TECHNICAL AUDIT REPORT

[Green, Environment, Energy, Waste Management, Soil and Water, Air Quality and Hygiene Audits]

Submitted to

JSS COLLEGE OF ARTS, COMMERCE AND SCIENCE (AUTONOMOUS), OOTY ROAD, MYSORE – 570 025 KARNATAKA, INDIA

Date of Audit: 09.05.2023

Submitted by

NATURE SCIENCE FOUNDATION
(A Unique Research and Development Centre for Society Improvement)
[ISO Certified and Ministry of MSME Registered Organization]
No. 2669, LIG-II, Gandhi Managar, Peelamedu
Coimbatore 641 004, Tamil Nadu, India
Phone: 0422 2510006, Mobile: 9566777255, 9566777258
Email: director@nsfonline.org.in

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Dr. S. RAJALAKSHMI, M.B.A., Ph.D., FNSF.,
Chairman

Mr. P. KANAGARAJ, FNSF.,
Secretary

Certificate of Declaration

The **Office of Nature Science Foundation**, Coimbatore, Tamil Nadu declare that

1. Nature Science Foundation has conducted onsite green audit at ***JSS college of Arts, Commerce and Science, Qoty Road, Mysore – 570 025, Karnataka, India*** by deputing certified Lead Auditors and Technical Experts.
2. On the basis of audit observations by the auditors and pertinent data collected from the Auditee, the Technical Report has been prepared and being submitted.
3. Data presented in the Technical Report are verified and to best of our knowledge, the data are authentic and reliable.
4. Nature Science Foundation declares that data generated were not shared with any third parties and the soft copy of the report is available with Nature Science Foundation's Office till its validity.
5. Provided the Auditee desired to publish or share the data with other agencies, Nature Science Foundation has no conflict of interest.
6. We at Nature Science Foundation express our deep sense of gratitude to the Management for given an opportunity to conduct green audit at their premises in compliance with NAAC criteria and for whole hearted support extended at the time of onsite audit. Our sincere thanks to NAAC, IQAC Coordinator and Head of the Departments of the Organization for their intangible assistance and cooperation extended to the audit team at the time of physical facility verification.

Date:
Place: Coimbatore

Authorized signatory
Nature Science Foundation

CONTENTS

1. GENERAL INTRODUCTION

1.1. Introduction

Green campus is an area of the Organization or the Organization as a whole itself contributing to have an infrastructure or development that is structured/planned to incurless energy, less water, less or no CO_2 emission and less or pollution free environment (Aparajita, 1995). Green Campus Audit is a tool to evaluate environment management system which is systematically executed to protect and preserve the environment. Green campus audit constitutes the environmental friendly practices and education combined to promote sustenance of green environment by adopting user-friendly technology within the campus. It creates awareness on environmental ethics, resolves environmental issues and offers solutions to various social and economic needs (APHA, 2017). It strengthens the concept of "Green Building" and "Oxygenated Building" which in turn provides a healthy atmosphere to the stakeholders.

1.2. Importance of National Building Code

National Building Code of India has a set of rules and guidelines that regulates construction and as well as ecofriendly activities of the campus. In order to achieve the minimum standards of welfare and safety of stakeholders of a campus, the Governing body lays down a set of guidelines to offer sustainable environment. In 1970, the National Building Code (NBC) was first published in India and the significant provisions of the Indian Building Code involve: 1. Structural safety of the building, 2. Earthquake-resistant building design, 3. Fire and life safety, 4. Solid waste management, 5. Accessibility for differently-abled and senior citizens, 6. Use of alternative building techniques and 7. Environmentally compatible building construction techniques like the use of solar power, rainwater harvesting, etc.

National building codes not only offer a standard benchmark that constructors must meet, but they also establish safety standards along with ecofriendly atmosphere of a campus for years to come. As extreme weather conditions and fires are growing rapidly in the country, it becomes vital that buildings and structures be built and designed using the current building codes to allow for maximum safety sustainability and resilience. For instance, new and updated building codes put much emphasis on conservation as energy and the waste is the most expensive byproduct of older regions. This will not only offer environmental benefits to future generations but will also regulate indoor air pollution to protect the health.

Before the introduction of National Building Codes of India in the construction industry, building commercial and residential properties used a lot of energy which adversely affected the environment. Thus, enforcing building codes to create low-energy buildings offers a tangible way for the company to help decrease the greenhouse gas emissions of the nation and in this way National building code offers multiple environmental benefits to various stakeholders. While safety is the primary objective, new building codes are making significant contributions toward solving energy issues. National building codes contain provisions relating to the use of environmentally compatible construction techniques like planting trees, landscaping, rainwater harvesting and renewable and non-renewable energy sources. These provisions allow the constructors to use natural energy sources which in turn reduces the energy bills to a greater extent.

1.3. Role of Educational Institutions in natural resource conservation

In view of providing eco-friendly atmosphere to the stakeholders, educational institutions are focused on establishing and maintenance of green and eco-friendly campus without harming the environment. A clean and healthy surrounding in an organization determine the effective learning/teaching and provides a favorable learning environment to thestudents. Educational institutions are insisted by both Central and State Governments to provide green, healthier and eco-friendly atmosphere to the stakeholders. In addition, all the educational institutions are asked to save the environment for future generations and to solve the problems associated with environment through Environmental Education. Implementation of Swachh Bharath Abhiyan Scheme by the Indian Government through Educational Institutions imparted neat and clean environment at tribal, rural and urban areas across the country. Seminar, Conference, Workshop, training and awareness programmes on biodiversity conservation education, environmental awareness programmes, etc., may be conducted periodically by the Management and Administrative people of an organization for the benefit of the stakeholders.

1.4. Environment Friendly Campus

As stated earlier, Organization is liable to provide an eco-friendly atmosphere along with good drinking water facility to all the stakeholders. Manuring the cultivated plants/grown within the campus may applied with organic manure, cow dung, farmyard manure and vermicompost instead of using chemical fertilizers. All non-compostable and single-use disposable plastic items, plastic utensils, plastic straws and stirrers should be avoided. Demonstration / awareness programme on establishing plastic-free environment and utility of organic alternatives for all incoming and current students, staff and faculty should be organized. Reduction of use of papers alternated with e-services, e-circulars, etc., and proper disposal of wastes, recycling and suitable waste management system should be considered to establish environment friendly campus.

The term ‘auditing’ is to examine the management practices and to evaluate performance of an organization in relation to environmental issues. World along with Associated Chambers of Commerce and Industry of India (ASSOCHAM), Green Building Code and Green Ratings Systems (GBCRS), Green Rating for Integrated Habitat Assessment (GRIHA), Bureau of Energy Efficiency(BEE), Leadership in Energy and Environmental Design (LEED), CII-GreenCo –GreenCo Rating System (CII-GRS), Food Safety Management System & Occupational Safety & Health (FSMS), Swatch Bharath under India Clean Mission (SBICM) and International Standard Organization (ISO 2021) have formulated a series of standards in the field of environmental auditing. These standards are basically intended to guide organizations and auditors on the general principles common to the execution of environmental audits.

1.5. About Nature Science Foundation (NSF)

NSF is an ISO QMS (9001:2015), EMS (14001:2015), OHSMS (45001:2018) & EnMS (50001:2018) Certified and registered with Ministry of Micro, Small and Medium Enterprise (MSME), Government of India Organization functioning energetically towards the noble cause of nature conservation and environmental protection. NSF is managed by a Board

of Trustees which is a Public Charitable Trust registered under the TN Societies registration Act 1975 (TN Act 27 of 1975) on 29th November, 2017 at Peelamedu, Coimbatore 641 004, Tamil Nadu, India with Certificate of Registration No. 114 / 2017. In addition, NSF has 12AA, 80G and Form 10AC certificates for income tax exemption and implanting various Government schemes. The main motto of the NSF is "Save the Nature to Save the Future" and "Go Green to Save the Planet". NSF family iswide spread across India with over 115 State wise Lead Auditors to conduct Green Audit (Table 1).

NSF is functioning strenuously to conduct different awareness programmes and implement various schemes to public and school / college students towards the noble cause of nature protection. Some of the programmes are also being organized for the benefit of tribal communities to create the supply chain for biodiversity conservation studies. The objectives along with vision and mission are illustrated to promote educational and environmental awareness programmes through social activities for enhancing the quality of life and to conserve nature from environmental pollutants using traditional and modern technologies for sustainable land management. NSF is educating the tribal community children through social service and towards the upliftment of tribesas a whole and make them as entrepreneurs.

International Eco Club Student Chapter (IECSC) has been established for student volunteers and faculty members are encouraged to conduct National and International events pertinent to biodiversity and natural resource conservation. NSF is being released "Magazine" and "Quarterly Newsletter" to share the information about Environmental awareness programmes on biodiversity conservation in Western Ghats of Southern India. In order to encourage the students, faculty members, academicians, scientists,entrepreneurs and industrial experts those who are involving in nature protection and biodiversity conservation activities across the world, NSF tributes the deserved meritorious candidates with various awards/honours and these awards will be conferred to them during the Annual Meet and Award Distribution Ceremony which will be conducted every year.

Apart from the "Green Audit", NSF has introduced various types of audits such as Hygienic Audit Water & Soil Audit, Plastic Waste Management Audit, Biomedical Waste Audit, Solid Waste Management Audit, E-Waste Management Audit, Academic & Administrative Audits to Academic Institutions, R&D Organizations and Industries towards the accreditation process as well as maintaining a hygienic eco-friendly environment to the stakeholders in their campus. All audits will be conducted as per the Checklist prepared by the NSF in compliance with ISO 17020 Criteria and Government Law and Environmental Legislationsincluding World / Indian Green Building Council and the concept of Swachh Bharath Abhiyan under Clean India Mission.

1.6. About the Organization

JSS College of Arts, Commerce and Science (JSSCACS), Ooty Road, Mysuru, started in 1964, is the maiden First Grade College of JSSMVP. As a private, aided, co-educational, and multi-faculty College, JSSCACS is serving the society by providing the value added and skill-based education in Arts, Commerce and Science disciplines. The college after recognized under 2f & 12(B) of UGC has reached different milestones. The

College was accredited with '4-Star' Grade by NAAC in the year 2001. The College with permanent affiliation from University of Mysore strived successfully to get Autonomous status in the year 2005 and has grown in various aspects. As a witness to the development NAAC re-accredited the College with 'A' Grade (CGPA: 3.03) in the year 2008 and in the same year UGC sanctioned the College 'Buddha Study Centre'. The College was subjected to assessment by NAAC in 2014 for third cycle and re-accredited with 'A' Grade with CGPA of 3.04. During 2018-19 the college has undergone assessment by NAAC for fourth cycle and it was re-accredited with 'A' Grade with CGPA of 3.21. The College has been recognized as 'College with Potential for Excellence' by UGC in the year 2010 under which various interdisciplinary research activities were taken up and recognizing the outstanding outcome, the second phase of the same scheme has been sanctioned to the college for the period from 2015 to 2020. The College was identified as 'Biotechnology Finishing School (BTFS)' by the Government of Karnataka, in the year 2011 for a period of 5 years to create skill based and industry ready resources. After successful completion of the first cycle the College has been selected for running the second phase with the synonym of BTFS as BiSEP for the period 2017-2022.

In the year 2015, UGC has sanctioned the 'Deen Dayal Upadhyay Kaushal Kendra (DDU KAUSHAL Kendra)' to offer B.Voc, M.Voc and PhD programmes. The campus comprises of college building, Women's Hostel, Sports Ground, In-door Ground, Generator Rooms, Rain Water Harvesting and other facilities in 7.08 acres of area. The college has 30 Staff Rooms, 68 Class Rooms and 42 well equipped Laboratories. It also has Principal Chamber, Administrative Room and Common Room. The Central library with a spacious reading room contains 76858 books with 47404 titles, 5000 e-books, 141 printed journals, 10000 e-journals and 61 periodicals. The College has a well-designed Auditorium, Power Generator of 260 kVA and UPS system of 55 kVA. A 200 Mbps Optic Fiber internet connection with Wi-Fi and Firewall facility is provided all-over the college. In 75 rooms of hostel around 278 women are being accommodated for affordable fee. It also has a hygienic canteen facility within the campus. JSS Radio 91.2 FM Community Radio Centre has been established in the campus with the assistance of Ministry of Information and Broadcasting, Govt. of India in the year 2021 and the community related programs are being broadcasted every day. The College has rich faculty strength of 164 and out of which 54 are Doctoral and 7 are M.Phil degree holders. Many teachers have qualified NET/K-SET/SLET. The faculty members are well supported by 60 nonteaching staff for the development of the College continuously. The College offers Undergraduate, Postgraduate and Doctoral Degree Programmes in different disciplines. Under 26 UG Programmes, Bachelor of Arts (BA: 5)), Bachelor of Business Administration (BBA), Bachelor of Computer Application (B.C.A), Bachelor of Commerce (B.Com), Bachelor of Science (B.Sc: 10), and Bachelor of Vocational Programmes in Software Development, Food Processing & Engineering and Animation & Multimedia are being offered. Career Oriented Courses are also offered. The 15 Postgraduate programmes are MA in Kannada & English, M.S.W, M.Com, M.Sc in Biochemistry, Biotechnology, Chemistry, Computer Science, Mathematics, Physics, Botany and Zoology, M.Voc in Software Development and Food Processing & Engineering and Master of Computer Application (MCA). The College also offers PhD in Social Work, Kannada, English, Biochemistry, Biotechnology, Chemistry, Commerce, Mathematics and Physics. In the overall strength of 3530 students, 2359 are in UG, 1107 are in PG and there are 64 in Ph.D programmes. The National Education Policy 2020 (NEP-20) has been

implemented in 2021 for UG Programmes. The College received grants for research activities of the faculty of different departments from various funding agencies: UGC, CSIR, ICMR, DST and VGST. A number of major and minor research projects were undertaken and completed by the faculty of the college. Faculty of the College have been awarded with 'Young Scientist Research Award' by DST and VGST. The faculties of the College have authored many textbooks and book chapters, served as editorial board members or referees for journals and resource persons/subject experts in many events. Teachers have published good number of articles in national and international journals in the last five years. The maximum impact factor of a journal out of those articles published is 6.45 and the highest author h-index is 17. The faculty members have actively participated and presented papers in academic events.

Vision:

To be known as an institution providing need-based, skill-integrated, cost- effective, quality and holistic education, transforming the students into globally competitive, employable and responsible citizens and to be recognized as a centre of excellence.

Mission:

- To create and acquire relevant knowledge along with skills and global competencies and disseminate the same among students.
- To provide holistic education through relevant curricula, programmes and pedagogic innovations focusing on employability and self-employment.
- To undertake research work contributing to the creation of knowledge, skills and its applications for sustainable development.
- To establish linkage and collaborations for the betterment of teaching, learning, research and extension
- To provide good infrastructure, human resource and necessary support-services for the betterment of students' progress and welfare.
- To promote national integration, human rights, universal brotherhood and community development activities through inclusive practices.

1.7. Audit Team Details

Date of Audit	**:**	**09.05.2023**
Audit Site	**:**	**JSS College of Arts, Commerce and Science (Autonomous)** Ooty Road, Mysore - 570 025, Karnataka, India
Inspection Body	**:**	**Nature Science Foundation** Coimbatore, Tamil Nadu, India
Audit Scope	**:**	**Green, Environment, Energy, Waste Management, Soil & Water, Air Quality and Hygiene Audits**
Name of the Auditing Chairman	**:**	**Dr. S. Rajalakshmi** ISO QMS, EMS, OHSMS and EnMS Certified Lead Auditor, Founder & Chairman of NSF
Name of the Auditing Team Leader	**:**	**Dr. D. Vinoth Kumar** ISO QMS, EMS and EnMS Certified Lead Auditor & Joint Director, NSF.
Name of the Lead Auditor for Green Audit	**:**	**Dr. B. Mythili Gnanamangai** ISO QMS, EMS, IGBC and ASSOCHEM Certified Lead Auditor & Vice-Chairman of NSF
Name of the Lead Auditor for Environment Audit	**:**	**Mr. B.S.C. Naveen Kumar** Senior Faculty, Mahatma Gandhi National Council of Rural Education, Hyderabad Ministry of Higher Education, New Delhi
Name of the Lead Auditor for Energy Audit	**:**	**Er. D. Dinesh Kumar** BEE, IGBC, ASSOCHEM, GRIHA & LEED Certified Lead Auditor
Name of the Lead Auditor for Waste Management Audit	**:**	**Er. A. Karthick** Bureau of Energy Efficiency Certified Auditor
Name of Lead Auditor for Soil & Water Audit and Air Quality	**:**	**Er. P. Shanmugapriyan** BEE, IGBC, ASSOCHEM, GRIHA & LEED Certified Lead Auditor
Name of Lead Auditor for Hygiene Audit	**:**	**Ms. V. Sri Santhya** ISO OHSMS and FSMS Certified Lead Auditor & Assistant Director of NSF

1.8. List of Instruments used in the Inspection Process

Nature Science Foundation conducts audits by using the listed instruments

- Oxygen Meter
- Carbon Dioxide Meter
- Light (LUX) Meter
- Sound Level Meter

- pH Meter
- TDS Meter
- GPS Meter
- Deluxe Water and Soil Analysis Kit
- Digital Clamp (Voltage) Meter

1.8.1. Oxygen Meter

Oxygen meter is used in the audit process to measure the oxygen level in the organization. The instrument is calibrated after using 20 times. Suitability of the instrument are range between 0 to 30 % O_2, resolution of 0.1%, accuracy is ± (1% reading + 0.2 % O2), response time is ≤ 15 seconds, environment pressure range is 0.9 to 1.1 atmosphere, temperature range is 0 °C to 50 °C, 32 °F t 122 °F, temperature resolution is 0.1-degree, temperature accuracy is °C - ± 0.8 °C & °F –

1.8.2. Carbon dioxide meter

Carbon dioxide meter is to measure the carbon level in the organization. The instrument is calibrated after using 20 times. Suitability of the instrument are range between 0 ~ 4000 ppm, resolution of CO2 Meter is 1 ppm, accuracy is ≤ 1,000 ppm, repeatability is ± 20 ppm, temperature range between 0°C to 50°C, 32°F to 122°F, temperature Resolution is 0.1-degree, temperature accuracy is °C – 0.8°C, °F – 1.5°F.

1.8.3. Light (LUX) Meter

Light meter is to calculate the light intensity in the organization. Suitability of the instruments are, 5 ranges.ie.40.00, 400.0, 4,000, 40,000, 400,000 Lux, operating temperature is 0 to 50 °C (32 to 122 °F), Operating humidity is less than 80% RH, Power consumption is DC 8 mA approximately. This Instrument will be calibrated yearly once or during non-functioning.

1.8.4. Sound Level Meter

Sound level meter is to measure the noise level in the organization. This instrument is calibrated yearly once or after using 20 times. Suitability of the instruments are measurement range is 30 – 130 dB, resolution is 0.1 dB, accuracy is (23±5 °C), Frequency of the instrument is 31.5 to 8,000 Hz, Operating temperature is 0 to 50 °C (32 to 122 °F), Operating humidity is less than 80% RH, Power consumption is DC 6 mA approximately.

1.8.5. pH Meter

pH meter is generally used to measure the pH level in water. It is calibrated 6 months once or after 20 times of its use. Suitability of the instrument are range of the pH meter is 0 – 14, accuracy is ± 2%, resolution of the instrument is 0.1 pH, operating temperature is 0 to 50 °C (32 to 122 °F)

1.8.6. TDS Meter

TDS meter is generally used to measure the TDS level in water. Suitability of the meter are range of TDS meter is 0 – 9990 ppm (mg/L), operating temperature is 0 to 80 °C (32 to 176 °F) and accuracy is ± 2 %. This meter is calibrated six months once or 20 times after its use.

