

ENVIRONMENT AUDIT REPORT 2021

Submitted To



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INTRODUCTION

The rapid environmental degradation at local, regional and global level is leading us to global “Environmental poverty”. Stabilization of human population, adoption of environmentally sound and sustainable technologies, reforestation and ecological restoration are crucial elements in creating an equitable and sustainable future for all humans in harmony with nature and natural resources. Environmental auditing is essentially an environmental management tool for measuring the effects of certain activities on the environment against set criteria or standards. Depending on the types of standards and the focus of the audit, there are different types of environmental audit. The Organizations of all kinds now recognize the importance of environmental matters and accept that their environmental performance will be scrutinized by a wide range of interested parties. Environmental auditing is used to

- Investigate
- Understand
- Identify

These are used to help improve existing human activities, with the aim of reducing the adverse effects of these activities on the environment. An environmental auditor will study an organization’s environmental effects in a systematic and documented manner and will produce an environmental audit report. There are many reasons for undertaking an environmental audit, which include issues such as environmental legislation and pressure from customers. 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. Target areas included in this green auditing are water, energy, waste and green campus.

DEFINITION OF ECO AUDIT

The ICC defines environmental auditing as a management tool comprising a systematic, documented periodic and objective evaluation of how well environmental organization, management and equipment are performing, with the aim of helping safeguard the environment by

- (i) facilitating management control of environmental practices and
- (ii) assessing compliance with company policies which would include meeting regulatory requirements.

The European Commission in its proposed regulation on environmental auditing also adopts the ICC definition of environmental audit.

It is a means for ensuring the continual improvement in environmental management;

It is a good method of monitoring;

It can assist efforts for sustainable development;

It can help involve the people in environmental management;

It may reduce the need for government inspections;

It may help identify cost recovery through recycling and sale of by-products, etc.; and

It may generate valuable data for regional or national environment reports.

During the course of company's quest for an environmental system, two audits are done. The first is the environmental audit, which is done to know what a company actually does and how it affects the environment. The second audit is conducted to see whether an environmental system works according to its procedures and that objectives and targets are being achieved.

AIM OF ENVIRONMENTAL AUDITING

The overall objective of environmental auditing is to help safeguard the environment and minimize risks to human health. The key objectives of an environmental audit therefore are to determine how well the environmental management systems and equipment are performing verify compliance with the relevant national, local or other laws and regulations minimize human exposure to risks from environmental, health and safety problems.

SCOPE OF THE AUDIT

As the prime objective of audits is to test the adequacy of existing management systems, they fulfil a fundamentally different role from the monitoring of environmental performance. Audits can address one topic, or a whole range of issues. The greater the scope of the audit, the greater will be the

size of the audit team, the time spent onsite and the depth of investigation. Where international audits need to be carried out by a central team, there can be good reasons for covering more than one area while onsite to minimize costs.

In addition, the scope of an audit can vary from simple compliance testing to a more rigorous examination, depending on the perceived needs of the management. The technique is applied not only to operational environmental, health and safety management, but increasingly also to product safety and product quality management, and to areas such as loss prevention. If the intention of auditing is to help ensure that these broad areas are managed properly, then all of these individual topics must be reviewed. Items which may be addressed in audits, including environment, health, safety and product safety.



Showing the different view of the College Campus



Showing the different view of the College Campus

Environmental auditing is a process whereby a College environmental performance is tested against its environmental policies and objectives. As a part of such practice, internal environmental audit is conducted to evaluate the actual scenario at the company. Environment audit can be a useful tool for a company to determine how and where they are using the most water resources; the company 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. Environmental auditing and the implementation of mitigation measures is a win-win situation for all the company, the employers and the planet. It can also create health consciousness and promote environmental awareness, values and ethics. It provides the employees a better understanding of Environment impact on the company.

Eco-auditing is a systematic multidisciplinary method used periodically to assess the environmental performance of a project. Eco-auditing evolved as a management tool in the USA in 1980s. It has been promoted in Europe by the International Chamber of Commerce and by some multinational corporations as a means of getting effective environmental management. But, in developing countries, the eco-auditing concept is still a theoretical concept. However, India has modified its Companies Act to include a requirement for eco-audits. If environmental auditing is implemented in a constructive way there are many benefits to be derived from the process. The auditing approach described in this paper will help to:

- ✓ safeguard the environment
- ✓ verify compliance with local and national laws
- ✓ indicate current or potential future problems that need to be addressed
- ✓ assess training programmes and provide data to assist in training
- ✓ enable companies to build on good environmental performance, give credit where appropriate and highlight deficiencies
- ✓ identify potential cost savings, such as from waste minimization
- ✓ assist the exchange and comparison of information between different plants or subsidiary companies
- ✓ demonstrate company commitment to environmental protection to employees, the public and the authorities.
- ✓

It is important to draw the distinction between auditing and techniques such as environmental impact assessment (EIA). The latter assesses the potential environmental effects of a proposed facility. The essential purpose of an environmental audit is the systematic scrutiny of environmental performance throughout a company's existing operations. At best, an audit is a comprehensive examination of management systems and facilities; at worst, it is a superficial review.

Eco-audit is a tool to find the environmental impact of the product across all life cycle stages and for identify the problems in all aspects of a supply chain, from extraction of raw materials to manufacturing, distribution, use and disposal. The purpose of an analysis of a product is to establish the embodied energy, water usage, annual CO₂ to atmosphere, carbon foot print, recycle fraction in current supply, toxicity, approximate processing energy and sustainability criteria. Knowledges to

guide design decisions are needed to minimize or eliminate adverse eco-impacts. In eco-audit analysis, will be created material charts, processes selection and life cycle analysis allowing alternative design choices to meet the engineering requirements and reduce the environmental impact.

- Environmental education through systematic environmental management approach.
- Improving environmental standards.
- Benchmarking for environmental protection initiatives.
- Reduction in resource use.
- Financial savings through a reduction in resource use.
- Curriculum enrichment through practical experience.
- Development of ownership, personal and social responsibility for the college campus and its environment.
- Enhancement of university profile.
- Developing an environmental ethic and value systems in young students.

An essential step in establishing an audit programme is to decide the criteria against which the audit will be conducted and to ensure that management throughout the organization knows what these criteria are.

