmentally conscious practices.

Collaboration

The institution actively promotes partnerships with industries, research organizations, government agencies, and international universities to strengthen education, research, and innovation.

Inclusion and Diversity

An inclusive academic environment is maintained where individuals from diverse cultural, social, and economic backgrounds are provided equal opportunities to learn, grow, and succeed.

Social Responsibility

The institution actively contributes to societal development through outreach programmes, environmental initiatives, community engagement, and technology-driven solutions that improve quality of life.

1.2 Audit Team

The Green Audit was conducted by the Centre for Waste Management and validated by Enviroworks Private Limited, Chennai. The audit team comprised experienced environmental professionals, faculty members, researchers, and technical staff representing multiple academic departments.

The multidisciplinary composition of the audit team ensured comprehensive assessment of environmental practices, energy management systems, campus infrastructure, biodiversity conservation, waste management, water conservation, and sustainability initiatives implemented across the institution.

The audit methodology included document review, stakeholder consultations, field inspections, data verification, questionnaire-based assessment, and evaluation of environmental management practices. The collaborative approach adopted during the audit enabled objective assessment of institutional performance and formulation of practical recommendations for continual environmental improvement.

The Centre for Waste Management coordinated all audit activities with active support from faculty members, research scholars, technical staff, and student volunteers, reflecting the institution's commitment to participatory environmental management and sustainable campus development. Following are the members associated in the Audit

Centre for Waste Management

Dr.Dawn S S
Dr.Nirmala N
Dr.J.Arun
Dr.P.Priyadharsini
Dr.A.Santhosh
Dr.S.Sujithra
Mr.J.Jayakanth
Ms.A.Bhuvaneswari
Ms.S.V.Sivasankari
Mr.A.Silambarasan
Ms.J.Merlin

The team functions with the designated audits. The team has undergone Green, Energy and Environmental Audit training in July 2020 and are upgrading the skills as per requirement. Wasmanpro Environmental Solutions LLP, Chennai provided Audit training. Since then the team pursues the internal Green, Energy and Environmental Audits periodically.

1.3 Periodicity of Audit

The internal audit team initiated the audit for 2025 – 2026 period in June 2025. Inventories to pursue the audit were revised based on the recommendations given by the external audit team in the previous year's audit report. Each member of the internal audit team is allotted with a particular audit and is supported by student volunteers. The audit takes place during the third

week of every month, and compilation of the inventories is done by the in-charge and reviewed by the Lead Internal Auditor. The review of the audit happens quarterly by the External Audit team before the Final Audit report is validated in May every year. The external audit was undertaken by Enviroworks Pvt.Ltd for the year June 2025 to May 2026.

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Chapter 2

WASTE AUDIT

2.1 Introduction

Waste generation has become one of the most significant environmental challenges associated with rapid urbanization, industrialization, and population growth. Educational institutions, with their diverse academic, research, residential, and administrative activities, generate a wide range of waste streams that require systematic management to minimize environmental impacts. Effective waste management not only protects public health and the environment but also promotes resource conservation, circular economy principles, and sustainable campus development.

A Waste Audit is a structured and systematic assessment that identifies the types, sources, quantities, and characteristics of waste generated within an institution. The audit evaluates existing practices related to waste segregation, collection, storage, transportation, treatment, recycling, recovery, and final disposal. The information obtained through the audit serves as a valuable baseline for assessing the effectiveness of current waste management practices, identifying opportunities for waste reduction, and developing strategies for continuous improvement.

Sathyabama Institute of Science and Technology generates a variety of waste streams through its academic departments, laboratories, administrative offices, hostels, dining facilities, healthcare services, and campus maintenance activities. These include biodegradable waste, recyclable materials such as paper, plastics, metals, and glass, as well as biomedical waste, electronic waste, and other hazardous waste generated from specialized laboratory and healthcare operations. Proper segregation, handling, treatment, and disposal of these waste streams are essential for ensuring regulatory compliance and reducing environmental risks.

The Waste Audit was conducted to evaluate the existing waste management system across the campus and to assess its effectiveness in promoting sustainable waste handling practices. The audit involved field inspections, stakeholder interactions, questionnaire-based surveys, review of institutional records, and on-site observations of waste generation points and disposal practices. Particular emphasis was placed on source segregation, recycling initiatives, resource

recovery, waste-to-value technologies, and compliance with applicable environmental regulations.

The findings of the audit demonstrate that the institution has established a comprehensive waste management framework supported by source segregation, recycling programmes, biogas generation from organic waste, composting, authorized disposal of biomedical and electronic waste, and several innovative waste valorisation initiatives. These practices significantly reduce the quantity of waste sent for disposal while promoting resource efficiency and environmental sustainability.

