# REPORT OF ENVIRONMENT AUDIT

***Submitted to***

**Bharathiar University**
**Coimbatore - 641046, Tamil Nadu, India.**

***Date of Audit: 21.04.2018 (Saturday)***

***Submitted by***


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***Motto***

***'Save the Nature to Save the Future' & 'Go Green to Save the Planet'***

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## 1. Introduction

Environment (Eco) audit is quantitative and qualitative data to track air, soil and water waste, and to gain actionable insights to improve the operational performance in the atmosphere. This audit is generally used to observe the clean and green environment of an Organization. It provides a 360˚ view of a surrounding campus and makes it easy for Owners / Managers / Environmentalists to collaborate, measure, control, and reduce environmental impacts. Finally it leads to enhancing the quality of life for human beings, animals and plants. Eco audit initiatives are the need of the hour across the world due to change in environmental conditions, global warming and increasing human population (Maltby, 1995; Haahkim and Yunus, 2017). It aims to make a sustainable and friendly environment for the stakeholders.

Environment audit is a well-developed process of extracting information about an Organization that provides a realistic assessment of how the Organizations take steps towards protecting the environment. In order to save the eco-friendly atmosphere of an Organization, well-developed environmental objectives and targets should be undertaken to reduce the harmful effects to a greater extent. The audit process can minimize the environmental pollution in the campus remarkably which in turn reduces the global warming that affects as a whole. As per the Government law, the environmental legislations should be followed by all the Institutions and Organizations and make sure that their activities should not destroy the environment (Ramachandra and Bachamanda, 2007). An environmental audit is a kind of assessment supposed to create awareness of environmental compliance and implementation gaps in the management system, along with related corrective movements.

This audit is a systematic, documented, periodic and objective review by a regulated entity of facility operations and practices related to meeting the environmental requirements. Environment audit should be undertaken by observing, measuring, recording the data and collecting and analyzing the various components in an Organization related to the environment. To be effective, it must be done systematically and thoroughly together with full management support (Conde and Sanchez, 2017). In general, environmental audit is designed to achieve a maximum resource optimization and improved process performance in the audit sites. It is a ‘Common Sense Approach’ to identify the problems and solve those problems pertaining to curb eco-friendly atmosphere (APHA, 1981; Venkataraman, 2009). Environmental audit enables a comprehensive look at the audit sites to facilitate our understanding of material flows and to focus our attention on areas where waste reduction is executed and therefore cost saving is made possible (Gowri and Harikrishnan, 2014).

Environmental audits ensure that the environment is not disturbed from its balanced existence, so that it provides an eco-friendly atmosphere to the stakeholders. Similar to that of Environmental audit, Green campus audit is also a type of assessment to ensure that the Institution and Organization campus should grow a large number of trees, shrubs, herbs, lawns, climbers, twins and lianas in their campus to produce more amount of oxygen and absorb more amount of carbon-di-oxide to provide a healthy atmosphere to the stakeholders (Aparajita, 1995; Adeniji, 2008). Environmental audit provides vivid dimensions on how waste materials are being managed and the source

of wastes along with the solutions for environmental degradation is managed. Environmental Management System (ISO EMS 14001:2015) should be implemented by every Organization to ensure that the eco-friendly campus is being given to the stakeholders. Eco-friendly youth leadership programmes, green campus practices, social responsibility and Institutional values comprehending the relationship with the ecosystem for a sustainable environment are being evaluated (IGBC, 2018).

## 2. Aims and Objectives of Environment Audit

The important goal of an Environment audit is to promote the environment management and conservation for future generations. The reason for the environmental audit is to perceive, quantify, describe and prioritize the framework of environment sustainability in compliance with the applicable rules, regulations and requirements. In general, Environment audit can be achieved by creating awareness on the importance of safeguarding the environment among students, faculties and staff members, including public domain. The major goals of environment audit are:

- To safeguard the environment and reduce the threats posed to human health by the Organization.
- To create awareness among the stakeholders about the importance of environmental degradation and conservation as per the Environment Management Systems (ISO standard of 14001:2015) and Environmental Legislations by the Organization.
- To establish a baseline information about the eco-friendly environment in the campus to the stakeholders for future sustainability.
- To review the disposal of solid wastes and wastewaters in the campus and identify the sources of waste generation and possibilities of mitigation with respect to environmental compliance.
- To conduct outreach programmes to the rural, tribal and urban community people on the environment damage and conservation.
- To correlate the flora and fauna with environmental sustainability in the audit sites to provide a healthy atmosphere to the members of the Organization.
- To take steps to minimize the environmental pollution and degradation by means of developing ‘Sanitation and hygiene policy’, ‘Water conservation policy’, ‘Waste management policy' and ‘Green campus and Environment policy’ by the Organization.

