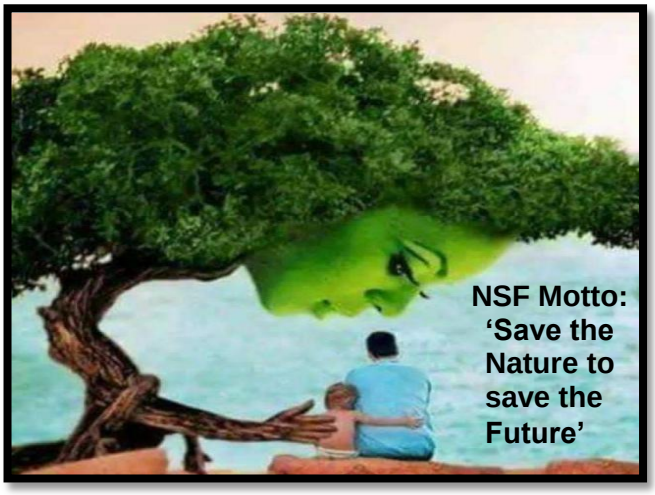
TECHNICAL REPORT OF GREEN CAMPUS AUDIT



Submitted to

ADHIYAMAAN COLLEGE OF ENGINEERING
DR. M. G. R. NAGAR, HOSUR - 635109,
TAMIL NADU, INDIA.

Date of Audit: 25.03.2022 (Friday)

Submitted by

NATURE SCIENCE FOUNDATION
(A Unique Research and Development Centre for Society Improvement)
An ISO 9001:2015 Certified Organization
LIG-II, 2669, Gandhi Managar, Peelamedu
Coimbatore - 641 004, Tamil Nadu, India.
Phone: 0422 2510006, Mobile: 9566777255, 9566777258
Email: director@nsfonline.org.in, directornsf@gmail.com

Contents

1. Introduction

Green campus is an area of the Organisation or the Organisation as a whole itself contributing to have an infrastructure or development that is structured/planned to incur less 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 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 strengthen the concept of "Green building" and "Oxygenated building" which in turn provides a healthy atmosphere to the stakeholders.

Green Campus Audit ensures the Organization's campus should be 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 utilisation and maintenance of natural topography and vegetation (Gowri and Harikrishnan, 2014, Aruninta *et al*., 2017). The maintenance of an eco-friendly campus ensures a neat and clean environment. 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 Campus 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 of Environment Management Systems and International Standards on ISO 14001:2015, Indian Green Building Council, Swachh Bharath Scheme under Clean India Mission to understand the principles and importance of various audits in the context of the organization and risk assessment at 360˚ views. Green campus 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).

2. Role of Educational Institutions in India

Educational institutions are playing important role in a nation's growth and development which starts from maintenance of green campus without harming the environment. A clean and healthy environment in an Organization determine effective learning skills and offers a conducive learning environment to the students. Educational institutions are insisted by both Central and State Governments to offer eco-friendly atmosphere to the stakeholders. In addition, all the Educational institutions are asked to save the environment for future generations and to resolve the environmental problems (accumulating solid wastes and wastewaters/effluents and their careless disposal, enormous utility of plastics, uneconomical consumption of water, irresponsible in water harvesting and storage procedures, etc.) through Environmental Education. Implementing Swachh Bharath Abhiyan Scheme launched by the Indian Government thro' the Educational institutions plays a major role in terms of giving neat and clean

environment to tribal, rural and urban people across the country, besides the regular and conventional activities carried out by NSS, NCC/Student Force, Nature club, Eco club, Science club, Fine Arts club, Flora and Fauna club, Youth Red cross unit, etc. 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 to the stakeholders.

Green campus auditing is a systematic method whereby an organization's environmental performance is checked against its environmental strategies and compliances of the Government guidelines. This audit process is definitely useful for the Educational institutions to maintain the campus neatly and can give pure atmosphere to the students and staff members including Management people. It is like an official examination of the environmental effects on an organization's campus as per the Government guidelines. The audit report may be useful to improve the organization's campus significantly by following the recommendations and suggestions given in the report. The green campus audit processes are being undertaken by World / Indian Green Building Council (IGBC), Green Building Code and Green Ratings Systems (GBCRS), Green Rating for Integrated Habitat Assessment (GRIHA), Conideration of Indian Industry GreenCo Rating System (CII-GreenCo) and Associated Chambers of Commerce and Industry of India (ASSOCHAM) along with ISO EMS 14001:2015 criteria and the concept of Swachh Bharath Abhiyan under Clean India Mission

3. Green Campus and Environment Policy

Green campus and environment policy aims to provide an education and awareness in a clean and green environment to the stakeholders with regard to environmental compliance. Scope of the policy applies to all employees and students of the Institution/organisation to provide an ecofriendly atmosphere. Green Campus Policy dealt with cleanliness of the campus maintained through proper disposal of wastes and steps to be followed to recycle the biodegradable wastes and utilization of eco-friendly supplies to maintain the campus free from hazardous wastes/pollutants. The concept of eco-friendly culture is disseminated among the students as well as rural community through various awareness programmes. Attempts are made to minimise the energy usage and substitute the non-renewable energy sources with renewable energy sources. Head of the Organization, Departmental Heads and Senior Managers/ Management Representatives are responsible for monitoring the "Go Green" initiatives of the College/University and maintain a clean/green campus while each and every individuals of the organisation should adhere to the policy.

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 (students and staff members). 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 oganic alternatives for all incoming and current students, staff and faculty should be organised. 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.

5. Aims and Objectives of Green Campus Audit

- To recognise the initiatives taken towards establishing the green campus in terms of gardening.
- To grow a large number of oxygen releasing and carbon dioxide assimilating plants in the campus to give a pure atmosphere to the stakeholders.
- To identify and provide baseline information to assess threat and risk to the ecosystem due to Organization development.
- To recognise and resolve different environmental threats of the Organization.
- To ensure proper utilization of resources available in the surrounding areas towards future prosperity of the humanity.
- To fix a couple of norms for disposal of all varieties of wastes and use green cover as a carbon sink for pollution free air.
- To assess the greenish nature of an Organization campus in terms of trees, herbs, shrubs, climbers, twins, lianas, lawns and reflected in reducing the environmental pollution soil erosion, biodiversity conservation, landscape management, natural topography and vegetation.

6. Importance of Green Auditing

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. They should promote all kinds of green activities such as conduct of environment awareness programmes, in-campus farming, planting trees and maintenance of greening, irrigation, use of biofertilizers and avoidance of chemical fertilizers and agrochemicals, etc., prior to and after the green campus auditing (Suwartha and Sari, 2013). The administrative authorities should formulate 'Green and Environment Policies' based on technical report of green ampus auditing. A clean and healthy environment will enhance an effective teaching/learning process and creates a favorable learning green environment to the scholars. They should create 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 campus audit may be beneficial to the campus in improving the greenery activities which in turn useful to save the planet for future generation. Green campus audit is a kind of professional care and a simple indigenized system about the environment monitoring in terms of planting a huge 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 in campus because students and staff members should aware of the green audit and its beneficial effects in order to save planet by means of 'Go green concept' 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.

7. Benefits of the Green Auditing

There are several benefits on conduct of green audit by the Organization which may be definitely useful to improve the campus significantly based on the audit report. The green campus audit contained methodology followed and both qualitative and quantitative measurements including physical observation of greeneries in terms of growing of terrestrial and aquatic plants, animals and microflora in the campus. The natural and planted vegetation and their maintenance are also considered in the organization campus through topography, landscape management design and soil erosion control in environment sustainable development. The following are the major benefits of the green auditing.

- Know the status of development of internal and external Green campus audit procedures and implementation scenario in the Organization.
- Establishment d Green campus objectives and targets as on today as per the 'Green and Environment Policy', 'Indian Biodiversity Act' and 'Wildlife Protection Act' of the Ministry of Environment, Forests and Climate Change, New Delhi and World & Indian Green Building Council concepts in accordance with prevailing rules issued by the government/local authorities
- Assigning the roles and responsibilities to the Environmental Engineer and Agriculture Staff who are all responsible to improve green initiatives.
- Development of ownership, personal and social responsibility for the Organization and its environment and developing an environmental ethic and value systems to young generations.
- Enhancement of the Organization profile and reach the global standards in proving the green campus and eco-friendly atmosphere to the stakeholders
- Suggested of availability of Biogas plant to the management to restrict the usage of fossil fuel in cooking purposes.
- Implementing status of the rain harvesting system, water reservoirs, percolation pond, etc. in the campus to increase the ground water level.
- Establishment of terrace garden, herbal garden, kitchen, zodiac, ornamental gardens, etc. for enhancing teaching and learning and commercial exploitation.
- Treated water consumption towards plant cultivation, canteen, hostel, machinery cleaning, transport, toilet use and etc. on water consumption and per capita water consumption per day calculation.
- Studying the campus flora by making a complete data on total number of both terrestrial and aquatic plants, herbs, shrubs, climbers, twins and grasses.
- Survey of campus fauna by conducting the number living and visiting animals, insects, flies, moths and worms in the campus.
- Documentation of the number of oxygen releasing and carbon dioxide assimilating plants planted in the campus to give pure atmosphere to the stakeholders.
- Operation of water irrigation, drip and sprinkler irrigation methods to improve the green campus.
- Studying the biodiversity conservation through Life Sciences and Biological

Sciences people to conserve economically important, rare and endangered plant and animal species in the campus ecosystem.

- Recommendation in use of biofertilizers, organic and green manures, cow dung manures and farmyard manures for the cultivation of plants to protect the environmental health
- Conduct of outreach programmes for dissemination of Green Campus motto and Green pledge initiatives to rural, tribal and urban people through Eco club, Nature club, Science club, Fine Arts club, Youth Red Cross unit, NCC/Student Force and NSS bodies.
- Academic credentials like major and minor Projects, Dissertations and Thesis work on green campus, environment protection and nature conservation by the students and staff members.
- The plants available in the campus must be tagged with their common name and Botanical name for the stakeholders to impart the knowledge on medicinal and ornamental, economic and food values of plant varieties.
- MoU may be signed with Government and non-Governmental Organizations (NGOs) to utilize the resources for nature conservation and environmental protection.
- Implementation of Government schemes (Swatch Bharath Abhiyan under Clean India Mission) to give pure and safe water to rural people and teach the importance of cleanliness of toilets and restrooms.
- Conduction of awareness programmes and cultural activities on global warming, environmental changes and ecosystem maintenance to the stakeholders.
- Steps taken for organic, inorganic, toxic, e-waste, biomedical, food, sewage waste management, segregation of wastes and reuse methods.
- Public transport, low-emitting vehicles and control of car smokes and exhaust towards carbon accumulation in the campus by carbon footprint studies.
- Implementation of advanced methods for watering plantations (Drip irrigation, Sprinkler irrigation, etc.) and use of metering for water utility, IoT based watering, automation, water device, remote water lines, etc.
- Percentage of Organization’s budget for environment sustainability efforts and green campus initiatives planning and efforts.
- Campus facilities for disabled, special needs and/or maternity care including security, safety and health infrastructure facilities for stakeholder’s wellbeing.
- High degree of resource management offers the basis for improved sustainable and creation of plastic free campus to evolve health consciousness among the stakeholders.
- Impart of knowledge on environment through systematic management approach and improving environmentally friendly standards by creating a benchmark for environmental protection initiatives
- Best practices followed on green campus initiatives in the Organization listed and disseminated among the stakeholders.
- Recommendations for improving the green initiatives, planning and efforts in the campus after audit report to improve further.

8. About the Organization

Adhiyamaan College of Engineering (ACE) is one of the educational institutions developed by Adhiyamaan Educational & Research Institution - a trust, which was started in the year 1987-1988 to cater the needs of the nation in the development of technocrats and to provide facilities for educating and training men and women to meet the entrepreneurial and management needs. The management has created adequate infrastructural facilities and sufficient funds and is keen on developing the institution for higher education.

It is the first Engineering College to be started in the most backward erstwhile Dharmapuri District of the State of Tamilnadu to develop the people academically, socially and economically. It was originally affiliated to University of Madras. When the Periyar University was carved out from the University of Madras; it was affiliated to it. Since the government of Tamilnadu decided to bring all the Engineering and Technical Institutions in the State under one Technological University in the year 2001, Adhiyamaan College of Engineering was affiliated to the Anna University, Chennai. The college is housed in Adhiyamaan Educational & Research Institutions Campus, Dr.M.G.R Nagar, Hosur. The Campus is spread over an area of 250 acres abutting National Highway NH-7.

The Institution is situated 6 kms from Hosur bus stand and railway station. The Institution is well connected to three major Railway Junctions viz., Hosur, Jolarpet and Bangalore.The climate of Hosur is similar to that of Bangalore, which is just 35 kms away. Hosur, because of its proximity to Bangalore, enjoys all the facilities like Highway, Train, Airport and other communication similar to that of a metropolitan city. Hosur is a fast-growing major industrial town with various Industrial Units like TITAN, Ashok Leyland, Hindustan Motors, TVS and a host of other small, Medium Scale Industries. The college has established very good rapport with Industries so that majority of students do their project work in these Industries. The quality policy of ACE is committed to develop skills, knowledge and right attitude among students to meet the expectations of Industry, Parents and Society with continual improvement through dedicated teamwork. The main objectives of ACE are

- To create sustainable teaching - learning process in all academic units that promote pedagogical innovations.
- To transform students by facilitating holistic personality development and sustenance of talent.
- To nurture higher commitment towards learning, research and creative thinking among students and faculty members.
- To enhance industry-institute relationship to accelerate students' industry readiness.