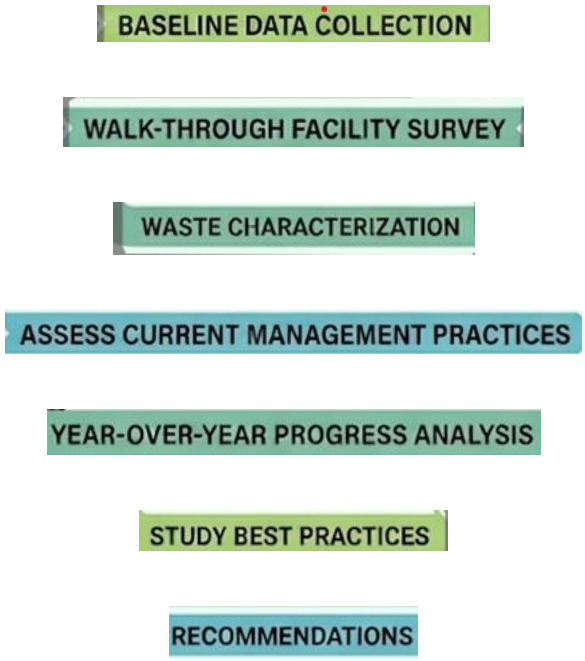
The baseline information generated through this audit provides an important framework for monitoring waste generation trends, evaluating the performance of waste management systems, benchmarking sustainability initiatives, and identifying future opportunities for improvement. The recommendations presented in this chapter are intended to strengthen waste minimization, improve resource recovery, enhance operational efficiency, and further support the institution's commitment to sustainable campus management and environmental stewardship.

2.2 Solid Waste Audit

Solid waste management is a critical component of environmental sustainability, particularly in higher educational institutions where diverse academic, research, residential, healthcare, and administrative activities generate substantial quantities of waste each day. Effective management of solid waste minimizes environmental pollution, conserves natural resources, improves campus hygiene, and supports the transition towards a circular economy through resource recovery and recycling.

The Solid Waste Audit of Sathyabama Institute of Science and Technology was conducted to evaluate the quantity, composition, sources, and management practices associated with solid waste generated across the campus. The audit assessed the effectiveness of the existing waste management system, including waste segregation, collection, transportation, treatment, recycling, recovery, and final disposal practices. It also examined compliance with institutional sustainability objectives and identified opportunities for improving waste minimization and resource utilization.

Solid waste audit is executed adopting the stages mentioned below



The campus generates a wide variety of solid waste from academic buildings, laboratories, administrative offices, hostels, food courts, residential facilities, healthcare units, and landscape maintenance activities. The major waste categories identified during the audit include paper and cardboard, plastics, metals, glass, organic waste, biomedical waste, electronic waste, hazardous waste, and other miscellaneous waste streams. These wastes were further classified as biodegradable, non-biodegradable, recyclable, combustible, and inert materials based on their physical characteristics and disposal requirements.

The audit was undertaken to establish a comprehensive baseline for waste generation and management practices within the institution. The information collected enables year-to-year benchmarking of waste generation trends, evaluation of waste reduction initiatives, and measurement of the effectiveness of recycling and resource recovery programmes. The findings also support the formulation of evidence-based strategies for improving operational efficiency and achieving long-term sustainability goals.

The assessment involved detailed field inspections, walk-through surveys, stakeholder interactions, questionnaire-based surveys, and verification of institutional records. Major waste generation points across the campus were identified and evaluated to determine the quantity and composition of waste produced. The solid waste generated in the campus include

- Paper Waste
- Plastic Waste
- Metal Waste
- Glass Waste
- Organic Waste
- Bio-Medical Waste
- E- Waste
- Hazardous Solid Waste
- Others(Specify)

Table 1 : Type and Quantity of Paper waste generated

Mode of Disposal : Sold to Local Waste Collector

SI.NO.	Type of Paper Waste	Generation Daily (kgs)	Generation Weekly (kgs)	Generation Monthly (kgs)
1	Newspaper and Magazines	19.68	98.4	393.6
3	Card Board	32.80	164.0	656.0
4	Box Board	82.00	410.0	1,640.0
5	Mixed Papers	0	0	0
6	Molded Pulp	0	0	0
7	Kraft Paper	16.40	82.0	328.0
8	Coffee Cups	122.54	612.70	2,450.82

Table 2 : Type and quantity of Food Container Waste Generated

Mode of Disposal: Handed over to recyclers

Sl.NO.	Type of Waste	Generation Daily (no)	Generation Weekly (no)	Generation Monthly (no)
1	**Poly Coat Containers**	**546**	**2,730**	**10,920**
2	**Aseptic Containers**	**18.2**	**91**	**364**

Table 3 : Types and Quantity of Plastic Waste Collected

Sl.No.	Type of Waste	Daily Generation (kgs or no)	Weekly (No)	Monthly (no)	Mode of Disposal
1	PET Soft Drink Bottle	865 no	4,325	17,300	Sold to local waste collector
2	PVC	34.6 kg	173	692	Sold to local waste collector
3	Thermocoal	Not recorded	Not recorded	29.41 kg	173 kg is generated in 6 months; sold to local waste collector