## 3. Procedures followed in Environment Audit

Environmental audit involves monitoring an Organization concerning about the green campus, environment, sanitation and hygiene policies. It is a regular process that is conducted periodically by a regulated entity to check whether an Organization meets the requirements of environmental compliance. The process of environmental audit includes examining, collecting, evaluating, documenting data and analyzing various components related to environmental aspects (IGBC, 2018; WGBC, 2018). Environmental audit was carried out as per the procedures mentioned of the Manual of Gnanamangai *et al*. (2018). The environmental audit possesses the following characteristic features in which various aspects of wastes generation and steps taken by the Organization to reduce both solid and liquid wastes without harming the environment.

- Identification of various sources to generate wastes and types of degradable and non-degradable wastes in the campus.
- Collection of information related to type of operations, use of various raw materials and products that generate wastes.
- Finding the highlights of inefficiencies in the process that generate wastes and areas that are to be monitored with extra care.
- Setting up the target for reduction of wastes and source of waste generation without affecting the environmental health.
- Steps taken to minimize the environmental pollution and degradation by means of developing internal policy methods.
- Suggestion of cost effective waste management strategies and zero waste discharge in the Organization.
- Creation of awareness among stakeholders on the benefits of reducing wastes without damaging the ecosystem.
- Aids in increase of process efficiency and status report with regards to environmental compliance and management.

**4. Steps involved in the Process of Environmental Audit**

The following are the major steps involved in the process of environmental audit:

**Step #1:** Opening meeting among the audit team and auditees, discussed about the audit procedure and document verification.

**Step #2:** Visited the on-site of the audit along with the audit team and auditees.

**Step #3:** Walked around campus to check the facility as walk-through audit and took photographs for preparing the audit report.

**Step #4:** Monitor the components as per the environmental audit checklist (Sanitation and hygiene, water conservation, waste management and green campus and environment policies).

**Step #5:** Noted down what all components are present and what are all not available in the campus as of environmental audit components listed by NSF ISO-EMS checklist.

**Step #6:** Identified the issues in the campus with respect to the environmental compliance and strengths and weaknesses of the Auditee's Management controls and risks associated with the audit.

**Step #7:** Looked into other items to be monitored as per the NSF checklist with respect to Ecology and Environment studies.

**Step #8:** Exit meeting held after the audit in which the audit findings with the members of the Organization was discussed.

**Step #9:** Prepared and distributed the findings as a Report and Certificate along with the recommendations including the best practices followed by the Auditee.

**Step #10:** Comparison between the last audit report with the present audit report in which the number of suggestions and recommendations were taken into consideration and rectified significantly by the Management.

**Step #11:** Observed the audit process undertaken by the certifying agency between the last audit and current audit processes, whether the same certifying agency has undertaken the audit process or not?.


**5. Benefits of an Environmental Audit:**

Environmental audit provides the following benefits to the Organization:

- Discover various issues related to the environment in the Organization.
- Compute the issues, identify and assess the impact of the issues.
- Provide suggestions to minimize the issues found in the Organization.

On conducting an Environmental audit, it provides the following results:

- Conservation of resources and reduction of raw materials.
- Minimizing wastes, control of pollution and reduction of costs.
- Improvement in working conditions and improvement in process efficiency.

**6. Phases of an Environmental Audit:**

The environmental audit encompasses three phases such as pre-audit, during- audit and post-audit. These phases involve various components to resolve the problems in the campus as well (Arora, 2017; Gnanamangai *et al*., 2018).

### 6.1. Pre-Audit:

Pre-audit involves the following components:

- ✓ Planning the audit
- ✓ Selecting the audit team
- ✓ Scheduling the audit facility
- ✓ Acquiring the background information
- ✓ Visiting the site of audit
- ✓ Collection of data and documents verification

### 6.2. During-Audit:

During the audit, the following components are involved:

- ✓ Understanding the scope of audit
- ✓ Analysing the strength and weakness of the internal controls audit
- ✓ Conducting the on-site audit
- ✓ Evaluating the observations of audit programme
- ✓ Noting down the key observations and taking photographs
- ✓ Clarifications if required during the audit site and document verification

### 6.3. Post-Audit:

Post-audit involves the following components:

- ✓ Identification of the best practices followed by the Organization
- ✓ Compiling a report of the data collected
- ✓ Distributing the report and certificate to the Organization
- ✓ Preparing an action plan to overcome the flaws
- ✓ Providing suggestions to implement the action plan
- ✓ Setting up the future environmental aims and objectives

## 7. Components of an Environmental Audit:

Environmental audit has five components, namely: 1) Sanitation and hygiene policy, 2) Water conservation policy, 3) Rainwater harvesting policy, 4) Waste management policy and 5) Waste management initiatives

### 7.1. Sanitation and Hygiene Policy:

In this component, the following are being considered:

- ➢ Physical appearance and overall ambience
- ➢ Adequacy of toilets (Student/Employee: toilet ratio)
- ➢ Gender balance and disabled-friendly toilets (Male: Women)
- ➢ Water taps and sanitation plumbing, adequacy and efficiency
- ➢ Adequate clean drinking water facilities
- ➢ Kitchen staff apparel and hygiene
- ➢ Canteen and hostel hygiene maintenance
- ➢ Kitchen hygiene and fly proof condition
- ➢ Cutlery, crockery and utensils hygiene
- ➢ Dining hall hygiene and bad odour free
- ➢ Cleaning equipment and consumables

**7.2. Water Conservation Policy:**

In this component, the following are being considered:

- Know the source of the campus water availability
- Monitor overhead tanks for periodical cleaning
- Reuse of treated water, recycling, leakages etc.
- Drip irrigation / sprinkler irrigation system for watering to plants
- Water efficient dispensing mechanism in campus

**7.3. Rainwater Harvesting Policy:**

In this component, the following are being considered:

- Implementation of rainwater harvesting system
- Functioning status of rainwater harvesting system
- Connectivity between rainwater harvesting and open wells and bore wells

**7.4. Waste Management Policy:**

In this component, the following are being considered:

- Is the campus a 'Plastic free zone'?
- What are the methods adopted for waste segregation and storage?
- Disposal of solid wastes, reuse and recycling process
- Vermicompost, cow dung and organic manure units
- Availability of Biogas plant and its implementation status
- Installation of incinerators and their functioning status
- Adequate number of waste bins, separate bins for dry and wet wastes
- Food waste dumped status methods of disposal

**7.5. Waste Management Initiatives:**

In this component, the following are being considered:

- Sign boards indicating energy / water conservation in respective places
- Awareness sign boards on usage of tobacco and tobacco free campus
- Awareness sign boards on plastic usage and plastic free campus
- Programmes related to waste segregation / waste disposal systems
- Sufficient ventilation facility
- Social responsible activities to rural, tribal and urban areas

**7.6. A good environmental audit**

- Defines sources, quantifies types of waste being generated
- Collates information on unit operations, raw material, products and water usage
- Highlights process inefficiencies and areas of poor management
- Helps in setting targets for waste reduction
- Permits the development of cost effective waste management strategies
- Raises awareness in the workforce regarding the benefits of waste reduction
- Helps to improve process efficiency
- Assess the quantity of water usage within the company.
- Find out various sources of organic and solid waste generation and mitigation possibilities.
- Document the waste disposal system properly and bring out a status report on environmental compliance with respect to the waste disposal system.

**8. About the Organization**

The Bharathiar University was established at Coimbatore by the Government of Tamil Nadu in February 1982 under the Bharathiar University Act, 1981 (Act 1 of 1982). The erstwhile Postgraduate Centre of the University of Madras formed the core of the Bharathiar University, which was functioning at Coimbatore before 1982. University Grants Commission (UGC) recognized Bharathiar University in 1985 for grants. The University has 39 Departments, offering 54 post-graduate programs besides offering M.Phil. and Ph.D. programs. The University is an affiliating University. The jurisdiction of the University covers the districts of Coimbatore, Erode, Tirupur, and The Niligiris with 133 affiliated colleges.

The National Assessment and Accreditation Council have accredited the University with an 'A' Grade in the third cycle assessment. Bharathiar University is marching towards becoming a World Class University by garnering ranking in the International arena. Times Higher Education Young Universities World Ranking ranked our University in the range of 201 to 250. We stand at 13$^{th}$ rank under the category of University and 21$^{st}$ among the top 100 institutions in the MoE's National Institute Ranking Framework's (NIRF) ranking. The state-of-the-art facilities available for faculty members and scholars nurture a culture of research in cutting-edge areas. Industry infusion into the curriculum is given prominence by involving industry experts - R&D managers, product development managers, technical managers in the curriculum development as special invitees in the Board of Studies.