PRE-AUDIT STEPS

Pre-audit steps include the administrative issues associated with planning the audit, selecting the personnel for the audit team (often from different parts of the company or from a specialized unit), preparing the audit protocol used by the organization and obtaining background information about the facility. If auditing is new, the need for education of those involved in the audit process (the auditors or those being audited) should not be underestimated. This also applies to a multinational college extending an audit programme in its home country to subsidiaries abroad. In these situations, the time spent on explanation and education will pay dividends by ensuring that the audits are approached in a spirit of cooperation and are not seen as a threat by the local management. When the college proposed extending its auditing programme to its operations in Europe, it was particularly concerned to ensure that the plants were properly briefed, that audit protocols were appropriate for European operations and that audit teams understood the relevant regulations. Pilot audits were conducted at selected plants. In

addition, the audit process was introduced in a way that stressed the benefits of a cooperative rather than a “policing” approach.

Onsite steps

As a first step, it is necessary to develop an understanding of the controls that are in place or are thought to be in place. These will include assessing formal procedures and practices; record keeping and monitoring; inspection and maintenance programmes and physical controls for containing spills. The audit team gathers information on the various controls by observation, interviewing staff and the use of detailed questionnaires.

Assessing strengths and weaknesses of internal controls: Evaluating the strengths and weaknesses of internal controls provides the rationale for conducting subsequent audit steps. Auditors will look for indicators such as clearly defined responsibilities, competence of personnel, appropriate documentation and records and systems of authorization. It is more important to determine whether the system is effective than whether it is sophisticated.

Gathering audit evidence: The audit team attempts to verify that the steps and controls work as intended. Evidence may be collected through inquiry (e.g., asking a plant operator what he or she would do if there were a major chemical spill), observation (e.g., watching specific activities and operations in progress) and testing (checking records to confirm compliance with regulations).

Recording audit findings: All the information obtained is recorded (usually on the audit protocol document and as working papers), and a comprehensive record of the audit and the state of the facility at the time is thus produced. Where a deficiency is found, it is noted as an audit “finding”.

Evaluating the audit findings: The audit team integrates and evaluates the findings of the individual team members. There may also be common findings. For some observations, an informal discussion with the plant manager may be sufficient; for others, inclusion in the formal report will be appropriate. Reporting the audit findings. This usually is done at a meeting with the plant management at the end of the team’s visit. Each finding and its significance can be discussed with the plant personnel. Prior to

leaving the site, the audit team will often provide a written summary of findings for the plant management, to ensure that there are no surprises in the final report.

Post-audit steps

Following the onsite work, the next step is to prepare a draft report, which is reviewed by the plant management to confirm its accuracy. It is then distributed to senior management according to the requirements of the company. The other key step is to develop an action plan to address the deficiencies. Some companies ask for recommendations for corrective action to be included in the formal audit report. The plant will then base its plan on implementing these recommendations. Other companies require the audit report to state the facts and the deficiencies, with no reference to how they should be corrected. It is then the responsibility of the plant management to devise the means of remedying the failings. Once an audit Programme is in place, future audits will include past reports and progress in the implementation of any recommendations made therein as part of their evidence.

Extending the Audit Process

Although the most widespread use of environmental auditing is to assess the environmental performance of a company's operations, there are variations on the theme. Other types of audit used in particular circumstances include the following:

Pre-acquisition audits: Concern about potential liabilities has promoted the dramatic increase in environmental auditing prior to acquisition. Pre-acquisition audits are a means of identifying actual or potential problems, and taking these into account in the final negotiations of the deal. Time scales are often very short. However, the information obtained on past operations (perhaps before the present owner), current activities, past incidents and so on can be invaluable.

Pre-sale audits: Less common than pre-acquisition audits, but becoming more popular, are audits conducted by the owner prior to selling a plant or a subsidiary company. The rationale is that the company will then know the status of environmental issues before the plant is sold, and can take action to remedy any problems if it feels that is appropriate. Equally important, it can present the results of an independent audit to a potential purchaser as confirmation of the situation. Should any environmental

problems arise after the sale, a baseline has been established against which issues of liability can be decided.



Showing the different view of the Honey Harvesting Unit

Waste Management

Waste Management is devoted to the presentation and discussion of information on solid waste generation, characterization, minimization, collection, separation, treatment and disposal, as well as manuscripts that address waste management policy, education, and economic and environmental assessments. It welcomes both fundamental and applied research that can be related to problems of interest to solid waste researchers, practitioners and/or policy makers. Vermicomposting is one such effective biological method for waste management in which microbes assist earthworms in waste degradation. Vermicomposting is a bio-oxidative natural decomposition process that occurs under mesophilic conditions further aided by the biochemical action of microorganisms.

The following are some of the major areas in which are solicited:

- Generation and characterization
- Minimization
- Recycling and reuse
- Storage, collection, transport, and transfer
- Treatment (mechanical, biological, chemical, thermal, other)
- Landfill disposal

- Environmental assessments
- Economic analysis
- Policy and regulations
- Education and training
- Planning



Showing the different view of the Solid waste Management – Vermicompost Unit

Water Management: Water management is the activity of planning, developing, distributing and managing the optimum use of water resources. Water is a basic necessity. No living creature can live without water. There's a scarcity of water. To avoid this scarcity, water is saved and managed efficiently.

Water harvesting: The technique to save water is called water harvesting. In summers water level of rivers goes below, people do not have sufficient amount of water to drink like in Rajasthan. Hence it is important to save water. It can be done by two major processes:

Rainwater harvesting: It is a method of collection and storage of rainwater into natural reservoirs or tanks or the infiltration of surface water into subsurface aquifers.

Groundwater harvesting: Groundwater harvesting is a method to save water placed under the ground to control the groundwater flow in an aquifer and to raise the water table.



Showing the different view of the Water Harvesting



Showing the different view of separation of waste

Water Management is important since it helps determine future Irrigation expectations. Water management is the management of water resources under set policies and regulations. Water, once an abundant natural resource, is becoming a more valuable commodity due to droughts and overuse. Here are links to articles that address water management subjects such as the optimization of water usage. Water resource management is the activity of planning, developing, distributing and managing the optimum use of water resources. It is a sub-set of water cycle management. Ideally, water resource management planning has regard to all the competing demands for water and seeks to allocate water on an equitable basis to satisfy all uses and demands.

ECO CLUB ACTIVITIES IN THE COLLEGE

- Beautifying selected road side area with plants including ornamentals and put campaign boards to create awareness on environment.
- Action based activities like tree plantation, maintaining a herbal garden, cleanliness drives both inside and outside the campus.
- Organizing seminars, debates, lectures and other invited talk on environmental issues.
- Sensitize the students to minimize the use of plastics and other non-biodegradable materials which pose environmental hazards.
- Creating awareness on the importance of saving water and in installation of Rain water Harvesting tanks.
- Avoid over exploitation of natural resources.
- Placing placards in classroom regarding environment.
- Visiting local forest areas, sanctuaries, botanical garden, parks and industrial areas including the waste management sites.
- Documentation of flora and fauna of the campus.
- Other activities include conducting various competitions viz., Painting, Pencil sketching, Rangoli, Paste the picture, Wealth out of waste, debate on environmental days, essay writing, card making etc., related to environmental issues.
- Seed bank collection.
- Bird watching and documentation.
- Making cloth bags out of old cloths.