Table 4 : Types and quantity of metal waste generated

Sl.No	Type of Waste	Daily (no or kg)	Weekly (no or kg)	Monthly (no or kg)	Mode of Disposal
1	Steel Cans	87.5 no	437 no	1,750 no	oil cans sold to the seller who reprocesses it
2	Scrap Metal / Steel waste	22.75 kg	113.75 kg	455 kg	Plate, bucket, kitchen scrap etc sold to the reseller to buy other utilises

Table 5 : Types and Quantity of organic waste generated

SI.NO.	Type of Waste	Daily (kgs)	Weekly (kgs)	Monthly (kgs)	Mode of Disposal
1	Food Waste	2,385	11,925	47,700	- Food and Other Organic waste is channelled to the Biogas plant to generate Biogas to run the kitchen stove
2	Compostable	87.45	437.25	1,749	-
3	Dry Leaves	190.8	954	3,816	- Dry leaves and other compostables are diverted to the Compost pit
	Total Organic	2,663	13,316	53,265	

Table 6 : Other wastes and quantity generated

Sl.No.	Type of Waste	Daily (kgs)	Weekly (kgs)	Monthly (kgs)	Mode of Disposal
1	Textile	3	15	60	Some cotton waste used for mat making and other will disposed as municipal waste
2	Latex Gloves	2	10	40	Disposed as municipal waste
3	Water Bottles	15	75	300	Disposed as municipal waste
4	Sanitary Napkins	5	25	100	Disposed as municipal waste
5	Milk packets	5	25	100	Return to milk supplier

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Table 7 : Glass waste generated and quantity

S.NO.	Type of Waste	Daily (kgs)	Weekly (kgs)	Monthly (kgs)	Mode of Disposal
1	Glass Clear/Coloured	4.75	23.75	95	Disposed as municipal waste
2	Chemical bottles, laboratory bottle waste Glass	3.80	19.00	76	Disposed as municipal waste

Table 8 :Solid Waste Generation

Waste Category	Typical Sources / Examples	Quantity generated
Paper Waste	Exam sheets, office documentation, packaging, cardboard	26.25 - 43.75 kg
Plastic Waste	Single-use bottles, packaging wrappers, canteen cutlery, containers	17.50 - 26.25 kg
Metal Waste	Aluminum cans, discarded office hardware, scrap metal, repair offcuts	1.75 - 5.25 kg
Glass Waste	Laboratory glassware, beverage bottles, broken window panes	1.75 - 3.50 kg
Organic Waste	Food waste from canteen/mess, horticulture/garden leaves,	70.00 - 122.50 kg
Bio-Medical / Medical Waste	Campus health centre materials, biology laboratory disposables, first-aid waste	0.88 - 3.50 kg
E-Waste	Obsolete computers, cables, printer cartridges, batteries, electronic spares	3.50 - 8.75 kg *(avg)*
Hazardous Solid Waste	Chemical residue from chemistry labs, paint cans, fluorescent tubes	1.75 - 5.25 kg
Others (Specify)	Sanitary waste, construction debris, rubber/textiles	5.25 - 8.75 kg
Total Estimated Generation		**~131.25 - 227.50 kg / day**

Existing practices related to source segregation, colour-coded collection systems, storage facilities, recycling mechanisms, composting, biogas generation, and authorized disposal were carefully examined. The audit further reviewed the institution's implementation of waste reduction strategies based on the **principles of Reduce, Reuse, Recycle, Recover, Refuse, Repair, and Rethink (7R Framework).**

The audit findings indicate that Sathyabama Institute of Science and Technology has established a systematic and integrated solid waste management system that emphasizes waste segregation at source, efficient collection, recycling of recoverable materials, biological treatment of organic waste, and environmentally responsible disposal of non-recyclable wastes. The institution has successfully implemented several waste-to-value initiatives, including paper recycling, compost production, biogas generation from food waste, recycling of waste cooking oil, and other innovative technologies that promote resource recovery while reducing dependence on conventional disposal methods.