1.8.7. GPS Meter

GPS meter is subjected to know the latitude and altitude, location, etc.,. Suitability of the GPS meter are, dimension is 2.1" x 4.0" x 1.3" (5.4 x 10.3 x 3.3 cm), Display resolution is 128 x 160 pixels an GPS Map features included in Continental Europe. It is calibrated six months once or after 20 times of the usage.

1.8.8. Deluxe Water and Soil Analysis Kit

Deluxe water and soil analysis kit is used to analyze the pH, TDS, salinity, turbidity, alkalinity dissolved oxygen of water.

1.8.9. Digital Clamp (Voltage) Meter

It is used to check the input and output voltage between two points of an electrical circuit of Alternating Current (AC) and Direct Current (DC) by means of the high resistance of the voltage that impede the flow of current.

1.9. Use of Personal Protective Equipment (PPE)

Personal Protective Equipment (PPE) refers to protective clothing for the eyes, head, ears, hands, respiratory system, body, and feet. It is utilized to protect individuals from the risks of injury and infection while minimizing exposure to chemical, biological, and physical hazards. PPE serves as the final line of defense when engineering and administrative controls are insufficient in reducing risks. Nature Science Foundation safeguards all the auditors by supplying PPE during the conduct of audits. PPE used are safety jackets, ear plugs, googles, face shield, hand gloves, shoes, etc.,

1.9.1. Safety jackets:

PPE includes safety vests and suits that can be used for inspection process which will protect body injuries from extreme temperatures, flames and sparks, toxic chemicals, insect bites and radiation.

1.9.2. Goggles and Face shield:

Goggles and face shield are used in the inspection process while inspecting items which would cause eye damage or loss of vision, spray or toxic liquids especially in chemistry labs, nearing the electric and electronic item.

1.9.3. Helmet:

PPE includes hard hats and headgears which will be required for tasks that can cause any force or object falling to the head. It also helps to resist penetration.

1.9.4. Hand gloves:

PPE includes safety gloves and should be used for tasks that can cause hand and skin burns, absorption of harmful substances, cuts, fractures or amputations**.** Selection of hand gloves is based on the application of use.

1.9.5. Safety Boots:

Foot protection is one of the most commonly used PPE and can differ depending upon the environment. Safety boots are used for tasks that can cause serious foot and leg injuries from falling or rolling objects, hot substances, electrical hazards, and slippery surfaces.

1.9.6. Ear Plug:

Ear plugs are used for tasks that can cause hearing problems and loss of hearing. Hearing protection devices reduces the noise energy reducing reaching and causing damage to the inner ear. This ear plug is mostly used near sound producing devices like power motors, genets, generators, etc.,

Opening and closing meeting with the Head of the Organization, NAAC and IQAC coordinators with Audit Team of NSF.

Green, Environment, Energy, Waste Management, Soil & Water, Hygiene and Air Quality Audits Activity at the JSS College of Arts, Commerce and Science (Autonomous), Mysore, Karnataka, India by the NSF Audit Team

2. GREEN AUDIT

2.1. Introduction

Green audit ensures the Organization's campus should have greenish with large diversity of trees, herbs, shrubs, climbers and lawns to reduce the environmental pollution and soil erosion; it is also useful in relation to biodiversity conservation, landscape management, irrigation/economic water utilization and maintenance of natural topography besides vegetation (Gowri and Harikrishnan, 2014, Aruninta *et al*., 2017). For the benefit of stakeholders, solid waste management, recycling of water, disposal of sewage and waste materials (electronic and biomedical wastes), "zero" use of plastics, etc. should be followed consistently in the organization campus. Green Audit procedures includes the definition of green audit, methodology on how to conduct green audit at Educational Institutions and Industrial sectors as per the checklist based on National Building Code (NBC) Part 11 - Approach to Sustainability and assessment of risk at 360^{o} scale (Arora, 2017; Rajalakshmi *et al*., 2022).

2.2. Importance of green audit

The Management of the Organization (Auditee) should be exposed their inherent commitment towards making ecofriendly atmosphere through the green auditing and ready to encourage/follow all types of green activities (Suwartha and Sari, 2013). The administrative authorities should formulate "Green and Environment Policies" based on technical report of green auditing. A clean and healthy environment will enhance an effective teaching/learning process. They shouldcreate the awareness on the importance of greenish initiatives through environmental education among the student members and research scholars. Green audit is the most effective, ecological approach to manage environmental complications.

Green audit is a kind of professional care and a simple indigenized system about the environment monitoring in terms of planting more number of trees which is a duty of each and every individual who are the part of economical, financial, social and environmental factors. It is necessary to conduct green audit frequently at least once in three years because students and staff members should aware of the green audit which in turn support the institution to set environmental models ("icon") for the community. Green audit is a professional and useful measure for an Organization to determine how and where they are retaining the campus eco-friendly manner. It can also be used to implement the alleviation measures at win-win situation for the stakeholders and the planet. It provides an opportunity to the stakeholders for the development of ownership, personal and social responsibility.

2.3. Aims and objectives of green audit

a. To recognize the initiatives taken towards establishing the green campus in termsof availability of flora and fauna diversity within study area
b. To assess the greenish nature of an Organization campus in terms of available vegetation which reflects on reducing the environmental pollution, soil erosion, biodiversity conservation, landscape management, naturaltopography and vegetation.
c. To grow a more number of oxygen releasing and carbon dioxide assimilatingplants in the campus to give a pure atmosphere to the stakeholders.
d. To identify and provide baseline information to assess threat and risk to the ecosystem due to developmental activities of the organization and resolve the same

e. To ensure proper utilization of resources available in the surrounding areas towards future prosperity of the humanity.
f. To fix a couple of norms for disposal of all varieties of wastes and use green cover as a carbon sink.

2.4. Identification of Flora and Fauna

Various vascular plant species were collected across the campus and subjected to botanical identification (botanical name, family, habitat, and economic importance). Plant specimens were freshly collected and their digital photographs were taken. The collected plant specimens have been identified using “The Flora of the Tamil Nadu Carnatic” (Matthew, 1983). Further, their identification was confirmed by matching with authentic specimens in the Botanical Survey of India (BSI), Southern Circle, Coimbatore, Tamil Nadu and India.

Birds were observed by visual sightings and by calls also the avifaunal data were observed through the Nikon 8 x 40 binoculars and photographs were taken. The recorded data was noted in the field work note. Later,the birds were identified with the help of field guide, "Birds of Indian subcontinent" byRichard Grimmett and the IUCN category of the birds were also noted with the same. The point count and transect line methods were used to record the number of bird species in the study area in which regular visits and personal visits were carried out (Ferenc *et al*., 2014). The surveys were conducted to understand the distribution of bird species in relation to habitats and nesting behaviour of birds in the study area. Based on survey, richness and abundance of bird species were calculated using Shannon-weaver diversityindex. Based on available data and species were selected for nest site selection study. Selected species of birds was analysed for its nest site characteristics between the habitats and also plant species preference was enumerated and assessed. The number of breeding bird species and nests found in different habitats as depend variables such as biotic and biotic factors as the independent variable (Jayson and Mathew, 2000).

Reptiles and Amphibians are identified based on coloration, markings on the skin, background colour generally brown. Males often have a flecked pattern on back. Occasionally they are in green, leading to mistaken identification as sand lizard, males have thicker base to tail and brighter, speckled underside. Newborn young are dark in colour, almost black. A rare species, almost entirely confined to heathland sites in Dorset, Hampshire and Surrey, and sand dunes on the Mersey and Welsh Coast. The most common reptile found in a variety of habitats, including gardens, spends most of its time underground or in vegetation litter. They are most likely to be found underneath objects lying on the ground or in compost heaps. Snakes are identified based on cream, yellow or white collar behind the head, bordered to the rear by black marks. Body colour ranges from bright green to dark olive, but mostly the latter. Darkerspecimens can appear black from a distance. Truly black grass snakes are rare. Males are predominately brown, females are grey. Dark butterfly shape on top of head may be noted. Pairs of spots, sometimes fused as bars, running along back with black line running through eye are recorded. Males typically grey with a black zigzag stripe, females generally brown with a dark brown zigzag stripe (Beebee and Griffiths, 2000).

2.5. Green audit observations

As mentioned earlier, green audit covers both qualitative and quantitative measurements including physical verification. Establishment of different types of gardens in the campus, rainwater-harvesting system, operation of water supply and irrigation methods are adopted to improve the green campus (Table 4). Academic credentials like taking up major and minor Projects, Dissertations and Thesis work by the students and staff members may be taken into account towards green campus initiatives and planning efforts. Best practices followed on green campus initiatives in the organization and aspects to be followed for further improvements for greening are illustrated in the audit report.

2.6. Flora diversity plants in the campus

Ensuring the rich biodiversity in the green campus is an important parameter which reflects the real-time ecosystem. Plants are indicators for assessing the varying levels of environmental quality. In general, plants improve the outdoor air quality with increased oxygen levels and reduced temperature and carbon dioxide. The green and varying colour of the flowering plants improve the ambience of the Organization environment. The record on maintenance of the plant biomass and its management are important with respect to green campus initiatives. The existence of such plants and birds in the green campus may be recorded for the rich flora and fauna which are beingconsidered as a value addition to the campus.

The most plants recorded are *Azadirachta indica* A. Juss., *Tamarindus indica, Pongamia pinnata, Cassia fistula* which are dominant trees species characteristic to the vegetation within the campus. Some of the shrub species like *Nerium oleander* L., *Nerium indicum* Mill, *Punica granatum* are also rather common in the campus. Ground flora is comparatively sparse but fairly rich in undistributed areas. Someof the common weeds like *Euphorbhia hirta* L., *is* found to be predominant. Species such as *Catharanthus roseus, Cynodon dactylon* are some common herbs in the campus.

This campus is rich in grass species like *Andropogon pumilis, Apluda mutica, Cenchrus ciliaris, Asparagus racemosus* Wild., and *Commelina benghalensis* L. Most of the species found are common in the campus, some of the species *Cucumis dipsaceus* Ehrenb, *Hybanthus, Bothriochloa compressa* (Hook.F.), and *Caralluma bicolor* Ramach., is the rare species. Some endemic grass species like *Andropogon pumilus* Roxb., *Panicum psilopodium* Trin., and *Perotis indica* (L.) Kuntzeare also occurring in the campus.

Table 1. List of Flowering plants in the Campus

S.No	Common Name	Botanical Name	Family	Habitat
1.	Neem Tree	*Azadiracta indica*	Meliaceae	Tree
2.	Monkey Bush	*Abutilon indicum*	Malvaceae	Herbs
3.	Aloe vera	*Aloe barbadense*	Liliaceae	shrub
4.	Common needle grass	*Aristida pinnata*	Poaceae	Herb
5.	Cycas	*Cycas revoluta* L.	Cycadaceae	Shrub

6.	Golden cane palm	*Dypsis lutiscens*	Arecaceae	Tree
7.	Asoka tree	*Sarca asoca*	*Fabaceae*	Tree
8.	White frangipani	*Plumeria alba*	Apocynaceae	Shrub/small tree
9.	Crotons	*Codiaem variegatum*	Euphorbiaceae	Shrub
10.	Arrowleaf elephant ear	*Xanthosoma taioba*	Araceae	Shrub

Plants found in the Campus

Cycas revoluta L.

Plumeria alba

Dypsis lutiscens

Saraca asoca

Xanthosoma taioba

Codiaeum variegatum

2.7. An account of more oxygen releasing and carbon dioxide assimilating plantsin the campus

There are quite a few plants are being considered as highly efficient in oxygen releasing and carbon dioxide assimilating (Carbon sinks) which in turn reflects on quality of the green campus. If more oxygen is made available in the campus naturally, the stakeholders may be free from various cardiovascular and pulmonary problems and breathing troubles. Green audit at the audited organization revealed that the campus is well distributed with more oxygen releasing and CO_2 assimilating plants such as *Money plant, Neem tree, Plumeria, Palm* and *Ash* trees.

2.8. Establishment of different gardens in the campus

Growing many types of herbal plants having medicinal importance in the campus becomes more attractive and useful provided gardens are maintained. Rare Endangered Threatened (RET) plants are most useful in terms of economic importance. The tree garden / arborea can be planted based on the zodiac signs which would attract the public and educate them based on their uses. In the tree gardens, trees as linings all over the campus can act as oxygen corridors. Native trees along with trees like *Azadirachta*, *Pongamia* and *Ficus* species can be cultivated at the maximum as these plants are used to remove the dust particles and carbon from the air and purifies the air considerably. Similarly, the ornamental plants with beautiful flowers can be maintained in the frontage gardens to provide good ambience.

2.9. Natural topography and vegetation

Natural topography means the original geographical features of the campus, around 60-65% of the organization should have the natural features like rocks, water resources, slopes, landscape, pathways, etc. and the altered topography can be accounted for, it is facilitated. The vegetation in the land alone is considered as they are part of the natural topography. Vegetation in the artificially created structures are also accounted when it is reported more than 70% of the claimed green campus auditsite. Vegetation is the cultivation of a bunch of plants irrespective of the plant *taxa* for the covering of the area or ground topography. Natural topography is better appreciated with wild vegetation than the artificially created topography like pathways and parking areas. The observation at the campus indicated that more than 25% natural topography and vegetation have been maintained properly. Further, there was no anthropogenic activity in the campus.

2.10. Fauna diversity in the campus

The observations on fauna diversity indicated that the campus has a large number of living as well as visiting birds. Migratory bird species like Mangrove heron, Common Wood shrike, Black-rumped flame back and Peacock. The campus has different family level diversities such as Papilionidae, Pieridae, Nymphalidae and Lycaenidae in which common butterflies species such as Mormon, Rose, Birdwing, Emigrant, Grass yellow, Gull Wanderer, Small Orange Tip, Plain Orange Tip, White Orange Tip, Evening and Grey are commonly observed. Mammals, a group of vertebrate animals, characterized by the presence of mammary glands, fur or hair and three middle ear bones. These characteristic features differentiate them from reptiles and birds. Observation on diversity of mammals in the campus of audited organization indicated that different Mammal species are commonly distributed.

Grasshoppers, a group of insects belonging to the suborder Caelifera and they are probably most ancient living group of chewing herbivorous insects. The Campus has different diversity of Grasshoppers. Termites are most successful groups of insects on earth, colonising most landmasses. Their colonies range in size from a few hundred individuals to

enormous societies with several million individuals. Two species of termites (*Odontotermes anamallensis, Trivitermes fletcheri)* recorded during onsite green campus audit at the organization and they are belonging to the Genera *Odontotermes, Trivitermes* and *Nasutitermes*.

2.11. Landscape design and soil erosion control

Landscape design is an important feature for any disasters to control especially with respect to the soil erosion. In general, soil erosion occurs if the design of the land is not altered so as to prevent the slope features by strong vegetation and use of a plant buffer zone as safe for escape of nutrients or fertilizers entering the streams. Observation revealed that the audited site has very good landscape design without disturbing the natural vegetation. Contour ploughing is being done at right angles to the slope wherever possible and ridges and furrows are properly maintained to break the flow of water down to the empty land. These activities are widely adopted to control soil erosion in the campus.

2.12. Audit Observations

- It is observed that the Organization has facilities (ramp walk, lift, wheel chair, rest rooms, etc.,) for disabled and different age group people.
- Monitoring plan is available for the periodic checking at proper time interval to maintain sustainability.
- Adequate training and awareness programmes are conducted to the Stakeholders for sustainable development at all stages of building life cycle.
- More than 30% of open space is maintained as soft scapes (vegetation) to lower the energy conservation in the campus.
- Land scape design are planned to maintain the natural capacity of the site.
- Land scape irrigation are performed as per the microclimatic condition like during humid / winter season less watering through irrigation is observed.
- Vegetation / vegetative structures are available around the building to reduce energy consumption and maintain indoor climates.
- Soil health is maintained well without using any chemical fertilizers.
- Ecological design / conserving biodiversity such as Transplantation, climate and design in accordance with bio diversity, reduced pesticides and other activities are not applicable because no new construction is planned and raised.
- Green roofs /green facades / shaded trellises / Green walls are adequately available to reduce the energy consumption.
- Vertical / terrace garden and green roof system are available to maintain sustainability.
- Plant and animal species are monitored by conducting the periodic survey in the Organization.
- Traffic survey are conducted to measure the number and type of vehicles passing on the existing main roads giving access to the campus

3. ENVIRONMENT AUDIT

3.1. Introduction

Environmental (Eco) audit is quantitative and qualitative data to track air, soil and water and to gain actionable insights to improve the operational performance in the atmosphere. It provides a 360˚ view of a surrounding campus and makes it easy for Owners / Managers / Environmentalists to collaborate, measure, control and reduce environmental negative impacts. Finally, it leads to enhance the quality of life of all living organisms. Eco audit initiatives are the need of the hour across the world due to changing environmental conditions and global warming besides ever-increasing humanpopulation and anthropogenic activities (Maltby, 1995; Haahkim and Yunus, 2017). Eco audit aims to make a sustainable and friendly environment for the stakeholders. In this context, to conserve eco-friendly atmosphere of an organization, well-developed environmental objectives and targets should be undertaken to reduce the harmful effects to a greater extent (Gnanamangai *et al*., 2022).

The audit process can remarkably minimize the environmental pollution in the campus which in turn reduces the impact of global warming scenario. As per the Rules and Regulations laid by Government, the environmental legislations should be followed by all the Institutions and Organizations and make sure that their activities should not degrade the environment (Ramachandra and Bachamanda, 2007). The environmental audit involves systematic documentation of periodic objective review by a regulated entity on available facilities, their operations and practices related to resolve the environmental requirements (Conde and Sanchez, 2017). In general, environmental audit is planned to achieve an optimum resource utilization and improved process performance in the audit sites. Venkataraman (2009) stated that it is a‘Common Sense Approach’ to identify the problems and solve those problems pertaining to curb eco-friendly atmosphere (Aparajita, 1995; APHA, 2017). Environmental audit enables an overall and complete overview at the audit sites to facilitate our understanding of flow of materials and to focus the priority areas where waste reduction is achieved thereby cost saving is made possible (Gowri and Harikrishnan, 2014).

Purpose of the audit is to determine performance of the environmental management systems and equipment related to environmental safety. Audit reports can provide key information to the management in relation to risk areas, progress towards strategic objectives and targets (Adeniji, 2018). Audit work can be undertaken voluntary for the benefit/advantage of the company and it can be executed with the help of environmental auditing authorities. As mentioned earlier, it helps in the proper natural resource utilization and on the whole, it improves the quality of environment.

An environmental auditor will study an organization's performance towards the environmental sustainability in a systematic manner where environmental management systems and equipment are performing with the aims of a) facilitating management control of environmental practices, b) assessing compliance with company policies, c) facilitating professional competence, d) sustenance activities without harming the environment and e) practicing the environmental conservation.

3.2. Aims and objectives of environmental audit

Primary objective of an Environmental audit is to promote the environmental safety management and preservation of natural resources for future generations. Major objective of environmental audit confined to:

a. Protecting the environmental health and minimise the threats posed to humansafety by the performance of the organization
b. To take steps to minimize the environmental pollution and degradation
c. To adopt measures to reduce water waste generation and waste water recycling
d. Evaluation and documentation of wastewater quality, its characteristics and their effects on living system
e. Maintenance of labour/occupational health & medicine followed by proper documentation of environmental compliance status
f. Annual environmental auditing will render educated to overcome existing issues and to conduct outreach programmes to the public.
g. To establish a baseline information about the eco-friendly environment in the campus and to create consciousness among the stakeholders about the requirementof clean environment and its conservation

3.3. Procedures followed in environment audit

Environment 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 environment audit includes examining, collecting, evaluating, documenting the data and analysing various components related to environmental aspects and carried out as per the procedures mentioned of the Manual of Gnanamangai *et al*., (2021).