SUGGESTIONS

- Adopt an environmental policy for the college.
- Establish a purchase policy for environmentally friendly materials.
- Introduce UGC Environmental Science course to all students.
- 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.
- Establish a functional biogas plant and solar system.
- A model solid waste treatment system to be established.
- Practice of waste segregation to be initiated.
- All trees in the campus should be named scientifically.
- Create more space for planting.
- Grow potted plants at both verandah and class rooms.
- Create automatic drip irrigation system during summer holidays.
- Not just celebrating environment day but making it a daily habit.
- Beautify the college building with indoor plants
- Providing funds to nature club for making campus more green
- Encouraging students not just through words, but through action for making the campus green

CONCLUSION

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 company. The environmental audit reports assist in the process of attaining an eco-friendly approach to the sustainable development of the company. Hope that the results presented in the environmental auditing report will serve as a guide for educating the employees on the existing environment related practices and resource usage at the company as well as spawn new activities and innovative practices. Considering the fact that the company is a well-established, long time run of college with good reputation, there is significant environmental research both by management and employees. The environmental awareness initiatives are substantial and college activities towards environmental conservation is appreciable one.

ENERGY AUDIT REPORT 2021

Submitted to



PROVIDENCE COLLEGE FOR WOMEN

Institution Affiliated to Bharathiar University
Re-accredited by NAAC with 'A'Grade
Coonoor, The Nilgiris

Submitted by



NATURE SCIENCE FOUNDATION
(An ISO 9001:2015 Certified Organization)
(A Unique Research and Development Centre for Society Improvement)
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1. Executive Summary

Energy audit is an inspection survey wherein the analysis of energy flows for conservation is studied. It includes a process or system that aims to reduce the energy input to the system without negatively affecting the output. It includes suggestion of alternative means and methods for achieving energy savings. Conventionally, electric energy is generated by means of fossil fuels. The availability of fossil fuels and their depletion rate, insist the need for alternate energy systems and conservation of electric energy. The main objective of the energy audit and management is to provide goods or services with least cost and environmental effects. The need for audit is to identify the savings potential, reduce the consumption of electric energy by means of alternatives, understand the ways in which fuel are used, where the waste occurs and finding the scope for improvement.

This walkthrough energy audit is proposed and conducted to ensure that energy saving practices are implemented and followed in the campus. The methodology include: preparation and filling up of questionnaire, physical inspection of the campus, observation and review of the documentation, interviewing key persons and data analysis, measurements and recommendations. Energy audit involves several facts including energy savings, energy management, finding alternatives etc. With these facts in mind, the specific objectives of the audit are to evaluate the adequacy of the management and control framework of sustainability as well as the degree to which the departments are in compliance with the applicable regulations, policies and standards. It can make a tremendous impact on the operational costs of the institution and the environment.

1.1 About the Organization – *Providence College for Women, Coonoor*

Providence College for Women, Coonoor is the brainchild of Mother Marie Therese, remembered as the Foundress of the college. The College came into existence since 1st July 1966. It is affiliated to Bharathiar University, Coimbatore. The institution is extremely anxious and completely trusts that there is a crucial necessity to report the essential glitches and reverse the trends. Providence College for Women is a pioneer institution offering higher education in the discipline of Arts and Science. Being a premier institution, the college has initiated energy conservation activities, which may lead to sustainable environment.

2. Scope of Energy Audit

The objective of energy audit by M/s. Nature Science Foundation is to identify the energy conservation and savings opportunities at the premises of Providence College for Women, Coonoor, The Nilgiris. The audit was conducted on 27-02-2021. The audit reviewed the implementation of energy saving and conservation opportunity identified and quantified. The study has been carried out on the following aspects.

1. Review of energy saving opportunities and measures implemented.
2. Identification of additional various energy conservation measures and saving opportunities
3. Implementation of alternative energy resources for energy saving opportunities
4. Creating awareness among the stakeholders on energy conservation.

3. Energy Audit Methodology

The audit involves visiting the campus and physical verification of the loads and sources installed. The entire building envelope of the institution is sectioned into 10 building areas and the audit was carried out as tabulated in Table 1.

Table 1. Sections to be audited

Date	Section where audit was conducted
27-02-2021	Adiminstrative Block
	Auditorium
	Faculty Rooms
	Language Lab
	Computer Labs
	Indoor Stadium
	Canteen
	Hostel – Rooms, Dining Hall & kitchen
	Library

In the aforementioned sections, the services offered are monitored, verified and analysed on the aspects of energy consumption. In all these areas lighting systems forms the major consumer of electrical energy. 3 nos. of electricity service connections available in the campus are

powered from Tamilnadu Generation and Distribution Corporation Limited (TANGEDCO). Out of the three service connections S. No.s 148 and 152 belongs to academic blocks and other one measures the power consumption in the hostel area. All the connections are three phase connections. The electricity consumption charges are audited and studied for the load demand requirement and efficient consumption of energy. Stake holders are interacted and the scope for improvement has been discussed. Potential areas in which scope of energy conservation and saving opportunities available have been identified and suggested for implementation.

4. Systems Studied during the audit

1. Lighting fixtures are verified physically.
2. Installation of energy efficient lighting systems are verified.
3. Verified the installed safety systems
4. Installed power backup systems (generators and UPS) are verified on the aspect of maintenance.
5. Electricity consumption through the TANGEDCO bill was analysed.
6. Reviewed the energy conservation awareness among the stake holders for Optimum use of electricity and its savings.