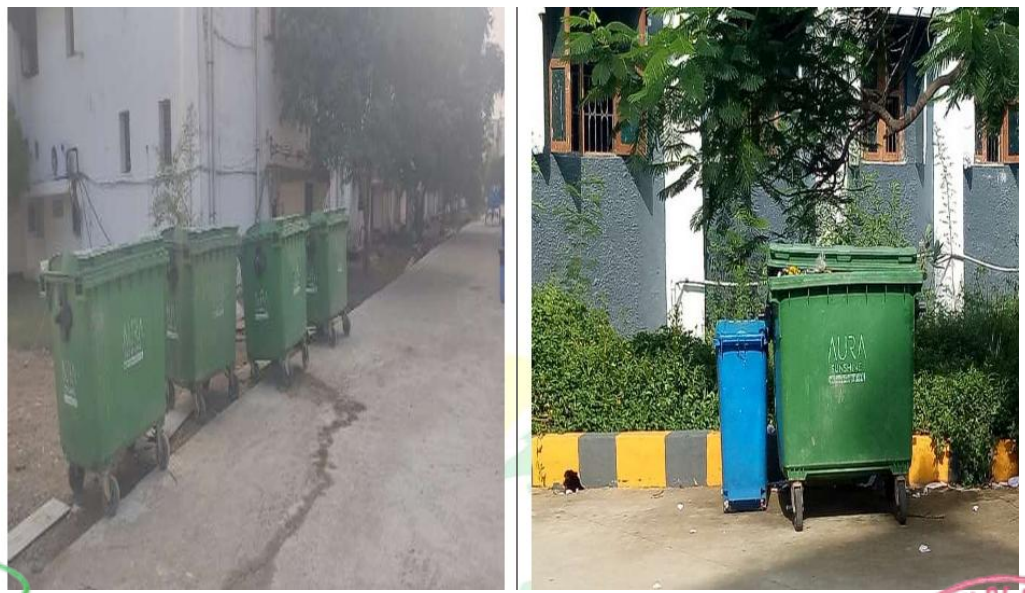
Overall, the Solid Waste Audit demonstrates the institution's strong commitment to sustainable waste management through responsible resource utilization, continuous environmental monitoring, and adoption of circular economy principles. The baseline data generated through this audit provides an important framework for evaluating future performance, strengthening waste management practices, and supporting continuous improvement towards a cleaner, greener, and more resource-efficient campus.

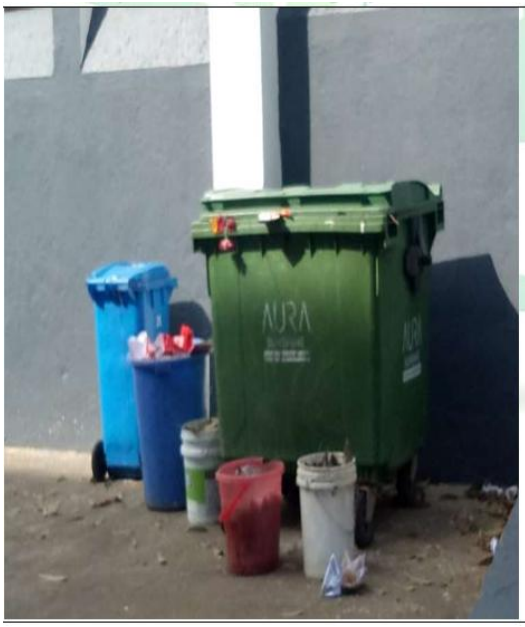
Best Practices Observed in the Institution – Solid Waste Management

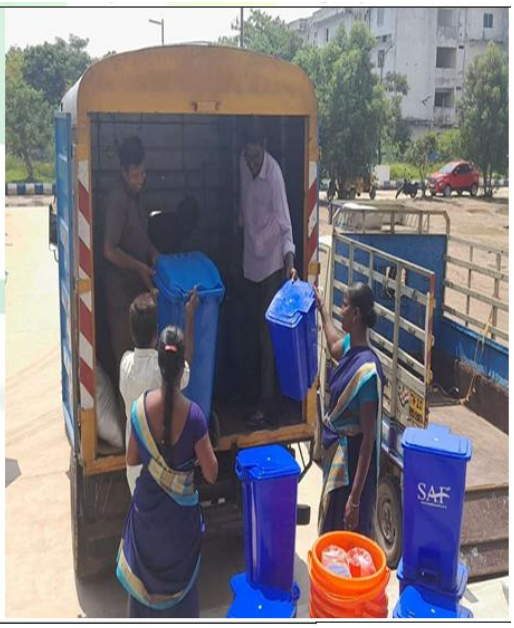
- **Source-Level Waste Segregation:** Multi-bin segregation system implemented across all campus buildings to ensure waste is sorted at the point of origin.
- **Color-Coded Bin System:** Standardized color-coded bins deployed campus-wide to enable efficient waste stream separation and stream-specific handling.
- **Paper Waste Recycling:** Institutional paper waste systematically collected and routed for recycling and resource recovery.
- **Upcycling Plastics for Academic Research:** Non-hazardous plastic waste diverted to the Architecture Department to support ongoing research in sustainable construction materials and building design.
- **Anaerobic Digestion & Energy Recovery (Biogas):** Food waste and organic kitchen scraps (including fruit and vegetable peels) are fed into an on-campus biogas plant. The

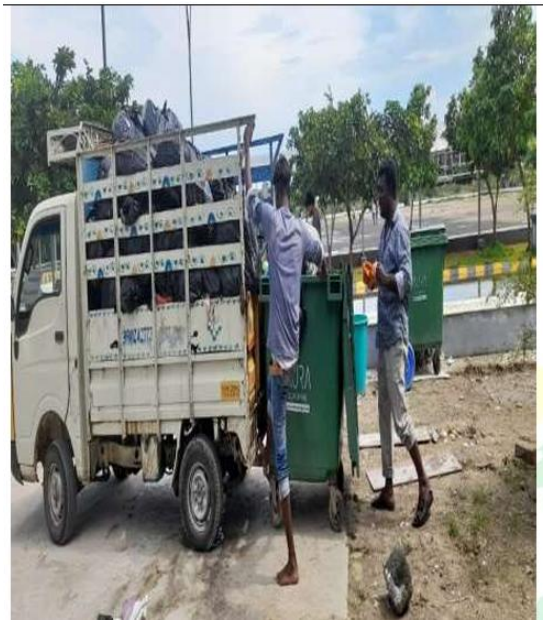
system generates sufficient biogas to replace **3 LPG cylinders per day**, directly fueling commercial kitchen burners.