Our University is a partner in the MHRD National Knowledge Network. Through UGC - Infonet, and Inflibnet a collection of physical and electronic resources is available. The Intellectual Property Rights Cell of Bharathiar University protects the rights of inventions of faculty and young researchers in the University. The DRDO-BU-Center for Life Sciences was established in Bharathiar University as a joint venture by DRDO, Ministry of Defence, Government of India, as an autonomous research institute to pursue basic and applied research. Bharathiar University Centre for International Affairs (BU-CIA) facilitates admission of international students through study in India (MoU) and Indian Council for Cultural Relations (MEA). BU-CIA operates in liaison with the Association of Indian Universities, the Association of Commonwealth Universities, and Shastri Indo Canadian Institute. With a dedicated team of faculty with vast experience in teaching and research and dedicated and experienced administrative members, the University has emerged as one of the strong pillars of higher education in this region.

Bharathiar University provides high quality education and training in the field of Arts, and Sciences to prepare students to contribute to India's social, technological and economic development. Apart from quality education, the Institute provides training to make students responsible and socially and culturally aware. The Institute is situated in a sprawling 720 acre in Coimbatore city. It is offering various Arts and Sciences, courses at postgraduate (M.A./M.Sc./M.Com./MBA./MCA.) level including M.Phil and Ph.D. degree programmes in various subject domains.

With a campus spread across 720 acres, the campus has a fine infrastructure and adequate state-of –the-art physical facilities which include administrative building, Department building containing classrooms, laboratories, staff cabins and restroom, central library, controller of examination building, DRDO centre, hostels, foot court, auditorium, seminar halls, canteen, playground and other sports, games and gym facilities, bank, ATM, post office, hostel, shed, farm, security cabin, green house and animal house, etc. The Organization provides hostel facility to boy and girl students in the campus facilities. The buildings and other infrastructural facilities are well-maintained and are put to optimum use. The Institution is open to students of all castes and creed, as envisaged in its lofty vision to cater to the higher education aspirations of the socially, educationally and economically marginalized sections of a rural population belonging to different communities, consisting mostly of economically weaker sections of the students. The Institution has a well-defined decentralized and participatory organizational structure to coordinate the academic and administrative functions very effectively.

The dedication of the Management and the Administration section of the Bharathiar University, combined with excellent infrastructural and teaching facilities help to maintain high standards in curricular and co-curricular spheres to the stakeholders like students, staff members and parents. It offers a well-established vision and mission coinciding with global standards to impart high quality of education to the students coming from rural background that lead to the challenges of an emerging India in a globalized world, by bringing in a positive difference in the socioeconomic-educational status of the state and the nation as a whole.

Bharathiar University is maintaining more than 80% of green cover area and open unutilized landfills zone after building construction as per the guidelines of World Green Building Council, Indian Green Building Council, Environmental Regulations and Compliances.


**9. Audit Details**

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|---|---|
| **Date/Day of Audit** | **: 21.04.2018 (Saturday)** |
| **Venue of Audit** | **: Bharathiar University**<br>Coimbatore - 641 046, Tamil Nadu, India. |
| **Audited by** | **: Nature Science Foundation,**<br>Coimbatore, Tamil Nadu, India. |
| **Audit type** | **: Environment Audit** |
| **Name of ISO EMS Auditor** | **: Mrs. S. Rajalakshmi,**<br>Chairman & ISO EMS Auditor, NSF. |
| **Name of Lead Auditor** | **: Dr. R. Mary Josephine,**<br>Board of Directors & Botanist, NSF. |
| **Name of Subject Expert-I** | **: Dr. D. Vinoth Kumar,**<br>Joint Director & Certified Lead Eco Auditor, NSF. |
| **Name of Subject Expert-II** | **: Er. Ashutosh Kumar Srivastava,**<br>Associated Chambers of Commerce and Industry. |
| **Name of Subject Expert-II** | **: Dr. A. Geetha Karthi,**<br>Certified ISO TUV NORD Auditor, Environment |
| **Name of IGBC AP Auditor** | **: Dr. B. Mythili Gnanamangai,**<br>IGBC AP, Indian Green Building Council. |