5. Steps under Energy audit

- Planning and organizing the audit
- Walk through Audit
- Macro data collection
- First hand observation and assessment
- Observation and Analysis
- Recommendations for further improvement

6. Audit Details

- **Audit Date(s) : 27-02-2021**
- **Venue : Providence College for Women, Conoor, The Nilgiris**
- **Audited by : Nature Science Foundation**
- **Audit Type : Walkthrough Energy Audit**

6.1 Audit Team

- 1. Dr. Muruganath Gopal Raj. M.E., Ph.D. FIE., Chartered Engineer**
- 2. Dr. P. Thirumoorthy. M.E., Ph.D., Energy Auditor**

7. Objectives of the Study

The primary objective of Energy Audit is to determine ways to reduce energy consumption per unit of product output or to lower operating costs. Energy Audit provides a “Bench-mark” (Reference point) for managing energy in the building and also provides the basis for planning a more effective use of energy throughout the Campus. The audit is conducted to identify, quantify, describe and prioritize framework of energy sustainability in compliance with the applicable regulations, policies and standards. The main objectives of carrying out Energy Audit are:

- To find out the ways to reduce the energy consumption.
- To find and implement the solutions that is feasible and acceptable.
- To create awareness among stake holders about the real concerns of energy management.
- To initiate the use of alternative or non-conventional energy sources to achieve energy conservation
- To make the institution campus to be self-sustained in energy utilization.

8. Conduct of audit

A structured methodology to carry out an energy audit is necessary for efficient working. An initial study of the site should always be carried out, as the planning of the procedures necessary for an audit is most important. These following steps are carried out in this audit.

Step 1: Planning and Organizing the Audit

Step 2: Conduct of Walk through Audit

Step 3: Macro Data Collection

Step 4: First Hand Observation & Assessment

8.1 Planning and Organizing the Audit

Planning and Organizing are the integral part of the energy auditing. An initial visit to the site is organized. The areas to be inspected are listed, segregated into various sections and the audit was scheduled as per Table 1.

8.2 Conduct of Walk Through Audit

It is also called a simple audit, screening audit or walk- through audit. The main purpose of walk through audit is to obtain general information. More specific information can be obtained from the maintenance and operational people during the time walk through audit. It also involves a brief review of facility utility bills and other operating data and a walk-through of the facility to become familiar with the building operation. The major problem areas are identified during this audit. Figure 1. Depicts the audit being conducted.



Figure 1. Conduction of Audit

8.3 Macro Data Collection

Current level operation and practices within the campus is assessed and then the data regarding the number of electrical loads connected in each sections are collected. The power ratings of each component and their respective hours of operation are observed. Annual intake of students are 1200, by a faculty strength of 60 members. Yearly on an average of 1100 students are being inculcated in the campus. The major equipment's / utilities available in the institution were tabulated as in Table 2. They are the major consumers of electricity.

Table 2. List of major equipment / utilities

S. No.	Equipment / utility	Rating / Capacity	Quantity
1	LED Lamps	7 W and 20 W	85
2	Fluorescent Light (Tube Lights)	40 W	309

3	CFL	18 W	53
4	Focus Lamp	500 W	12
5	Generator	25 kW	1
6	Pump 1	5H	1
7	Pump 2	3H	1
8	Solar Water Heater - 1	600 l	1
9	Solar Water Heater - 2	600 l	1
10	Solar Water Heater - 3	300 l	1
11	UPS - 1	7.5 kVA	1
12	UPS - 2	5 kVA	1
13	UPS - 3	20 kVA	1
14	UPS - 4	20 kVA	1
15	LCD Projector	100 W - 2.9 A	10
16	RO Water	1000 W	4
17	RO Water	500 W	4
18	Refrigerator in Kitchen	220 V -50 Hz	2
19	Refrigerator in Laboratories	220-240 V - 12A	2
20	Varanda light load	7W	20

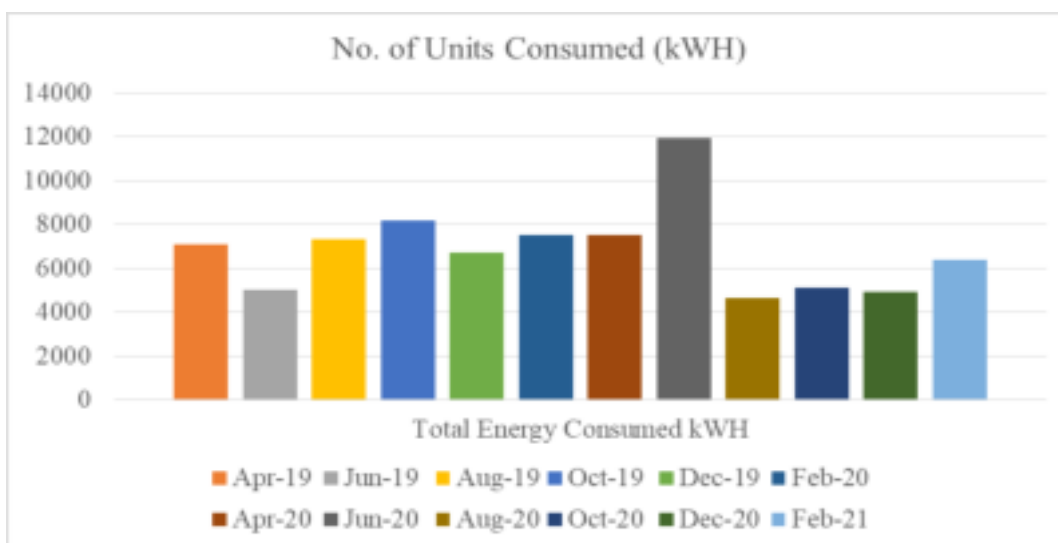
8.4 Electricity Service Provider

TANGEDCO is the Electricity service provider company. Totally 3 three phase service connections vide service nos. 148, 150 & unnumbered are available which powers the entire area of the campus. Consumption of electricity bills for the past year 2019 & 2020, has been

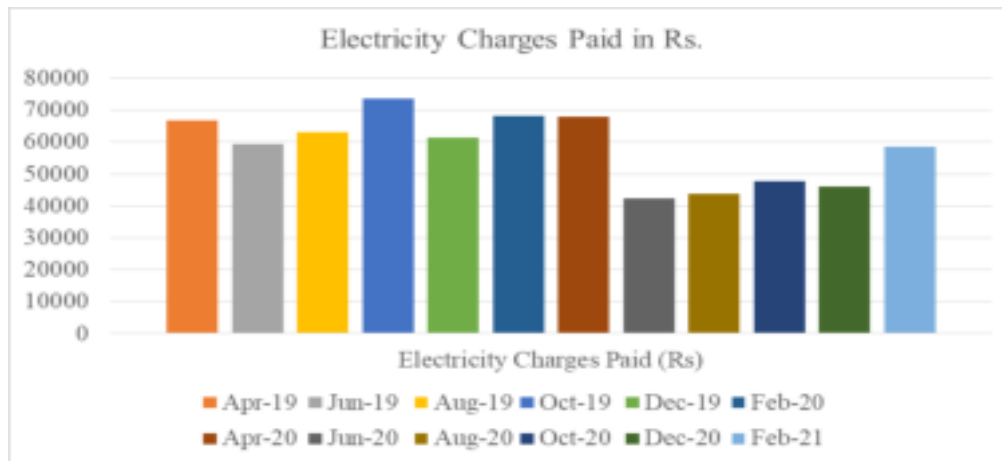
collected, monitored and analysed. The power consumption and the corresponding charges are monitored for a period of 1 year and are tabulated as in Table 3. The corresponding analysis is depicted in Figure 2.