It is a customary stepwise process where it starts with opening meeting among the audit team and auditees and completed with closing meeting (Table 15) However, any specific parameter comes under this section will be highlighted hereunder.

- During onsite audit it has been monitored and documented the components as per the environment audit checklist.
- Monitoring the pH of the water sources (Tap-, Bore well-, RO- and Recycled-water, if any and turbidity/EC of above said samples with portable pH and TDS meters, respectively,as per the standard operating procedures.
- Identify the issues in the campus with respect to environment compliance and merits/ demerits of the auditees Management controls.Collect information about Ecology and Environment studies, awareness programmesconducted and publications with respect to Environment.

3.3.1. Campus Details

S.No.	Details / Descriptions	Quantity
1.	Total strength of Students	**3530**
2.	Total strength of Employees	**164**
3.	Total number of Buses in the campus	**Nil**
4.	Number of Cars entering in the campus	**20**
5.	Number of Motorcycles entering in the campus	**700**
6.	Number of other vehicles (Lorry, Ambulance, Jeep, Trucks, Cranes, Poclain, and etc. entering in the campus)	**Nil**
7.	Number of E-Vehicles	**03**
8.	Number of RO Water Plants	**02**
9.	Number of Borewells	**02**
10.	Number of Open wells	**Nil**
11.	Number of Percolation Ponds	**Nil**
12.	Number of Wastewater treatment facility	**Nil**
13.	Number of Rain harvesting system	**Yes**
14.	Number of Composting pits and Vermicompost units	**Yes**

3.4. Safety measures and green building conservation code

Environmental safety measures are very important in Institutional buildings as far as students, staff members and other stakeholders are concerned and it requires vigilance and awareness Organisation work to foster safe environments; however, students honestly share equal responsibility. Management should extend by issuing guidance and the best safety tools. The organization has have a police force, escort services, call boxes, first aid box, fire extinguishers, fire alarms, security systems and staffs towards the safety measures. Organisation has very good safety measures as per the green building conservation code such as fire extinguisher and fire bell and alarms in all the place. In addition, in all the place, 'Exit', 'Entry' and other sign boards kept across the place to give safety to the stakeholder.

Safety measures in JSS College of Arts, Commerce and Science (Autonomous)

3.5. Ventilation, exhaust systems and lightening in buildings

Ventilation is necessary in the buildings and continuous air flow removes 'stale' air and replace it with 'fresh' air which facilitates to moderate internal temperatures, reduce the accumulation of moisture, odours and other gases. In addition, ventilation create air movement which improves the comfort of occupants. Mechanical ("forced") ventilation tends to be driven by exhaust fans to replace stable air with fresh air along with moderating the optimum temperature to the occupants. Natural ventilation is driven by pressure differences from one part of the building to another. Internal partitions may prevent the air paths, hence the creation of draughts adjacent to openings for adequate flow of air. If air quality is poor, natural ventilation by means of opening windows may be adopted to use in the building. It may also be useful to reduce the noise level to a greater extent. It has been recorded that the audited Organization has a large number of ventilators for effective air circulation.

Ventilation facilities in the Campus

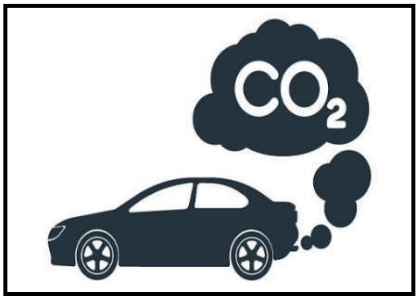
3.6. Public transport, low emitting vehicles and control of car smokes

Utility of public transportation (buses) reduces carbon emissions greatly and decreases the development of smog within the towns. This means that human beings have healthy air to respire. Comparing a bus travelling with a car transport for a person, it has been observed that buses are the most effective system by producing lower quantum of emission of carbon when compared to that of car transport. This will be a huge decrease in utility 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. The audited Organisation is provided two E- Vehicles to maintain eco-friendly environment in the campus and to reduce carbon dioxide emissions. Apart from the e-vehicles, students are encouraged to use bicycles.

E-Vehicles in JSS College of Arts, Commerce and Science (Autonomous)

Bicycles in the Campus

3.7. Auditing carbon footprint



Carbon footprint means measuring/recording the greenhouse gases (GHG) emissions of an organization within its defined boundary. Burning fossil fuel emits carbon which accumulate in the atmosphere if there is not sufficient bio capacity dedicated to absorb the same. Commutation of stakeholders has an impact on the environment through the emission of greenhouse gases consequent to burning of fossil fuels. The most common greenhouse gases are carbon dioxide, methane, nitrous oxide and ozone; among them, carbon dioxide is the prominent one. An important aspect of doing an audit is to access the impact within defined boundary which can helpful to derive better ways to minimise its impact. It is necessaryto assess the carbon foot prints of an organisation to understand how far they contributing towards sustainable development. It is therefore essential that any environmentally responsible organizations should examine their carbon emission and subjected to calculate carbon footprint (Woo and Choi, 2013).Observations on carbon dioxide and oxygen levels monitored in different parts of the campus are presented under Green Audit section while observation on carbon footprint due to electricity usage per year at the Organization along with other fossil fuel utility are presented under Energy Audit portion of this Technical Report.

3.9. Use of biofertilizers, organic and green manures

Natural or eco-friendly methods should be used to grow plants vigorously in the campus which could reduce the environmental pollution. Use of biofertilizers, organic manures (cow dung, vermicompost and plant wastes and litters) and green manures to grow healthy plants should be ensured to keep the campus organic. The plant waste such as fallen leaves, stems, fruits, nuts, seeds and other plant parts should be used to make green manures.

Vermicompost Unit in College Campus

Minimal use of chemical fertilizers as part of integrated nutrient management system is acceptable but “zero use” of chemical fertilizers is highly appreciable. The soil, air, water and sunlight are considered as fourmajor natural resources. Biofertilizers such as nitrogen fixing bacteria, phosphorus solubilizing bacteria, farm yard manure, dried cow dung manure and vermicompost manures are extensively used in the audited organization to cultivate plants. These practices are very well appreciated because air, water and soil pollution due to use of agrochemicals is eradicated which in turn to improve the soil health significantly.

3.10. Pedestrian path facility at the campus

The concept of pedestrian path is to give safe space to walk freely by the pedestrian. It is very important in the green campus in terms of freely walk pedestrians or people going on foot without any obstacles. The pedestrian path is otherwise called as zebra crossing by the combination of black and white stripes remained to characterize the zebra. In addition, pedestrian path is created in the green campus along with road side which meant for walking only using special cement bricks and stones. The pedestrian path aims to end circulation not only cars, buses, vans, trucks and othervehicles but also giving safe space to the pedestrians, where cross and pass through blocks and also forcing vehicles to comply with it. The audited organization is having very good facility in creating pedestrian path for stakeholders.

3.11. 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. 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 coursein ‘Environmental studies’ and teach to the students about the ecosystem, pollution and problems associated with the environment.

3.12. Audit Observations

- The construction is proposed based on the applicable climatic zone and geological conditions.
- Human comforts are implemented and observed like ramp walk, fire safety, etc.,
- To reduce the demand of water, rain water harvesting system is implemented and used for irrigation facilities.
- Training and awareness programmes records are available to maintain sustainability.
- Fire extinguishers are available in the building to consider the safety of all the Stakeholders and maintained properly.
- Separate health care room is available in the campus as one of the health management practice.
- It is observed that the mock drills and awareness programmes are conducted for disaster management.
- Retaining wall built near drainage and vegetation has been planted to avoid the surface soil run off.
- Paver block to increase the percolation of rain water to ground are implemented and practiced.

- Parking is provided under the tree shade to reduce the Heat Island effect (Temperature).
- Rain water harvesting unit is maintained well without using any chemical, the water is used for irrigation purpose.
- Use of potable and non-potable waters are identified to conserve water.
- Public transport facilities are available in the campus to control air pollution.
- E-vehicle are implemented and operated for internal mobility to reduce the carbon emission.
- Bicycle for internal mobility is implemented and used inside the campus.
- The pedestrian pathways are maintained with adequate shading facilities by planting more number of trees.
- No offsite and subsidized parking are encouraged in the campus.
- Waste are segregated before the disposal.
- Biodegradable waste are used in the vermicomposting as a recycling practice.

4. ENERGY AUDIT

4.1. Introduction

An energy audit is a survey in which the study of energy flows for the purpose of conservation is examined at an organization. It refers to a technique or system that seeks to reduce the amount of energy used in the Organization without impacting the output. The audit includes suggestions of alternative means and methods for achievingenergy savings to a greater extend. Conventionally, electrical energy is generated by means of fossil fuels, hydraulic and wind energy. The availability of fossil fuels and their depletion rate, insist the need for alternate energy systems and conservation of conventional electric energy. In general, the primary objective of an energy auditing and management of energy consumption is to offer goods or services at the lowest possible cost and with the least amount of environmental impact (Backlund and Thollander, 2015).

Energy Conservation Building Code (ECBC) is established in the year 2017 which provides minimum requirements for the energy-efficient design and construction of buildings across India. It also provides two additional sets of incremental requirements for buildings to achieve enhanced levels of energy efficiency that go beyond the minimum requirements. Bureau of Energy Efficiency (BEE) came into force in 2002 towards implementation of energy saving practices in an organization. Energy-efficiency labels are information affixed to manufactured products and usually communicate the product energy performance (Ingle *et. Al*., 2014).

BEE Star Rating Scheme is based on actual performance of the building as well as equipment in terms of specific energy usage termed as 'Energy Performance Indicator' by means of star ratings labelled items used which will be useful for energy savings in a sustainable manner (Mishra and Patel, 2016). Energy audit programme provide aid in maintaining a focus on energy price variations, energy supply availability and efficiency, determining an appropriate energy mix, identifying energy-saving technology, retrofitting for energy-saving equipment and so on (Gnanamangai *et al*., 2021, 2022; Rajalakshmi *et al*., 2019). In general, an energy audit process dealt with the driving energy conservation concepts into reality by giving technically possible solutions within a specified time limit while considering the economic and other organizational issues (Asnani and Bhawana, 2015). It also dealt with the uncover ways to cut operating expenses or reduce energy use per unit of production interms of savings. It serves as a "benchmark" for managing energy in the organization for planning more energy-efficient use across the board (Cabrera *et al*., 2010).

4.2. Need for an Energy Audit

In an organization, the top three operating expenses are energy, labour and materials. Relating the manageability of the cost or potential cost savings in each of the above components, energy management is found to be the top ranker and thus energy management constitutes the essential part in reducing the cost. Energy audit helps in understanding the ways of energy and fuel are being used in any organization and identifies the areas where wastes occur and the scope for improvement exists. Energy audit gives a positive orientation to the energy cost reduction, preventive maintenance quality control programmes and will help to keep focus on variations which occur in the energy costs, availability and reliability of supply of energy.

The ecofriendly campus concept essentially focuses on the efficient use of energy conservation and its savings opportunities in a sustainable way. It also gives importance for reduction in carbon emissions, carbon footprint calculation, use of star rated equipment, encouraging energy use conservation practices, reduce the organization's energy consumption, reduce wastes to landfill. Of course integrating environmental considerations into all contracts and services considered to have significant environmental impacts (Anirudhan *et al.*,2023). The energy consumption, energy sources, energy monitoring, lighting, vehicle movement, electrical and electronics appliances and transportation are addressed by this indicator.

4.2.1. Aims and Objectives of an Energy Audit

An energy audit is a useful tool for developing and implementing comprehensiveenergy management plans of an organization. As mentioned earlier, aim of an energy audit is to identify the energy efficiency, conservation and savings opportunities at the audit sites in a systematic manner. The audit process involves following steps.

- Review of energy saving opportunities and measures implemented in an audit site.
- Identification of various energy conservation measures and saving opportunities.
- Implementation of alternative energy resources for energy saving opportunities and decision making.
- Providing a technical information on how to build an energy balance as well as guidance to be sought for particular application.
- Detailed analysis on energy consumption based on latest electricity bills and understanding the tariff plan provided by the Central and State Electricity Board.
- The utility of energy in terms of electricity, LPG, firewood, petrol, diesel and other resources to calculate carbon foot print analysis with in the campus.
- Utility of number if incandescent (tungsten) bulb and CFL bulbs, fans, air conditioners, cooling apparatus, heaters, computers, photo copiers, inverter, generators and laboratory equipment and instruments installed in the organization to calculate the energy utilization.
- Alternative energy sources / nonconventional energy sources are employed / installed in the organization (photovoltaic cells for solar energy, windmill, energy efficient stoves, Biogas, etc.).
- Creating awareness among the stakeholders on energy conservation and utilization.

4.3. Procedures followed in an energy audit

Several methods are adopted in the energy audit, walk-through audit is one among them. The balance of total energy inputs with total energy outputs and identification of all energy streams in a facility are taken into account. The amount of energy used by each of its energy streams are calculated as per the methodology mentioned in the audit Manual. The production process flow is studied and electricity consumption are measured. Location of the electrical machines, conditions of them and their accessories are inspected through physical verification as per the regulation of Indian Green Building Council and World Green Building Council (IGBC, 2021). Physical verification of installed electrical appliances and when considering the cost or prospective cost savings in each of the above components, energy always wins and the energy management task becomes a key cost reduction area.

An energy audit is proposed and conducted to ensure that energy saving practices are implemented and followed in Educational Institutions and Industrial sectors in a sustainable way. Preparation and completion of a questionnaire, physical examination of the campus, observation and examination of documentation, key person interviews, data analysis, measurements and suggestions are all part of the audit process. Energy audit involves several facts including energy savings potential, energy management, finding alternatives, etc. (Cabrera *et al.*, 2010; Rajalakshmi *et al.*, 202*1*; Leon- Fernandez and Dominguez-Vilches, 2015; Bae and Seol, 2006; Singh *et al*., 2012). It may be useful to check where carbon emission is prominent which could be taken into account to reduce. Finally, after the audit process, the energy auditincluded suggestions for energy cost reduction, preventive maintenance and quality control activities, all of which are critical for the utility operations in the auditee (Organization).

4.4. Carbon footprint

The carbon footprint per year is calculated (www.carbonfootprint.com) basedon electricity usage per year in which CO_2 emission from electricity and the sum of transportation per year in terms of number of the shuttle buses service operated by the Organization and number of cars, motorcycles and trucks entering in the Organization campus. These factors are multiplied with total number of trips in each day and approximate travel distance of vehicles covered in each day with a coefficient (0.01)to calculate the emission of CO_2 in metric tons per year.

Humans contribute to a massive increase of carbon dioxide emissions by burning fossil fuels, deforestation, and other industrial activities. Methane (CH_4) is largely released by coal, oil and natural gas industries. Anthropogenic activities are responsible for almost all of the increase in greenhouse gases in the atmosphere over the last 150 years. The largest source of greenhouse gas emissions from human activities is from burning fossil fuels for electricity, heat and transportation (Peters and Romi, 2014).

4.5. Observations of the energy audit

During onsite audit following departments were verified for physical facility availability. In all these areas lighting systems forms the major consumer of electrical energy. In all the sections lighting fixtures, installed energy efficient lighting systems/ safety systems were verified besides installed power backup systems (generators and UPS) were verified. The electricity consumption charges are audited and studied for the load demand requirement and efficient consumption of energy. The scope for improvement has been discussed with the auditee's. Potential areas in which scope of energy conservation and saving opportunities available have been identified and suggested for implementation.

4.6. Energy consumption and cost profile

The following chart shows the profile of energy consumed and the cost for one year by the auditee (Figs.1 & 2; Table 1).

Figure 1. Electrical energy consumption profile

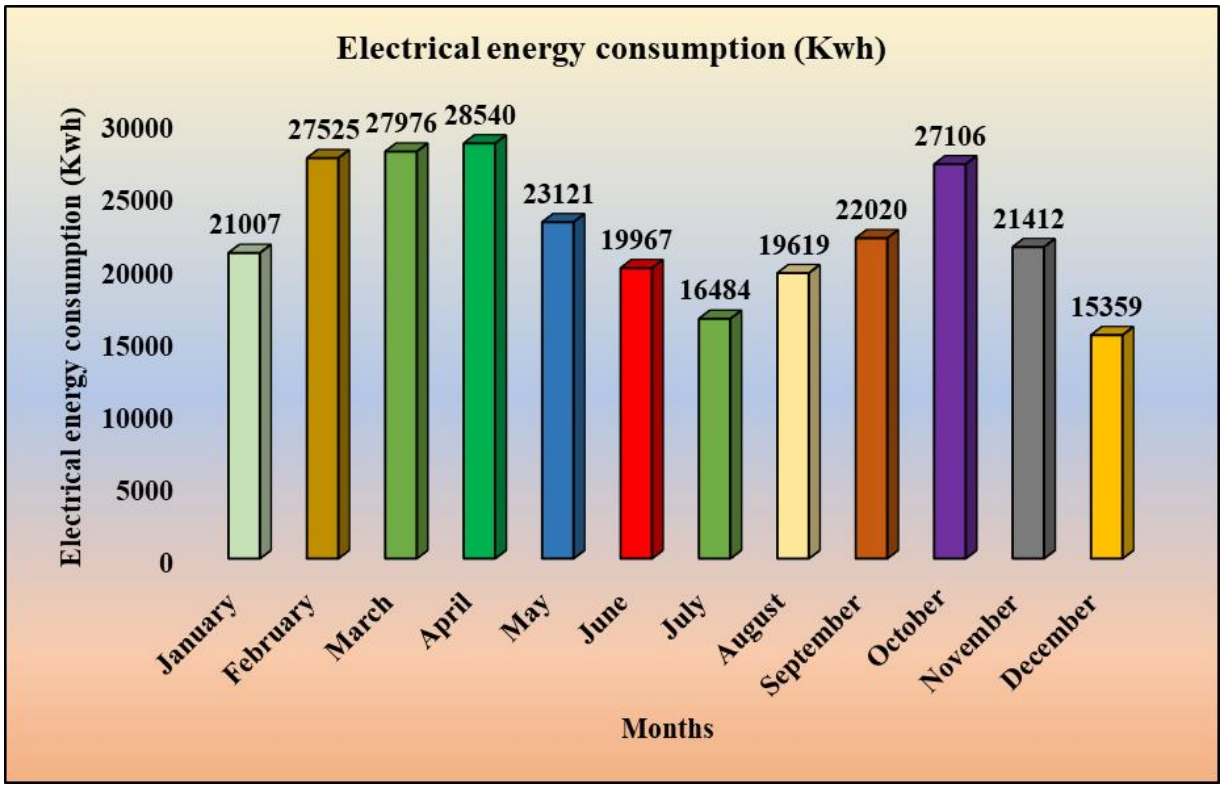


Figure 2. Overall electrical energy consumption and cost profile

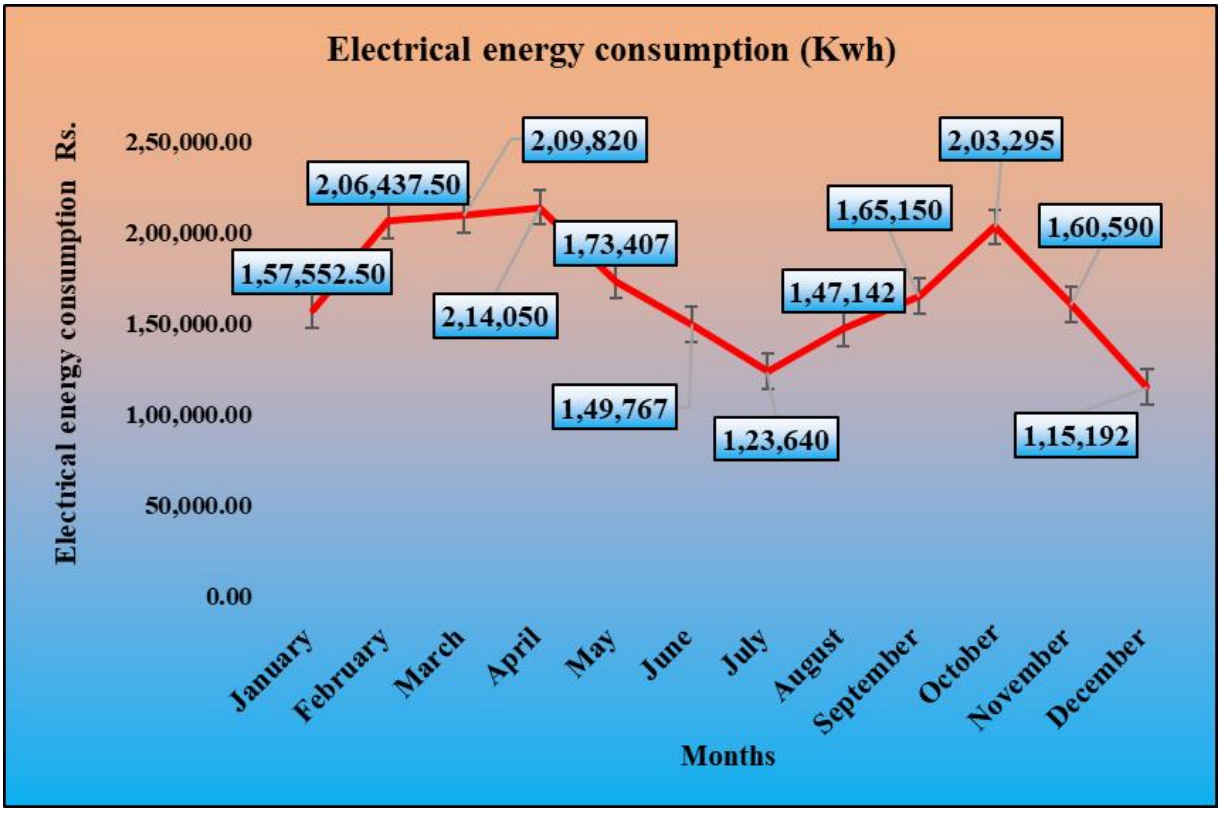


Table 1. Electrical energy consumption and cost profile in the Institution

S.No	Months	Rating / Capacity units in kWh	Cost in Rs.
1.	January	21007	1,57,552.5/-
2.	February	27525	2,06,437.5/-
3.	March	27976	2,09,820/-
4.	April	28540	2,14,050/-
5.	May	23121	1,73,407/-
6.	June	19967	1,49,767/-
7.	July	16484	1,23,640/-
8.	August	19619	1,47,142/-
9.	September	22020	1,65,150/-
10.	October	27106	2,03,295/-
11.	November	21412	1,60,590/-
12.	December	15359	1,15,192/-

4.7. Power consuming equipment and electrical appliances

Other than electrical energy from grid, energy generated using fossil fuels for the year 2022 are presented in Table 2.