The vision is to foster ACE as a centre for nurturing and developing world class Engineers and Managers who convert global challenges into opportunities through value-based quality education. The mission is to impart value-based quality education through effective teaching and learning processes. To nurture creativity, excellence, and critical thinking by applying global competency factors to contribute and excel in the rapidly growing technological world. To continuously develop and improve holistic and innovative personality for global mobility. To make ACE a centre for excellence.

Table 1. The ACE Campus facility details

S.No.	Details of Area	Total area
1.	Total Campus area	46.51 acres
2.	Total Built up area	1657518.22 Sq. ft.
3.	Covered Car parking area	64470.20 Sq. ft.
4.	Forest vegetation	87.4%
5.	Planted vegetation	12.5%

9. Audit Details

Date / Day of Audit **: 25.03.2022 (Fridayday)**
Venue of Audit **: Adhiyamaan College of Engineering,**
Dr. M. G. R. Nagar, Hosur- 635109,
Krishnagiri District, Tamil Nadu, India.
Audited by **: Nature Science Foundation,**
Coimbatore - 641 004, Tamil Nadu, India.
Audit type **: Green Campus Audit**
Name of ISO EMS Auditor **: Mrs. S. Rajalakshmi,**
Chairman, ISO QMS & EMS Auditor, NSF.
Name of Subject Expert **: Dr. D. Vinoth Kumar,**
Joint Director , NSF
Name of IGBC AP Auditor **: Dr. B. Mythili Gnanamangai,**
IGBC AP, Indian Green Building Council.
Name of ASSOCHAM Auditor **: Er. Ashutosh Kumar Srivastava,**
Associated Chambers of Commerce and Industry
Name of Eco & Green Officer **: Ms. S. Sri Santhya,**
Assistant Director, NSF.

10. Procedures followed in Green Campus Audit

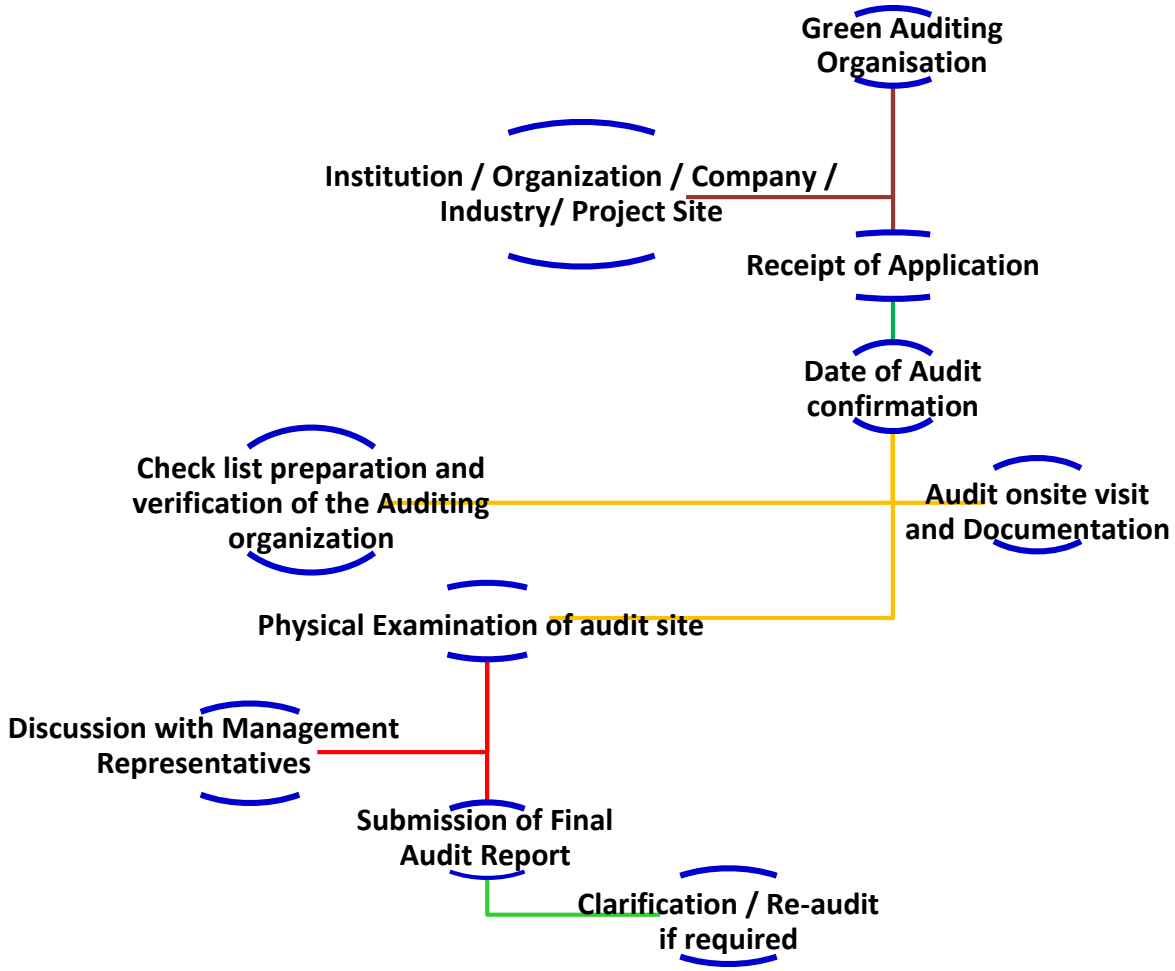
Green campus audit is a structured process of documenting the credentials in terms of number of trees, herbs, shrubs, lawns, climbers and lianas reflected in reducing the environmental pollution and soil erosion and useful for biodiversity conservation, landscape management, natural topography and vegetation. It is a kind of a professional tool for assessing the green campus. Green 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 building the green campus, in order to validate the same (Adeniji, 2018).

Green campus is not intended for the self-sustainability of the building alone, it also involves in propagation of the green campus initiatives so as to be adopted by anyindividuals and organization at a minimum cost. Green campus audit has been conducted as per the checklist of Nature Science Foundation, Coimbatore, Tamil Nadu, India (www.nsfonline.org.in) through the authenticated Professionals for people qualified to investigate and evaluate the campus for validating the best environmental practices (Staniskis and Katiliute, 2016, SCSR, 2018). Professional team of ISO Environment Management Audit (14001:2015), Indian Green Building Council Accredited Professionals, Experts of Green campus Lead Auditors and Botanists / Zoologists / Biotechnologists were selected to conduct the Green campus audit process.

During the audit, the nature of plants and animals / birds species thriving within the campus were recorded. Establishment of lawns, trees, herbs, shrubs and climbers and establishment of terrace / kitchen / herbal / zodiac / ornamental / medicinal garden / aquarium and aquatic (hydrophytes) plants in the campus were recorded. Labelling of common names and Botanical names of plants were observed. The operation of the water irrigation system, trip and sprinkler irrigation methods and use of recycled water for irrigation purpose or any other purpose in the campus area were noted.

Attempts made for water scarcity during summer season towards the maintenance of plants and frequency of watering for plantations in the campus were noted. Biodiversity conservation education, projects, awareness programmes, etc., through Indian Biodiversity Act and Ministry of Environment, Forests and Climate Change, Government of India and the conduct of outreach programmes for dissemination of Green campus motto were recorded (Venkataraman, 2009). Conduct of outreach programmes for dissemination of Green campus motto to the students and staff members including public domain and signing of MoU with Government and Non-Governmental Organizations to ensure green campus activities for future generation were noted (Lauder *et al*., 2015; Brindusa *et al*., 2007). Technology driven solutions initiated by the Green campus organization can also be disseminated and documented successively for propagating the attitude of the Green campus in wider masses.

Projects, Dissertations and Thesis are the academic effort credentials that always fosters the innovative ideas on thinking and implementation of new innovative approaches towards the green campus. These should be disseminated through presentations and publications in social media, books, magazines and journals so as to spread the innovative ideas and methods to the broad public. These efforts taken by the students and staff were deliberated while conducting the Green campus audit. Green audit processes are taking place as per the following flow-chart starting from the receipt of application forms from the auditee (organization) and ending upon the submission of final report to the concerned organization (Leal Filho *et al*., 2015). During the audit process, the best environmental / greenery practices followed and new initiatives undertaken in the organisation to reduce the environmental pollution and steps taken for nature conservation that brings added value to the organisation in maintaining the eco-friendly campus were assessed. In addition, supporting activities of the scholars and staff with regard to “Vision and Mission” of the greenery activities of the Organization is also evaluated.



Flow-chart of Green Campus Audit Procedures

10.1. Onsite Green Campus Audit activities

1. Opening meeting is the first step between the audit team and auditee along the Management Representatives where the purpose of the audit, procedures to be adopted for the conduct of the audit, verification of the documents and the time schedules were discussed, in brief.
2. Followed by opening meeting, onsite inspection will be conducted which is the second step in the audit where the Audit team members visited different sites in the ACE campus and required photographs were taken then and there for preparing the audit report.
3. During the onsite phase of visit, it is vivid how the various facilities made by the ACE Management to the stakeholders without disturbing the landscape, natural topography and vegetation to ensure the green campus.
4. It is observed how the environment is protected in the campus and by what means an eco-friendly atmosphere is being given to the stakeholders. The assessment reveals the strengths and weaknesses of the Auditee's Management controls and risks associated with their failure in creating Green campus facilities.

5. Collecting audit proofs *ie*, data collection and information from the auditee as per the audit protocol were carried out.
6. An exit meeting was conducted to describe the findings of the audit with Management Representatives and staff members along with the audit team in brief.

10.2. Pre-Audit stage activities

A pre-audit meeting (opening meeting) is conducted with Management and Administrative people along with staff coordinators of Energy and Environment audit process, wherein, audit protocol and audit plan were discussed in brief. The purpose of this meeting is to provide a chance to emphasize the scope and objectives of the audit and discussions held on the feasibilities associated with the audit (Marrone *et al*., 2018). Pre-audit stage activities are an essential prerequisite for the green audit to meet the auditee and to gather information about the campus and required documents were collected directly from the Organization before the start of the audit processes (Fachrudin *et al*., 2019). Audit team was selected by the Nature Science Foundation as per the checklist comprised of Lead Auditor of ISO (EMS 14001:2015), Botanist, Agriculture and Horticulture Scientists from Conventional and Technical Universities across India, Accredited Professionals from Indian Green Building Council, Hyderabadand Associated Chambers of Commerce and Industry of India, New Delhi.

Opening meeting with the College Secretary, IQAC Coordinator, Staff Coordinators and Audit Team of the Nature Science Foundation at ACE, Hosur

Energy and Environment audit activity at the ACE by the NSF Audit Team

10.3. Target Areas of Green Auditing

Green campus audit is nothing but a professional tool to assess the greenery activities in the educational institutions and give a value addition to the campus and considered as a resource management process. Eco-campus concept mainly concentrate on the efficient use of energy and water; minimize waste generation or pollution and also improve the economic efficiency. Green campus audit process may be undertaken at frequent intervals and their results can demonstrate improvement or change over time. Eco-campus focuses on the reduction of carbon emissions, water consumption, wastes to landfill and enhance energy use conservation to integrate environmental considerations into all contracts and services considered to have significant environmental impacts (Choy and Karudan, 2016).

There are several target listed in the Green audit process in which a few are taken into consideration as per the Indian scenario is concerned. They are water use efficiency, energy use efficiency, solid, e-waste biomedical, food, sewage waste management and reuse methods, planting of oxygen releasing and carbon dioxide assimilating plants, landscape management, topology, vegetation, soil erosion control, carbon footprint due to use of vehicles, electricity and fossil fuels (León-Fernández and Domínguez-Vilches, 2015). drinking water quality supply, Biogas plant, rain harvesting system, water reservoirs, percolation pond, establishment of various herbal, terrace and ornamental, gardens, campus and flora fauna, water irrigation, implementation of Government schemes, conduction of awareness programmes management, public transport, low-emitting vehicles and control of car smokes and exhaust, Organization's budget for greenery activities, campus facilities for disabled, persons needs special attention and or maternity care, security, safety and health infrastructure facilities for stakeholder's wellbeing (Nunes *et al*., 2018).

10.4. Flora and Fauna diversity of study area

The ACE Campus is situated in Hosur, Karnataka, India. It is located about 6 km from Hosur Bus stand and railway station. At present, the campus is quite clean, green and with much less pollution when compared to the rest of the city. Study/documentation of biodiversity provides a useful measure of the quality of the environment and the ecological studies are important aspects of environment, in view of the consideration of environmental quality and natural flora and fauna conservation.

10.4.1. Topography

The ACE consists of an environment of Tropical and deciduous type with a mixture of teak, located at a minimum elevation of 635 m above mean sea level and maximum elevation of 1295m above mean sea level, 77°49′ E of longitude and 12° 44' N latitude.

10.4.2. Geology and Soil condition

The geology of ACE comprises hard rocks of granite or gneiss.