Table 3. No. of Units consumed & Charges Paid

Month & Year	Total Energy Consumed kWh	Electricity Charges Paid (Rs)
Apr-19	7110	66845
Jun-19	5010	59531
Aug-19	7350	63081
Oct-19	8170	73719
Dec-19	6710	61336
Feb-20	7500	68159
Apr-20	7500	67893
Jun-20	11960	42241
Aug-20	4640	43791
Oct-20	5110	47770
Dec-20	4910	46087
Feb-21	6370	58428



(a) No. of Units Consumed



(b) Electricity Charges Paid

Figure 2. Electricity Consumption details

8.5 Backup Facilities

The college consists of a 25 kVA 3-phase alternator for backup which is depicted in Figure 4. However, it is operated only during the requirement of backups. The pattern is such that it is used for a maximum period of 8 to 10 hours a month. The maximum loading has been observed to be around 60%. 4 nos. of three phase inverters are available to provide backup service for laboratory and computers.



(a) Generator Installed



(b) Inverter Backup

Figure 4. Back-up power Sources

8.6 First Hand Observation and Assessment:

The data collected during the above observation are analysed and interpreted. The energy consumed in each section is observed and the energy pattern of the campus is determined in this assessment. Significance energy conservation opportunities that are appropriate to the campus are obtained.

**On average energy consumed by per stakeholder per month is accounted as
3.045 kWh.**

9. Observation and Analysis

Overall Observations

During the audit the following observations were made:

Positive Observation

- Generator installed is used only in case of emergency backup requirements.
- Proper distance is maintained behind the refrigerators that provide suitable ventilation and enhanced life of the appliance.
- Solar based street lighting systems are installed.
- Usage of high star labelled appliances.



Figure 5. Star Label of Installed Appliance

- The fire extinguishers available in the campus are refilled promptly.



Figure 6. Fire Extinguisher installed

Areas for Improvement

1. Majority of the loads are lighting loads ex: fluorescent lamps, CFL and LED lamps.
2. Glare in the windows are observed.
3. Fluorescent lamps are to be replaced with slim fluorescent and LED lamps in certain areas.
4. Appliances without star label are installed. But they are being replaced by high star labelled appliances. (Ex: Refrigerators)
5. Computers and lighting systems were not properly turned off when not in use.

10. Recommendations for Energy Conservation:

Energy saving measures have to be taken up by the stake holders. The following Energy Conservation (ECON) measures tabulated in Table 4 are suggested for the campus.

Table 4. ECON Measures

S. No.	Energy Conservation Measure	Remarks / outcomes	Cost Analysis	Estimated Energy Savings
1.	Switch OFF lights when not in use.	Atleast during day time of the summer and winter season when it is a sunny day the lights the lights can be switched OFF.	No cost involved. Stake holders to be motivated to switch OFF lights when not in use.	12.8 kWh/day
2.	Proper Cleaning of windows	This will remove the dust from the window glasses, thereby making the availability of natural lighting inside the wards	No cost involved.	3 to 5 kWh/day
3.	Proper Switching OFF the appliances and computers	Computer systems, printers etc. are left ON for even when they are not used.	No cost involved. Stake holders to be motivated to switch OFF lights when not in use.	1 to 1.5 kWh/day
4.	Computers rearrangement	Computers are placed closely to the walls. This adds up heat and reduces the life time of the systems.	Rearrange such that sufficient gap is available for ventilation for the computers.	----

By implementing all the aforementioned measures, approximately 20 kWh/day of energy consumed can be reduced. Overall per annum, 7300 kWh of energy can be reduced. This leads to a savings of Rs. 36,500/- per annum (approximately).

The other energy conservation practices that are suggested include:

1. Create a team of members in charge for energy audit and conduct periodical study on the energy conservation once in three months.

2. One stakeholder from each section can be appointed as energy manager. Their duties and responsibilities on the aspect of energy savings and conservation to be defined. Best performing energy manager can be appreciated.
3. Promote energy conservation awareness among all the stake holders and make them actively participate in the process. They should know the cost of electricity being paid. A mechanism should be devised to share these data with the stakeholders.
4. Display boards on a positive manner viz. “Thanks for Switching OFF the Lights and Proper Shutting Down of the System”, and Danger sign boards for high voltage and power levels can be made available everywhere.
5. Replacement of conventional lighting schemes through energy efficient lighting schemes can be done.
6. Periodical monitoring of all the safety devices is recommended.
7. Presently, organization is using three star rating appliances. Recommended to use higher star rating appliances.
8. Recommended to use automatic ON/OFF or occupancy based controllers can be installed for lighting systems.
9. Energy Conservation Club can be formed among the stakeholders to promote energy conservation activities among the stakeholders and also the public.
10. Energy Conservation day celebrations on December 14th of every year is recommended.
11. Following practices to be followed for energy conservation
 - a. Switch off all the equipment’s when not in use.
 - b. Use high star rated equipment
 - c. Use heavy equipment’s like sump motors and bore motors during off-peak hours
 - d. Avoid leaving the equipment’s in standby mode, particularly chargers, electronic gadgets etc.
 - e. Optimal water usage and temperature settings
 - f. Replace maximum utilized lighting with Solar LED lamps

11. Conclusion

Considering the fact that the organization is a well-established, long time run establishment with good reputation, there is significant scope for conserving energy and make the campus as self-sustained in it. The energy conservation initiatives taken up by the institution are substantial. Energy efficient lighting schemes, awareness created among stakeholders and necessary power backups are being practiced by the institution. Few recommendations, in addition, can further improve the energy savings of the college. This may lead to the prosperous future in context of Green Campus & thus sustainable environment and community development.

12. Acknowledgement

We are grateful to the management of Providence College for Women, Connoor, The Nilgiris for providing opportunity to Nature Science Foundation to carry out this this walkthrough Energy Auditing project at their premises. Further we sincerely thank the Principal, faculty members, non-teaching staff and studnets for providing us necessary facilities and co-operation during the audit. This helped us in making the audit, a success. Further we hope, this will boost the new generation to take care of Environment and propagate these views for many generations to come.