Table 2. Annual Energy Consumption of Fuels in the College

S.No	Month	Diesel consumption (Liters)	Petrol consumption (Liters)	LPG consumption (kg) College (15 kg) + Hostel (19kg)	Mean consumption (kg)
1	January	100	-	2+ 27	543
2	February	Nil	-	1+ 27	528
3	March	100	-	1+ 27	528
4	April	Nil	-	1+ 27	528
5	May	Nil	-	2+ 27	543
6	June	100	-	2+ 27	543
7	July	Nil	-	2+ 27	543
8	August	Nil	-	2+ 27	543
9	September	Nil	-	1+ 27	528
10	October	Nil	-	2+ 27	543
11	November	Nil	-	2+ 27	543
12	December	Nil	-	2+ 27	543

4.8. Calculation of carbon footprint

The carbon footprint analysis can be calculated based on the earlier reports as stated in www.carbonfootprint.com which is the sum of electricity usage per year (Padmini, 2007). According to the data provided by the Management, carbon emission due to electricity consumption and fossil fuels are presented hereunder.

The CO_2 emission from electricity

= (electricity usage per year in kWh/1000) x 0.84, where 0.84 is the coefficient to convert kWh to metric tons
= (874105 kWh/1000) x 0.84
= 226.9 metric tons

According to the above calculations, carbon emission due to electricity usage per year accounts for 226.9 metric tons.

Transportation per year (Shuttle)

= (Number of the shuttle vehicle in the campus (2) x total trips for shuttle bus service each dayx approximate travel distance of a vehicle each day inside campus only (20 km)x 365/100) x 0.01
= ((0 x 20 x 1 x 365)/100)) x 0.01
= 0 metric tons

365 is the number of days per year
0.01 is the coefficient to calculate the emission in metric tons per 100 km for bus

a. Transportation per year (Car)

= (Number of cars entering the campus x 2 x approximate travel distance of a vehicle each day inside campus only (in kilometers) x 365/100) x 0.02
= ((20 x 20 x 1 x 365)/100)) x 0.02
= 29.2 metric tons

365 is the number of days per year
0.02 is the coefficient to calculate the emission in metric tons per 100 km car

b. Transportation per year (Motorcycles)

= (Number of motorcycles entering the campus x 2 x approximate travel distance of avehicle each day inside campus only (in kilometers) x 365/100) x 0.01
= ((500 x 20 x 1 x 365)/100)) x 0.01
= 365 metric tons

365 is the number of days per year
0.01 is the coefficient to calculate the emission in metric tons per 100 km formotorcycles.

c. Total Carbon emission per year

= total emission from electricity usage + transportation (bus, car, motorcycle)
= (226.9+ 0 + 29.2 +365)
= 621.1 metric tons

4.9. Noise level measurements

Noise is all unwanted sound or set of sounds that causes annoyance or can havea health impact and noise level is measured in decibels (dB). Noise pollution is defined as

consistent exposure to elevated sound levels that may cause adverse effectsin humans or other living organisms. World Health Organization (WHO) defined environmental noise (sound produced by transport, industrial activities, construction sites, public works and services, cultural, sporting and leisure activities and neighborhood) as noise from all sources with the exception of workplace noise and recognizes that noise pollution is an increasing problem. Prolonged exposure to loud noises (>75 dB (A) over eight hours a day for years) can lead to hearing loss.

The body can also respond to lower noise levels. Level of noise are expected tobe within 55 dB in residential areas, including institutions. Class room noise levels aresupposed to be around 50 db (Table 26). From the graph, it is evident that mostof the noise level values across campus are above the normal or permissible range. Within the auditorium the noise levels were within range. Sound levels in other areas of campus are largely due to the interactions of people on campus than any other causes like construction or traffic. Sound Level Meter / NoiseThermometer are used to measurethe noise level in the surroundings which converts the sound signal to an equivalent electrical signal and the resulting sound pressure level in decibels (dB) referenced to 20 μPa. Noise level prescribed by Central Pollution Control Board waspresented in (Table 3).

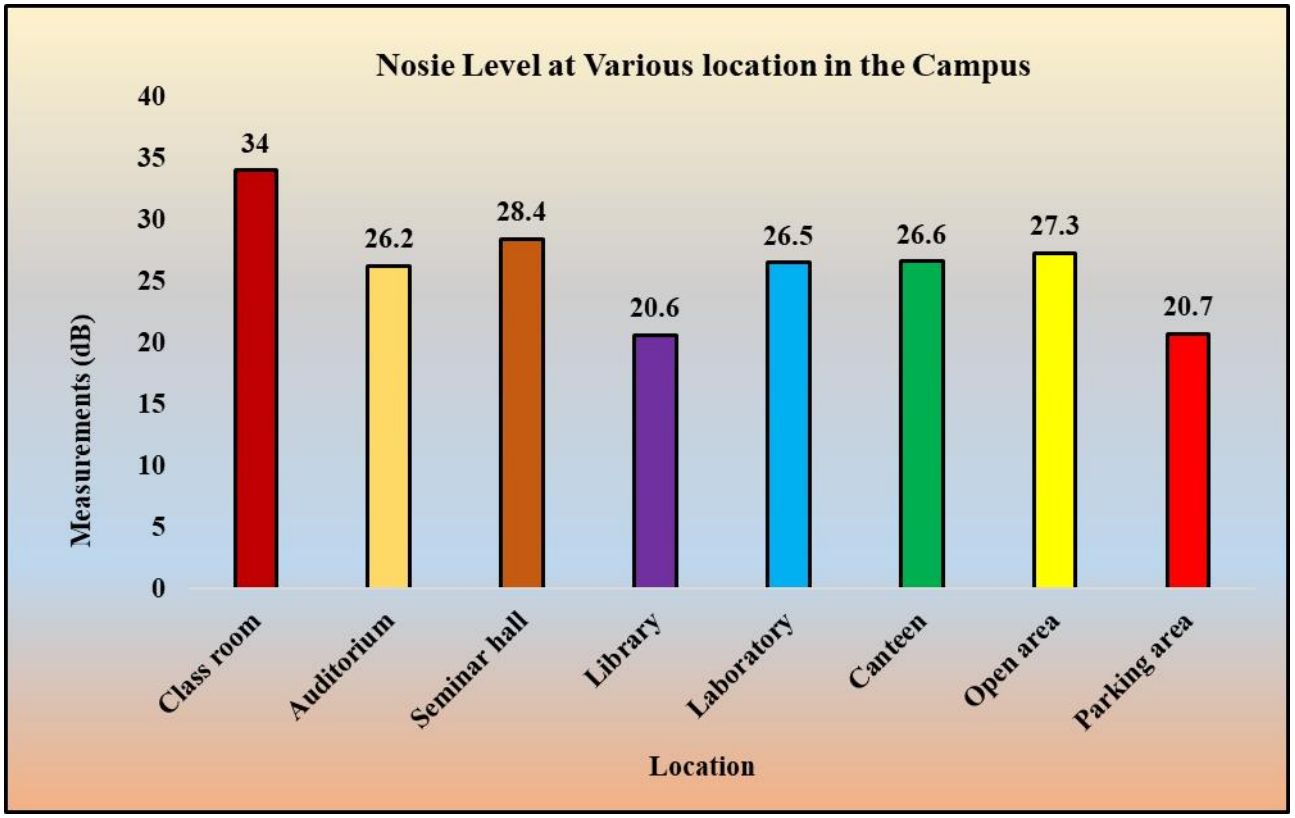
Table 3. Noise level at various location in the campus

S.No	Locations	Measurements (dB)	Major noise sources	Remarks
1.	Class room	34.0±1.7	Students and Staff	No Noise Pollution
2.	Auditorium	26.2±1.3	Students	No Noise Pollution
3.	Seminar hall	28.4±0.1	Students	No Noise Pollution
4.	Library	20.6±0.2	Staff members	No Noise Pollution
5.	Laboratory	26.5±0.3	Students	No Noise Pollution
6.	Canteen	26.6±0.2	Students and Staff	No Noise Pollution
7.	Open area	27.3±0.2	Students and staff	No Noise Pollution
8.	Parking area	20.7±0.2	Vehicles	No Noise Pollution
	Mean	23.37		
	SE	0.73		
	CD	1.30		

Table 4. Noise level standard prescribed by Central Pollution Control Board, Government of India

Area Code	Zone	Limits in dB (A) Leq	
		Day Time	Night Time
A	Industrial	75	70
B	Commercial	65	55
C	Residential	55	45
D	Silence	50	40

Figure 2. Noise level at various location in the campus



4.10. Light intensity measurement at the campus

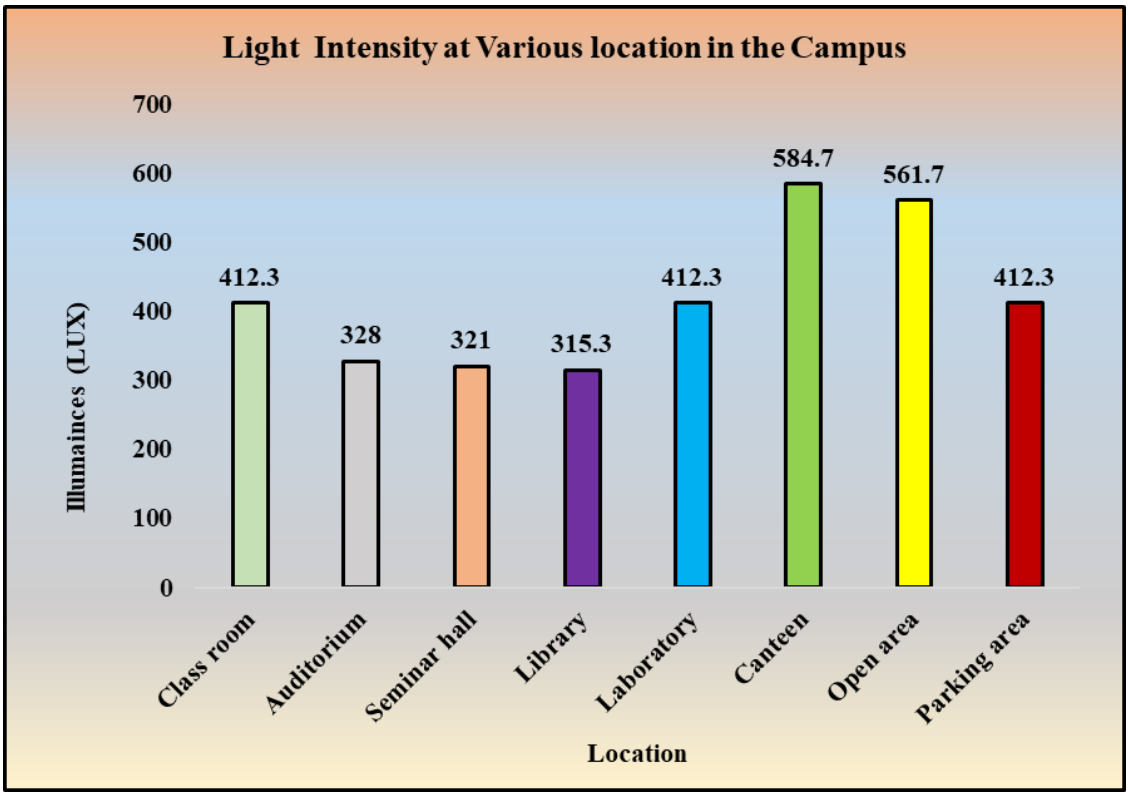
Light intensity or light output is used to measure whether a particular light source provides enough light for an application needed. There is a well-established light level recommendation for a wide range of applications in lighting industry and also for the type of space. Understanding the light intensity helps to properly evaluate whether the space has adequate lighting conditions or not. Light intensity is measured in terms of lumens per square foot (foot-candles) or lumens per square meter (Table 28) (lux). Measuring the amount of light that falls on a surface allows to evaluate if the particular space has sufficient light to perform the tasks. A light meter (lux meter) is used to measure the amount of light in a space/on a particular work surface. The light meter consists of a sensor that measures the light falling on it and provides the user with a measurable illuminance reading. Light meters are an especially useful tool for measuring light for safety or over-illumination. The light intensity is usually measured by taking initial reading, where the lightings are turned off (Baseline measurement) and the final reading is taken by turning on the lights in the particular space (illuminated level) Subtracting the baseline measurement from illuminated level gives the light intensity of the particular room (Table29).

Table 5. Light intensity measured at various locations in the Institute

S.No	Type of Spaces	Illuminances (LUX)
1.	Class room	412.3±2.5
2.	Auditorium	328.0±2.1
3.	Seminar hall	321.0±1.0
4.	Library	315.3±3.0

5.	Laboratory	412.3±2.5
6.	Canteen	584.7±3.8
7.	Open area	561.7±2.5
8.	Parking area	412.3±2.5
	Mean	371.96
	SE	4.60
	CD	8.20

Figure 2. Light intensity measured at various locations in the Institute



4.12. Voltage Measurement at the Campus

Voltage measurement in AC & DC at different places in the campus is measured using the clamp (voltage) meter to reduce the energy consumption.

S.No	Name of the Place	AC & DC Voltage Measurement [Volt (v)]
1.	Class Room	236.7
2.	Auditorium	239.3
3.	Seminar Hall	228.0
4.	Library	225.3
5.	Laboratory	219.6
6.	Canteen	233.0
7.	Hostel	235.0
SD±		2.27

4.13. Other facilities

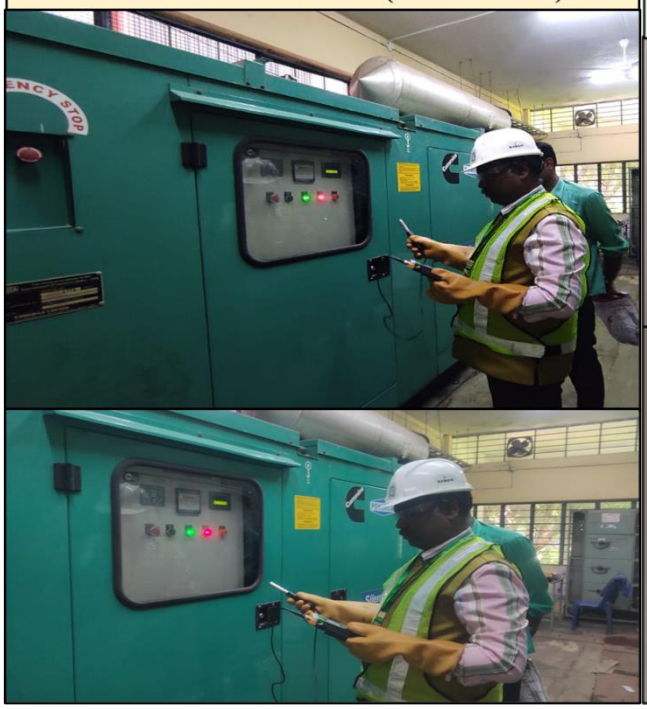
Within the auditees premises, there are other facilities are available that are depicted as glimpses of photographs

Power rooms and UPS Facility in the Campus

Solar Units are well maintained in the JSS College of Arts, Commerce and Science (Autonomous)

Noise Level, Light Intensity and Voltage analysis in the Campus

Generator Facility in the JSS College of Arts, Commerce and Science (Autonomous)



Sign Boards Indication towards Energy Conservation in the JSS College of Arts, Commerce and Science (Autonomous)

Transformer Facility in the Campus

4.14. Audit Observation

- Adequate awareness programmes are organized and conducted to the stakeholders for the proper handling and maintenance of the appliances.
- Standard Operating Procedure and user manual are adequately available for the operation and maintenance of utilities like DG, AC, UPS , lifts, etc.,
- Adequate external and vertical shading are provided to conserve energy.
- Natural ventilation through windows and shading is available adequately to reduce the energy consumption.
- It is observed that large foliage trees are planted inside the campus to reduce noise pollution.
- Low emitting lights are fixed as per the LPD mentioned in National Building Code (NBC) Part -11(Approach to Sustainability) for safety and comfort.
- External and internal signage lits are differentiated to conserve energy.
- 'Danger' and 'warning boards' are available near transformer, generator and UPS.
- Over deck and under deck insulation of roofs are available.
- Solar water heater and panel are available to maintain the sustainability.
- Building Integrated Photovoltaic system like power storage system, backup power supplies, wiring and safety disconnects are available.
- Adequate HVAC and day lighting facilities are observed.
- Outside air is introduced through windows for ventilation in the conditioned spaces.