10.4.3. Climatic conditions

Considering Hosur climate, Eastern part of the district experiences hot climate and western part has a contrasting cold climate. The average normal rainfall is 850.88mm per annum. March – June is Summer season. July – November is Rainy Season and between December – February winter prevails. The total rainfall received is 830mm with the average of 59 rainy days.

Table 2. Soil edaphic and environmental parameters of the ACE

S.No	Details of Parameters	Data collected
Soil edaphic parameters		
1.	Soil pH	7.1
2.	Soil types	Red Soil
3.	Total organic carbon	11%
4.	Electrical conductivity	8 dSm^{-1}
5.	Water holding capacity	2 inch
6.	Total Nitrogen	5 ppm
7.	Available Phosphorous	32 ppm
8.	Exchangeable Potassium	2 ppm
1.	Minimum Temperature	14°C
2.	Maximum Tempearure	24°C
3.	Minimum Relative humidity	22%
4.	Maximum Relative humidity	73%
5.	Annual Average Rainfall	84 cm/avg.year
6.	Annual Average Sunshine	10 hrs/avg.day
7.	Wind speed	8 km/hr

11. Identification of Plant Species

11.1. Identification of Flowering Plant Species

Various vascular plant species were collected across the ACE campus and subjected to botanical identification (botanical name, family, habitat, and economic importance) and anthropogenic disturbances to the natural vegetation in campus. Plants were freshly collected and their digital photographs were also taken. The collected plant specimens have been identified using taxonomic literatures (Gamble and Fischer, 1972; Matthew, 1983; Nair and Henry, 1983; Henry *et al*., 1989; Chandrabose and Nair, 1988). Further, their identification was confirmed by matching with authentic specimens in the Madras Herbarium (MH), Botanical Survey of India (BSI), Southern Circle, Coimbatore, Tamil Nadu, India.

11.2. Identification of Non-Flowering Plant Species

11.2.1. Lichen Identification

Lichen specimens were collected from the ACE campus and then identified based on the lichen identification key of Awasthi (2007). Representative lichen specimens were identified based on thalli morphology such as rhizine, cilia and pseudocephellae and reproductive structures (fruiting bodies) such as apothecia, perithecia, soredia, soralia, conidia and isidia embedding on the thalli surface using a stereo microscope (CZM4, Labomed, India). In the present study, Anatomy of the thallus were carried out in order to document micro morphological features such as medulla thickness, upper and lower surface of thallus, lobes, size and shape of spores. Thin section of apothecia and perithecia was made to observe the nature ascus spores and the arrangement of the algal and fungal layers in the thallus; respectively. Spot tests featured the use of chemical reagents to detect lichen substances by appearances of the characterized colour changes on lichen thallus was noted. The lichen chemistry was analyzed according to Culberson and Kristinson (1970) methods. The colour spot test was done

on medulla of lichen thallus using test reagents of potassium hydroxide (K), calcium hypochlorite (C) and paraphenylene di amine (PD). Lichen was identified based on colour spot test using the procedure defined by Orange *et al*. (2001).

To authenticate the identified lichen samples, the representative samples were compared with the voucher specimens at the Lichen Herbarium Centre of National Botanical Research Institute (NBRI), Lucknow, Uttar Pradesh, India and Department of Botany, Bharathiar University, Coimbatore, Tamil Nadu. The lichen species might be confused with other species unless their morphological, biochemical and anatomical features were closely monitored. Therefore, apart from microscopic observation, spot tests, chemical profiling and TLC tests, attempts were made to compare the representative samples with voucher specimens.

11.2.3. Identification of Algae Genera

Algae are the members of a group of predominantly aquatic photosynthetic organisms of the kingdom *Protista* followed by terrestrial algae found in freshwater and slump areas. Algae are non-flowering and lower group of plants which are green in colour because of presence of chlorophyll pigments in the body called thallus. Algae adopt diverse life cycles, and by size, they range from microscopic *Micromonas* to giant kelps that reach 60 metres (200 feet) in length. Their photosynthetic pigments highly varied when compared to that of higher plants; their cells have features not foundamong plants and animals. In addition to their ecological roles as oxygen producers, they serve as food base for almost all aquatic life; algae are economically important asa source of crude oil and as sources of food and a number of pharmaceutical and industrial products for humans. Algae are defined as eukaryotic (nucleus-bearing) organisms that photosynthesize. They lack specialized multicellular reproductive structures of plants, but they always contain fertile gamete-generating cells surroundedby sterile cells. Algae also lack true roots, stems, and leaves features they share with the avascular lower plants (e.g., mosses, liverworts, and hornworts). Algae identification key consists of couplets of characteristics using algal description of the specimen based on morphological characterization from 58 Genera to species level identification as per the comprehensive key.

12. Identification of Mammals, Birds, Reptiles, Amphibians and Termites

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 by Canon 600 D camera (55 – 250 mm). 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" by Richard 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 diversity index. Based on available data and species were selected for nest site selection study. Selected species of birds was analyses 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 colourtion, 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. 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. Darker specimens 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 eyeare recorded. Males typically grey with a black zigzag stripe, females generally brownwith a dark brown zigzag stripe (Beebee and Griffiths, 2000).

13. Green Campus Audit Observations

It covers both qualitative and quantitative measurements including physical observation of greeneries in terms of growing of terrestrial and aquatic plants, animals and microflora in natural and planted vegetation and their maintenance. Topography, landscape management design and soil erosion control are playing important role in environment sustainable development in the campus. An account of a large number of Oxygen releasing and Carbon dioxide assimilating plants planted in the Campus are taken into consideration to give pure atmosphere to the stakeholders. Establishment of different types of gardens in the campus, rainwater harvesting system, operation of water irrigation, drip and sprinkler irrigation methods may be adopted to improve the green campus. Similarly, biodiversity conservation strategies are very essential to conserve a variety of plant and animal species in the campus ecosystem. Biofertilizers, organic and green manures, cow dung manures and farmyard manures may be used for the cultivation of plants which may be protected the environmental health that will not cause any air, water and soil pollution. The various Clubs, Forums, Cells, Associations and Student / Staff Chapters such as Eco club, Nature club, Science club, Fine Arts club, Flora and Fauna club, Youth Red Cross, NCC/Student Force and NSS bodies maybe involved in green campus initiatives, planning and efforts among stakeholders. Outreach programmes may be conducted for dissemination of Green Campus motto and Green pledge initiatives to rural, tribal and urban people. 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, planning and efforts. Best practices followed on green campus initiatives in the Organization and recommendations for greening are illustrated in the audit report as well.

Table 3. Qualitative Measurements of Green Auditing

S.No	Requirements and checklists of the audit	Conformity		
		Yes	No	NA
1.	Have internal Green campus audit procedures been developed and implemented in the Organization?	✓		
2.	Have programmes for the achievement of Green campus objectives and targets been established and implemented as on today?	✓		
3.	Whether Green campus audit and Environment audit are simultaneously carried out or separately carried out?	✓		
4.	Whether Indian Biodiversity Act as per the Ministry of Environment, Forests and Climate Change, New Delhi, Wildlife protection act and World & Indian Green Building Council concepts followed?	✓		
5.	Have responsibilities been assigned for programmes at each appropriate function and level? (Environmental Engineer & Agriculture Staff working for environment monitoring)	✓		
6.	Are the following environmental aspects considered in sufficient detail?			
	a. Drinking water / RO water / Borewell water / Open well water / Pond water / Municipal or Corporation water use and to check quality of water through Physico-chemical properties analysis	✓		
	b. Wastewater treatment facility	✓		
	c. Sufficient number of trees, shrubs, herbs and lawns	✓		
	d. Solid waste management facility	✓		
	e. Availability of Biogas plant		✓	
	f. Rain harvesting system, water reservoirs, etc.	✓		
	f. Aquarium and aquatic (hydrophytes) plants	✓		
	g. Establishment of terrace garden, herbal garden, kitchen, zodiac, ornamental gardens, etc.		✓	
	h. Natural Topography or Forest, Planted vegetation	✓		
	i. Water well, Bore well, lake, water reservoir facility	✓		
	j. Water consumption towards plant cultivation, canteen, hostel, machinery cleaning, transport, toilet use	✓		
	k. Treated water consumption towards plant cultivation, machinery cleaning, transport, toilet use and etc.	✓		
	l. Per capita water consumption per day calculated (45L/P/C/D)	✓		
7.	Whether plants are tagged properly with their common name and Botanical name for stakeholders?	✓		
8.	Signing of MoU with Govt. and NGOs to disseminate Green campus motto and pledge	✓		
9.	Biodiversity conservation of plants, animals and wildlife, genetic resources (Endangered and endemic species) at		✓	

	each appropriate function and level?			
10.	Are any biofertilizers, organic manures, farmyard manures, vermicompost, green manures and chemical fertilizers used for maintaining plants?	✓		
11.	Establishment of herbal garden, zodiac garden, medicinal garden, kitchen garden, terrace garden and ornamental plants garden in the campus		✓	
12.	Implementation of Government schemes (Swatch Bharath Abhiyan under Clean India Mission)	✓		
13.	Functioning of Nature club, Eco club, Cell, Forum, Association, NCC/Student Force, NSS bodies and Social Service League for students and staff members on biodiversity conservation, green campus development, etc.	✓		
14.	Conduction of awareness programmes and cultural activities on global warming, environmental changes and ecosystem maintenance to the stakeholders		✓	
15.	Conduction of outreach programmes for dissemination of green campus initiatives, natural resources, environmental pollution and biodiversity conservation to rural, tribal and urban people	✓		
16.	Implementation of composting pits, vermicompost unit, recycling of kitchen wastes collected from Hostels, Canteens, Cafeteria, Food court and other places	✓		
17.	Maintenance of plantations in the campus and steps taken for water scarcity during summer season to maintain plants	✓		
18.	Steps taken for organic, inorganic, toxic, e-waste, biomedical, food, sewage waste management, segregation of wastes and reuse methods	✓		
19.	Public transport, low-emitting vehicles and control of car smokes and exhaust towards environment monitoring		✓	
20.	Observation on the site preservation, soil erosion control and landscape management	✓		
21.	Projects and Dissertation works and Scholarly publications on environmental science and management carried out by students and staff members	✓		
22.	Implementation of advanced methods for watering plantations (Drip irrigation, Sprinkler irrigation, etc.)		✓	
23.	Use of metering for water utility, IoT based watering, automation, water device, remote water lines, etc.		✓	
24.	Percentage of Organization's budget for environment sustainability efforts	✓		
25.	Campus facilities for disabled, special needs and or maternity care including security, safety and health infrastructure facilities for stakeholder's wellbeing	✓		

Table 4. Quantitative Measurements of Green Auditing

S.No.	Details of Plant and animal species	Numbers / Percentage
1.	Total number of Flowering plant species inside the Campus	151 species belonging to 130 Genera under 66 families
2.	Total number of Non-Flowering plant species inside the Campus	35 species belonging to Lichens, Pteridophytes, Bryophytes and Mycoflora
3.	Total number of living Mammals inside the Campus	6 such as Cats, cows and Dog
4.	Total number of visiting Mammals inside the Campus	3 species belongings Squirrel, Shrew and Mouse
5.	Total number of living Birds inside the Campus	20 species belonging Stork, Heron, Pigeon, Myna, Robin, Sparrow, Dove and owl.
6.	Total number of visiting Birds inside the Campus	5 species belonging Cormorant, Kingfisher, bee-eater, Bulbul and Drongo.
7.	Total number of Aquarium	Two ponds and one well
8.	Total number of Aquatic (hydrophytes) plant species	Two species belonging to *Lotus and Water Hyacinth,*
9.	Total number of Grasshopper and Termites	Grasshopper: 6 species Termites: 4 species
10.	Total number of Amphibians and Reptiles	Amphibians: 8 species Reptiles: 6 species
11.	Total number of Butterflies and Mosquitos	Butterflies: 13 species Mosquitos: 03 species
12.	Percentage of Forest Vegetation	87.4%
13.	Percentage of Planted Vegetation	12.5%
14.	Percentage of Water consumption to total human population	2.78%
15.	Percentage of Water consumption to total flora and fauna	11.7%
16.	Per capita water consumption per day	67.8%

13.3. Flora and Fauna diversity in the ACE Campus
13.3.1. Flora diversity in the ACE Campus
13.3.1.1. Flowering plants diversity in the ACE 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 being considered as a value addition to the campus.

The observations indicated that the ACE campus has more than 87 % of wild as well as native plant species and the other 13 % plant species are ornamental in nature coming under the planted vegetation. Native plant traits promote the indigenous fauna at the site area. Hence, the accountancy of 50 % of the wild traits are leveraged for the native animals and birds. The most probable natural vegetation of ACE campus is the dry deciduous type. The remnants of this past vegetation are found in the campus.

The most plants recorded are *Albizia lebbeck, Acacia auriculiformisa, Araucaria columnaris, Azadirachta indica, Bauhinia variegate, Callistemon lanceolatus, Cassia siamea, Cassia fistula, Cocos nucifera, Delonix regia, Mangifera indica, Michelia champaca, Polyalthia longifolia,* and *Terminalia arjuna* which are dominant trees species characteristic to the vegetation within the campus. Some of the shrub species like *Abutilon indicum, Caesalpinia pulcherrima, Canna indica, Hamelia patens, Hibiscus rosa-sinensis, Melasto mamalabathricum, Microcos panicula* and *Plumeria obtusa* are also rather common in the campus.