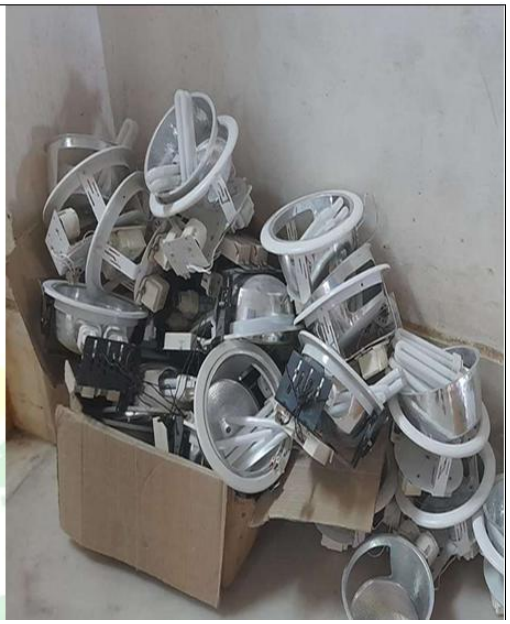
- **Eco-Pot Production:** Technology developed to process organic food waste into biodegradable planting pots.
- **Floral Waste Valorization:** Floral waste and discarded ornamental flowers collected from events are processed into handcrafted incense sticks.
- **Waste-to-Energy Innovations:** Research initiatives underway exploring technologies to convert bulk organic campus waste into electrical energy.
- **Sustainable Hygiene Solutions:** R&D project initiated for manufacturing eco-friendly, organic sanitary pads.
- **Smart Composting Infrastructure:** Implementation of smart composting systems designed for rapid, high-efficiency conversion of solid organic waste into organic fertilizer.
- **Biofuel Production for Transport:** Used cooking oil from campus dining halls converted into biodiesel to fuel campus transit buses.
- **Agricultural Biofuel Support:** Scaled waste-to-biodiesel conversion protocols to supply eco-friendly fuel for local agricultural pump sets.
- **Soap Manufacturing from Used Oils:** Conversion of discarded cooking oil into eco-friendly, biodegradable soaps for institutional cleaning.
- **Student-Led Community Outreach:** Student-driven awareness campaigns involving the fabrication and distribution of paper bags to local vendors in exchange for single-use plastic bags.











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Biogas plant

Fig.1 Campus witnessed Waste Management Practices

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2.3 Biomedical Waste Audit

Biomedical waste management is an essential component of environmental protection and public health within healthcare institutions. Improper handling, storage, transportation, treatment, or disposal of biomedical waste can pose significant risks to healthcare workers, patients, waste handlers, and the surrounding environment. Therefore, systematic management of biomedical waste in accordance with statutory regulations is crucial for preventing the spread of infections, minimizing occupational hazards, and ensuring environmental sustainability.

The Biomedical Waste Audit of Sathyabama Institute of Science and Technology was undertaken to evaluate the effectiveness of biomedical waste management practices implemented within its healthcare facilities. The audit assessed the procedures adopted for segregation, collection, storage, transportation, treatment, and disposal of biomedical waste generated by the institution's healthcare services. Particular emphasis was placed on compliance with the Biomedical Waste Management Rules, 2016, adherence to prescribed colour-coding systems, staff awareness, occupational safety measures, and record maintenance.

Biomedical waste generated within the institution primarily originates from the Dental College and Hospital, General Hospital, diagnostic laboratories, clinical departments, research laboratories, and other healthcare facilities operating on the campus. The waste stream includes infectious waste, pathological waste, contaminated materials, sharps, pharmaceutical waste, laboratory waste, personal protective equipment (PPE), chemical waste, glassware, and other healthcare-related materials requiring specialized handling and disposal.

The audit was conducted through comprehensive site inspections, walk-through surveys, stakeholder interactions, questionnaire-based assessments, verification of institutional records, and observation of waste handling practices across various clinical and laboratory departments. The assessment examined waste generation points, source segregation practices, colour-coded collection systems, temporary storage facilities, internal transportation procedures, staff training programmes, use of personal protective equipment (PPE), and the overall implementation of biomedical waste management protocols.

The evaluation also assessed the awareness and competency of healthcare professionals, laboratory personnel, housekeeping staff, and waste handlers in implementing safe biomedical waste management practices. Existing documentation, waste generation records, authorized disposal mechanisms, and institutional compliance with applicable environmental and healthcare regulations were carefully reviewed to ensure effective implementation of the prescribed management system.