- The metering system are appropriately monitored through maintenance of log books and sub meters.
- Five star rated appliances (lift, AC, Air cooler, Refrigerator, etc.,) are procured to conserve energy.
- All the fluorescent (tube) lights are replaced with LED lights to conserve energy.
- Awareness posters like ‘Turn off when not in use’, ‘Save Energy’, etc., are displayed for conserving energy.
- All are the artificial lighting system are monitored and controlled through partial availability of sensors.
- Lifts, escalators, moving walk path are adequately available in the campus.
- Operation and maintenance manual are observed in the on-site.
- No emissions and leaks are observed
- Instruments and equipment are properly calibrated and maintained.
- Noise level observed in the different location resulted in normal range.
- Adequate training and awareness programmes are conducted to the stakeholders for energy conservation.
- To optimize the energy campus has implemented solar panel, water heater, sensor lights, operation and maintenance, etc.,

5. WASTE MANAGEMENT AUDIT

5.1. Introduction

Waste management is a global environmental task but has always been neglected by the public. Improper waste management will create environmental issues viz., soil, water- and air-pollution which lead to health problems. Main reason for polluted environment is unawareness of consumers and improper or poor legitimate initiatives. Ever increasing population rate and the improved life style of the people results in generation of amplified amount of solid wastes, irrespective of urban and rural areas. Solid waste is defined as the unwanted substance which is generated by the society that does not have any economic value from the point of view of the user. Waste management is defined as the discipline associated with control of generation, storage, collection, transport/transfer, processing and disposal of solid waste materials in aesthetic way.

There is a daunting need of effective waste management in India as 62 million tons of municipal solid waste and 38 billion liters of sewage is generated annually only from urban areas. The solid waste increases at the rate of 1.0 - 1.3% annually and the maximum amount of municipal waste is left untreated. Primary reason for unclean surroundings in the nation is unawareness of individuals, in general, deprived institutional initiatives. While educating the environmental health and security, it has to be initiate from grass root level, primarily, educational institutions are the right forum to start with. Prior to teaching the students on waste management practices and prepare them to adopt strategic plan of waste management to material management, educational institutions should establish the physical facilities and follow the fundamental guidelines. The physical facilities established in the higher educational institutions and their utility through onsite auditing and to assess the implemented waste management practices with particular reference to recycling and generation of value added products.

5.2. Importance of waste management audit

The Management (Auditee) should be exposed their inherent commitment towards making eco-friendly atmosphere through the waste management audit and ready to encourage all types of hygiene activities. It is necessary to conduct waste management audit at regular interval (one year interval) because students and staff members should aware of the importance of hygiene and cleanliness of the campus and processes involved in the waste management audit which in turn help the institution to set a “bench- mark” (icon) to the community.

5.3. Benefits of waste management audit

- Find out various sources of organic and solid waste generation and mitigation measures
- Documentation of the waste disposal system
- Release of standing order report on waste management compliance
- Waste minimization opportunities realized that contributes to reduction in operating price
- Increased worker cognizance of environmental standards and responsibilities.
- Improve employee relations and morale.

5.4. Waste management initiatives

Waste management initiatives revolved around keeping sign boards indicating

“Waste disposal pit”, keeping adequate number of waste bins with colour codes, awareness sign boards as “Tobacco free zone” and to create awareness among the stakeholders, installation of sign boards “Plastic free campus” and the routine activities related to waste collection, segregation, storage and disposal units. The Management should allot the work to concerned representatives/staff members however, each and every individual should adhere to the initiatives and policies implemented by the Management.

5.5. Aims and objectives of waste management audit

Primary objective of waste management audit is to safe guard the environment in terms of sustenance of environment in compliance with the appropriate valid rules, regulations and requirements. Waste management audit programme conventionally designed and implemented judiciously which can boost the sustainable healthier environment of an organization which in turn to monitor the optimum utilization of the resources. Primary objective of waste management audit revolve around,

- Review the disposal of solid- and liquid-waste within the campus and ascertain the sources of waste generation and to mitigate with possible solutions in relation to environmental compliance
- To take steps to minimize the environmental pollution and degradation by means of developing ‘Sanitation and hygiene policy’, and ‘Waste management policy’, by the Organization.
- In accordance with legislative compliances, to adopt measures to reduce waste generation and recycling the both.
- Establishing plastic free campus/zone with the help of management and to evolve health consciousness among the stakeholders.
- In order to classify the solid and hazardous wastes, their source of generation, quantities and characteristics with respect to prevent environmental hazards.
- To conduct outreach programmes on the environmental damage and conservation.

5.6. Observations of the waste management audit

5.6.1. Plastics use and their impact on the environment

The Ministry of Environment, Forest and Climate Change, Government of India has advised the Plastic Waste Management Rules, 2016. People should be probed to use reusable substances and initiate models which allow up-cycling of waste for better use. This will help to reduce plastic waste from urban local bodies, as well as curb the value for waste among the citizens.

Organization has taken sufficient attempts not to use plastics in the campus and displayed a slogan ‘say no to plastics’ in the campus like canteen, hostel dining halls, seminar halls, corridors, etc. to the students, parents and public. The Management insisted the people to use eco-friendly bags made from organic materials like plant fibers which are easily decomposable in nature. These efforts are very much essential to keep the environment neat and clean to conserve nature.

5.6.2. Solid waste management practices at the campus

The term, solid waste control refers to the method of accumulating and treating solid wastes by following ecofriendly methods. It is also a solution for recycling objects that do not belong to garbage. In the solid waste management, the wastes are accumulated from

different parts and are disposed based on degradability materials like paper and non-degradability materials like glasses, plastics and metals.

According to Solid Waste Management Rules, 2016 (Ministry of Environment, Forest and Climate Change, Government of India), the local authorities are responsible to collect, treat and dispose the solid wastes. The 'Central Board of Solid Waste Management' is the monitoring authority and is responsible for granting authorization to local bodies for processing and disposal of solid waste.

Organization 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 canteens, stationary shop and hostels every day and disposed through Corporation facility.

Solid waste management practices in the Organization

5.6.3. Waste management practices

Waste Management has a common mandate that the "Producer Owns the Responsibility". In the Campus it had quantified a daily average of wastes in which food waste is about 37%, recyclable waste is about 27% and other organic waste is about 36%. The study revealed that the solid wastes need to be professionally handled. The solid wastes are collected from different places of campus and segregated based on biodegradable and non-degradable materials subsequently subjected for recycling and degradation processes like composting.

Details of the waste management practices in the Organization are 1) bio-degradable waste handling, 2) sewage treatment plant and 3) disposal of e- waste.

5.6.4. Bio-degradable and non-degradable waste materials management practice

For segregation of waste (Organic, recyclable, non-recyclable and e-waste) at source and collecting the same 'Waste Bins' are placed at designated locations in the Campus viz. Students Hostels and Staff rooms, Students Service Centre, Sports Complex and Guest rooms. A Contractor is engaged for the collection and further process of waste generated within the campus where biodegradable wastes subjected to preparation of organic compost.

5.6.5. Disposal of E-Waste

According to E-Waste Management Rules, 2016 (Ministry of Environment, Forest and Climate Change, Government of India), electronic waste or e-waste includes old and non-functional electrical and electronic appliances. As per the Rules, the producer of the electrical and electronic equipment shall be responsible to collect and channelize the e-wastes generated under the criteria Extended Producer Responsibility. In compliance to the E-Waste Management Rules, 2016, Government of India, e-waste materials were collected from the Organization are being segregated and then sold to Authorized Agencies which are approved by the Pollution Control Board (PCB) for handling e-waste. Due to this e-waste activity disposal, the e-waste pollution is significantly reduced in the Campus. However, a proper method of e-waste disposal should be done in coming years in collaboration with Karnataka State Pollution Control Board as per the E-Waste Management Rules, 2016.Organization has produced lesser quantity of e-waste and the same has been disposed thro' Corporation facilities.

5.6.6. Construction & Demolition waste management

The Ministry of Environment, Forest and Climate Change, Government of India has notified the Construction and Demolition Waste Management Rules, 2016 exclusively to manage waste (building materials, debris and rubble) from construction activities like new construction, re-modelling, repair and demolition. According to the Rules, the local authorities need to ensure proper management of construction and demolition wastes. State Pollution Control Board is to grant authorization for the waste processing facility and to monitor the implementation of these Rules. One of the best waste management practices is rebuilding of construction waste into pillars, pathway road. The construction waste inside the campus is found to be very low.

5.6.7. Hazardous waste management

The Organization should have taken pioneering efforts to dispose the hazardous waste properly that are generated from various Department laboratories. Acids, solvents, salts, reagents and cancer-causing substances (carcinogens) will cause cancer to the stakeholders those who doing research and/or experiments. Most chemical wastes must be disposed of safely without affecting the environment, soil health and water quality as per the directions of World Hazardous Waste Programme. Carcinogenic substances should not dispose of from the laboratories directly through drains or by evaporation into the atmosphere, nor should they be buried since they might be released later.The campus has a certain protocol to dispose waste as well as expiry chemicals properly. As mentioned earlier, most of the waste materials were disposed through corporation facilities. Napkins are incinerated onsite while agricultural wastes are recycled within the campus. Hazardous chemical waste is not used in the campus and also not applicable.

5.7. Recycling of wastewaters

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. Wastewater treatment plant is installed in the campus and functioning well at the time of onsite audit. Treated water has been recycled for gardening / vehicle wash purposes within

the campus.

5.8. Napkin disposal facility

The campus Management is implementing the safe practices of disposing of napkins using small scale incinerators in ladies' hostels. Incinerator's 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 Organization is taking care of adolescent girls and women significantly in their personal hygiene. The management has installed napkin incinerators, wherever it is required.

5.9. Audit Observations

- Recycling and reuse of waste materials are implemented and practiced through vermicomposting.
- Solid wastes are segregated at the source of generation by implementing the use of different coloured dustbins.
- Solid waste are minimized in the campus by controlling the usage, recycling practices.
- Different coloured dustbins for the collection of waste at various locations are observed in the campus.
- Incinerator facilities are available for the disposal of napkins.
- No usage of radioactive elements observed in the campus.
- Chemical wastes like acids, solvents and salts are dissolved properly before the disposal.
- Electrical and electronic wastes are collected and segregated properly.
- Records are available for e-waste disposal by the authorized agency.
- MoU signed with the authorized waste disposal agency as an effective practice of waste management.
- Observed the allotment of separate team to perform environmental impact assessment and environmental management plan
- Training needs are identified and workforce training is carried out in regular basis.
- Hazardous materials are stored in the separate room and disposed properly through the authorized agency.
- Top soils are preserved and reused in the same site are observed.
- Some of the construction waste are reused for constructing cement roads inside the campus.

6. SOIL AND WATER AUDIT

6.1. Introduction

Soil and water are inequitable natural resources of India at global level. Soil are naturally occurring loose covering on the earth's surface. Weathering altered the rock particles of soil into mixtures of mineral and organic constituents (Bridges, 1997). Soil is rich in microorganisms such as bacteria, fungi, actinomycetes, algae, protozoa and nematodes. The microorganism of the soil helps in enzymatic degradation of organic matter, energy storage and conversion of nutrients in available form in their biomass (Jenkinson and Ladd, 1991). The chemical and physical property of soil makes it a rich medium for the plant growth. Water the other natural resource constituting with 97% of salt water and 3% of fresh water (Alley *et al*., 1999). The use of water is inevitable in our daily needs. Water is used in agriculture, industrial, household, recreational and environmental activities. The natural source of fresh water are surface water and ground water. Ground water is used as primary source of domestic drinking water. Artificial sources of fresh water are treated wastewater and desalinated seawater.

Soil and water are natural resources of the organization that has to be structured, planned and developed from the point of entry to end users the stakeholders in such a way with contamination free soil and water, sustainable use of land and water and suitable measures for their conservation. Soil and water Audit is a tool to improve the quality of the land and water to provide a healthy environment for the stakeholder directly and indirectly of the campus. It creates awareness on environmental ethics, resolves environmental issues and offers solutions to various social and economic needs (APHA, 2017). It strengthens the concept of "Jal Jeevan Mission" and "Sustainable Land Management" among stakeholders of India for the protection of natural ecosystems for future prospects.

Soil and water audit helps the educational institutions/ industries to maintain eco-friendly environment, assures personal hygiene to various stakeholders and supports the nation; on the whole for the noble cause of environmental protection and nature conservation which in turn enhances the quality of life of all living beings (Arora, 2017).

Most of the soil in India are well drained, deep, fairly loamy, slightly acidic to alkaline and lime-free soils and they are ideal for variety of plant cultivation (Arora and Sekhon, 2015). The Indian soils are mainly derived from gneissic rock containing large amount of mica with good behaviour of water holding capacity with abundance of micro and macro elements. Some of the soils are characterized by clay loam type, classified as latosols with good organic matter contents along with sufficient amount of nitrogen, potassium and phosphorous contents all tea soils are distinctly acidic, rich in nitrogen content and (Mishra, 2020).

6.2. Aims and Objectives of Soil and Water Audit

- To maintain periodic records on physico-chemical and biological parameters of soil and water in the organization campus.
- To maintain contamination free with safe soil and water for the stakeholders which in turn useful for maintaining the environment and personal hygiene.

- To identify and provide baseline information to assess threat and risk to the ecosystem with respect to safe soil and water due to Organization development.
- To recognise and resolve different environmental threats of the Organization without creating any soil and water pollution.
- To ensure proper utilization of resources available in the surrounding areas towards future prosperity of the humanity as bioresources like water and soil are considered to be very important.
- To fix a couple of norms for disposal of all varieties of wastes for pollution free soil and water as per the Green and Environment Policy.
- To assess the proper utilization of water from the entry to the consumers and discharge the wastewater as per the guidelines of Central and State Government Pollution Board

6.3. Procedures followed in Soil and Water Auditing

Soil and Water audit is a structured process of documenting the credentials in terms available water and land resources, water distribution network, conveyance system from raw water source to treatment plant, from treatment plant to treated water storage system, treated water storage system to distribution networks, individual users, measures undertaken in reducing the environmental pollution and soil erosion, implementation and maintenance of vermicomposting to enrich the soil quality and conservation of water by rainwater harvesting. It is a kind of a professional tool for assessing the soil and water of the campus. Soil and water audit projects the best environmental practices and initiatives taken in the organisation at the prescribed site of audit that brings added value to the organisation in maintaining the eco-friendly campus to the stakeholders. First step of the audit is ensuring that the organisation has a central role in maintaining the health and hygiene of the campus, in order to validate the same.

During the audit, the sources of water and the type of soil within the campus were recorded and samples were collected for the analysis. The operation of the water irrigation system, drip and sprinkler irrigation methods and use of recycled water for irrigation purpose or any other purpose in the campus area were noted. The number of water wells, bore wells and water reservoir facilities in the campus were also noted as per the Audit Manual of Gnanamangai *et al*. (2021).

6.4. Geology, topography and soil condition

Mysore officially Mysuru is a city in the southern part of the state of Karnataka, India. Mysore city is geographically located between 12° 18′ 26″ north latitude and 76° 38′ 59″ east longitude. It is located at an altitude of 770 m (2,530 ft) above mean sea level. The soil type of Mysore is mainly red sandy loams. The colour of the soil changes from place to place.

6.5. Assessment of Physico-chemical property of Soil samples collected from of the Organization

Soil physic-chemical properties influence the behaviour of soil and hence, knowledge of soil property is important. Soil testing is the only way to determine the available nutrient status in soil and the only way we can develop specific fertilizer recommendations. Analysis of soil is carried out for the studies of various parameters like total organic carbon, available

nitrogen (N), phosphorus (P_2O_5) and potassium [K_2O], pH, electrical conductivity, soil texture, bulk density, chloride, fluoride and % moisture content. The fertility of the soil depends on the concentration of N, P, K, organic and inorganic materials, conductivity. The soil profile and soil edaphic parameters of the campus observed to be low in the essential nutrients which are needed for the plant growth. The soil fertility has to be enhanced by adapting vermicomposting and proper irrigation facility.

Soil samples were collected from different places of College campus and then subjected to analyse for their fundamental soil edaphic parameters such as pH, Electrical conductivity (Ec), Total organic carbon, Total nitrogen, Available Phosphorous, Exchangeable Potassium, Total ferric and ferrous ion concentration, Manganese, Magnesium, Zinc, Copper with the help of ISO 17020 Accredited lab.

Table 1. Soil edaphic parameters of the Campus

S.No	Details of Parameters	Data collected
Soil edaphic parameters		
1.	Soil pH	6.4 - 7.5
2.	Soil types	Sandy loam
3.	Total organic carbon	1 ppm
4.	Electrical conductivity	220 - 240
5.	Water holding capacity	-
6.	Total Nitrogen	0.04 – 0.06%
7.	Available Phosphorous	0.65 – 1.2%
8.	Exchangeable Potassium	0.16 – 0.28%

6.5.1. Use of Biofertilizers, Organic and Green Manures in the Campus

Natural or eco-friendly methods should be used to grow plants vigorously in the campus which could reduce the environmental pollution. Use of biofertilizers, organic manures (cow dung, vermicompost and plant wastes and litters) and green manures to grow healthy plants in the medicinal plant garden, kitchen garden and terrace garden should be ensured to keep the campus organic. The plant waste such as fallen leaves, stems, fruits, nuts, seeds and other plant parts should be used to make green manures. A concrete or ground level green manure production unit and vermicomposting units will help to convert all the plant and animal based wastes into green/organic manures. This will be a healthy way of solid litter waste management in the campus. Minimal use of chemical fertilizers as part of integrated nutrient management system is acceptable but nil use of chemical fertilizers is highly appreciable and also helps to keep the campus more of an organic ecosystem. The soil, air, water and sunlight are the four major natural resources any campus gets. Proper use and conservation of these resources are mandatory in green campus audit sites. The available resources and their utilization should be accounted for from time to time. Management of the right way of utilization of these resources with the vision of sustainability should be carried out by framing a committee led by the Head of the Institution concerned. Biofertilizers such as Nitrogen fixing bacteria, Potassium and Phosphorus solubilizing bacteria, Potassium mobilizing fungi (VAM), farm yard manure, dried cow dung manure,

vermicompost manures and biofungicides and biopesticides are extensively used in the Campus to cultivate plants. Agrochemicals, chemical fertilizers (urea, murate of potash, sulphate of potash, rock phosphate, etc.), pesticides and fungicides are not used. These practices are very well appreciated because air, water and soil pollution due to use of agrochemicals is eradicated which in turn to improve the soil health significantly.

6.6. Role of higher educational institutions with respect to water conservation

Periodical monitoring of existing water management system in the campus with participation and transparency. Development of a detailed guideline for conserving water within the campus is compulsorily adopted. Generate case studies on best water conservation practices adopted in the campus which will serve as models for other institutions and villages to adopt.

The team that would be involved in all aspects of water management (exploring, surveying, fact-finding, recording, planning, taking action and monitoring) will also include all relevant stakeholders' viz., citizens, student teams, their teachers, village leaders apart from administrative officials concerned in both campus and villages. A couple of environmentally concerned inclined faculty members or village community leaders may be given the responsibility to lead the water conservation movement in the respective realms. Water Conservation Initiative can be a successful only if the Head of the Institution ignites the spirit of everybody in the organization. She/he needs to direct the departments, pay attention to the findings of student teams and ensure that their valuable suggestions are followed in letter and spirit by all students, faculty members as well as administrative, non-teaching and support staff. A motivated leader can bring a sea-change in the system and therefore she/he is the cornerstone of this campaign. An advisory committee may be constituted to guide the initiative on water conservation.

6.7. Water management activities

In order to conserve water resources, it is essential that any environmentally responsible institution should examine its water use practices. Water auditing is conducted for the appraisal of facilities of raw water intake and determining the facilities for water treatment and reuse. Auditor concerned investigates the relevant method that can be adopted and implemented to balance the demand and supply of water (Rajalakshmi *et al* 2023). The Organization is taking enough attempt to manage wastewater that are coming out from various Department laboratories, hostels and canteens. In general, water management activities are very important in terms of conserving water and its resources for future generations which in turn useful to reduce the land contamination.