Ground flora is comparatively sparse, but fairly rich in undistributed areas. Some of the common weeds like *Passiflora incarnata, Achyranthes aspera, Ageratum conyzoides and Alternanthera sessilis* are found to be predominant. Species such as *Aristida pinnata, Asystasia gangetica, Bidens pilosa, Chenopodium albumsp, Evolvulus alsinoides, Neottia ovata, Oldenlandia corymbosa, Parietaria officinalis* and *Turnera subulata* are some common herbs in the campus.

Certain common climbers found among the shrubs are *Allamanda cathartica, Clitoria ternatea, Combretum indicum, Epipremnum aureum, Passiflora incarnata, Pyrostegia venusta, Thunbergia grandiflora* and *Tribulus cistoides.* This campus is rich in grass species like *Dactyloctenium aegyptium, Aristida nnata, Chloris barbata* and *Cynodon dactylon.*

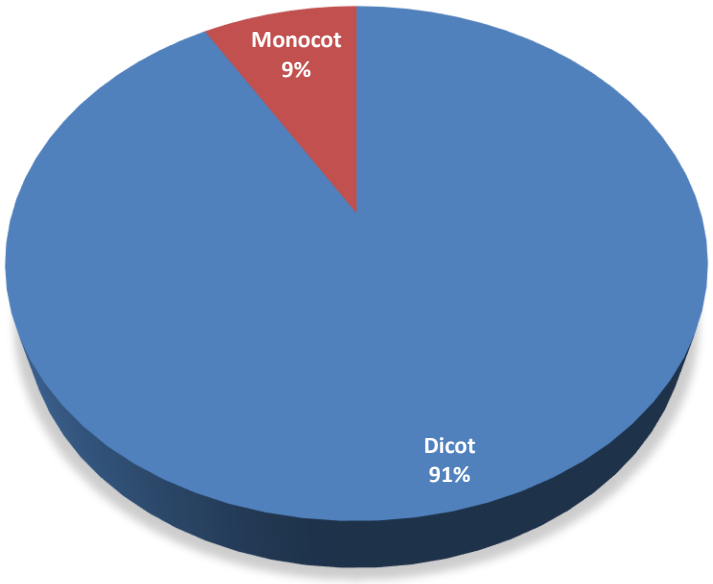
Most of the species found are common in the campus, some of the species *Cucumis dipsaceus* Ehrenb, *Bothriochloa compressa* (Hook.F.), *Chloris bournei* Rang & Tadul., *Hybanthus puberulus* M. Gilbert are rare species. Some endemic grass species like *Andropogon pumilus* Roxb., *Caralluma bicolor* Ramach., *Panicum psilopodium* Trin., and *Perotis indica* (L.) Kuntze are also occurring in the campus. Number of above species decreased in number and a few face the danger of going extinct due to anthropogenic activities (regular clearing and construction activities). Hence in terms of conserving the available floral biodiversity, it is pertinent to set up a botanical garden within the campus and cultivate them while protect the ones that grow naturally on the grounds upon the vegetation maintenance.

Invasive species

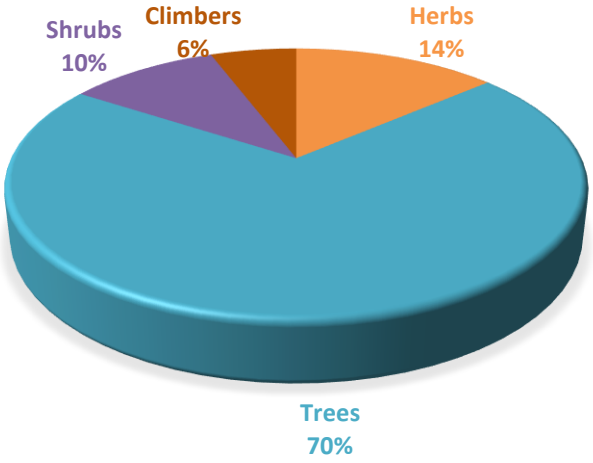
The campus has 33 invasive species such as *Tribulus cistoides, Dactyloctenium aegyptium, Argemone Mexicana, Evolvulus alsinoides, Helianthus tuberosus, Hieracium umbellatum, Hamelia patens, Jatropha integerrima, Lantana camara, Solanum violaceum, Calophyllum inophyllum and Roystonea regia.* These invasive species are indicated as disturbances to the natural setting in the vegetated areas.

The alien / exotic species *viz., Tabernaemontana divaricata, Muntingia calabura, Pyrostegia venusta, Cassia siamea, Annona squamosa , Tamarindus indica* and *Tecoma stans* occur in the campus. Two Threatended species such as *Manilkara elengi and Swietenia mahagoni* were also observed in the campus.

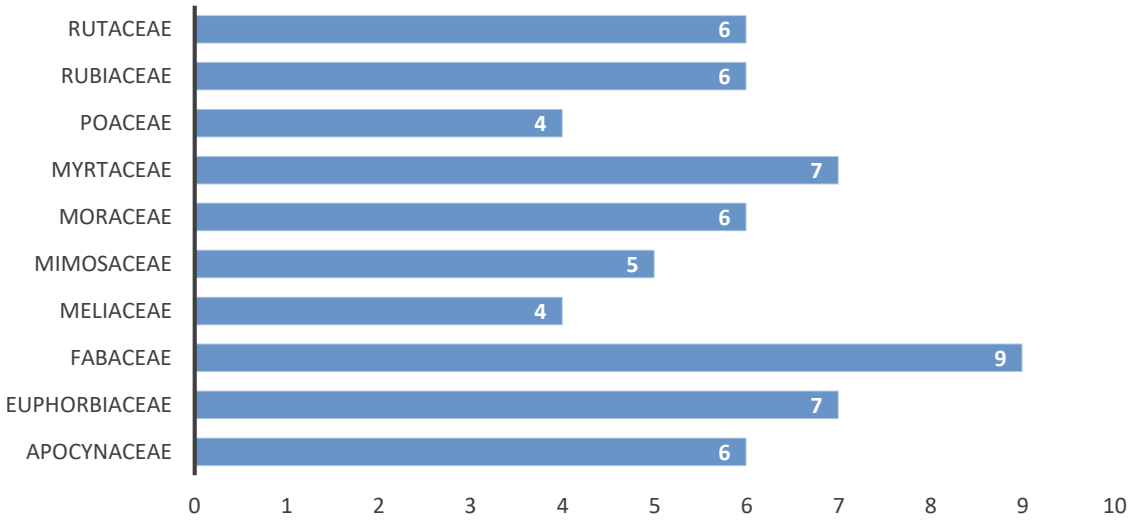
Some of the species are utilized as fruit yielding like *Mangifera indica, Manilkara zapota, Musa paradisiaca, Phyllanthus acidus, Syzygium cumini, Syzygium fruticosum, Phyllanthus emblica, Prunus amygdalus* and *Psidium guajava.*



Systematic groups of the plants in the ACE campus



Analysis of habit-wise distribution of plant species in the campus area



Plant families with higher number of species in the campus area

The biodiversity of ACE Campus comprises a sum of 151 species belonging to 130 genera under 66 families besides the lichens, mycoflora, pteridophytes and bryophytes. Among the documented higher plants, Dicots are dominating with 59 families followed by monocots (7 families). Over all analysis revealed that trees were dominating flora (65%) followed by herbs, shrubs and climbers which accounts 12.5, 9.2 and 5.2%, respectively. Among the documented dicots, Polypetalae formed a major proposition with 39 families, 75 genera and 95 species; Gamopetalae with 10 families, 26genera and 26 species while Monochlamydeae with 8 families, 19 genera and 23 species. In monocots 7 families are spreading over 13 genera belonging to 13 species. Fabaceae is first dominant family followed by Myrtaceae, Euphorbiaceae, Rubiaceae, Apocynaceae, Moraceae, Rutaceae, Mimosaceae, Poaceae and Meliaceae with 9, 7, 6, 5 and 4 species respectively. At the time of green campus audit at ACE campus, a total of 25 invasive floral species were recorded. These invasive species shows disturbances to the natural setting in the vegetated sector.

Table 5. List of Flowering plants in the ACE Campus

Sl. No	Common Name	Botanical Name	Family	Habitats
1	Monkey Bush	*Abutilon indicum*	Malvaceae	Shrub
2	Auri	*Acacia auriculiformisa*	Mimosaceae	Tree
3	Pigweed	*Achyranthes aspera*	Amaranthaceae	Herb
4	Goat Weed	*Ageratum conyzoides*	Asteraceae	Herb
5	Blue weed	*Ageratum houstonianum*	Asteraceae	Shrub
6	White siris	*Ailanthus integrifolia*	Simaroubaceae	Tree
7	Women's tongue	*Albizia lebbeck*	Mimosaceae	Tree
8	Allamanda	*Allamanda cathartica*	Apocyanaceae	Climber
9	White cheesewood	*Alstonia scholaris*	Apocynaceae	Tree
10	Sessile joyweed	*Alternanthera sessilis*	Amaranthaceae	Herb
11	Cashew nut	*Anacardium occidentale*	Anacardiaceae	Tree
12	Soursop	*Annona muricata*	Annonaceae	Tree
13	Custard apple	*Annona reticulata*	Annonaceae	Tree
14	Sugar Apple	*Annona squamosa*	Annonaceae	Tree
15	Burflower - tree	*Anthocephalus chinensis*	Rubiaceae	Tree
16	Black currant tree	*Antidesma ghaesmbilla*	Phyllanthaceae	Tree
17	Aloewood	*Aquilaria malaccensis*	Thymelaeaceae	Tree
18	Christmas Tree	*Araucaria columnaris*	Araucariaceae	Tree
19	Mexican prickly poppy	*Argemone mexicana*	Papaveraceae	Herb
20	Common needle grass	*Aristida pinnata*	Poaceae	Herb
21	Jack fruit	*Artocarpus heterophyllus*	Moraceae	Tree
22	Ganges Primrose	*Asystasia gangetica*	Acanthaceae	Herb
23	Star fruit	*Averrhoa carambola*	Oxalidaceae	Tree
24	Neem	*Azadirachta indica*	Meliaceae	Tree
25	Orchid tree	*Bauhinia variegata*	Fabaceae	Tree
26	Beggar's Tick	*Bidens pilosa*	Asteraceae	Herb
27	Silk cotton tree	*Bombax insigne*	Malvaceae	Tree
28	Toddy Palm	*Borassus flabellifer*	Arecaceae	Tree
29	Gray Nicker	*Caesalpinia bonduc*	Caesalpiniaceae	Shrub
30	Peacock flower	*Caesalpinia pulcherrima*	Caesalpiniaceae	Shrub
31	Red Powder Puff	*Calliandra haematocephala*	Fabaceae	Shrub
32	Bottlebrushes	*Callistemon lanceolatus*	Myrtaceae	Tree

33	Alexandrian laurel balltree	*Calophyllum inophyllum*	Calophyllaceae	Tree
34	Giant milkweed	*Calotropis gigantea*	Apocynaceae	Shrub
35	Indian shot	*Canna indica*	Cannaceae	Shrub
36	Wild guava	*Careya arborea*	Lecythidaceae	Tree
37	Papaya	*Carica papaya*	Caricaceae	Tree
38	Golden Shower Tree	*Cassia fistula*	Mimosaceae	Tree
39	Kassod tree	*Cassia siamea*	Fabaceae	Tree
40	Periwinkle	*Catharanthus roseus*	Apocynaceae	Shrub
41	Lamb's quarters	*Chenopodium albumsp*	Amaranthaceae	Herb
42	Swollen finger grass	*Chloris barbata*	Poaceae	Herb
43	Lemon	*Citrus limon*	Rutaceae	Tree
44	Pummelo	*Citrus maxima*	Rutaceae	Tree
45	Mandarian orange	*Citrus reticulata Blanco*	Rutaceae	Tree
46	Clausaena	*Clausaena heptaphylla*	Rutaceae	Tree
47	Aparajita climbing vine	*Clitoria ternatea*	Fabaceae	Climber
48	Coconut tree	*Cocos nucifera L.*	Arecaceae	Tree
49	Rangoon creeper	*Combretum indicum*	Combretaceae	Climber
50	Sago palm	*Cycas revoluta*	Cycadaceae	Tree
51	Bermudagrass	*Cynodon dactylon*	Poaceae	Herb
52	Coco-grass	*Cyperus rotundus*	Cyperaceae	Herb
53	Egyptian crowfoot grass	*Dactyloctenium aegyptium*	Poaceae	Creeper
54	Basterd Rosewood	*Dalbergia lanceolaria*	Fabaceae	Tree
55	Flame of the forest	*Delonix regia*	Caesalpinaceae	Tree
56	Monkey suckle mistletoe	*Dendropthe falcata*	Loranthaceae	Shrub
57	Sweet William	*Dianthus barbatus*	Caryophyllaceae	Herb
58	Dog teak	*Dillenia pentagynaroxb.*	Dilleniaceae	Tree
59	Ebony	*Diospyros montana*	Ebenaceae	Tree
60	Abyssinian Gooseberry	*Dovyalis abyssinica*	Salicaceae	Tree
61	Indian olive	*Elaeocarpus floribundus*	Elaeocarpaceae	Tree
62	Mauwa	*Engelhardia spicata*	Jullandaceae	Tree
63	Money plant	*Epipremnum aureum*	Areceae	Climber