The audit findings indicate that the institution has established a well-structured biomedical waste management framework supported by systematic source segregation, colour-coded waste collection, safe handling procedures, periodic staff training, proper use of personal protective equipment, and authorized treatment and disposal through approved biomedical waste management agencies. Regular monitoring, documentation, and adherence to regulatory guidelines have significantly strengthened the institution's environmental and occupational safety performance.

2.3.1 Methodology adopted

Step 1: Baseline Data Collection

- **Interactions:** Conducted online interactions with institutional authorities and administrative staff.
- **Interviews:** Held interviews with healthcare professionals including doctors, nurses, and housekeeping staff to gather foundational operational data.

Step 2: Knowledge Assessment Survey

- **Walk-Through Surveys:** Executed structured walk-through surveys across hospital facilities.
- **Awareness Evaluation:** Assessed the depth of knowledge held by doctors and paramedical staff regarding Biomedical Waste (BMW) handling and segregation guidelines.

Step 3: On-Site Practice Observation & Quantification

- **Real-Time Monitoring:** Observed actual biomedical waste handling practices across all departments of the Dental College and Hospital.

- **Waste Quantification:** Formulated metrics detailing the quantities of infectious and non-infectious waste generated daily, weekly, and monthly.

Step 4: Timeline & Logistics Execution

- **Survey Period:** Executed multi-site survey rounds repeatedly over a multi-month period (June 2025 to May 2026).
- **Field Visits:** Maintained regular visits across different facility departments to account for fluctuations in waste generation.

Step 5: Log Book Verification

- **Record Audit:** Verified log book entries during each site visit.
- **Tracking Check:** Ensured proper entries were consistently maintained regarding waste generation, collection times, quantities, and downstream treatment.

Step 6: Compliance Audit

- **Regulatory Standard:** Conducted an on-site audit to measure facility compliance against the statutory **Biomedical Waste Management Rules, 2016**.
- **Premises Evaluation:** Checked container labeling, color-coded bin usage, and storage facilities directly within hospital premises.

Step 7: Analysis & Real-Time Interaction

- **Handling Protocols:** Interacted with staff during active waste handling shifts to check safety protocol awareness.
- **Compliance Analysis:** Evaluated gathered survey data against legal standards to identify gaps in real-time waste handling.

Step 8: Recommendations & Report

- **Gap Mitigation:** Identified procedural shortcomings and compliance errors.
- **Actionable Output:** Formulated tailored recommendations, corrective action plans, and a final audit report for institutional management.

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2.3.2 Basis for Data Collection

Segregation, Color Coding & Labeling Compliance

- Biomedical waste is segregated at source and disposed of in designated color-coded bags/containers in strict adherence to Schedule I of the Bio-Medical Waste Management Rules, 2016.
- Standardized labeling proforma (barcoded and non-barcoded warning labels) is prominently applied to all waste containers and bags.

Waste Generation Metrics

- Detailed quantification records of biomedical waste generation are systematically maintained across daily, weekly, monthly, and annual intervals.

Treatment Standards & General Waste Segregation

- Mandated standards for biomedical waste treatment and disposal are strictly observed.
- General municipal waste is completely segregated, preventing any cross-contamination with biomedical waste streams.
- Doctors, nurses, and paramedical staff demonstrate adequate awareness regarding waste segregation, disposal practices, health impacts, and waste management protocols.

Personal Protective Equipment (PPE) Provision

- All staff and waste handling workers are equipped with necessary Personal Protective Equipment (PPE), including heavy-duty gloves, face masks, and head caps.

On-Site Pre-Treatment of Hazardous Biological Waste

- Laboratory waste, microbiological waste, blood samples, and blood bags undergo mandatory on-site pre-treatment via sterilization/disinfection in accordance with WHO or NACO guidelines.

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Liquid Waste Management

Liquid effluent generated from healthcare facilities is pre-treated and disinfected prior to discharge or mixing with general wastewater systems.

Staff Training & Capacity Building

- Induction training and mandatory annual refresher sessions on biomedical waste handling are systematically conducted for all healthcare personnel and support staff.

Occupational Health Surveillance

- Regular occupational health checkups are conducted for all healthcare personnel and waste management workers.