GREEN AUDIT REPORT - 2021

Providence College for Women

Coonoor - 643 104, The Nilgiris, Tamil Nadu.



Prepared by,

 Govt. Reg. No. 114/2017	Nature Science Foundation (An ISO 9001:2015 Certified Organization) Coimbatore - 641 041, Tamil Nadu, India. www.nsfonline.org.in	
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1. Introduction

Green auditing is a means of assessing environmental performance. It is a systematic, documented, periodic, and objective review by regulated entities of facility operations and practices related to meeting environmental requirements. It is otherwise the systematic examination of the interactions between any operation and its surroundings. This includes all emissions to air; land and water; legal constraints; the effects on the neighbouring community; landscape and ecology; the public's perception of the operating company in the local area. Green audit does not stop all compliance with legislation. Nor is it a 'green washing' public relations exercise. Rather it is a total strategic approach to the organisation's activities (CBI, 1990).



Fig. 1. Green Auditing at Providence College for Women

2. Green Audit Approach and Plan of Action

1. Audit is a systematic approach.
2. Audit is conducted objectively.
3. Auditor obtains and evaluates evidence.
4. Evidence obtained and evaluated by the auditor concerns assertions about economic actions and events.

5. Auditor ascertains the degree of correspondence between assertions and established criteria.

6. Goal, or objective, of the audit is communicating the results to interested users

3. About the College:

PROVIDENCE COLLEGE FOR WOMEN, COONOOR is the brainchild of Mother Marie Therese, remembered as the Foundress of the college. The college came into existence on 1st July 1966 and the student strength was 31. The college was affiliated to the University of Madras. It is presently affiliated to Bharathiar University, Coimbatore. Affiliation for B.A. History and English Literature was given from 1967-68 and in 1968-69 affiliation was granted for B.A. Economics, B.Sc. Mathematics and B.Sc. Botany. B.Com. was introduced in the year 1981-82.

4. Audit Details:

- Audit Date : 27.02.2021 (Saturday)
- Venue : Providence College for Women, Coonoor, Tamil Nadu
- Audited by Nature Science Foundation, Coimbatore, Tamil Nadu
- Audit type is Green Campus Audit

5. Objectives of the study:

1. Verifying compliance: Verifying compliance with standards or best available techniques.

2. Identifying problems: Detecting any leakage, spills or other such problems with the Operations and processes

3. Formulating environmental policy: Formulating the organisation's Environmental Policy if there is no existing policy.

4. Measuring environmental impact: Measuring the environmental impact of each and every process and operation on the air, water, soil, worker health and safety and society at large.

5. Measuring performance: Measuring the environmental performance of an organisation against best practices.

6. Confirming environmental management system effectiveness: Giving an indication of the effectiveness of the system and suggestions for improvement. Providing a database: Providing a database for corrective action and future plans.

7. Developing the organization's environmental strategy: Enabling Management to develop its environmental strategy for moving towards a Greener corporate and performance culture.

8. Communication: Communicating its environmental performance to its stakeholders through reporting will enhance the image of the Institution.

6. General steps:

1. Systematic and comprehensive data collection
2. Documentation with physical evidences
3. Independent periodic evaluation with regulatory requirements and appropriate standards
4. Systematic and comprehensive improvement and management of existing system.

7. Onsite audit activities:

1. The opening meeting is the first step between the audit team and auditee. In this meeting the purpose of audit, the procedure and the time schedule were discussed.
2. Site inspection is the second step for onsite activity. In this step the Audit team discovered matters which are important to the audit but which we're not identified at the planning stage.
3. Onsite phase of the audit developed a working understanding of how the facility manages the activities that influence the

environment and how any EMS, if there are some substantial work in the college campus.

4. Assessed strengths and weaknesses of the auditee's management controls and risks associated with their failure were established.
5. Gathering audit evidence ie, collecting data and information using Audit protocol.
6. Communicated with the staff members of the auditee to obtain the data and information related to the audit.
7. Evaluated the audit evidence against the objectives established for the audit.
8. An exit meeting to explain the audit findings.

8. Procedure followed:

The audit team is divided into three groups, and under the guidance of the teaching staff each group collected data on the assigned topics. The assigned topics were as follows:

1. Analysis of Greening in the campus
2. Analysis of Biodiversity distribution and conservation
3. Analysis of Water quality and usage
4. All the data were united and based on these, a report was formulated.

9. Audit Report:

Trees play an important ecological role within the urban environment, as well as support improved public health and provides aesthetic benefits to cities. Newly planted and existing trees decrease the amount of carbon dioxide in the atmosphere. In one year, a single mature tree will absorb up to 20 Kg of carbon dioxide from the atmosphere, and release it as oxygen. The amount of

oxygen that a single tree produces is enough to provide one day's supply of oxygen for humans.

10. Recommendations for greening:

- Plant more trees in Miyawaki method so that you can accommodate more number of trees in small place. The trees that produce more oxygen and absorb more CO₂. For healthy environment we have to maintain 33% of the green cover.
- Initiate vegetable cultivation in the college, you have to plan in systematic way which means you can fulfil the canteen requirements (fruits and vegetables).
- Maintaining herbal garden is appreciated. It gives awareness to the students and also it acts as basic means of medicine for everyone. Plant medicinal plants in ground so that it can attain the full growth and increase number of species.
- Increase the vermicompost production use with the campus tree leaf litters and bio-degradable waste. The vermicompost manure can be used for the trees yearly twice as well as you can sell the excess production.
- White Was the trees upto 3ft with limestone and neem oil mix. It can prevent pests and diseases in trees.
- Place name board in all trees and mention the year of planting so that you can identify the oldest tree in the campus.
- Increase the Honeybee hives. Honeybees are natural pollinators and it helps increase yield upto 33% [flower, fruits and vegetables].
- Install bio-gas plant so that you can convert the college mess and kitchen waste into manure and you can get bio gas also. It may reduce the fuel expenditure.
- Introduce terrace garden using HDPE grow bags.



Conclusion:

Considering the fact that the college is a well-established, long time running Institute with good reputation in terms of academics in India, there is significant environmental research by students, staff members and management people in a sustainable manner. The environmental awareness initiatives are substantial. The installation of rain water harvesting system is noteworthy. Besides that, environmental awareness programmes initiated by the administration shows how the campus is going to be greenish and made available to the stakeholders. Few recommendations are added using eco-friendly and scientific techniques in coming days as a plan of action. This may lead to the prosperous future in context of Green Campus and thus sustainable environment and community development will be automated significantly.