64	Lemon-scented gum	*Eucalyptus citriodora*	Myrtaceae	Tree
65	Tasmanian blue gum	*Eucalyptus globosus*	Myrtaceae	Tree
66	Indian tree Spurge	*Euphorbia tirucalli*	Euphorbiaceae	Tree
67	Dwarf morning-glory	*Evolvulus alsinoides*	Convolvulaceae	Herb
68	Banyan	*Ficus benghalensis*	Moraceae	Tree
69	The common fig	*Ficus carica*	Moraceae	Tree
70	Hairy fig	*Ficus hispida*	Moraceae	Tree
71	Scared fig tree	*Ficus religiosa*	Moraceae	Tree
72	Coffee plum	*Flacourtia jangomus*	Flacourtiaceae	Tree
73	Giant Cabuya	*Furcraea foetida*	Asparagaceae	Shrub
74	Glochidian	*Glochidian lanceolarium*	Euphorbiaceae	Tree
75	White teak	*Gmelina arborea*	Verbenaceae	Tree
76	Silky Oak	*Grevillea robusta*	Proteaceae	Tree
77	Firebush	*Hamelia patens*	Rubiaceae	Shrub
78	Jerusalem artichoke	*Helianthus tuberosus*	Astraceae	Herb
79	Chinese hibiscus	*Hibiscus rosa-sinensis*	Malvaceae	Shrub
80	Canadian hawkweed	*Hieracium umbellatum*	Asteraceae	Herb
81	Bridal couch plant	*Hymenodictyon excelsum*	Rubiaceae	Tree
82	Pignut	*Hyptis suaveolens*	Lamiaceae	Shrub
83	Arabian Nights	*Jasminum sambac*	Oleaceae	Shrub
84	Peregrina	*Jatropha integerrima*	Euphorbiaceae	Shrub
85	Pride of India	*Lagerstroemia speciosa*	Lythraceae	Tree
86	The Indian ash tree	*Lannea coromendalica*	Anacardiaceae	Tree
87	Common Lantana	*Lantana camara*	Verbenaceae	Shrub
88	Rusty kamala	*Mallotu stetragona*	Euphorbiaceae	Shrub
89	Kamala tree	*Mallotus phillipensis*	Euphorbiaceae	Tree
90	Mango tree	*Mangifera indica*	Anacardiaceae	Tree
91	Bullet wood	*Manilkara elengi*	Sapotaceae	Tree
92	Sapota	*Manilkara zapota*	Sapotaceae	Tree
93	Singapore Rhododendron	*Melasto mamalabathricum*	Melastomataceae	Shrub
94	Chinaberry tree	*Melia azedarach*	Meliaceae	Tree
95	Champak	*Michelia champaca*	Magnoliaceae	Tree

96	Elm-Leaf Grewia	*Microcos panicula*	Malvaceae	Shrub
97	Indian Beech	*Millettia pinnata*	Papilionaceae	Tree
98	Touch-me-not	*Mimosa pudica*	Fabaceae	Shrub
99	Tanjong Tree	*Mimusops elengi*	Sapotaceae	Tree
100	Indian mulberry	*Morinda citrifolia*	Rubiaceae	Tree
101	Indian mulberry	*Morinda tinctoria*	Rubiaceae	Tree
102	Drumstick tree	*Moringa oleifera*	Moringaceae	Tree
103	Cherry Tree	*Muntingia calabura*	Muntingiaceae	Tree
104	Curry Leaf Tree	*Murraya koenigii*	Rutaceae	Tree
105	Banana	*Musa paradisiaca*	Musaceae	Tree
106	Common twayblade	*Neottia ovata*	Orchidaceae	Herb
107	Night flowering jasmine	*Nyctanthes arbor-tristis*	Oleaceae	Tree
108	Diamond flower	*Oldenlandia corymbosa*	Rubiaceae	Herb
109	Upright pellitory	*Parietaria officinalis*	Utricaceae	Herb
110	Tree bean	*Parkia roxburghii*	Mimosaceae	Tree
111	Passion flower vine	*Passiflora incarnata*	Passifloraceae	Climber
112	Copperpod	*Peltophorum pterocarpum*	Caesalpiniaceae	Tree
113	Canary Island date palm	*Phoenix canariensis*	Arecaceae	Tree
114	Otaheite Gooseberry	*Phyllanthus acidus*	Phyllanthaceae	Tree
115	Indian goose berry	*Phyllanthus emblica*	Phyllanthacea	Tree
116	Lily of the Valley shrub	*Pieris japonica*	Ericaceae	Shrub
117	Great White Frangipani	*Plumeria obtusa*	Apocynaceae	Shrub
118	Asoka tree	*Polyalthia longifolia*	Annonaceae	Tree
119	Almond	*Prunus amygdalus*	Rosaceae	Tree
120	Guava	*Psidium guajava*	Myrtaceae	Tree
121	Indian kino	*Pterocarpus marsupium*	Fabaceae	Tree
122	Red Sandal wood	*Pterocarpus santalinus*	Fabaceae	Tree
123	Pomegranate	*Punica granatum*	Lythraceae	Tree
124	Flame plant	*Pyrostegia venusta*	Bignoniaceae	Climber
125	Florida Royal Palm	*Roystonea regia*	Arecaceae	Tree
126	The rain tree	*Samanea saman*	Mimosaceae	Tree
127	Sandal wood	*Santalum album*	Santalaceae	Tree

128	Indian soapberry	*Sapindus mukorossi*	Sapindaceae	Tree
129	Chinese guger tree	*Schima wallichii*	Theaceae	Tree
130	Agati	*Sesbania grandiflora*	Fabaceae	Tree
131	Turkey berrry	*Solanum violaceum*	Solanaceae	Shrub
132	Toothbrush tree	*Streblus asper*	Moraceae	Tree
133	False lime	*Suregada multiflora*	Euphorbiaceae	Tree
134	American mahogany	*Swietenia mahagoni*	Meliaceae	Tree
135	Java plum	*Syzygium cumini*	Myrtaceae	Tree
136	Malabar plum	*Syzygium fruticosum*	Myrtaceae	Tree
137	Rose Apple	*Syzygium jambos*	Myrtaceae	Tree
138	Caribean trumpet tree	*Tabebuia aurea*	Bignoniaceae	Tree
139	Pinwheel Flower	*Tabernaemontana divaricata*	Apocynaceae	Shrub
140	Teak	*Tectona grandis*	Lamiaceae	Tree
141	Arjun tree	*Terminalia arjuna*	Combretaceae	Tree
142	Beleric myrobalan	*Terminalia bellirica*	Combretaceae	Tree
143	Bengal clock plant	*Thunbergia grandiflora*	Acanthaceae	Climber
144	Toon tree	*Toona ciliate*	Meliaceae	Tree
145	Pigeon wood	*Trema orientalis*	Cannabaceae	Tree
146	False White teak	*Trewia nudiflora*	Euphorbiaceae	Tree
147	Puncture vine	*Tribulus cistoides*	Zygophyllaceae	Climber
148	White buttercup	*Turnera subulata*	Passifloraceae	Herb
149	Indian prickly ash	*Zanthoxylum lintonella*	Rutaceae	Tree
150	Indian jujube	*Ziziphus mauritiana*	Rhamnaceae	Tree
151	Jackel jujube	*Ziziphus oenoplia*	Rhamnaceae	Shrub

Bauhinia varigata

Albizia lebbeck

Bidens pilosa

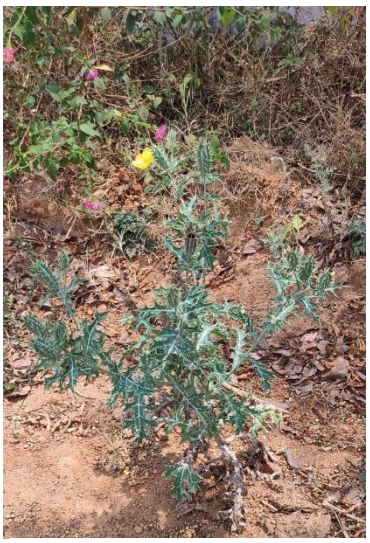
Ailanthus integrifolia

Calophyllum inophyllum

Calotropis gigantea

Azadirachta indica

Achyranthes aspera



Argemone mexicana

Canna indica

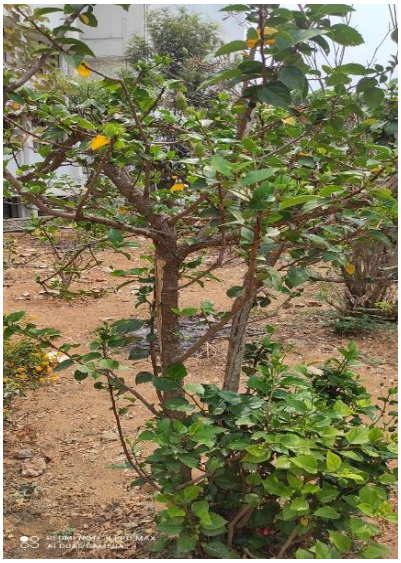
Furcraea foetida

Epipremnum aureum

Grevillea robusta

Cocus nucifera

Dianthus barbatus

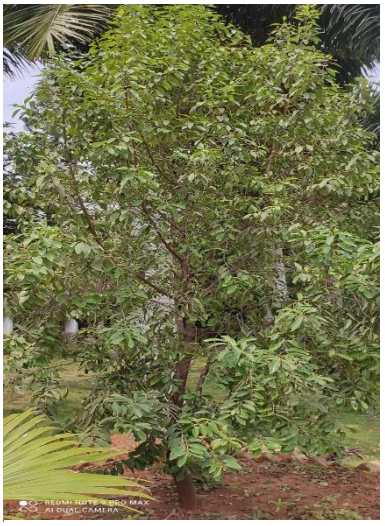


Dovyalis abyssinica

Evolvulus alsinoides

Hamelia patens

Plumeria obtusa



Santalum album

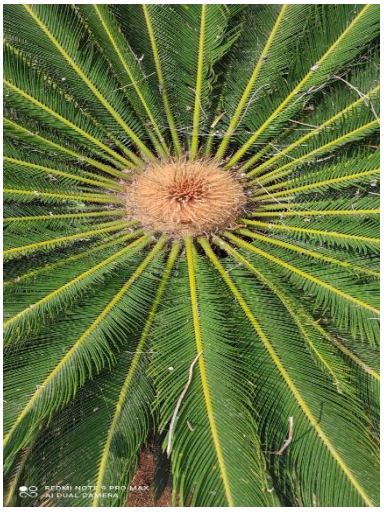
Phoenix canariensis

Jasminum sambac

Roystonea regia

Musa paradisiaca

Jatropha integerrima



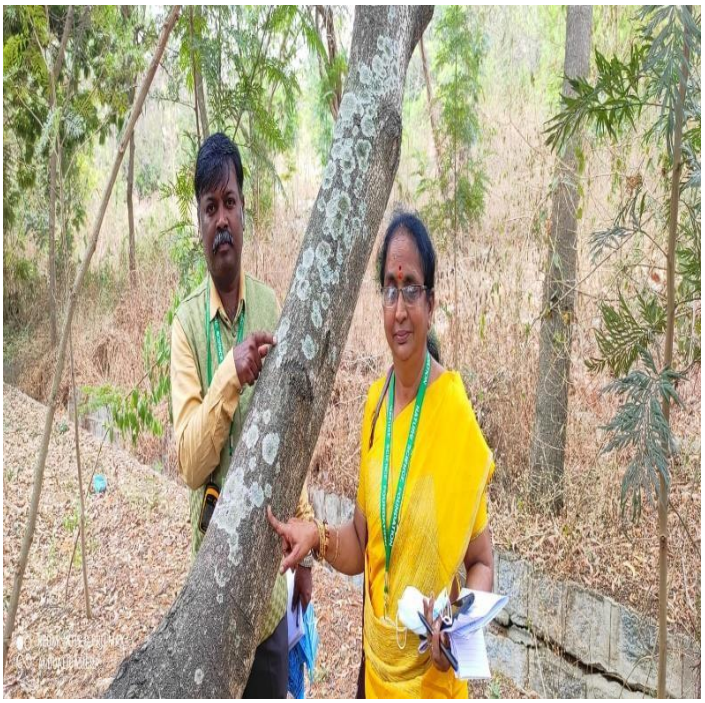
Cycas revoluta

Hibiscus

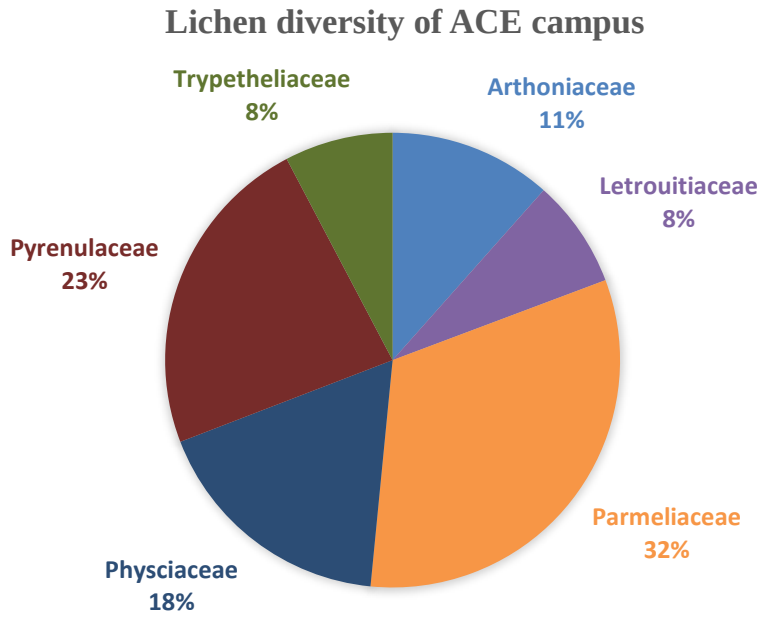
13.3.1.2. Lichen diversity in the ACE College campus