**10. Observations of the Environment Audit**

**10.1. Plastics use and their impact on the environment**


People use plastic bags and plastic ware items every dayto hold objects like meals, clothes, grocery and stationary items, which can be bought from shops. Generally, the plastic items are non- degradable in nature that lead to soil pollution and affect the soil health significantly. Most of the plastic items are considered as solid waste. This has resulted in many damaging environmental effects inclusive of animal choking, pollution, blockage of channels, rivers and streams, and landscape disfigurement. According to the World Health Organization (WHO) report, plastic items take at least 400 years to decompose completely in the soil which illustrates the subsequent effects on the environment. Plastic pollutants form a basis for damage to humans, animals and flora through toxic pollution. It can take masses or even heaps of years for plastic to break down so the environmental harm is lengthy-lasting. It impacts all organisms in the food chain from tiny species to big ones. There is a need to reduce the plastic use to effectively limit plastic waste in the campus.

The Bharathiar University has taken sufficient attempts not to use plastics in the campus and displayed a slogan ‘Plastic free campus’ in places like canteen, hostel dining halls, seminar halls, department premises, open places, car parking areas, corridors, etc. to the students, parents and public. It insisted the people use eco-friendly bags made from organic materials like plant fibres which are easily decomposable in nature. These efforts are very much essential to keep the environment neat and clean to conserve nature for the future generations.

## 10.2. Solid Waste Management


Solid waste control is a term that is used to consult the method of accumulating and treating solid wastes by following the method of eco- friendly manner. It also offers solutions for recycling objects that do not belong to garbage or trash. As lengthy as humans have been living in settlements and home regions, rubbish or solid waste has been a difficult task. In the solid waste management, the wastes are accrued from different parts and are disposed of based on degradability materials like paper and non- degradability materials like glasses, plastics and metals. Integrated Solid Waste Management (ISWM) is an activity that promotes prevention of waste, recycling, composting, and disposal. A powerful ISWM considers how to save, recycle, and manage stable waste in better methods that will protect the humans and the environment.

The Bharathiar University Campus has a very good solid waste recycling unit which operates a few vehicles to collect wastes using compostable bags across the campus. Both degradable and non-degradable items are being collected from different Department laboratories, canteens, cafeteria, stationary shops and hostels every day and dumped in the place which is subsequently segregated based on the nature of degradability. The segregated items are neatly packed in eco-friendly covers and subjected to degradation without harming the environment. In addition, dust bins are kept in different places across the campus to provide a dust free atmosphere to the stakeholders. The dust bins are labelled properly for the indication of degradable and non-degradable items. These biocomposts are utilized for cultivation of plants in the campus and enhance the health of soils and population density of beneficial microorganisms to a greater extend.

Waste management has a common mandate that the “Producer Owns the Responsibility”. The community that generates waste should develop more responsibility in handling the waste with more care thus reducing negative impact on the environment. The study revealed that the solid wastes needs to be professionally handled. The solid wastes are collected from different places of Bharathiar University campus and segregated based on bio-degradable and non-degradable materials subsequently subjected for recycling and degradation processes like composting. For the purpose of segregation of waste at source and collecting the same ‘Waste Bins’ are placed at designated locations in the Bharathiar University Campus *viz*., students hostels and staff quarters, canteen and guest house. Similarly, e-waste materials were collected and segregated properly and then given to the Authorised Agencies which are approved by the Pollution Control Board (PCB) for handling e-waste for the proper disposal, the e-waste pollution is significantly reduced in the Bharathiar University Campus.

## 10.3. Recycling of Wastewaters

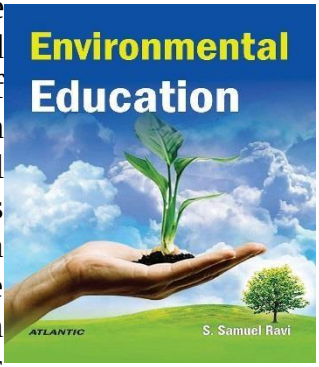
Wastewater recyclers are important features in any Organization or Industry. Once for all the implementation should follow the proper guidelines for wastewater treatment system discharge standards as per Central Pollution Control Board (CPCB). The main feature of these discharge standards is the treated water should not be harmful to the biodiversity, resources and the environment. If an industry or Organization has the wastewater treatment plan, proper records on the analysis of water input and output parameters including the running time of the wastewater treatment plant; its operation cost, its maintenance and the reuse records of the treated water should be well accounted. A typical wastewater treatment system should be based on the waste characterization and the treatment of wastes can be modified so as to fit into the motto of treating the wastewater which in turn to release of safe water subsequently it should be ensured.