6.7.1. Operational water supply thro' drip and sprinkler system

Maintaining the green campus, water conservation mechanisms should be applied efficiently in the campus. Well planned water irrigation systems like sprinkler and drip should be implemented in the entire green area of the campus for an effective water management system. This can be implemented only when the plantations are well planned. The tree growing areas can be connected with medicinal plants growing areas and flower gardens can be connected with sprinkler irrigation. Vegetative area of the audited organization has taken sufficient efforts to maintain the plants greenish and frequency of watering to the plants. A register is maintained to note down the timing of watering the plants and quantity of water irrigated every time. Internal auditing of time of plantation, number of times the plants are watered and growth parameters of the plants in the campus is beings carried out.

Irrigation Facilities in College Campus

6.7.2. Rainwater harvesting system and percolation pond

Rainwater harvesting system is a traditional old practice not only in drought prone areas and also in areas having seasonal rainfall. Indian traditional rainwater harvesting systems are constructed based on three modes either direct pumped, indirectpumped or by both modes. In addition, lakes, ponds, water channels and any other water reservoir methods are considered as the rainwater harvesting system. During the audit it has been observed that the organization has well developed and maintained rain water harvesting system. Rainwater harvesting structures have been commissioned at different locations of the audited organisation's campus

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6.8. Physical appearance and overall ambience on water conservation

Water conservation strategies broadly rely on a) adequacy of water, b) elaborate plumbing facilities with adequate, suitable water taps and sanitary fixtures, c) establishing water use efficient toilets with two levels of flushing facilities, d) wellorganised water usage, e) dedicated staff for water management including inspection, f) periodic service/repairs/corrective measure of leaks in taps and pipes, g) improved sanitization for cleanliness, h) use of carbonated water, i) planting and maintenance of indigenous variety of plants and less water consuming plants and j) organising water conservation workshops to the faculty and students and conducting awareness programme for the benefit of public.

6.9. Water quality

After air, water is the second most critical element for life to exist. As a result, the scientific literature has numerous descriptions of water quality. "It is the physical, chemical and biological characteristics of water," is the most frequently used definition of water quality. Water quality is a measurement of the state of water in relation to the needs of one or more biotic species and/or to any human need or purpose.

Drinking Water Units in College Campus

6.9.1. Physico-chemical parameters of water quality

- One of the most crucial aspects of water quality is pH. It is described as the hydrogen ion concentration's negative logarithm. It is an arbitrary number that expresses how acidic or basic a solution is. Actually, water's pH is a gauge of how acidic or basic it is. Both basic and acidic water have more hydrogen (H+) and hydroxyl (OH) ions than usual.
- Total dissolved solids is referred to as TDS. It calculates the overall concentration of soluble salts and minerals in water. One mg/L of dissolved minerals, for instance, means that the water pitcher contains one mg/L of TDS.
- The salinity of a body of water, commonly known as saline water (also see soil salinity), is the degree to which salt is present. It is often measured in grams per litre (g/L).
- Water that is cloudy is referred to as turbid. It gauges how well light can travel through water. It is brought on by particulate matter suspended in water, including clay, silt, organic matter, plankton and other particles.
- One of the most crucial indicators of the water quality in streams, rivers and lakes is dissolved oxygen (DO) which is regarded as one of the factors. It isan important indicator of water pollution. The water quality improves as the dissolved oxygen concentration does.

6.9.2. Standards for physico-chemical properties of water

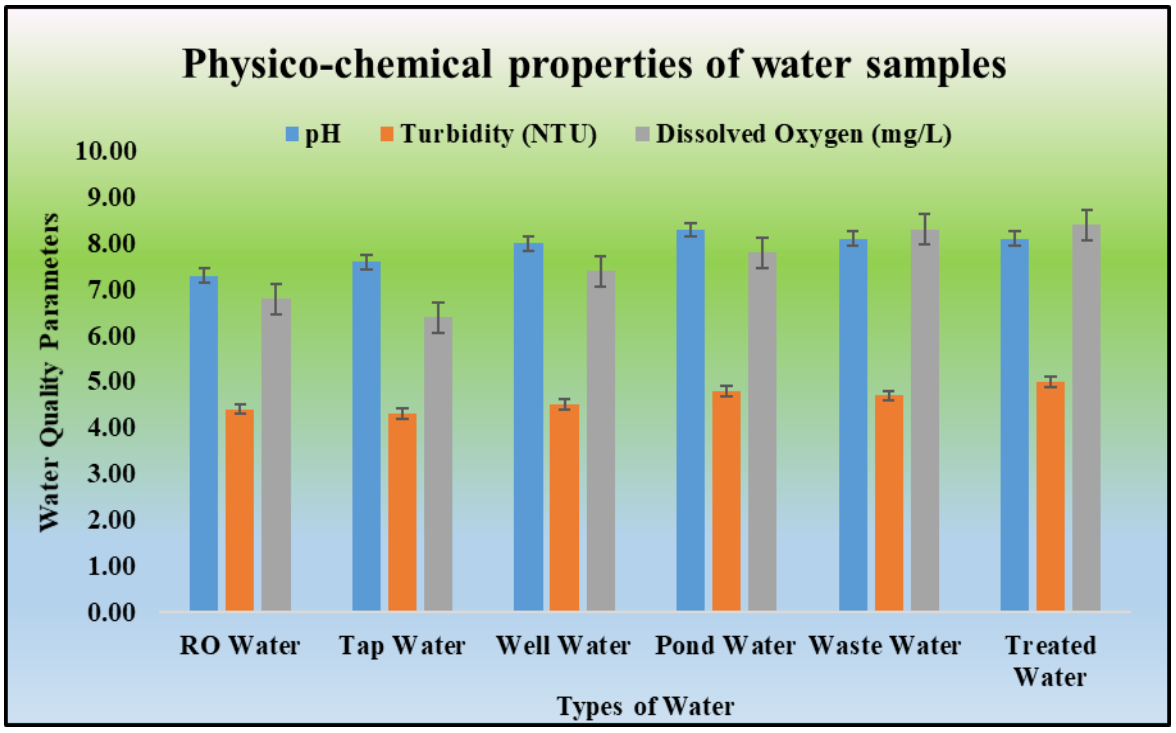
According to the Bureau of Indian Standards (BIS), the upper limit of TDS levelsin water is 500 ppm. Long term exposure to high levels of salinity and turbidity could lead to bone issues in adults and also the fertilisation of nearby farm fields or sanitationfacilities located too close to the well. In most cases, these compounds aren’t a serious health risk. They are harmful to infants, however, causing blue baby syndrome, which can be lethal effects. The water samples collected from various sources, i.e., RO water, tap water, bore well water, wastewater and treated water samples were subjected to analyzed for its physicochemical parameters. The results showed that all the parameters were found to be appreciable and no harmful effect was recorded (Table 16).These parameters were observed to be within the limit of Indian Standards of drinking water quality. Hence the direct consumption of these waters is recommended for drinking, irrigation and domestic usage

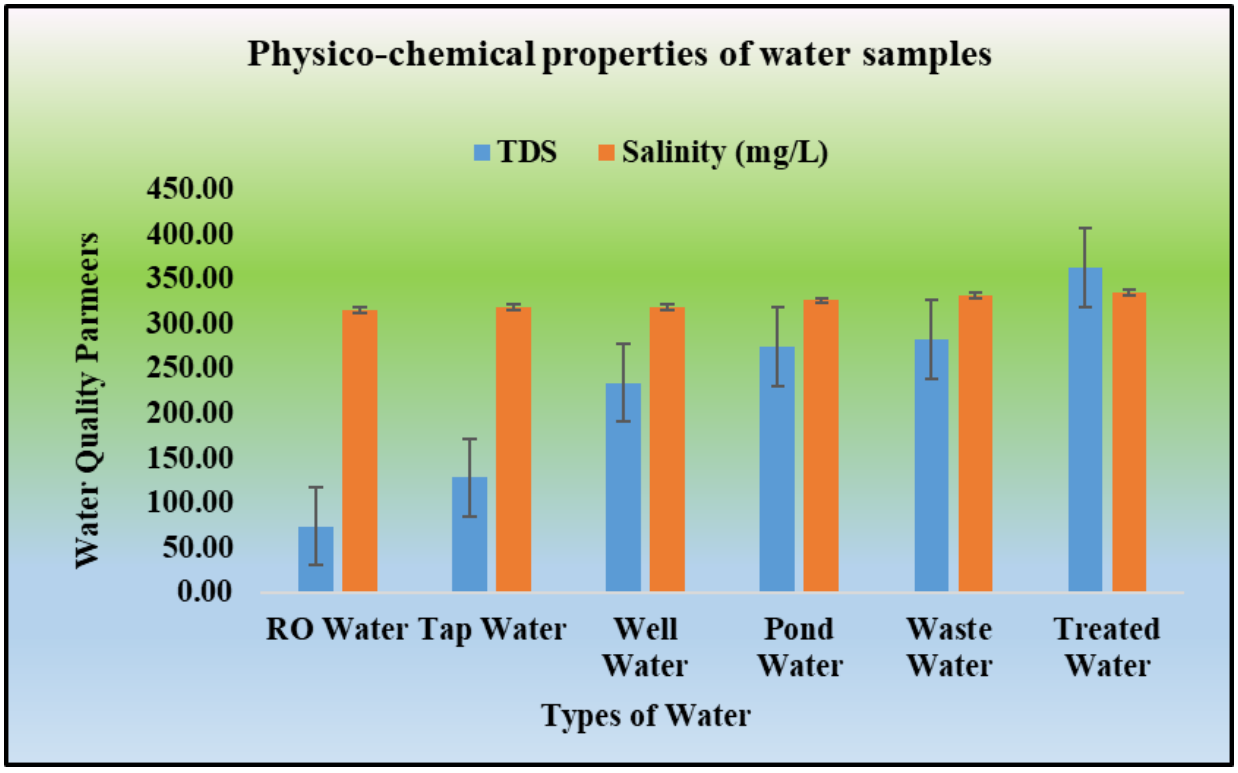
purposes. If any water samples exceed the limit of ISI standards, it could be reduced significantly by adopting reverse osmosis technology. The observed pH values were found to be 6.5 - 8.5 ranges. Similarly, observed TDS and salinity were 0 - 900 mg/L and 300 - 380 mg/L, respectively. Turbidity and dissolved oxygen were 4.5 – 5.5 NTU and 6.5 - 8.0 mg/L, respectively which are compliance with ISI standards.

Table 1. Physico-chemical properties of various water sources

S.No.	Water source	pH	TDS (mg/L)	Salinity (mg/L)	Turbidity (NTU)	Dissolved Oxygen (mg/L)
1.	RO water	7.3±0.1	74.00±1.0	314.70±2.5	4.40±0.2	6.80±0.1
2.	Tap water	7.6±0.2	128.70±1.5	319.30±1.5	4.30±0.3	6.40±0.2
3.	Bore well water	8.0±0.1	234.30±3.0	318.70±3.2	4.50±0.2	7.40±0.1
4.	Artificial pond water	8.3±0.1	274.70±2.5	326.00±2.0	4.80±0.2	7.80±0.2
5.	Waste water	8.1±0.2	283.00±2.0	331.00±2.0	4.70±0.2	8.30±0.2
6.	Treated water	8.1±0.2	362.70±2.1	335.30±1.5	5.00±0.1	8.40±0.2
Mean		7.85	252.8	327.95	4.70	7.70
SEC ±		0.12	1.78	1.77	0.14	0.12
CD at P = 0.05:		0.22	3.18	3.15	0.24	1.21

Figure 1 Physico-chemical properties of water samples





6.10. Water consumption rate

Since several variables are influenced water consumption by various stakeholders of an organization; it is hard enough to precisely assess the water quantity demanded by the public. Water required by various set-ups, which a city may have, is listed here under (Table 17).

Table 2. Water consumption for various purposes

S. No.	Types of consumption	Normal range (L/capita/day)	Average
1.	Per capita domestic consumption at hostel and canteen	90 - 125	110
2.	Industrial and commercial demand at laboratories	140 - 220	175
3.	Public uses including fire demand, transport washes	2500 - 3500	2600
4.	Losses and waste as routine consumption	30 - 40	35
5.	Daily use (day-to-day use)	60	32

Water is an immense requirement of any living organism. Though it is a natural resource, we are exploiting water for various purposes in day-to-day activities. As an educational institution, water requirement for various activities may differ. Per capita Domestic Consumption in Hostels combined with Canteen ranges between 90 - 125 litres. Industrial or laboratory demand for water is estimated ranges between 100 - 300 litres. Losses as leakages and routine consumption accounts approximately 30 - 50 litres (per

capita) and other uses daily usage uses accounts another 50 litres.

6.10.1. Estimation of water requirements for drinking and domestic use (Source: National Building Code 2016 BIS)

As a general rule, the following rates per capita per day may be considered for domestic and non-domestic needs. For communities with population 20,000 to 1,00,000 together with flushing the per capita per day rates may be considered for domestic and non-domestic ranges ~40 to 230 lphd, respectively (Table 3)

Table 3. Water requirements calculation

S. No	Educational Institutions water requirements	Domestic use (lphd)	Flushing (lphd)	Total use (lphd)
1.	Without boarding facility	20	20	40
2.	With boarding facility	150	40	190

6.10.2. Firefighting demand

The per capita fire protection demand is very less on an average basis but the quantum of water is required is very huge. The rate of fire demand is sometimes treated as a function of population and is worked out from following empirical formulae (Table4).

Table 4. Per capita fire demand calculation

S. No	Authority	Formulae (P in thousand)	Q for 1 lakh Population)
1.	American Insurance Association	Q (L/min) =4637 □P (1-0.01 □P))	41760
2.	Kuchling's Formula: per capita fire demand	Q (L/min) =3182 □P	31800
3.	Freeman's Formula: per capita fire demand	Q (L/min) = 1136.5(P/5+10)	35050
4.	Ministry of Urban Development Manual Formula	Q (kilo litres/d) =100 □P for P>50000	31623

6.10.3. Fluctuations in rate of demand/consumption of water

- Average Daily per Capita Demand = Quantity required in 12 Months/(365 x Population); If this average demand is supplied at all the times, it will not be sufficient to meet the fluctuations.
- Seasonal variation: The demand peaks during summer. Firebreak outs are generally more in summer which increases the demand.
- Daily variation in water demand depends on human activities. People draw out more water on Sundays and Festival days, thus increasing demand on these days.
- Hourly variations in water demand is widely varied. During active household working hours i.e., from six to ten in the morning and four to eight in the evening, the bulk of the daily requirement is taken. During other hours the requirement is negligible.
- Adequate quantity of water must be available to meet the peak demand. To resolve all

the fluctuation issues, the supply pipes, service reservoirs and distribution pipes must be properly proportioned. The water is supplied by pumping directly and the pumps and distribution system must be designed to meet the peak demand. Effect of monthly variation impacts the design of storage reservoirs and hourly variations influences the design of pumps and service reservoirs. It may be noted that as the population decreases, the fluctuation rate increases

Sign Boards regarding Water Conservation Activities

6.11. Audit Observations

1. The campus has well established rainwater harvesting models, percolation pond to recharge the bore wells by collecting rainwaters from the building roofs, open areas and playgrounds including unexplored areas which are channelized properly.
2. The physic-chemical properties of soils revealed that the soil health is good towards the construction of building and the cultivation of various native and wild type plant species.
3. The water quality parameters revealed that the quality of water is good in terms of domestic and irrigation purposes.
4. It is observed that the Organization is created massive facilities for wastewater treatment to purify the wastewaters using activated- sludge to manage the wastewaters effectively without harming the environment.
5. A well-established rainwater harvesting system to recharge water ground status by collecting rainwaters from the campus coinciding with the contour of the terrain and natural drains.
6. Solar water heater are available to serve hot water for domestic purpose.
7. Low flow fittings, low cisterns, bath faucet are available to conserve water.

7. HYGIENE AUDIT

7.1. Introduction

A hygiene audit will provide an insight into how an organization operates in a sustainable manner in terms of hygiene environment to the stakeholders as per the International Standard for Occupational Health and Safety Management Systems (ISOHSMS). If an organization has a hygiene auditing process implemented already, then it should apply environmental context into a clean environment. Environmental audit is a natural management tool and it will become more effective when hygiene audit is added to it. It is an essential requirement to adopt an audit process for a sustained utilization of resources in a hygienic way in both developed and developing countries like India. Hygiene will be of different types such as personal hygiene, environmental hygiene, medical hygiene and public hygiene which are all interrelated between each other in terms of maintaining a hygienic atmosphere to the stakeholders (Chen *et al*., 2015; Jeanes *et al*., 2015).

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 and personal safety in the campus should be implemented effectively. Each year a plan for the hygiene audit should be prepared by the management of an organization. A committee of faculties and student representatives and social aware members appointed to take this plan forward in the beginning of every year will ensure that the entire hygienic environmental management system is implemented in the organization without any hindrance. An effective hygiene practice should be followed among the stakeholders which in turn useful to control a wide variety of disease outbreaks (Roethlisberger and Dickson, 2017).

A healthy population is the essential component of a country's wealth in terms of political, economic and environmental sustainability. In terms of population growth statistics, India is the fastest populating country to strike the second position in total population cover which is about 138 million and constitutes 17.25% of the total global population. Demographic status of India revealed that if the population increase continues to be at this rate, India is expected to be the most populated country by 2050. Along with the birth rate, social and environmental issues are also increasing and alarming now-a-days. As consequences of over population, social well-being of man and status of quality environment of the country get affected by the developing pressure on food, clothes, housing and other basic necessities, unemployment, loss of standard of living, decrease of forest cover, environmental pollution, energy crisis, ecological degradation and lack of hygienic condition-resulting in the distortion of well-being of a country (Silvennoinen *et al*., 2015).

7.2. Aims and Objectives of the Hygiene Audit

The main objectives of a hygiene audit is to achieve complete safety for both people and the environment of any organization by promoting the hygiene management and sanitization standards in the enterprise. The hygiene audit identifies, quantifies, describes and prioritizes the framework of hygienic environment in compliance with the applicable regulations, policies and standards to the stakeholders. The main objectives of a hygiene audit are:

- To assess the diversity and density of microbial wealth in the atmosphere.
- To assess the waste management strategies and methods of disposal of food and human wastes.
- To check the availability of tools and materials for hygiene such as hand wash, soap, sanitiser, dryer, tissue roll, hand gloves, masks, lab coats, etc.
- To be aware of the public domain with personal and environmental hygiene.
- To ensure the facilities of sufficient ventilation, napkin disposal and waste management in the campus.
- To check the availability of effective water purification and recycling systems for ensuring the safety of drinking water.

7.3. Procedures followed in the Hygiene Audit

Hygiene auditing ensures the monitoring and safeguarding the standards of sanitation by assessing both the organizations' as well as the associated people's hygiene practices and by suggesting such establishments with proper measures of cleanliness. According to hygiene audit criteria, 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. As the major contaminants causing hygiene issues and disease outbreaks due to various pathogenic microorganisms in the atmosphere that cannot even seen with naked eyes, it focuses on the enumeration of several microbial colonies in the Petri plates containing nutrient medium (Pelczar *et al*., 2000).

7.4. Observation on Personal Hygiene and Safety measures

Hand wash with a

A number of illness and disease outbreaks are reported to be consequences of lack of maintaining proper personnel hygiene among people. By touch, handling of contaminated food, contact with the untidy surfaces can cause invasion of germs and other contaminants. A good personal hygiene is primarily achieved by cleansing hands to remove germs. Soap washing or use of sanitizers ensures removal of 90% of germs and protects the person from catching illness and spreading it to other people. Hence, it is important to create awareness among the stakeholders on personal hygiene.