Immunization & Occupational Safety

- Healthcare workers and handlers involved with biomedical waste are fully immunized against occupationally transmitted infections, including Hepatitis B and Tetanus

Table 9 : No. of Persons Involved in Waste Handling

Source of BMW	Types Of Waste Generated	No of Persons Involved In Waste Handling
Department of oral maxillofacial pathology	Sharps, body fluids, Discarded medicine	> 6
Department of public health dentistry	Gloves, mask, washed water	3
Department of oral medicine and Radiology	Gloves, mask, instrument pouches	4
Department of oral maxillofacial surgery	Sharps, outdated Medicine	2
Department of prosthodontics and implantology	Plaster of paris, Alginate	5
Department of Pedodontics	Cotton, gloves, needles, bandages	2

Source of BMW	Types Of Waste Generated	No of Persons Involved In Waste Handling
Department of Conservative dentistry and endodontic	Soiled cotton, needles, syringes, amalgam	5
Casualty	Sharps, plastics container, anatomical organs	2

The various biomedical wastes include Sharps, Body Fluid, Discarded Medicine, Gloves, Mask, Wash Water, Instrument Pouch, Expired Medicine,Plaster of Paris, Cotton swabs, Needles, Syringes, Bandages, Soiled Cotton, Amalgam, Plastic Containers, Anatomical Organs,Scalpels, Cytotoxic drugs, Used Catheters, Used tubes.

BMW and Color codes

❖ Yellow-Human &Animal Anatomical Waste, Waste

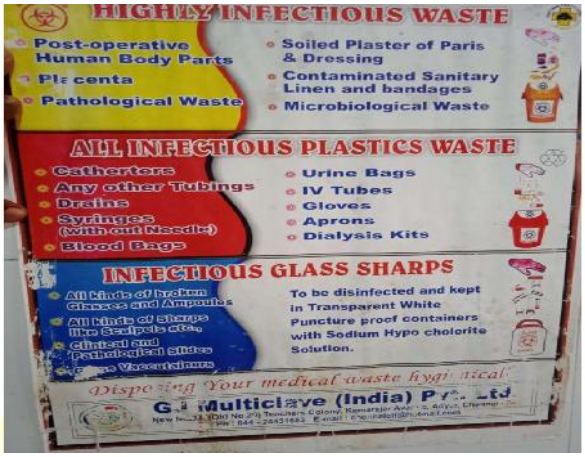
❖ Red- Contaminated Waste (Recyclable) tubing, bottles, intravenous tubes and sets, catheters, urine bags, syringes (syringe without needle)

❖ Blue-Broken or discarded and contaminated ampoules

❖ White-Needles, syringes with fixed needles, needles from needle tip cutter or burner, scalpels, blades.

Table 10 : BMW -Color wise and quantity

Red			Yellow			Blue		
Avg / day	Avg/ Week	Avg/ month	Avg/ day	Avg/ week	Avg/ Month	Avg / Day	Avg/ week	Avg/ Month
13	91	390	8	56	240	2	14	60



Overall, the Biomedical Waste Audit demonstrates the institution's strong commitment to maintaining a safe, hygienic, and environmentally responsible healthcare environment. The baseline information generated through this audit provides a valuable framework for monitoring biomedical waste generation, evaluating management practices, strengthening regulatory compliance, and identifying opportunities for continuous improvement. The recommendations presented in this chapter are intended to further enhance biosafety, environmental protection, operational efficiency, and sustainable healthcare waste management practices across the institution.

2.4 E-Waste Audit

The rapid advancement of information technology and the increasing use of electronic and electrical equipment have led to a significant rise in electronic waste (e-waste) generation worldwide. Educational institutions rely extensively on computers, laboratory instruments, communication devices, office equipment, and other electronic systems to support academic, research, administrative, and healthcare activities. As these devices reach the end of their

service life, they generate e-waste that requires environmentally sound management to prevent adverse impacts on human health and the environment.

Electronic waste contains valuable recoverable materials such as metals and plastics, alongside hazardous substances including lead, mercury, cadmium, chromium, and other toxic components. If not managed properly, these materials can contaminate soil, water, and air, posing serious environmental and public health risks. Therefore, systematic collection, segregation, storage, recycling, and disposal of e-waste through authorized channels are essential to ensure resource recovery, pollution prevention, and compliance with environmental regulations.

The E-Waste Audit of Sathyabama Institute of Science and Technology was conducted to evaluate the generation, handling, storage, recycling, and disposal practices associated with electronic and electrical waste generated across the campus. The audit assessed the effectiveness of existing e-waste management practices, compliance with the E-Waste Management Rules, and the institution's commitment to sustainable resource management through responsible disposal and recycling mechanisms.

The primary sources of e-waste within the institution include computers, laptops, printers, scanners, servers, laboratory equipment, mobile phones, electrical appliances, networking devices, batteries, uninterruptible power supply (UPS) systems, lighting fixtures, electronic components, and other obsolete or damaged electrical and electronic equipment generated from academic departments, laboratories, administrative offices, libraries, hostels, healthcare facilities, and campus infrastructure.

The audit was carried out through field inspections, walk-through surveys, stakeholder interactions, questionnaire-based assessments, verification of institutional records, and observation of existing e-waste handling practices. The assessment focused on identifying the quantity and categories of e-waste generated, evaluating storage facilities, examining repair and refurbishment practices, reviewing inventory management systems, assessing compliance with Extended Producer Responsibility (EPR) provisions, and verifying the use of authorized recyclers for final treatment and disposal.