The Bharathiar University Campus has a very good wastewater treatment facility covering primary, secondary and tertiary water treatments for elimination of excess phosphorus, potassium, zinc, chromium and nitrogen contents along with harmful pathogens and the degradation of inorganic wastes. The wastewaters are treated with both chemical and biological treatment methods using activated-sludge, UV light and chlorination. There is a proper connectivity and channels for the discharge of wastewaters from various departments, canteens, cafeteria and hostels to wastewater treatment plants. The wastewaters are purified considerably and reused for gardening as water reclamation. In addition, there is a Reverse Osmosis (RO) water unit to get RO water. The RO treated water is periodically tested for the physico-chemical properties for which Registers containing data relevant to water analysis are being maintained. There is a periodical test to check the physico-chemical properties of wastewaters such as pH, biological oxygen demand, chemical oxygen demand, dissolved oxygen and carbon-di- oxide and total soluble solids before reuse for gardening.

**10.4. Oxygen producing and Carbon dioxide absorbing plants to give pure atmosphere to the Stakeholders**

Attempts are being made to give a pure atmosphere without any air contaminants to the stakeholders for which a large number of oxygen producing and $CO_2$ absorbing plants are planted in the Bharathiar University Campus. There are some plants which are being considered highly efficient in oxygen production and carbon dioxide absorption which in turn reflected the air quality of the green campus. If more oxygen is made available in the campus naturally, the stakeholders may be free from cardiovascular and pulmonary problems including breathing troubles. The oxygen producing and $CO_2$ absorbing plants available in the campus are Neem (*Azardirachta indica*), Snake plant (*Sansevieria zeylanica*), Gerbera Daisy (*Gerbera jamesonii*), Portia tree (*Thespesia populnea*), Bamboo (*Bambusa vulgaris*), Pongam (*Pongamia pinnata*), Fire croton (*Codiaeum variegatum*), Malabar plum (*Syzygium cumini*), Bahera (*Terminalia bellirica*), Ilupai (*Madhuca longifolia*), Veldt grape, devil's backbone (*Cissus quadrangularis*), Asna (*Terminalia elliptica*), Mastwood (*Calophyllum inophyllum*), Talipot palm (*Corypha umbraculifera*), Indian mulberry (*Morinda tinctoria*) and Arjun tree (*Terminalia arjuna*). The predominant families of various monocot and dicot plants of oxygen producing and $CO_2$ absorbing plants found in the Bharathiar University Campus are Acanthaceae, Anonaceae, Arecaceae, Bignoniaceae, Caesalpiniaceae, Combretaceae, Cycadaceae, Euphorbiaceae, Fabaceae, Lythraceae, Malvaceae, Meliaceae, Moraceae, , Myrtaceae, Nyctaginaceae, Phyllanthaceae, Polygalaceae, Rutaceae, Rubiaceae, , Turneraceae, Verbenaceae, and Vitaceae.

## 10.5. Environmental Education




An environmental study is the learning principle of the ecosystem and how it will expand sustainable techniques to defend the surroundings. It enables people to develop an understanding of the environment in which we live and helps to overcome tough environmental troubles affecting nature. In addition, the physical aspects of the environment should be studied, it also emphasizes the need to conserve biodiversity and undertake an extra sustainable way of life and make use of sources in a responsible manner. To create attention amongst today's generation on pressing environmental troubles, the University Grants Commission (UGC) in India has made it mandatory for the Universities and Autonomous Colleges to introduce a course in 'Environmental studies' and teach to the students about the ecosystem, pollution and problems associated with the environment.

The students of Bharathiar University are motivated to study 'Environmental Science' and 'Environmental Engineering' subjects as per the University guidelines. The Undergraduate students of Bharathiar University are studying 'Environmental Science and Engineering' subject which is included as a core subject in the curriculum. In addition, the students from Biotechnology, Civil Engineering and Environmental Engineering courses are studying 'Environmental Biotechnology', 'Environmental Engineering', 'Solid Waste Management' and 'Wastewater Treatment' elaborately as core subjects. Both UG and PG students are motivated to do mini-projects and final year projects as a part of their curriculum on environmental protection and biodiversity conservation. The students are encouraged to visit industries involving in solid waste management and wastewater purification and eco-friendly materials production processes across India.