As far as the stakeholders and employees are concerned, the safety and convenience of everyone working/access to the organization, the following safety rules should be observed at all times. The following basic steps should be followed at all times to reduce the contamination of the working environment especially in edible preparation areas. Wearing a laboratory coat or apron along with hand gloves and caps before entering a working environment for protecting clothes from contamination or accidental discoloration by staining solutions are always mandatory in Organization's hygiene. The observation on providing hygiene environment to the stakeholders at campus revealed that sanitizing materials such as soap, liquid detergent, tissue paper role, hand gloves, hand towels are made available nearby washbasins and restrooms focussing towards personal hygiene and sanitation related concerns. It is observed that working tables and benches are

kept clean at laboratories across the Departments. The working tables and benches are regularly cleaning with a disinfectant solution and neat cloth. Equipment and machineries are very neatly maintained without any dusts and covered with the appropriate covers. Appropriate dustbins and eco-friendly covers are made available at laboratories, canteens, food courts, cafeteria and hostels across the campuses. At hostel dining halls and canteens, food suppliers are tied their long hairs properly and wear disposable hand gloves, full cover aprons and caps to minimize contamination and fire hazards.

Details of pest management strategies adopted (cockroach traps, rodents control measures, insect repellents and other control facilities) at the campus is very good. Food preparation (kitchen) area at hostels and canteen is very clean, free of insect pests and in good state of ventilation and exhaust system along with proper water supply and drainage. It is observed that waste disposal area and waste disposal collection centre are neat and regularly cleaned, free of insect pests and free of spillage with no stagnation of water in food zones.

Sign Boards regarding Cleanliness activities in college campus

7.5. 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.

The Campus 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 Management is taking care of adolescent girls and ladies significantly in terms of their personal hygiene and safety.

7.6. Audit observations

- No person is suffering from a disease or illness or with open wounds or burns among the students, teaching and non-teaching staff members including supportive staff and management people across the campuses observed during the hygiene audit which indicated the campus is very keen interest in providing good hygiene atmosphere to the stakeholders.
- The sanitizing materials such as soap, liquid detergent, tissue paper role, hand gloves, hand towels, etc. are made available nearby the washbasins and restrooms focussing towards the personal hygiene and sanitation related concerns to the stakeholders.
- Appropriate dustbins and eco-friendly covers are made available at laboratories, canteens, food courts, cafeteria and hostels across the campuses to control the spread of wastes and contaminants from one place to another place and without harming the environmental health.
- The pest management strategies adopted (cockroach traps, rodents control measures, insect repellents and other control facilities) at the campus is very good. The laboratories, classrooms, hostels, canteens, foot courts and toilets / restrooms are very neat and clean with proper ventilation and exhaust system.
- Food and Waste handlers are equipped with suitable personal safety materials like disposable hand gloves, full cover aprons and caps to minimize contamination and fire hazards at hostel dining halls and canteens to minimize contamination and fire hazards.
- Maintenance of equipment and machinery items are very good and being carried out regularly as per the instructions of the manufacturer. They are neatly maintained without any dusts and covered with the appropriate covers. They college management has signed a MoU to maintain Hygienic environment.
- Pest control programmes for cockroach, house flies, mosquitos, rodents etc. are effectively implemented and pest control activities (eggs, larvae, pupa, faeces, etc.) are carried out by trained and experienced personnel and no signs of pest activity or infestation in the Organization premises is noticed.
- Medical facilities are available for the laborers with physician to diagonise.

8. Air Quality Audit

8.1. Introduction

When the air is clear and contains only small amounts of solid particles and pollutant then the air quality is determined as good. Air is the mixture of gases, as air is moving its quality can be changed day to day. Temperature, wind movements are also major reason for air quality.

8.2. Objectives

The objectives of air quality audit audits are

- To analyze carbon and oxygen level in the campus
- For maintaining sustainable environment
- Determining levels of community exposure to harmful pollutants
- Helps in categorizing the nature and severity of air pollution.
- For protecting public health.

8.3. Procedure

There are different types of gases in the air, out of that carbon dioxide and oxygen level are measured using the carbon dioxide and oxygen meters at various locations.

8.4. Measurement of carbon dioxide level in the campus

Climatic conditions of the earth changed now-a-days due to a massive increase in global warming and environmental changes including human population and human activities. In addition, primarily fossil fuel burning and an extensive usage enhances heat-trapping greenhouse gas levels in the atmosphere. Global warming is driven by human-induced emissions of greenhouse gases which resulted in paramount shifts in weather patterns. In general, a portable CO_2 Analyzer is used to measure the level of carbon dioxide in the atmosphere at different places across the campus.

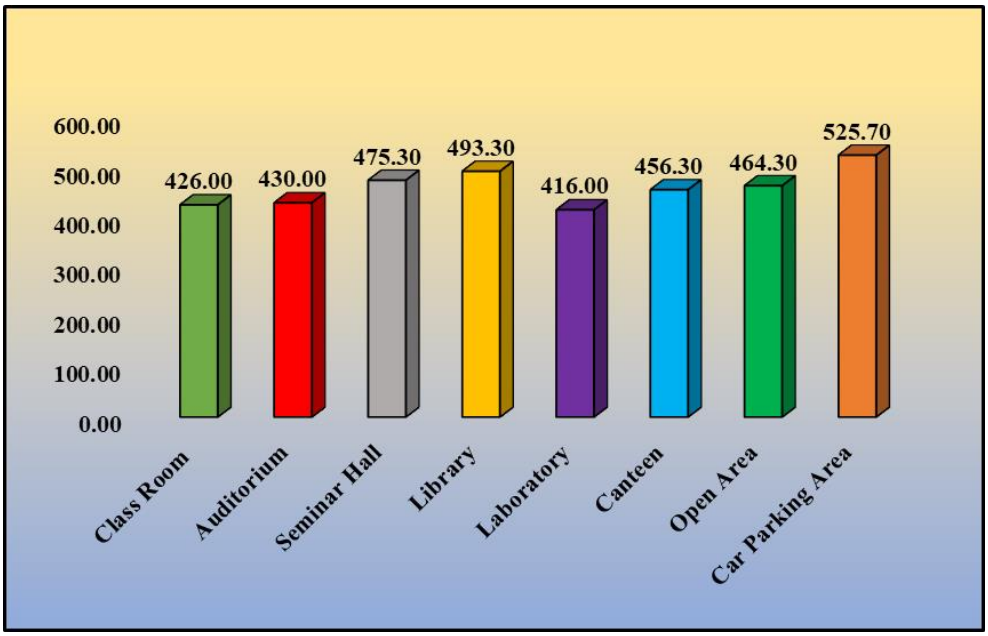
The observation showed that the concentration of CO_2 in the atmosphere is found to be optimal which did not exceed the critical limit of CO_2. It is further revealed that all the selected locations are having pure air without any air contaminants with good air exchange/circulation in the campus. Some of the places like Canteen and Class Roomsare recorded with high level of carbon dioxide level due to student mobilization and the maximum number of electrical items fixed from which the carbon dioxide emission were observed followed by all laboratories and seminar and auditorium halls (Table 8).

Table 1. Measurement of CO_2 concentration in the Organization

S.No.	Different locations of the Organization's Campus	Carbon dioxide level (ppm)*	Remarks
1.	Classroom	426 ± 1.0	Within permissible limits
2.	Auditorium	430 ± 1.0	Within permissible limits
3.	Seminar Hall	475.3 ± 4.5	Within permissible limits

4.	Library	493.3 ± 1.5	Within permissible limits
5.	Laboratory	416.0 ± 2.6	Within permissible limits
6.	Canteen	456.3 ± 4.0	Within permissible limits
7.	Open Area	464.3 ± 3.0	Within permissible limits
8.	Car Parking area	525.7 ± 4.2	Within permissible limits
	Mean		409.7 %
	SEC ±		2.47
	CD at P=0.05%		4.40

Measurement of CO_2 concentration in the Organization



Measurement of CO_2 level at JSS College of Arts, Commerce and Science (Autonomous) Campus, Mysuru, Karnataka

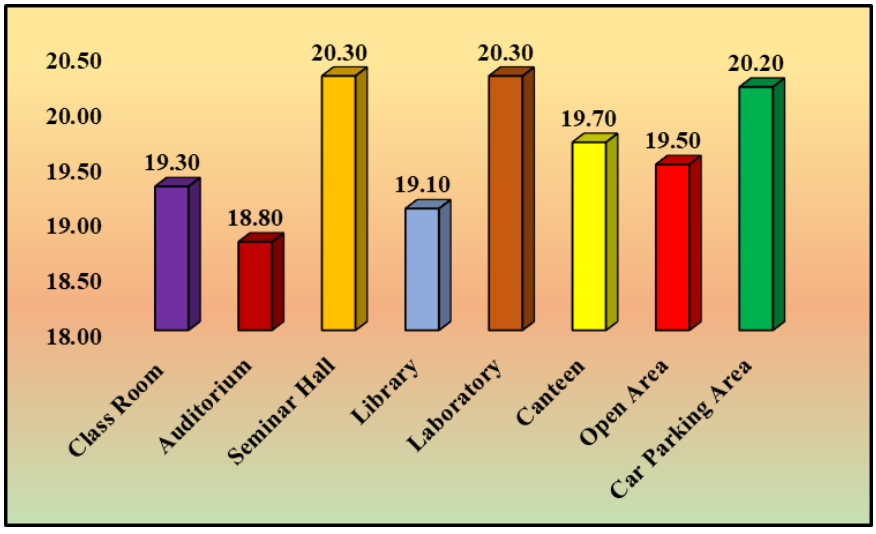
8.5. Atmospheric oxygen level measurements analysis and interpretation

Oxygen level refers to the amount of oxygen available within the atmosphere orwater bodies. Oxygen is produced/released as a by-product of photosynthesis, the metabolic activity of all green plants besides certain microbes. Oxygen plays a paramount role in metabolic activities like respiration and the energy-producing chemistry of all living organisms. In order to quantify the oxygen level, Oxygen Meteris used. The atmosphere contains 18-21% oxygen concentration, 75-78.5% nitrogen and 2- 3% other gases like carbon dioxide, neon and hydrogen. The amount of oxygen level inthe atmosphere is determined by abiotic factors like altitude, latitude and longitude and biotic factors like plantations in the surroundings. If oxygen level is low in the atmosphere lead to headaches and shortness of breath to human beings. If it excess, it causes oxygen toxicity and oxygen poisoning by creating coughing, breathing trouble and damage the lungs to human beings. The oxygen level of different places at the campus are monitored and presented (Table 9).

Table 9. The oxygen concentration at different places of audited organization

S. No	Location	Oxygen Level (%)*	Remarks
1.	Classroom	19.3 ± 0.2	O_2 level is good
2.	Auditorium	18.8 ± 0.1	O_2 level is good
3.	Seminar Hall	20.3 ± 0.2	O_2 level is good
4.	Library	19.1 ± 0.2	O_2 level is good
5.	Laboratory	20.3 ± 0.2	O_2 level is good
6.	Canteen	19.7 ± 0.1	O_2 level is good
7.	Open Area	19.5 ± 0.1	O_2 level is good
8.	Car Parking area	20.2 ± 0.1	O_2 level is good
	Mean		17.5 %
	SEC ±		0.12
	CD at P=0.05%		0.22

Figure 4. The oxygen concentration in the Organization



Measurement of O_2 level at JSS College of Arts, Commerce and Science (Autonomous)Campus, Mysuru, Karnataka

8.6. Audit Observations

- It is observed that carbon dioxide and oxygen values are acceptable range.

8.7. Conclusion

Considering the fact that the organization is a well-established, there is significant scope for conserving energy, water and make the campus as self-sustained in it. The energy conservation initiatives taken up by the organization are substantial.

Water conservation activities are also implemented and practiced. Proper facilities and procedures are followed for waste collection, segregation, disposal, recycle and reuse. Quality of Soil and Water observed to be good. Hygienic practices are monitored and maintained considering the health and sustainability of the stakeholders. Tree Plantation at appropriate locations are maintained to resist the indoor climate and conserve energy as per the National Building Code (Part 11 – Approach to Sustainability).

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10. Certificates of Nature Science Foundation

1. ISO Certificate (QMS 9001:2015)
2. ISO Certificate (EMS 14001:2015)
3. ISO Certificate (OHSMS 45001:2018)
4. ISO Certificate (EnMS 50001:2018)
5. MSME Certificate

QUALITY MANAGEMENT SYSTEM

Certificate of Registration

ROHS

This is to Certify That The Quality Management System of

NSF

NATURE SCIENCE FOUNDATION

LIG II, GANDHIMAA NAGAR, PEELAMEDU, COIMBATORE - 641004, TAMILNADU, INDIA.

has been assessed and found to conform to the requirements of

ISO 9001:2015

for the following scope :

PROVIDING ENVIRONMENT, ENERGY, GREEN AND HYGIENE AUDITS
TO ACADEMIC INSTITUTIONS AND ORGANISATIONS
AS PER THE OWN CHECKLIST AND AWARDS TO
MERITORIOUS CANDIDATES.

Certificate No	**20DQHY90**		
Initial Registration Date	: 08/01/2021	Issuance Date	: 08/01/2021
Date of Expiry*	: 07/01/2024		
1st Surve. Due	: 08/12/2021	2nd Surve. Due	: 08/12/2022

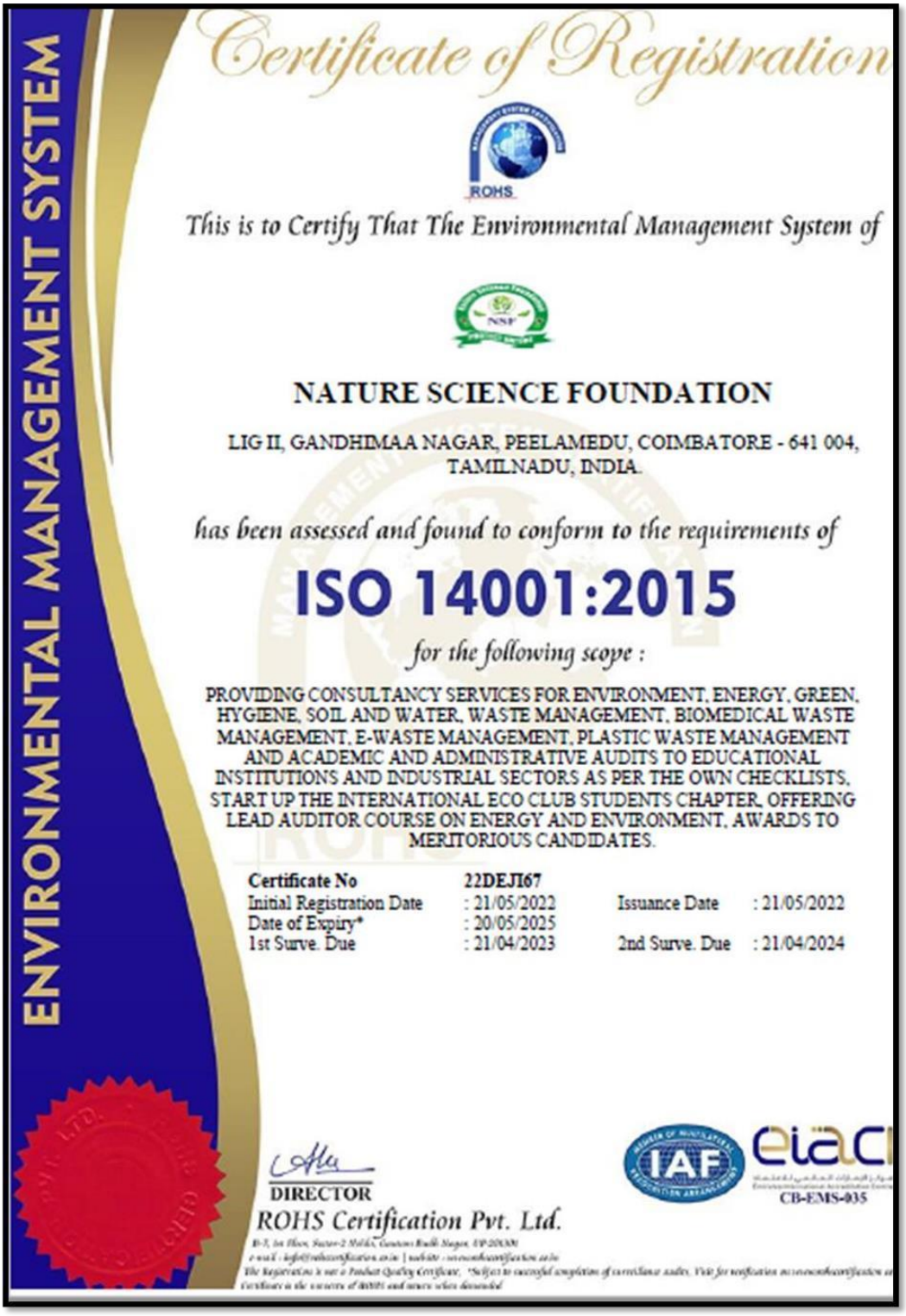
MEMBER OF MULTILATERAL RECOGNITION ARRANGEMENT IAF

eiac
مركز الإمارات العالمي للاعتماد
Emirates International Accreditation Centre
035-CB-QMS

DIRECTOR

ROHS Certification Pvt. Ltd.

408, Madhuban Building, 55, Nehru Place, New Delhi - 110 019, India
phone : +91.11.41525522 | e-mail : info@rohscertification.co.in | website : www.rohscertification.co.in
*The Registration is not a Product Quality Certificate. *Subject to successful completion of surveillance audits, Visit for verification on www.rohscertification.co.in*
Certificate is the property of ROHS and return when demanded



ENVIRONMENTAL MANAGEMENT SYSTEM

Certificate of Registration

ROHS

This is to Certify That The Environmental Management System of

NSF

NATURE SCIENCE FOUNDATION

LIG II, GANDHIMAA NAGAR, PEELAMEDU, COIMBATORE - 641 004, TAMILNADU, INDIA.

has been assessed and found to conform to the requirements of

ISO 14001:2015

for the following scope :

PROVIDING CONSULTANCY SERVICES FOR ENVIRONMENT, ENERGY, GREEN, HYGIENE, SOIL AND WATER, WASTE MANAGEMENT, BIOMEDICAL WASTE MANAGEMENT, E-WASTE MANAGEMENT, PLASTIC WASTE MANAGEMENT AND ACADEMIC AND ADMINISTRATIVE AUDITS TO EDUCATIONAL INSTITUTIONS AND INDUSTRIAL SECTORS AS PER THE OWN CHECKLISTS, START UP THE INTERNATIONAL ECO CLUB STUDENTS CHAPTER, OFFERING LEAD AUDITOR COURSE ON ENERGY AND ENVIRONMENT, AWARDS TO MERITORIOUS CANDIDATES.

Certificate No	**22DEJI67**		
Initial Registration Date	: 21/05/2022	Issuance Date	: 21/05/2022
Date of Expiry*	: 20/05/2025		
1st Surve. Due	: 21/04/2023	2nd Surve. Due	: 21/04/2024

DIRECTOR

ROHS Certification Pvt. Ltd.

IAF

eiaCB

CB-EMS-035

QRO
QUALITY RESEARCH ORGANIZATION

Certificate of Registration

This is to certify that

NATURE SCIENCE FOUNDATION

LIG II, GANDHIMAA NAGAR, PEELAMEDU, COIMBATORE - 641 004, TAMILNADU, INDIA.

has been independently assessed by QRO
and is compliant with the requirement of:

ISO 50001:2018

Energy Management Systems

For the following scope of activities:

PROVIDING CONSULTANCY SERVICES FOR ENVIRONMENT, ENERGY, GREEN, HYGIENE, SOIL AND WATER, WASTE MANAGEMENT, BIOMEDICAL WASTE MANAGEMENT, E-WASTE MANAGEMENT, PLASTIC WASTE MANAGEMENT AND ACADEMIC AND ADMINISTRATIVE AUDITS TO EDUCATIONAL INSTITUTIONS AND INDUSTRIAL SECTORS AS PER THE OWN CHECKLISTS, START UP THE INTERNATIONAL ECO CLUB STUDENTS CHAPTER, OFFERING LEAD AUDITOR COURSE ON ENERGY AND ENVIRONMENT, AWARDS TO MERITORIOUS CANDIDATES.