Lichens are one of the most fascinating symbiotic organisms found worldwide. The lichens species are ubiquitous and common inhabitants of the bark of the tree, rock surface, soil etc. They are a lower group of plants coming under non-flowering plants that live in a variety of substrates under a wide range of environmental conditions with or without causing harm to the hosts. Ecologically, lichen plays important roles in soil formation; re-establishes life on earth; fixes atmospheric nitrogen; plant's health, ecology distribution, and in the formation of organic matter of habitat which in turn benefitting mosses in nutrient availability. A unique synergetic association between a fungal and an algal species results in lichens and occupied in plant kingdom. In this relationship both the organisms are mutually benefited. The algal partner may be cyanobacteria or the blue green algae and this is responsible for the process of photosynthesis. The algae thus provide food or nutrition for the fungi too. The fungal partner in turn provides space and protection for the algae. The lichen is an autotrophic organism in the sense that they can produce their own food by the process of photosynthesis. Even though the lichen is made up of two different organisms, the characteristics of the lichen are entirely different from the original characteristics of the algal and the fungal partner. Lichens are classified as micro lichens and macro lichens in which the microlichens cover the substrate on which they grow in the form of a crust whereas macro lichens grow in the form of a bush or a leaf like structure. The major forms of lichens are a) Foliose lichens exhibit a flat leaf like thallus, b) Fruticose lichens exhibit erect, pendulous and bushy thallus c) Squamulose lichens exhibit thallus with minute, scale like squamules and d) Crustose lichens exhibit flat crust shaped thallus.





Lichen diversity recorded in the ACE campus showed a total of 35 different lichens species representing 21 genera and 14 families. The observation on lichen diversity revealed that three types of lichens growth forms. The lichens belonging to the genus *Arthonia, Arthopyrenia, Bacidia, Brigantiaea, Buellia, Trypethelium, Letrouitia Anthracothecium Pyrenula* and *Graphis* sp. were accounted 68% diversity coming under crustose lichens. Ten species of foliose lichens belonging to the genus, *Pannaria Canoparmelia, Parmotrema, Hypotrachyna, Pyxine* and *Physcia* were accounted to about 28% of lichens. One single species of *Usnea* accounted for fruticose lichens.



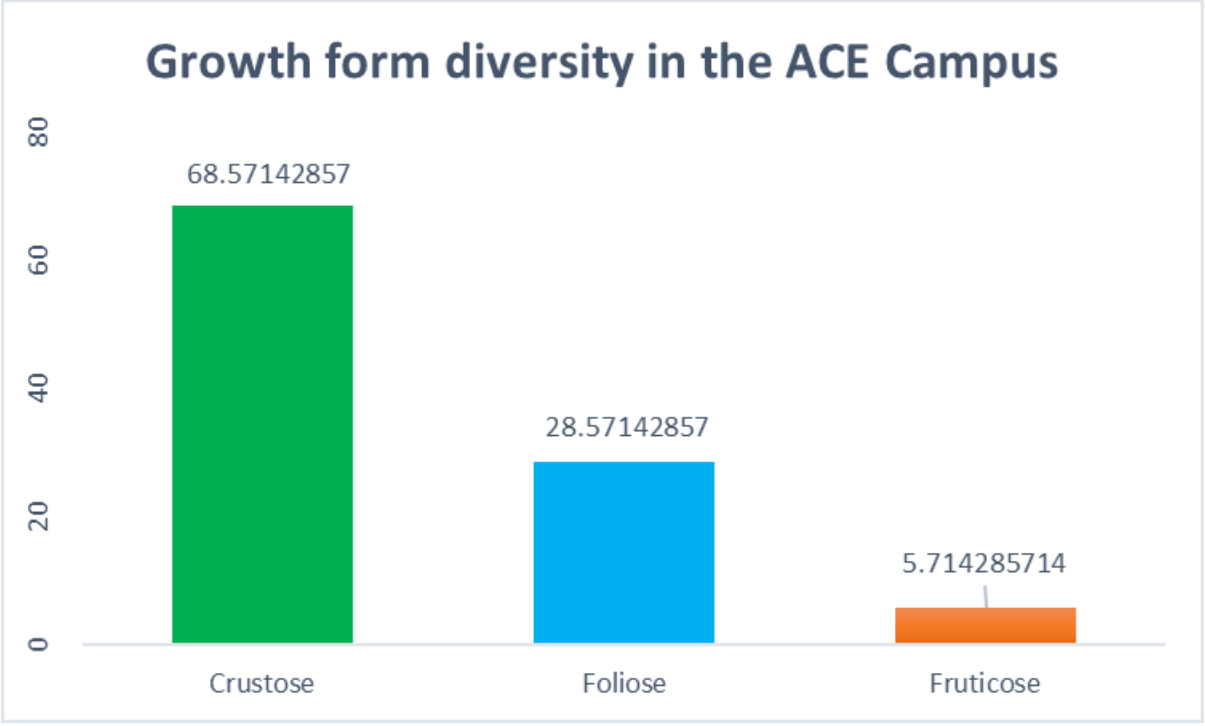


Table 6. Lichen diversity of the ACE campus with respect to family, substratum and growth forms in genus and family wise classification

S. No	Lichen diversity	Family	Growthforms
1.	*Anthracothecium assamiense*	Pyrenulaceae	Crustose
2.	*Anthracothecium corticatum*	Pyrenulaceae	Crustose
3.	*Anthracothecium macrosporum*	Pyrenulaceae	Crustose
4.	*Arthonia medusula*	Arthoniaceae	Crustose
5.	*Arthonia reniformis*	Arthoniaceae	Crustose
6.	*Arthopyrenia alboatra*	Arthopyreniaceae	Crustose
7.	*Arthopyrenia fraxinii*	Arthopyreniaceae	Crustose
8.	*Bacidia subletorum*	Bacidiaceae	Crustose
9.	*Bacidia submedialis*	Bacidiaceae	Crustose
10.	*Brigantiaea leucoxantha*	Brigantiaceae	Crustose
11.	*Brigantiaea nigra*	Brigantiaceae	Crustose
12.	*Buellia conformis*	Physciaceae	Crustose
13.	*Canoparmelia texana*	Parmeliaceae	Foliose
14.	*Usnea undulata*	Parmeliaceae	Fruticose
15.	*Usnea pictoides*	Parmeliaceae	Fruticose
16.	*Trypethelium tropicum*	Trypetheliaceae	Crustose
17.	*Trypethelium eluteriae*	Trypetheliaceae	Crustose
18.	*Pyxine minuta*	Physciaceae	Foliose
19.	*Pyxine cocoes*	Physciaceae	Foliose
20.	*Pyrenula subglabriuscula*	Pyrenulaceae	Crustose
21.	*Pyrenula nitens*	Pyrenulaceae	Crustose
22.	*Pyrenula interducta*	Pyrenulaceae	Crustose
23.	*Physcia tribacia*	Physciaceae	Foliose
24.	*Physcia alba*	Physciaceae	Foliose
25.	*Phaeographina wattiana*	Graphidaceae	Crustose
26.	*Parmotrema tinctorum*	Parmeliaceae	Foliose
27.	*Parmotrema pseudonilgherrense*	Parmeliaceae	Foliose
28.	*Pannaria stylophora*	Pannariaceae	Foliose
29.	*Myriotrema terebrans*	Thelotremataceae	Crustose
30.	Thelotremataceae	Thelotremataceae	Crustose
31.	*Letrouitia transgressa*	Letrouitiaceae	Crustose
32.	*Letrouitia domingensis*	Letrouitiaceae	Crustose
33.	*Hypotrachyna awasthii*	Parmeliaceae	Foliose
34.	*Graphis guimarana*	Graphidaceae	Crustose
35.	*Everniastrum nepalense*	Parmeliaceae	Foliose

13.3.3. Algal diversity in the ACE campus

Microcystis, Oscillatoria, Oedogonium, Spirogyra, Volvox, Chlamydomonas, Scytonema and *Cladophora spp.* belonging to the class of Cyanophyceae, Chlorophyceae and Bacillariophyceae are the predominant species found in the campus.

The families Chlorellaceae, Closteriaceae, Desmidiaceae, Radiococcaceae, Ulotrichaceae, Uronemataceae and Oedogoniaceae were represented by single genus and species. Chlorophyceae plays an important role in both terrestrial and aquatic ecosystem as most of the members are found to be ecologically important. The highest diversity of Chlorophyceae indicated relatively good health of atmosphere. The presence of these algal species in abundance can be concluded that the ACE Campus ecosystem has high amount of organic nutrients in soil and rock. Generally, occurrence of abundant algal flora at a place indicates the availability of abundant nutrients along with conducive favourable environmental conditions.

13.3.1.3. Mushrooms diversity in the ACE campus

Mushrooms, edible basidiomycete, represent white rot fungi which contained higher amount of proteins, rich in minerals with medicinal properties. At present three mushroom varieties (white mushroom, the paddy-straw mushroom and the oyster mushroom) are being cultivated in India. These are most popular, economically sound to grow and is extensively cultivated throughout the world. Due to moderate temperature requirement for luxuriant growth, its cultivation are restricted to the cool climatic zones and during winter months in the plains of Coimbatore region. Mushroom growth yield is influenced by the type of compost, spawn, temperature, percentage of moisture and also affected by the pests and disease-causing agents. There has been extensive discussed in recent years, as far as the production of fungal protein from domestic, agricultural and industrial wastes. Since mushrooms have a very short life span, it should reach to consumers within a short time or immediately canned. Mushroom growth is determined by means of carbohydrate content in the substrates like paddy straw, sugarcane molasses, saw wood dust and other plant waste materials.

The ACE campus has various mushroom types covering poisonaous, edible and medicinal varieties such as white mushroom (*Agaricus bisporus* and *A. laccata*), the paddy-straw mushroom (*Volvariella vovvacea*), oyster mushroom (*Pleurotus sajor-caju* and *P. florida*), button mushroom (*Omphalotus olearius*) and other mushroom types such as *Amauroderma conjunctum, Amylosporus campbellii, Daldinia concentrica, Ganoderma applanatum, Phallus atrovolvatus, Laccaria laccata, Termitomyces fuliginosus, Pycnoporus cinnabarinus* and *Volvariella bombycina.*

13.3.2. Fauna Diversity in the ACE campus

13.3.2.1. Birds Diversity in the ACE campus

The observations on fauna diversity indicated that the ACE campus has a large number of living as well as visiting animals, birds, reptiles and insects including termites. A total number of 25 birds belonging to 24 different species representing 20 families and 12 orders were recorded from different habitats during winter and summer. During this study, Passeiformes constituted the predominating group representing 8 families. Out of 24 bird species, 5 species were found to be migratory to favourable environment and high availability of food resources. The Migratory bird species are Little Cormorant, Common Kingfisher, Green bee-eater, Red vented Bulbul and Black Drongo.