Acknowledgement:

We are grateful to the Management and Principal of Providence College for Women, Coonoor, Tamil Nadu for providing us necessary facilities and co-operation during the audit. This helped us in making the audit a success. Further we hope, this will boost the new generation to take care of environment and propagate these views for many generations to come.

HYGIENE AUDIT REPORT

Providence College for Women (Autonomous)

Spring Field, Bandishola, Coonoor – 643 104,
Tamil Nadu.



Prepared by

NATURE SCIENCE FOUNDATION

(A Unique Research and Development Centre for Society Improvement)

இயற்கை அறிவியல் நிறுவனம்

Coimbatore - 641 046, Tamil Nadu, India



Regd. No. 114/2017

Executive Summary

Hygiene audit is a process of extracting information about hygienic environment that provides a realistic assessment of how the Institutions and Organizations cause adverse effect to human beings health and surroundings. To ensure that the hygienic management system, maintenance of environmental and personal hygiene, cleanliness ensured at the site of disposal of hazardous materials, personal safety, microbial load (bacteria, fungi and viruses) in the surroundings are being implemented effectively.

Hygiene audit will provide an insight into how an organization operates in a sustainable manner in terms of hygiene. If an auditing process is already in place, it should be applied in environmental context into clean environment. An audit is a natural management tool and it will become more effective when hygiene audit is added to it. The need of the time is that all the developed and developing countries should adopt the hygiene-auditing system periodically.

Providence College for Women (Autonomous), Coonoor, Tamil Nadu is deeply concerned and unconditionally believes that there is an urgent need to address these fundamental problems and reverse the trends. Being a premier institution of higher learning, the college has initiated Environment Friendly hygienic programmes long back that actively promotes various projects for the environment protection and sustainability including the reduction of hazardous materials and implementing sanitization utility in the college campus which in turn useful to offer hygienic environment to the stakeholders such as students, faculty members and non-teaching staff members including administrative staff. Attempts are being made to give pure and safety along with hygiene environment to various stakeholders especially student communities in the campus by giving hygienic products such as hand soap, towel at rest room, sanitizers, cleaning pads, floor cleaning solutions like Dettol, cotton swabs, toilet cleaners, tissue papers, Vacuum cleaners, pure buckets, mugs, mosquito & cockroach traps, waste disposal drums, bottle brushes, moisturizer, hand lotion, wet wipes, dryer, and etc.

Based on the Audit which is conducted on 27th February 2021, the college is being maintained various hygiene facilities like wash room, hand wash, drinking water and napkin disposal facilities in a proper manner. The observations revealed that number of bacteria, fungal and actinomycete load in the air was within the limit (lesser than 5 cfu) in study areas such as Principal room, Staff cabins, Seminar halls, Class rooms, Laboratories, Auditorium, Canteen and rests rooms. Microbial load was counted using Potato Dextrose Agar, Nutrient Agar and Casein Nitrate Agar Medium for enumerating fungi, bacteria and actinomycetes; respectively. Availability of hand wash, hand soap, sanitiser, mosquito & cockroach traps, waste disposal drums, bottle brushes, moisturizer, hand lotion, wet wipes, dryer, tissue roll and etc have been placed in all the places. Sufficient ventilation, napkin disposal method, effective water purification and recycle system for use of hygienic water in the college campus have been observed.

1. Introduction

Hygiene audit is a process of extracting information about an Institution and Organization that provides a realistic assessment of how the Institutions and Organizations affect the human beings health and also a set of prominent objectives and targets to reduce the adverse effects to human beings. This audit can minimize the hazardous materials in the campus remarkably which in turn reduce the adverse effects to human beings as a whole. As per the Government law, the environmental legislations including food consumption should be followed by all the Institutions and Organizations and make sure that their activities should not harm the environment. It finally lead to give pure atmosphere to various stakeholders such as members of faculty, supporting staff members, parents, students and administrative staff members those who are depending upon the educations institutions.

To ensure that the hygienic environmental management system, maintenance of environmental and personal hygiene, availability of clean resources, maintenance of water supply and hygiene, cleanliness ensured at the site of disposal of human waste materials, personal safety in the campus are being implemented effectively. Each year a

plan for the hygiene audit is prepared by management. This plan serves to ensure that the entire hygienic environmental management system is implemented to ensure health and personal safety in maintaining hygiene. Hygiene auditing is a management tool to objectively and systematically evaluate hygiene and sanitization management systems with the following objectives:

- Number of microbial load in the air
- Methods of disposal of food and human wastes.
- Availability of hand wash, soap, sanitiser, dryer, tissue roll and etc
- Placing environmental information in the public domain.
- Facilities of sufficient ventilation, napkin disposal and waste management
- Effective water purification and recycle system for use of hygienic water

2. STEPS UNDER ENVIRONMENT AUDIT:

2.1. Pre – Audit:

- Planning the audit
- Selecting of the audit team
- Scheduling the audit facility
- Acquiring the background information
- Visiting the site

2.2. On – Site:

- Understanding the scope of audit
- Analyzing the strength and weakness of the internal controls
- Conducting the audit
- Evaluating the observations of audit program
- Preparing a report of the observations side by side

2.3. On – Site:

- Compiling a report of the data collected
- Distributing the report to the institute
- Preparing an action plan to overcome the flaws
- Providing suggestions to implement the action plan.

3. AUDIT DETAILS:

Audit Date	: 27.02.2021 (Saturday)
Venue	: Providence College for Women, Coonoor, Tamil Nadu.
Audited by	: Nature Science Foundation, Coimbatore, Tamil Nadu.
Audit Type	: Hygiene Audit

4. OBJECTIVES OF THE STUDY

The main objective of the Hygiene audit is to promote the hygiene Management and Sanitization utility in the College Campus. The purpose of the audit is to identify, quantify, describe and prioritize framework of hygiene environment in compliance with the applicable regulations, policies and standards to the stakeholders such as.