Date of Certification: 9th August 2022
1st Surveillance Audit Due: 8th August 2023
2nd Surveillance Audit Due: 8th August 2024
Certificate Expiry: 8th August 2025

Certificate Number: 305022080903EN

QRO QUALITY RESEARCH ORGANIZATION
EGAC CAB # 119005
IAF MEMBER OF MULTILATERAL RECOGNITION ARRANGEMENT

Head of Certification

Validity of this certificate is subject to annual surveillance audits to be done successfully on or before 365 days from date of the audit.
(In case surveillance audit is not allowed to be conducted; this certificate shall be suspended / withdrawn).
The Validity of this certificate can be verified at www.qrocert.org
This certificate of registration remains the property of QRO Certification LLP, and shall be returned immediately upon request.

India Office : QRO Certification LLP
142, IInd Floor, Avtar Enclave, Near Paschim Vihar West Metro Station, Delhi-110063, (INDIA)
Website : www.qrocert.org, E-mail : info@qrocert.org

QCS MANAGEMENT PVT. LTD.

MANAGEMENT SYSTEMS CERTIFICATION

Certificate of Registration

ISO 45001:2018 (Occupational Health & Safety Management System)

NATURE SCIENCE FOUNDATION

ADDRESS: NO. 2669, LIG-II, GANDHI MANAGAR PEELAMEDU COIMBATORE - 641 004 TAMIL NADU, INDIA.

Scope of Certification:

PROVIDING TRAINING AND AUDITING SERVICES IN THE FIELD OF GREEN CAMPUS, ENVIRONMENT, ENERGY, OCCUPATIONAL HEALTH AND SAFETY, HYGIENE AND WASTE MANAGEMENT AT EDUCATIONAL INSTITUTES AND INDUSTRIAL SECTOR.

Certificate Number : QCS/EUAS/OHS/002

		1ST Surveillance Audit Within	: 02/07/2023
Issue Date	: 03/08/2022	2nd Surveillance Audit Within	: 02/07/2024
Expiration Date	: 02/08/2023	Re-certification Due Date	: 02/08/2025

Partha Bagchi
(Managing Director)

Validity of this Certificate is subject to Surveillance Audits to be conducted before scheduled due dates of surveillance audits as mentioned on the certificate, failing which the certificate will stand to be withdrawn and need to be treated as an initial certification process to reactivate its continuity on the register of EUAS and QCS . This Certificate is valid when confirmed by data listed on the (Euro Universal Accreditation Systems) EUAS" www.euas-ac.org. The authenticity & validity of this certificate may be re-affirmed by referring to our company website - www.qcspl.com . Lack of fulfillment of conditions as set out on the 'Certification Contract' (Annex 13) may render this certificate invalid. Any alteration, forgery or falsification of the content or appearance of this document is unlawful and offenders may be prosecuted to the fullest extent of law. This certificate remains the property of QCS and to be returned on request.

REGISTERED OFFICE: 37E/1(310) 2ND STREET, MODERN PARK, GREENAGE APARTMENT - 2ND FLOOR, SANTOSHPUR, KOLKATA - 700075, WEST BENGAL, INDIA.
Email: info@qcspl.com. Call: +91 8697724963,+91 8902447427. Website: www.qcspl.com

भारत सरकार
Government of India
सूक्ष्म, लघु एवं मध्यम उद्यम मंत्रालय
Ministry of Micro, Small and Medium Enterprises

UDYAM
REGISTRATION CERTIFICATE

UDYAM REGISTRATION NUMBER	UDYAM-TN-03-0073706
NAME OF ENTERPRISE	M/S NATURE SCIENCE FOUNDATION
TYPE OF ENTERPRISE *	MICRO
MAJOR ACTIVITY	SERVICES
SOCIAL CATEGORY OF ENTREPRENEUR	GENERAL

NAME OF UNIT(S)

S.No.	Name of Unit(s)
1	Green Campus, Energy and Environment Management Audits

OFFICAL ADDRESS OF ENTERPRISE

Flat/Door/Block No.	LIG-II,2669	Name of Premises/ Building	GANDHIMAA NAGAR
Village/Town	Gandhimaanagar S.O	Block	LIG-II
Road/Street/Lane	Peelamedu	City	Coimbatore South
State	TAMIL NADU	District	COIMBATORE , Pin 641004
Mobile	9566777255	Email:	chairmannsf@gmail.com

DATE OF INCORPORATION / REGISTRATION OF ENTERPRISE	28/11/2017
DATE OF COMMENCEMENT OF PRODUCTION/BUSINESS	12/03/2020

NATIONAL INDUSTRY CLASSIFICATION CODE(S)

SNo.	NIC 2 Digit	NIC 4 Digit	NIC 5 Digit	Activity
1	69 - Legal and accounting activities	6920 - Accounting, bookkeeping and auditing activities; tax consultancy	69201 - Accounting, bookkeeping and auditing activities	Services
2	85 - Education	8542 - Cultural education	85420 - Cultural education	Services
3	85 - Education	8549 - Other education n.e.c.	85499 - Other educational services n.e.c.	Services

DATE OF UDYAM REGISTRATION	26/02/2022

* In case of graduation (upward/reverse) of status of an enterprise, the benefit of the Government Schemes will be availed as per the provisions of Notification No. S.O. 2119(E) dated 26.06.2020 issued by the M/o MSME.

Disclaimer: This is computer generated statement, no signature required. Printed from https://udyamregistration.gov.in & Date of printing - 26/02/2022

For any assistance, you may contact:

1. District Industries Centre: COIMBATORE (TAMIL NADU)

2. MSME-DI: CHENNAI (TAMIL NADU)

Visit : www.msme.gov.in ; www.dcmsme.gov.in ; www.champions.gov.in

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11. Certificates of Lead Auditors

1. Bureau of Energy Efficiency (BEE), LEED AP and GRIHA Certificates of Er. D. Dineshkumar, Energy and Environment Auditor of NSF.

2. Indian Green Building Council (IGBC AP) Accredited Professional of Dr. B. Mythili Gnanamangai, Vice-Chairman of NSF.

3. Tamil Nadu Fire and Rescue Service Certificate of Er. S. Srinivash, Energy Auditors of NSF.

4. Energy Management System ISO 50001:2018 Certificate of Dr. D. Vinoth Kumar, Joint Director of NSF.

5. ISO 17020:2012 certificate of Ms. V. Sri Santhya, Assistant Director of NSF.

BUREAU OF ENERGY EFFICIENCY

Examination Registration No. : EA-14056 Serial Number. 9176

Certificate Registration No. : 9176

Certificate For Certified Energy Manager

This is to certify that Mr./Mrs./Ms. Dinesh Kumar D Son/Daughter of Mr./Mrs. R M Dhanasekaran who has passed the National Examination for certification of energy manager held in the month of October 2011 is qualified as certified energy manager subject to the provisions of Bureau of Energy Efficiency (Certification Procedures for Energy Managers) Regulations, 2010.

This certificate shall be valid for five years with effect from the date of award of this certificate and shall be renewable subject to attending the prescribed refresher training course once in every five years.

His /Her name has been entered in the Register of certified energy manager at Serial Number 9176 being maintained by the Bureau of Energy Efficiency under the aforesaid regulations.

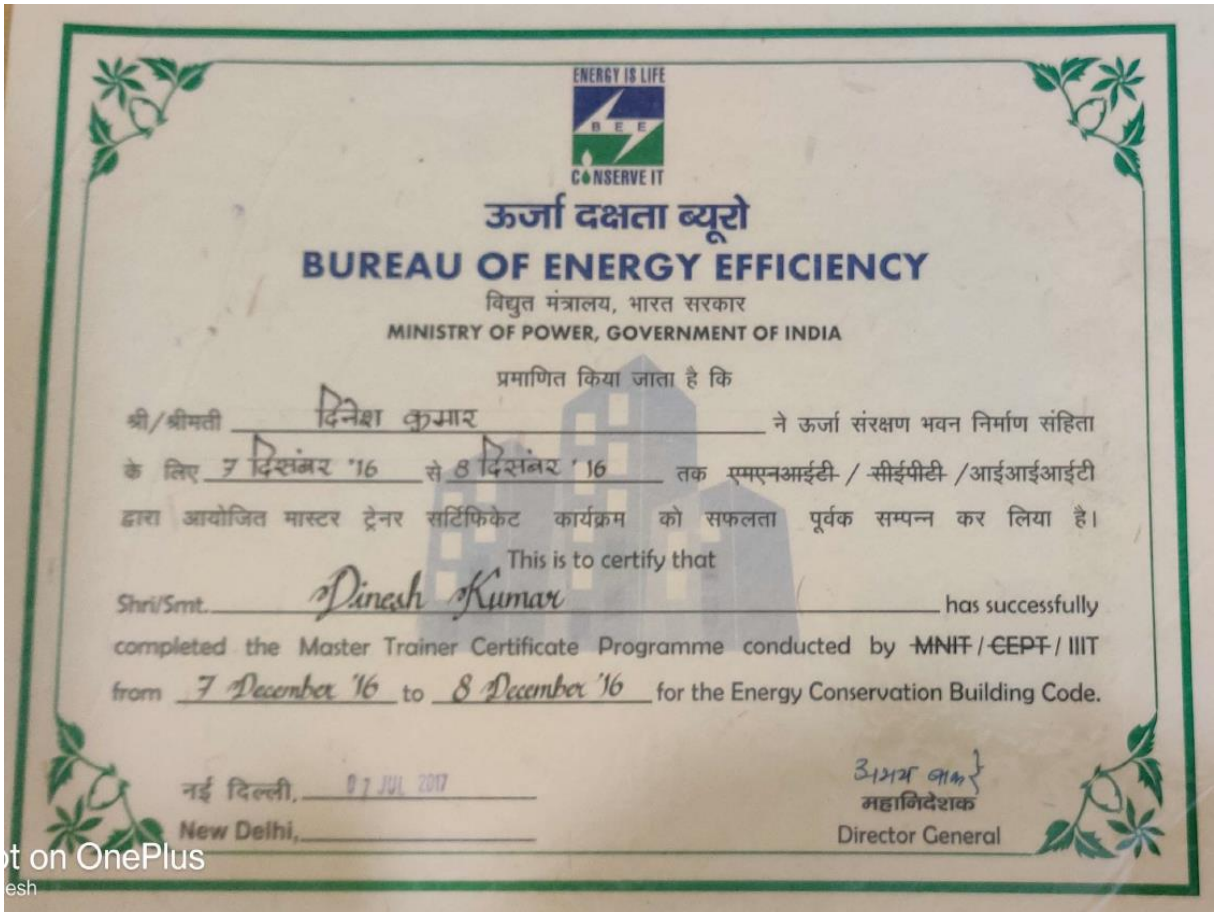
Mr./Mrs./Ms. Dinesh Kumar D is deemed to have qualified for appointment or designation as energy manager under clause (/) of Section 14 of the Energy Conservation Act, 2001 (Act No.52 of 2001).

Given under the seal of the Bureau of Energy Efficiency, this 7th day of February, 2013

Digitally Signed: RAKESH KUMAR RAI
Sun Mar 01 10:58:55 IST 2020
Secretary, BEE New Delhi

Secretary
Bureau of Energy Efficiency
New Delhi

Dates of attending the refresher course	Secretary's Signature	Dates of attending the refresher course	Secretary's Signature
22.12.2019			



ENERGY IS LIFE
CONSERVE IT

ऊर्जा दक्षता ब्यूरो
BUREAU OF ENERGY EFFICIENCY
विद्युत मंत्रालय, भारत सरकार
MINISTRY OF POWER, GOVERNMENT OF INDIA

प्रमाणित किया जाता है कि

श्री/श्रीमती दिनेश कुमार ने ऊर्जा संरक्षण भवन निर्माण संहिता के लिए 7 दिसंबर '16 से 8 दिसंबर '16 तक ~~एमएनआईटी~~ / ~~सीईपीटी~~ /आईआईआईटी द्वारा आयोजित मास्टर ट्रेनर सर्टिफिकेट कार्यक्रम को सफलता पूर्वक सम्पन्न कर लिया है।

This is to certify that

Shri/Smt. Dinesh Kumar has successfully completed the Master Trainer Certificate Programme conducted by ~~MNIT~~ / ~~CEPT~~ / IIIT from 7 December '16 to 8 December '16 for the Energy Conservation Building Code.

नई दिल्ली, 07 JUL 2017
New Delhi,

महानिदेशक
Director General

GRIHA

GREEN RATING FOR INTEGRATED HABITAT ASSESSMENT

GRIHA CERTIFIED PROFESSIONAL CERTIFICATE

This is to certify that

Dinesh Kumar Dhanasekaran

has qualified as a **GRIHA** Certified Professional For V. 2015

Date of issue: 19th June 2020

Note : This certification is valid only for GRIHA version 2015.

Chief Executive Officer
GRIHA Council

GEM Certificate

ASSOCHAM

ASSOCHAM hereby certifies that

Dr. B. Mythili Gnanamangai

has successfully passed the

Green and Eco-friendly Movement Certified Professional Test (GEM CP)

with

"Excellent Performance"

on

16 July, 2021

He/she is now eligible to execute the GEM Sustainability Certification Projects.
ASSOCHAM feels proud to award the GEM Certified Professional title to him/her.

Pankaj R. Dharkar
Chairman, GEM

GEM CP 20/649

Deepak Sood
Secretary General, ASSOCHAM

IGBC

Confederation of Indian Industry

The Indian Green Building Council

hereby certifies that

B Mythili Gnanamangai

has successfully demonstrated knowledge on the Green Building Design & Construction, Building Standards & Codes, IGBC Resources & Processes and Green Design Strategies & their Impacts, required to be awarded the title of

IGBC Accredited Professional

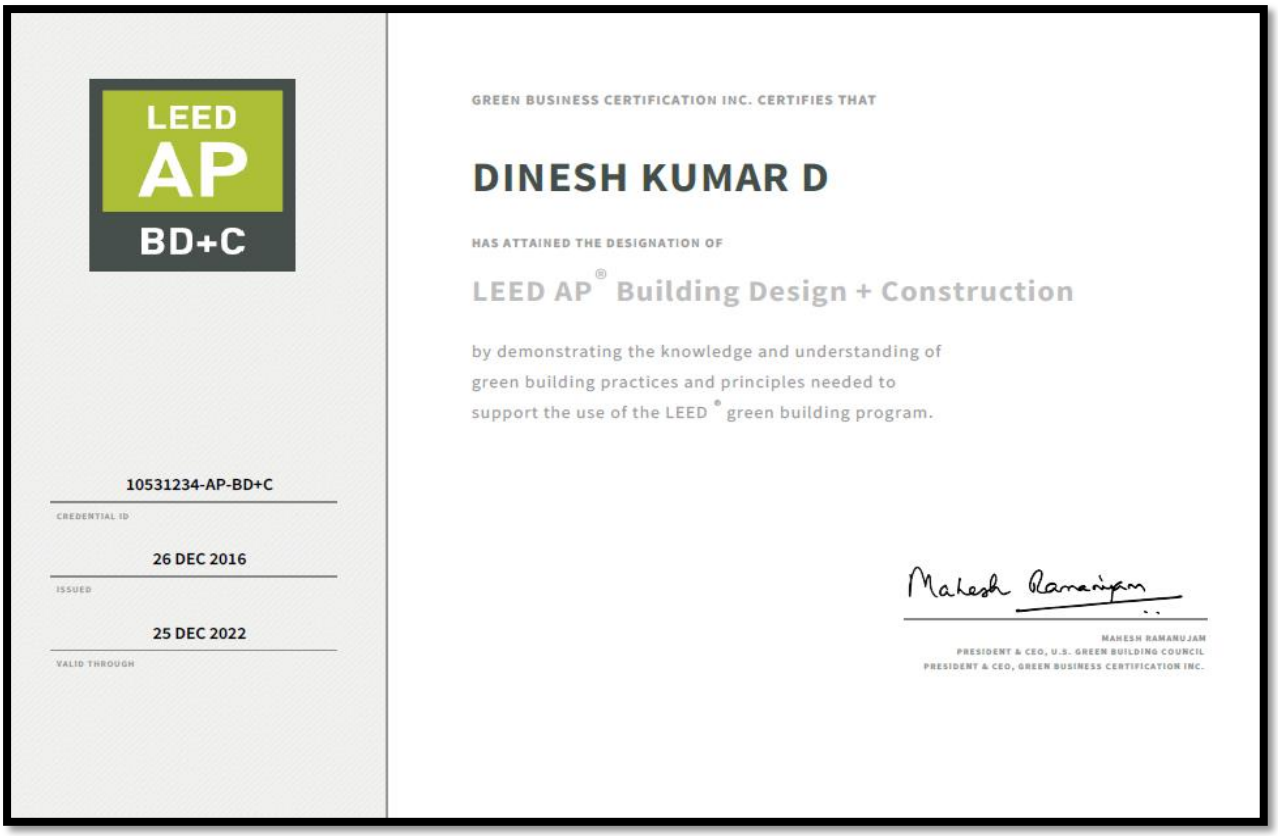
K S Venkatagiri
Executive Director
CII-Godrej GBC

V Suresh
Chairmar
Indian Green Building Council

Gurmit Singh Arora
Vice-Chairman
Indian Green Building Council

210122

17 April 2021



LEED AP BD+C

GREEN BUSINESS CERTIFICATION INC. CERTIFIES THAT

DINESH KUMAR D

HAS ATTAINED THE DESIGNATION OF

LEED AP® Building Design + Construction

by demonstrating the knowledge and understanding of green building practices and principles needed to support the use of the LEED ® green building program.

10531234-AP-BD+C
CREDENTIAL ID

26 DEC 2016
ISSUED

25 DEC 2022
VALID THROUGH

Mahesh Ramanujam

MAHESH RAMANUJAM
PRESIDENT & CEO, U.S. GREEN BUILDING COUNCIL
PRESIDENT & CEO, GREEN BUSINESS CERTIFICATION INC.

TCB Training and Capacity Building

QCI QUALITY COUNCIL OF INDIA
Creating an Ecosystem for Quality

CERTIFICATE OF PARTICIPATION

This certificate is awarded to

V. SRI SANTHYA

for participating in the Virtual Training on

Requirements of ISO/IEC 17020:2012 for Inspection Bodies

organized by

Training and Capacity Building (TCB) Cell, Quality Council of India

on

10-11 August 2023

Alok Jain
Director & Head, TCB

Cert No. TCB/QCI/110823/06-012

QUEST® (An eLearning Platform of TCB)

QCS MANAGEMENT PVT LTD

The CPD Accreditation Office

Certificate of Successful Attainment

This is to certify that

DR. D. VINOTH KUMAR

HAS SUCCESSFULLY COMPLETED THE FIVE DAYS (40 HOURS)

LEAD AUDITOR COURSE

BY PASSING THE WRITTEN EXAMINATION BASED ON

ISO 50001:2018

ENERGY MANAGEMENT SYSTEMS

Examination Date: 15/07/2022
Certificate issue Date: 22/07/2022
Certificate registration number: QCS/TR/C/0056
Total Course duration: 40 hours CPD Credits Earned: 32

Remarks: Roughly one hour of study time equals to 1 CPD Credit.

This certificate can be validated online from the industry wide Global Professional Register at www.qcspl.com.

Partha Bagchi
(Managing Director)

QCS MANAGEMENT PVT LTD

Accredited by "CPD Accreditation Office UK"
H.O: 37E/1(310) 2ND STREET, MODERN PARK, SANTOSHPUR, KOLKATA-700075, WEST BENGAL, INDIA
BRANCHES: INDONESIA, BANGLADESH, QATAR, SAUDI ARABIA, TURKEY, UAE
WHATTS APP: +918697724963/+918902447427,
EMAIL:info@qcspl.com, WEB: www.qcspl.com

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