Table 7. Birds Diversity in the ACE campus

S.No	Common Name	Scientific Name
1.	Lesser Whistling Teal	*Dendrocygna javanica*
2.	Asian Openbill Stork	*Anastomus oscitans*
3.	Indian Pond Heron	*Ardeola grayii*
4.	Little Egret	*Egretta garzetta*
5.	Black Kite	*Milvus migrans*
6.	Common Pigeon	*Columba livia*
7.	Common Myna	*Acridotheres tristis*
8.	Oriental Magpie Robin	*Copsychus saularis*
9.	Asian Pied Myna	*Gracupica contra*
10.	House Sparrow	*Passer domesticus*
11.	Eurasian Tree Sparrow	*Passer montanus*
12.	Spotted Dove	*Spilopelia chinensis*
13.	Eastern Jungle Crow	*Corvus levaillantii*
14.	Greater Flameback	*Chrysocolaptes guttacristatus*
15.	Purple sunbird	*Cinnyris asiaticus*
16.	Rose-ringed parakeet	*Psittacula krameri*
17.	Barn owl	*Tyto alba*
18.	Hen	*Gallus domesticus*
19.	Oriental White Eye	*Zosterops palpebrosus*
20.	Red Wattled Lapwing	*Vanellus indicus*

Table 8. Total number of visiting birds in the ACE campus

S.No	Common Name	Scientific Name
1.	Little Cormorant	*Phalocrocorax niger*
2.	Common Kingfisher	*Alcedo atthis*
3.	Green bee-eater	*Merops orientalis*
4.	Red vented Bulbul	*Pycnonotus cafer*
5.	Black Drongo	*Dicrurus macrocercus*

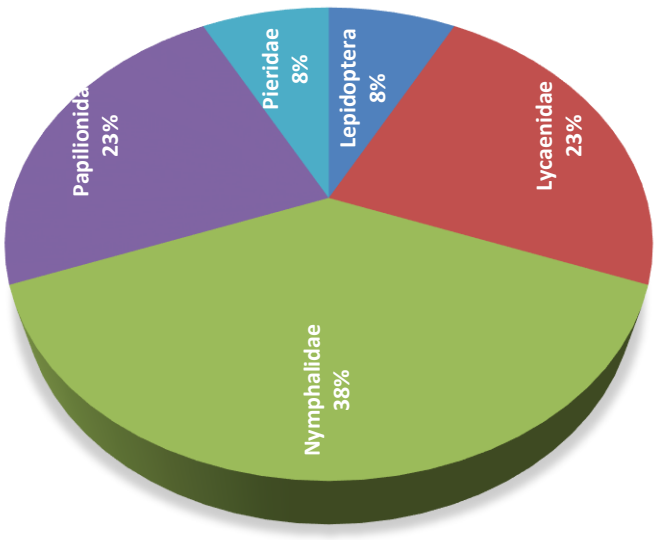
13.3.2.2. Butterflies diversity in the ACE campus

The ACE campus has five family level diversities such as Papilionidae, Pieridae, Nymphalidae, Lycaenidae and Hesperiidae in which Common butterflies species such as Mormon, Emigrant, Pansy are commonly found.

Table 9. List of Butterflies recorded in the ACE campus

S.No.	Common Name	Scientific Name	Family
1.	Common Mormon	*Papilio polytes*	Papilionidae
2.	Great Mormon	*Papilio memnon*	Papilionidae
3.	Common Birdwing	*Troides helena*	Papilionidae
4.	Chocolate Pansy	*Junonia iphita*	Nymphalidae
5.	Lemon Pansy	*Junonia lemonias*	Nymphalidae
6.	Common Sailor	*Neptis hylas*	Nymphalidae
7.	Common pierrot	*Talicada nyseus*	Lycaenidae
8.	Lemon emigrant	*Catopsilia pomona*	Pieridae
9.	Common seargent	*Athyma perius*	Nymphalidae
10.	Common lescar	*Pantoporia hordonia*	Nymphalidae
11.	Jezelbel	*Delias eucharis*	Lepidoptera
12.	Limeblue	*Chilades lajus*	Lycaenidae
13.	Tiny Grass Blue	*Zizula hylax*	Lycaenidae

Butterfly Diversity in the ACE campus



13.3.2.3. Mammals diversity in the ACE campus

Mammals, a group of vertebrate animals (class: Mammalia), characterized by the presence of mammary glands (where females produce milk for feeding/nursing their young), a neocortex (a region of brain), fur or hair and three middle ear bones. These characteristic features differentiate them from reptiles and birds. Observation on diversity of mammals in the ACE campus indicated that around 6 Mammal genera are commonly distributed.

Table 10. List of Mammals diversity in the ACE campus

S.No.	Common Name	Scientific Name
1.	House Shrew	*Suncus murinus*
2.	Squirrel	*Funambulus palmarum*
3.	Indian Long Tailed Field Mouse	*Apodemus sylvaticus*
4.	Dogs	*Canis lupus*
5.	cats	*Felis catus*
6.	cow	*Bos taurus*

13.3.2.4. Amphibians diversity in the ACE campus

Amphibians (class: Amphibia) are ectothermic, tetrapod vertebrates. All living amphibians represent the group Lissamphibia and they inhabit a wide variety of habitats. Most of them living within terrestrial, fossorial, arboreal or freshwater aquatic ecosystems. Amphibians naturally start out as larvae living in water, but some species bypass this by developed behavioural adaptations. Observation made on diversity of Amphibians in the ACE indicated that around 3 species are Amphibians are commonly distributed.

Generally amphibians undergo metamorphosis from larva with gills to air-breathing adult with lungs. Skin of the Amphibians served as a secondary respiratory organ while very few terrestrial salamanders and frogs lack lungs and they rely entirely on their skin for respiration. With their complex reproductive needs and permeable skins, amphibians are often ecological indicators. In recent decades, there has been a drastic decline in populations of many amphibian species around the globe.

Historically, amphibians evolved in the Devonian period from sarcopterygian fish with lungs and bony-limbed fins, which were helpful them to adapt to dry land conditions. Their spread was higher and predominant during Carboniferous and Permian periods and they were later displaced by reptiles and other vertebrates. Over a period, amphibians shrank in size and their diversity decreased drastically, leaving only the modern subclass Lissamphibia. Modern amphibian orders include Anura (the frogs), Urodela (the salamanders) and Apoda (the caecilians). Number of known amphibian

species is nearly 73% are frogs. Observation made in the ACE Campus on diversity of Amphibians revealed that around 3 species of Amphibians are commonly disseminated. The commonly found amphibians are Common Toad (*Duttaphyrnus melanosticus*), Common Tree Frog (*Polypedates teraiensis)* and Pygmy Toad (*Microhyla berdmorei).*

13.3.2.5. Grasshopper diversity in the ACE Campus

Grasshoppers, a group of insects belonging to the suborder Caelifera and they are probably most ancient living group of chewing herbivorous insects. They are typically ground-dwelling insects with powerful hind legs which allow them to escape from threats by leaping dynamically. As a hemimetabolous insects, they do not undergo complete cycle of metamorphosis. In other word, they hatch from an egg into a nymph or "hopper" which undergoes five moults, to become identical to that of an adult. Grasshoppers hear through the tympanal organ which can be found in the first segment of the abdomen attached to the thorax; its sense of vision is compound eyes. Under certain environmental conditions, some grasshopper species at high population densities can change colour and behaviour besides form swarms. Grasshoppers are plant-eaters; few species at times become as a serious pests of cereals, vegetables and pasture, especially when they swarm to destroy the crops over huge contiguous areas. Surveillance audit at ACE campus on diversity of Grasshoppers demonstrated that 6 species of Amphibians are commonly distributed which includes *Eyprepocnemis alacris, Cyrtacanthacris tartarica, Crucinotacris decisa, Aulacobothrus luteipes* and *Sathrophyllia rugosa*

13.3.2.6. Termites Diversity in the ACE Campus

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. Eusocial insects, commonly Termites, are taxonomically ranking as infraorder. Isoptera, or alternatively as epifamily Termitoidae, within the order Blattodea (along with cockroaches). Although Termites are habitually known as "white ants", they are not ants and they are not closely related with them. Earlier, Termites were classified as a separate order from cockroaches. Recent phylogenetic studies revealed that they evolved from cockroaches, as they are deeply nested within the group and the sister group found to wood eating cockroaches of the genus *Cryptocercus*. More recent estimates suggest that they have originated during the Late Jurassic period evidenced with the first fossil records in the Early Cretaceous. Termites mostly nourish on cellulose based dead plant material (wood, leaf litter), soil and animal dung. Three species of Termites (*Odontotermes anamallensis, Trivitermes fletcheri* and *Nasutitermes indicola)* recorded during on-site Green Campus audit at ACE campus and they are belonging to the Genera *Odontotermes, Trivitermes* and *Nasutitermes*.

13.4. An account of more Oxygen releasing and Carbon dioxide assimilating plants in the ACE Campus

There are some plants which are being considered highly efficient in oxygen releasing and carbon dioxide assimilating (Carbon sinks) which in turn reflected the 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. *Sansevieria zeylanica* (commonly known as snake plant or the mother-in-law's tongue plant) and Gerbera Daisy (*Gerbera jamesonii*) plants are unique for oxygen release during night time and they are able to purify the atmospheric air in terms of removal of toxic gases. Although options are available to enhance the level of oxygen by reducing CO_2 with the aid of oxygenators and air purifiers, there are certain alternatives to improve the air quality which is beneficial for both body and mind. Green campus audit at ACE campus revealed that the campus is well distributed with more oxygen releasing and CO_2 assimilating plants such as Neem, Tasmanian blue gum, Java Plum/Jamun, Arjun tree, Pipal Tree, Asoka tree, Banyan tree, Tanjong Tree, Curry Leaf Tree, Mango tree and Teak. There are 11 plant species whichare able create an eco-friendly atmosphere in terms of reducing erosion, moderating the climate, improving air quality and supporting wildlife besides they are economically important and valued for different medicinal aspects.

The ornamental plants such as Indian mulberry (*Morinda citrifolia*), Java Plum / Jamun (*Syzygium cumini*), Champak (*Michelia champaca*), Kassod tree (*Cassia siamea*) and White cheesewood (*Alstonia scholari*) are made available. In addition, medicinal plants such as *Albizia lebbeck*, *Annona squamosa*, *Azadirachta indica*, *Melia azedarach*, *Morinda tinctoria*, *Phyllanthus emblica*, *Pterocarpus marsupium*, *Tabernaemontana divaricate* and *Tectona grandis* are available in the campus**.**

Oxygen releasing and Carbon dioxide assimilating plants in the ACE Campus

Table 11. List of Oxygen releasing and Carbon dioxide assimilating, Ornamental / Medicinal plants in the ACE Campus

S.No	Plant Name (Tamli Name)	Plant Name (English)	Scientific Name	Grouping / Nature	Characteristic Features of the plant
1.	Vembu	Neem	*Azadirachta indica*	Dicots	O_2 releasing Plant
2.	Vilvam	Tasmanian blue gum	*Eucalyptus globosus*	Dicots	CO_2 assimilating Plant / Medicinal Plant
3.	Navel	Java Plum/Jamun	*Syzygium cumini*	Dicots	Ornamental Plant
4.	Marutha maram	Arjun tree	*Terminalia arjuna*	Dicots	O_2 releasing Plant
5.	Arasha maram	Pipal Tree/Sacred Fig	*Ficus religiosa*	Dicots	O_2 releasing Plant
6.	Nettilinkam	Asoka tree	*Polyalthia longifolia*	Dicots	CO_2 assimilating Plant
7.	Aalamaram	Banyan tree	*Ficus benghalensis*	Dicots	O_2 releasing Plant
8.	Magizhamboo	Tanjong Tree	*Minusops elengi*	Dicots	Ornamental Plant
9.	Karivepillai	Curry Leaf Tree	*Murraya koenigii*	Dicots	O_2 releasing Plant
10.	Ma maram	Mango tree	*Mangifera indica*	Dicots	O_2 releasing Plant
11.	Tekku	Teak	*Tectona grandis*	Dicots	CO_2 assimilating Plant

13.5. Lawns, Trees, Herbs, Shrubs, Climbers and Lianas in the ACE Campus

Lawns are gazing features of unutilized land made to cover the soil with green grass for the ambience of the place to have a greenish look. Lawn provides a hollow space among the building structures. The shaded trees in between the grass lawn, pathways and garden benches are meaningful lineaments to the green campus. The advantage of lawn is that it prevents the unintended weeds growth in the unutilized landscape areas. Trees that are native to land with medicinal value, ethnicity and environmental value add an advantage to green building. Purpose of trees is to provide shade, atmospheric CO_2 sequestration and supply of oxygen that serves the purpose of a green campus. Herbs are small plants with medicinal values and shrubs are small plants with thick stems and can hold soil to some extent than the herbs and serve the purpose of soil erosion. Climbers can grow with the support of wall structures and the climbers can enhance the wall value with greeneries.

The ACE campus has a huge number of trees, herbal plants, bushes, climbers, lianas, twiners and lawns. It is further observed that all the plants are growing profusely and showing healthier free from pests and diseases attack. The commonly available native as well as wild shrub species in the ACE campus are Monkey Bush (*Abutilon indicum*), Blue weed (*Ageratum houstonianum*), Peacock flower (*Caesalpinia pulcherrima*), Red Powder Puff (*Calliandra haematocephala*), Indian shot (*Canna indica*), Periwinkle (*Catharanthus roseus*), Rusty kamala (*Mallotu stetragona*), Elm-Leaf Grewia (*Microcos panicula*) and Lily of the Valley shrub (*Pieris japonica*)

Similar to that of shrubs, there are 11 kinds of herbs available in the ACE campus. The predominant species of herbs available in the ACE campus are Ganges Primrose (*Asystasia gangetica*), Lamb's quarters (*Chenopodium albumsp*), Common twayblade (*Neottia ovata*), Diamond flower (*Oldenlandia corymbose*) and Upright pellitory (*Parietaria officinalis*)

The existence of climber, creepers, twiners and lianas species available which accounted more than 6 species in the ACE campus are Allamanda (*Allamanda cathartica*), Aparajita climbing vine (*Clitoria ternatea*), Rangoon creeper (*Combretum indicum*), Money plant (*Epipremnum aureum*), Flame plant (*Pyrostegia venusta*) and Bengal clock plant (*Thunbergia grandiflora*). The major grasses are Periapullu (*Aristida pinnata*), Chevvarakupul (*Chloris barbata*), Arugam Pillu (*Cynodon dactylon*), Korai Pollu (*Cyperus rotundus*) and Crowfoot grass (*Dactyloctenium aegyptium*). Weak stemmed creeper plants grow alongside the ground,depends another plant support, or climb up a wall by means of extending stems or branches. Climbers, include herbs or shrubs, whose stems are weak, which needs support to grow, where it climbs up trees and walls and grow vigorously without any pest and disease attack which are observed in the ACE campus.