## 10.6. Implementing Swachh Bharath Abhiyan Scheme under Clean India Mission


Swachh Bharath Abhiyan under Clean India Mission is the new initiative and a step towards sanitation, solid waste management and cleanliness to promote cleanliness across India. It is the country-wide campaign applied on a large scale in India for both the rural and urban places, producing needs for the bathrooms and providing hygienic atmosphere amongst the population by household member's was the main purpose of this. This scheme is implemented by the Educational Institutions covering Universities, Colleges and Schools, Government Departments, Companies and Public sectors across the country to give a safe pollution free environment, eliminate the open defecation, improve solid waste management and sanitation and refining drinking water quality to the stakeholders.

The initiative is easily attainable by the support of Government employees, management representatives, staff members and students. The students of Bharathiar University conduct more awareness programmes on cleanliness, use of plastics, solid waste management and sanitation and importance of environment to the rural people across Coimbatore District of Tamil Nadu through NCC and NSS units. The students collected and disposed of the wastes in the trash by using eco-friendly covers. They created awareness among the rural and urban people to keep the surroundings clean and hygiene. A sizable number of programmes and rallies are conducted periodically during the celebration of various events such as 'Independence Day', 'Republic Day', 'World Environmental Day' and 'Biodiversity Conservation Day' events.

### 10.7. Public transport, Low emitting vehicles and Control of Car Smokes and Exhausts for Environment Management

A smart method is to pick out public transportation as much as feasible without polluting the environment by way of driving a car or bike. It additionally often is cheaper, and it leaves much tear in personal automobile expenses. Public transportation cars together with buses reduce carbon emissions which greatly decreases the development of smog within the towns. This means that human beings have more healthy air to respire. Comparing a bus travelling with seven people to one single person using a vehicle, it's been observed that buses are the most effective by producing 1/5 the quantity of carbon gas emissions compared to the findings of the car effects. This is a huge decrease in discharge of natural resources per person. Public transportation is better for the surroundings which have been proven through research on emissions. Other than this, it also gives more benefits like less noise and traffic congestion. Whenever possible, try to take public transport in place of one's own vehicle. Fewer miles means approaching fewer emissions.

Bharathiar University operates some vehicles (Bus) to pick up the students and staff members around Coimbatore city to enhance the teaching and learning processes. In addition, a few vehicles are operated to collect the garbage for day-to-day activities with respect to running of hostels, canteens, cafeterias, mechanical workshops and other departments like construction, plumbing and wiring. The vehicles are maintained properly by following periodical services, changing oil filters and belts, grease and lubricate, batteries, and etc. It is observed that staff members and students are coming to Bharathiar University every day using their own vehicles (Cars and Bikes / Scooters) which accounted to be moderate. It is Bharathiar University to operate some bicycles and battery cars for internal mobility for all stakeholders who wish to use it inside the Bharathiar University Campus to control car smokes and exhaust significantly. It is playing an important role to act as a global indicator for checking the purity of the atmosphere in terms of car smokes and exhaust in the level of carbon dioxide. The observation showed that the concentration of $CO_2$ in the atmosphere is found to be low which did not exceeds the critical limit of $CO_2$ having pure air without any air contaminants with good air exchange/circulation in Bharathiar University campus.

**10.8. Napkin disposal facility**

Menstrual Hygiene Management (MHM) is an indispensable part of the Swachh Bharath Mission Guidelines (SBM-G) for adolescent girls and ladies. As in step with MHM hints, 'Safe disposal' method making sure that the process of destruction of used and dirty materials is performed without human touch and with minimum environmental pollutants and 'Unsafe disposal' method throwing used material into ponds, rivers, or inside the fields exposes others inside the vicinity to decaying material and have to be averted. Some of the unsafe practices of napkins include throwing them unwrapped into fields and rooftops, Wrapping them in paper/ plastic bags and throwing them outdoors or in dustbins, burying them for de-composting, throwing them in latrine / toilets, burning it. These unsafe practices are to be avoided and rather health practices can be adopted.

Bharathiar University is implementing the safe practices of disposing of napkins using small scale incinerators in ladies hostels. Incinerators facility and disposal structures in the proper directions and other social stigmas connected to menstruation influences the sanitary waste disposal conduct of women within the campus is very much appreciated. The University is taking care of adolescent girls and ladies significantly.