Particular attention was given to institutional awareness regarding responsible e-waste management, documentation of e-waste generation, safe temporary storage, periodic disposal,

and regulatory compliance. The audit also evaluated initiatives aimed at extending the service life of electronic equipment through maintenance, repair, refurbishment, and component replacement, thereby reducing unnecessary waste generation and promoting resource conservation.

The findings indicate that Sathyabama Institute of Science and Technology has established an organized e-waste management system that emphasizes responsible procurement, periodic maintenance, secure storage, inventory monitoring, and environmentally sound disposal through authorized e-waste recycling agencies. The institution also promotes reuse and refurbishment wherever feasible, thereby maximizing the useful life of electronic equipment and minimizing waste generation.

Overall, the E-Waste Audit demonstrates the institution's commitment to sustainable electronic resource management and environmental stewardship. The baseline information generated through this assessment provides a valuable framework for monitoring e-waste generation trends, strengthening regulatory compliance, enhancing resource recovery, and improving future waste management strategies. The recommendations presented in this chapter are intended to further strengthen responsible e-waste management practices, encourage circular economy principles, and support the institution's long-term sustainability objectives.

2.5 Final Evaluation & Recommendations

2.5.1 Final Evaluation

The Waste Audit conducted at Sathyabama Institute of Science and Technology demonstrates that the institution has established a comprehensive and well-organized waste management system that effectively integrates environmental sustainability with day-to-day campus operations. The audit evaluated the generation, segregation, collection, treatment, recycling, recovery, and disposal of solid waste, biomedical waste, and electronic waste across academic, research, healthcare, residential, and administrative facilities.

The assessment indicates that the institution has successfully implemented source segregation through colour-coded collection systems and adopted environmentally responsible practices for managing different categories of waste. Organic waste generated from hostels and dining facilities is effectively utilized for biogas generation and compost production, thereby reducing

landfill disposal while promoting renewable energy generation and nutrient recycling. Recyclable materials such as paper, plastics, metals, and glass are systematically recovered and channelled through authorized recycling mechanisms, supporting resource conservation and circular economy principles. Biomedical waste generated from healthcare facilities is managed in accordance with the Biomedical Waste Management Rules, 2016, while electronic waste is collected, stored, and transferred to authorized recyclers in compliance with applicable environmental regulations.

The audit also highlights the institution's commitment to innovation in waste valorisation through initiatives such as biodiesel production from waste cooking oil, conversion of organic waste into value-added products, paper recycling, composting, and awareness programmes that actively engage students, faculty, and staff in sustainable waste management practices. These initiatives demonstrate the institution's proactive approach towards minimizing environmental impacts while maximizing resource recovery.

Overall, the findings confirm that the existing waste management system is effective, environmentally responsible, and aligned with the institution's sustainability objectives. The baseline information generated through this audit provides a valuable framework for monitoring future performance, benchmarking progress, and continuously improving waste management practices across the campus.

2.5.2 Recommendations

To further strengthen the institutional waste management system and enhance long-term environmental performance, the following recommendations are proposed:

- Continue strengthening waste segregation at source by ensuring consistent use of colour-coded bins and periodic monitoring across all campus facilities.
- Enhance awareness programmes and regular training for students, faculty, housekeeping personnel, laboratory staff, and healthcare workers on sustainable waste management practices and regulatory compliance.
- Expand composting and biogas generation facilities to maximize the utilization of biodegradable waste and further reduce dependence on conventional energy sources.
- Promote paperless administrative processes and digital documentation to minimize paper consumption and improve resource efficiency.

- Strengthen campus-wide initiatives to reduce single-use plastics by encouraging reusable and environmentally friendly alternatives.
- Improve inventory management, maintenance, repair, and refurbishment of electronic equipment to extend service life and minimize e-waste generation.
- Continue disposing of biomedical and electronic waste exclusively through authorized agencies while maintaining complete documentation and regulatory records.
- Conduct periodic internal waste audits to evaluate waste generation trends, recycling efficiency, and compliance with institutional and statutory requirements.
- Develop measurable waste reduction targets and key performance indicators to support continuous environmental improvement and sustainability reporting.
- Encourage research, innovation, and student participation in waste-to-value technologies, circular economy practices, and sustainable resource management solutions.
- Strengthen collaborations with government agencies, industries, and certified recycling organizations to improve resource recovery and adopt emerging waste management technologies.
- Periodically review and update the institutional waste management policy to ensure alignment with evolving environmental regulations, technological advancements, and national sustainability goals.

Conclusion

The Waste Audit confirms that Sathyabama Institute of Science and Technology has developed a robust and integrated waste management framework that reflects its commitment to environmental stewardship, regulatory compliance, and sustainable campus development. Through effective waste segregation, resource recovery, recycling, renewable energy generation, and continuous environmental awareness initiatives, the institution has significantly reduced its environmental footprint while promoting responsible resource utilization.

The recommendations presented in this report provide a strategic roadmap for further strengthening waste management practices, improving operational efficiency, enhancing circular economy initiatives, and supporting the institution's long-term vision of becoming a model sustainable and environmentally responsible campus.

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