The main objectives of carrying out Hygiene Audit are:

- Number of microbial load in the air
- Methods of disposal of food and human wastes.
- Availability of hand wash, soap, sanitiser, dryer, tissue roll and etc
- Placing environmental information in the public domain.
- Facilities of sufficient ventilation, napkin disposal and waste management
- Effective water purification and recycle system for use of hygienic water

5. METHODOLOGY

In order to perform hygiene audit, the methodology included different tools such as preparation of questionnaire, physical inspection of the campus, observation and review of the documentation, interviewing key persons and data analysis, enumeration of various microorganisms such as bacteria, fungi and actinomycetes in air using suitable basal media, measurements and recommendations. The study covered the following areas to summarise the present status of hygiene management in the campus:

- Microbial load in the air
- Disposal of food and human wastes
- Napkin disposal and Waste management

- Availability of hand wash, soap, sanitiser
- Water purification and recycle system

6. OBSERVATIONS AND RECOMMENDATIONS

Hygiene audit will be of more useful for assessing the microbial population in a college campus to give pure hygiene atmosphere to the stakeholders. To keep in mind, this audit was conducted to enumerate the number of microbial colonies such as bacteria, fungi and actinomycetes at the College campus. The main purpose of hygiene audit is covering various aspects such as 1) No person suffering from a disease or illness or with open wounds or burns is involved in handling of food or materials which come in contact with food, 2) Food handlers maintain personal cleanliness (clean clothes, trimmed nails & water proof bandage etc.) and personal behaviour (hand washing, no smoking, no spitting etc.), 3) Food handlers are equipped with suitable aprons, gloves, headgear, etc.; wherever necessary, 4) Cleaning of equipment, food premises is done as per cleaning schedule & cleaning programme. There should be no stagnation of water in food zones, 5) Preventive maintenance of equipment and machinery are carried out regularly as per the instructions of the manufacturer, 6) Pest control program is available & pest control activities are carried out by trained and experienced personnel, 7) No signs of pest activity or infestation in premises (eggs, larvae, faeces etc.), 8) Drains are designed to meet expected flow loads and equipped with grease and cockroach traps to capture contaminants and pests and 9) Food waste and other refuse are removed periodically from food handling areas to avoid accumulation.

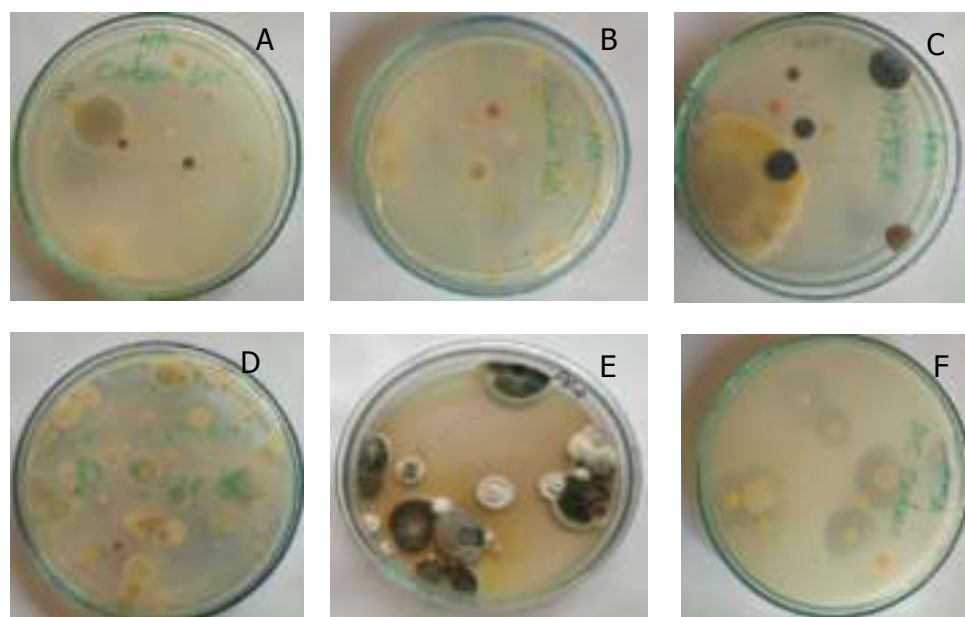
The results indicated that actinomycete colonies were found to be lesser than fungal and bacterial colonies in terms of number of colony forming units (cfu). All the three microbes were least with Principal's cabin followed by Staff Room. They were found to be least in Canteen and Auditorium places. Average number of microbial colonies showed that bacterial colonies were about 10.2 cfu, fungal colonies were about 7.0 cfu and actinomycete colonies were about 4.8 cfu (Table 1 and Figure 1). Generally, actinomycete colonies are found to be least always in all the places due to generic

characteristic features. On the other hand, bacterial colonies are always exhibited higher due to small size and rapid multiplication factors. The fungal colonies are always placed in between two microorganisms such as bacteria and actinomycetes in terms of size, shape, growth, doubling time and generic characters.

Table 1. Microbial colonies in Potato Dextrose Agar medium in different places of Providence College for Women (Autonomous), Coonoor, Tamil Nadu.

S.No.	Name of the Place	No. of Fungal colonies (cfu)	No. of Bacterial colonies (cfu)	No. of Actinomycetes (cfu)
1.	Principal's cabin	2	3	3
2.	Seminar hall	10	18	8
3.	Class Room	6	10	5
4.	Staff Room	5	8	3
5.	Library hall	10	12	5
Total Number of Colonies		35	51	24
Avg. Number of Colonies		7.0	10.2	4.8

Figure 1. Microbial colonies in Potato Dextrose Agar medium in different places of Providence College for Women (Autonomous), Coonoor, Tamil Nadu.



7. Recommendations

- Should continue to maintain about no person suffering from a disease or illness or with open wounds or burns is involved in handling of food or materials which come in contact with food or persons in the college campus.
- Food handlers should also to maintain personal cleanliness (clean clothes, trimmed nails & water proof bandage etc.) and personal behaviour (hand washing, no smoking, no spitting etc.).
- Food handlers should be equipped with suitable aprons, gloves, headgear, etc.; wherever necessary,
- Cleaning of equipment, food premises is done as per cleaning schedule & cleaning programme. There should be no stagnation of water in food zones.
- Preventive maintenance of equipment and machinery are carried out regularly as per the instructions of the manufacturer.
- Pest control program is available & pest control activities are carried out by trained and experienced personnel and no signs of pest activity or infestation in premises (eggs, larvae, pupae, faeces etc.),
- Drains are designed to meet expected flow loads and equipped with grease and cockroach and mosquito traps to capture contaminants and pests) and food wastes and other refuse are removed periodically from food handling areas to avoid accumulation.





9. Acknowledgement

We are grateful to the Management and principal of Providence College for Women (Autonomous), Coonoor, Tamil Nadu for proving an opportunity to conduct Hygiene Audit by Nature Science Foundation in a systemic manner. Further we sincerely thank the college staff for providing us necessary facilities and co-operation during the audit. Further we hope, this will boost the new generation to take care of hygienic environment and propagate these views for many generations of stakeholders to come.

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