**10.9. Biogas plant facility at Bharathiar University Campus**

A biogas plant is where biogas is produced by means of fermenting biomass using cow dung and plant waste products. This is done by developing methane-containing fuel that is usually present in energy crops like corn, or waste substances such as manure or food waste. The fermentation residue left over from the substrates at the end of the manner can be used as fertilizer. The biogas is produced by the micro-bacterial decomposition of the substrate in an oxygen-loose surrounding like below anaerobic situations. This is implemented by pumping the substrate into the fermenters. The substrate is stored beneath anaerobic situations and is periodically shifted *via* agitators to avoid the formation of surface scum and sinking layers. This also permits the biogas to rise greater effortlessly. Installing biogas in educational institutions and industries help in the waste management process, as the wastes accumulated in canteen, hostels, mess and restaurants can be used for biogas plant, which in turn can be used for cooking. This fulfils two purposes simultaneously by energy saving and waste management.

Bharathiar University in in the initial stage of establishing the Biogas plant at University hostel towards energy efficiency management and also it may be used to reduce the fossil fuel expenditure as well as impact on the environment. Since the University has five hostels for girls and boys, the food waste generated in the hostel zones (both ladies and gents) and organic wastes collected from the different locations of Bharathiar University Campus may be treated by biogas plant. The biogas produced from the plant are utilized for cooking, and the residual dung or the digested slurry left after generating biogas is advised to use as manure for agricultural purposes in the Bharathiar University Campus. In addition, the treated effluent from biogas plant may be diverted to the STP for storage and utilized for irrigation / gardening purpose.

## 11. Best Practices on Environment Audit Initiatives followed in the Organization

1. A compositing unit is made available for decomposing the hostel's kitchen and plant wastes naturally and converting them into organic manures which are utilized efficiently for cultivation of plants in the Bharathiar University Campus.

2. Swachh Bharath Abhiyan under Clean India Mission is implemented effectively towards sanitation, solid waste management and refining drinking water quality to promote cleanliness to rural and tribal people across Coimbatore District.

3. The University has created a very good campus ecosystem for making a coexisting and sustainable environment which includes natural and planted vegetation supporting a rich biodiversity of flora and fauna.

4. 'Eco Club' and 'Nature Club' along with NSS Units are functioning well and conducting a large number of awareness programmes related to nature conservation and environmental protection.

5. A well-established 'Rainwater harvesting system', 'Percolation ponds' and 'Check Dam' to recharge wells and ground water status by collecting rainwaters from the campus coinciding with the contour of the terrain and natural drains.

## 12. Recommendations for sustainable environment

- Suggested to conduct a large number of awareness programmes on nature conservation and environmental protection among the students and scholars.

- Recommended to include various courses related to environmental safety, conservation and environmental pollution in the Curriculum for the students and research scholars.

- Advised to check the physico-chemical properties bore well, open well and RO waters to assess the quality of water for drinking and watering purposes.

- Advised to test the soil edaphic parameters of soil samples collected from various locations of the campus for macro and micro nutrients and health.

- Amended to plant more number of oxygen producing and carbon dioxide absorbing plants in the campus to create a very good ecosystem to the stakeholders.

- Suggested to measure the carbon footprint across the campus due to electricity, fossil fuel use and human population density

- Helpline numbers for waste collection may be made available in the Bharathiar University Campus which may be useful for door-to-door collection of wastes thus avoiding improper disposal by individuals.

- The concept of eco-friendly culture and sensitize the students to minimize the use of plastics, non-biodegradable materials and exploitation of natural resources which pose the environmental hazards may be carried out.

- A commitment to keeping students in conducting various competitions *viz*., painting, pencil sketching, rangoli, paste the picture, wealth out of waste, debate on environmental days, essay writing, card making, etc., for the noble cause of environmental protection and nature conservation.

## 13. Conclusion

Bharathiar University, Coimbatore, Tamil Nadu is a well-established Institute in India in terms of academic activities, efforts are continuously made in providing an eco-friendly atmosphere to the students, research scholars, parents and staff members. The environmental protection initiatives are substantial by means of creating solid waste management, wastewater treatment, sanitation, rainwater harvesting system and natural vegetation in the Bharathiar University Campus without harming the environment. Bharathiar University has 'solid waste management and wastewater treatment facility to recycle the solid wastes and wastewaters; respectively. A campus ecosystem is supported a rich biodiversity of flora and fauna which is making a sustainable environment and eco-friendly campus. Swachh Bharath Abhiyan is implemented effectively by the Bharathiar University to promote sanitation and cleanliness to rural and tribal people across Coimbatore District of Tamil Nadu. Environmental audit is carried out to provide an indication to the University about how the environmental system is performing to provide an ecofriendly atmosphere to the stakeholders. The report of environment audit may be useful to implement ecofriendly practices in Bharathiar University campus in coming years without harming the environment.

## 14. Acknowledgement

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