13.6. Establishment of different Gardens in the ACE Campus

Growing many types of herbal plants having medicinal importance in the campus becomes more attractive and useful if concept gardens are maintained. Medicinal plant gardens can contain the locally available medicinal plants, RET (Rare Endangered Threatened) listed plants and those 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 students, faculties, staff members, employees 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 lead from the air and purifies the air considerably. Similarly, the ornamental plants with beautiful flowers can be maintained in the frontage gardens of campus for attraction and good ambience. This will give an overall aesthetic look and also provide fresh air for healthy respiration to the stakeholders.

In ACE, they are planted ornamental plants for the display of appealing characteristic features including: varying types of leaves and their texture, flowers and their fragrance, fruit, stem and bark. In some places, plants unusual features also planted to be of interest, such as the prominent thorns of cactus and snake cactus. There are 14 varieties of ornamentals plants that are maintaining the surroundings of the college campus. In front of principal's room, cafeteria, college grounds and many places are planted with ornamentals plants of nearly 38 plants in different places. These plants are making the college campus pleasantly and decoratively. Every year they try to plant new varieties with help of Environmental department. Once in three months the unwanted barks of the plants are cut it down, to make the beautification of their campus. No plant is cut unless it becomes dead. Not only can visitors enjoy seeing the ornamentals plants and also humming birds, butterflies shelter in that. This environment makes campus greenish and pleasant.

13.7. Natural Topography and Vegetation

Natural topography means the original geographical features of the campus, around 30-35% 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. The vegetation in the artificially created structures are also accounted for when it is reported more than 30% of the claimed green campus audit site. 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 ACE campus indicated that more than 25% natural topography and vegetation have been maintained properly. Further, there was no anthropogenic activity in some of the interior side of the campus.

13.8. 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. The Indian traditional rainwater harvesting is being practiced in various parts of the country to improve the ground water status. Now the threatening features of the lower ground level of water has created a revamp of newly featured rainwater harvesting systems. Indian traditional rainwater harvesting systems are constructed based on three modes either direct pumped, indirect pumped or by gravity alone in the campus. In addition, lakes, bonds, water channels and any other water reservoir methods are considered as the rainwater harvesting

system. The green campus should have adopted any of the above said modes of rainwater harvesting or any new methods that has the benefit of conserving the water resource as well. A small square shaped pit containing gravels and sands constructed nearthe building for rainwater harvesting and connected with pipes from the roof of thebuilding to pit. During the audit, there are was a well developed rain harvesting system of water channels connected with a round shaped pit observed with the ACE campus. Rainwater harvesting structures and recharge wells have been commissioned in the campus at different locations.

13.9. Landscape design and Soil Erosion control

Landscape management is the maintenance of land to make sure that backgrounds can fulfil the needs and objectives in an effective and sustainable manner for current and future members. It is an action that forms a perception of viable expansion, to ensure the preservation of a panorama, in order to help and harmonize alterations which are supplemented through social, monetary and environmental methods. 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. When the slope features are altered, adequate vegetation can alone be enough to prevent soil erosion. The observation revealed that the ACE campus 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.

13.10. Operation of Water irrigation, Drip and Sprinkler Irrigation methods

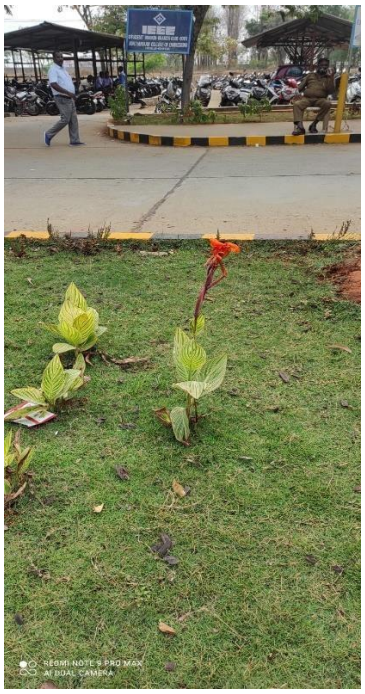
Maintaining the green campus and water conservation mechanisms should be applied efficiently in the campus. Well planned water irrigation systems like sprinklers and drip should be implemented in the entire green area of the campus for an effective water management system. This can be implemented only when the plantations are well planned. The tree growing areas can be connected with drip irrigation and medicinal plants growing areas and flower gardens can be connected with sprinkler irrigation. The ACE campus 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 poured 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.

13.11. Importance of Biodiversity Conservation

The campus should be a mini biodiversity conservation area, wherein, more greenery due to native plant species, medicinal plant garden, concept gardens, flowering plants that attract bees, birds, beetles and other animals like squirrels should be monitored as ecosystems. Shade giving trees in the paths, flowering trees in the avenues and fruit trees at the back yards also would attract birds, bees, butterflies and squirrels.The ACE campus is free of exotic plants that cause threat to the natural vegetation. It is like a mini bio-reserve rich in native species and endemic plants. A complete data on the soil type, water holding capacity and soil nutrition in the campus is being thoroughly studied internally or with the Government agriculture departments. It is useful for cultivation of various native and wild plant species and also helps in choosing the proper irrigation system.

13.12. Pedestrian Path facility at the ACE 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. This path is specially designed space to the stakeholders to walk freely without any disturbance. It is useful for cross walk and easy to recognize to walk by means of wide black and white colour combination of lines and authorize to walk while crossing and walking on the foot. In addition, pedestrian path are 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 other vehicles but also giving safe space to the pedestrians, where cross and pass through blocks and also forcing vehicles to comply with it. The ACE campus is having very good pedestrian path for stakeholders.



13.13. Use of Biofertilizers, Organic and Green manures

Natural or eco-friendly methods should be used to grow plants vigorously in thecampus 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, Potassiummobilizing fungi (VAM), farm yard manure, dried cow dung manure, vermicompost manures and biofungicides and biopesticides are extensively used in the ACE 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.

13.14. Conduct of Outreach programmes for dissemination of Green Campus motto and Green pledge initiatives by Eco club, Nature club, Associations, Cells, Forums, NCC/Student Force and NSS bodies in Green Campus initiatives

Professional implementation of all the Eco plans in the campus should be done through the Eco clubs, Nature clubs, Science clubs, Youth Red cross units, Fine Arts clubs, Women cell, Associations, Forums, SSL, NCC (National Cadet Corps) and NSS (National Service Scheme). All the students, members of staff and employers should be mandatory members of the club and should do tree planting and maintenance of greenery in the campus periodically. Conducting frequent seminars, conferences, workshops, awareness rallies, etc. on

topics relevant to the environment is necessary to educate and create awareness among the students and staff members. In addition, student's associations, cells, clubs and forums should be the first hand receivers of all the new plans proposed by the Government such as Swachh Bharath Abhiyan and Jal Shakti Abhiyan under Clean India Mission and implement the same in the campus. The ACE has well developed NCC/Student Force, NSS, Swatch Bharath Abhiyan under Clean India Mission. These bodies are actively involved in mass cleaning programme across Hosur municipality. The ACE is conducting a large number of activities to conserve the nature and to teach about the importance of environment torural, tribal and urban people.

Awareness programmes on the green campus initiatives and dissemination of green motto and pledges are accounted in a sustainable manner. Its benefits and self-sustainability are being projected for wider centric on earth and Ecology conservation. Innovative practices that add up credentials in implementing the green campus which needs to be promoted in the awareness programme to the students and staff members including public domain. Technology driven solutions initiated by the green campus organization are periodically disseminated and documented successively for propagating the attitude of the green campus in wider masses. The ACE has taken sufficient attempts to disseminate the green campus motto and green pledge such as plastic carry bags eradication drive with Hosur municipal employees.

The ACE is implemented the Government schemes (Swatch Bharath Abhiyan under Clean India Mission) to give pure and safe water to rural people and teach the importance of cleanliness of toilets and restrooms to people living in Hosur. These activities are very important in view of the instantaneous vicinity to undertake progressive programmes and conducted Participatory rural appraisal programmes. It is involving the socioeconomic position of the inhabitants, natural resources, traditional knowledge systems, cropping patterns, etc. of the rural and tribal people. The ACE is also focusing on the development of women through Women Empowerment cell. It provides awareness to overcome women exploitation and d women entrepreneurs.

The ACE helps to develop social commitment and to expose the students to get sensitized to social realities and to build a link between the student community and the wider community. It initiated many soft skill training programmes to improve the skill set of the students. This has equipped them to face interviews, participate in group discussions with selfconfidence and gain better placements.

13.15. Establishment of Aquarium and Aquatic plants

Growing fishes in the small ponds will keep the environment pleasant. In the closed environment like corridors and the front offices, auditoriums and galleryclasses placing the fish aquarium as well as plant aquarium will improve the scenic value of the place bringing peace to the people. The fish water waste alsocan be used as manure

for growing potted indoor plants. Growing *Lotus, Lilly, Hydrilla* and other water plants will give a pleasant and calm environment and growing fishes like *Guppies* can keep the water clean and neat. The fountains and small ponds can be built in the frontages to give an aesthetic look and also growing water plants in these ponds will help to maintain the aesthetic sense of the environmentin greenish. The ACE campus has a good aquatic ponds in which aquatic plants and birds are living generously.

13.16. Academic credentials: Projects, Dissertations and Thesis work

Project, Dissertation and Thesis works are academic effort credentials that always fosters the innovative ideas on thinking and implementation of new innovative approaches. Applied research work of the faculties, staff and student members should be implemented within the campus owing to the credential of the research. Those works indicating the significance of empowering the green campus can be implemented or adopted in other organizations. If the innovation is capable of developing into entrepreneurship, then it is highly appreciable. The Report of projects and dissertations which are productive in methodologies should be disseminated through presentation and publication in social media, books, magazines and journals so as to spread the innovative ideas and methods to the broad public. The ACE faculty members and students from various subject domains are doing extensive project work related to nature conservation, environmental pollution, soil and water analysis.

14. Best practices followed on Green Campus initiatives in the Organization

1. NSS activities at ACE conducted Medical Camp, Drug Abuse Campaign, Blood Donation camp, Eye checkup Camp, Women Empowerment programme, Yoga Day Event, Swatch Bharat campaign Road Safety Programme, Awareness about Education to Government School Students and Planted the saplings in different places.

2. A well-established Rainwater harvesting system s to recharge ground water status by collecting rainwaters from the campus coinciding with the contour of the terrain and natural drains.

3. It is observed that the ACE is maintaining more than 70% of the green cover area after building construction as per the guidelines of World Green Building Council and Indian Green Building Council to provide a healthy environment and

   ecofriendly atmosphere to the stakeholders. It is calculated that the natural vegetation was 87.4 % and planted vegetation was 12.5%.

4. The ACE campus is established in Hosur Karnataka, India which provide pure atmosphere to the stakeholders under natural environment, topology, landscape and soil erosion. The campus is established without disturbing the natural vegetation along with the artificially created topography like pathways and parking areas.

5. In view of floral biodiversity in the ACE campus, a sum 151 species belonging to 130 Genera under 35 families covering trees, herbs, shrubs, climbers, lianas, twiners and lawns and 6 species belonging to Lichens, Pteridophytes, Bryophytes and Mycoflora like Mushrooms were recorded. It is observed that all the plants are growing profusely and showing healthier free from pests and diseases.

6. In view of faunal biodiversity in the ACE campus, a total of 6 living Mammals representing six Genera under six families, visiting Mammal species (3) belongingto three Genera under three families, 20 species of birds, 6 species of Grasshopper,4 species of Termites, 8 species of Amphibians, 6 species of Reptiles, 13 species of Butterflies and Three species Mosquitos were recorded and documented.

7. The ACE has established rainwater harvesting models, percolation pond to recharge the borewells by collecting rainwaters from the building roofs, open areas and playgrounds including unexplored areas which are channelized to flow of rainwaters to increase the ground water level.

8. The campus has a maximum number of more oxygen releasing and carbon dioxide assimilating plants such as *Azadirachta indica, Eucalyptus globosus, Syzygium cumini, Terminalia arjuna, Ficus religiosa, Polyalthia longifolia, Ficus benghalensis, Minusops elengi, Murraya koenigii, Mangifera indica* and *Tectona grandis.*

15. Recommendations for Greening

- The name board may be kept in each plant species in which the common name along with binomial name may be mentioned. The year of planting and economic importance with medicinal values if any may be mentioned in some plants so that the oldest as well as useful herbal plants may be identified in the campus.

- A well-established Biogas plant for energy efficiency management and to reduce the fossil fuel expenditure as well as impact on the environment may be created. The treated effluent from biogas plant may be diverted to the STP for storage and utilized for irrigation purpose.

- Honey Bee hives may be kept in the campus which is free from student's mobilization. Honeybees are natural pollinators help to increase the yield potential of plants (flowers, fruits and vegetables) upto 33%.

- Automatic water irrigation systems like drip and sprinkler irrigation methods adopted may be extended in the entire green area of the campus which in turn are useful to reduce the operation costs under energy conservation policy.

- To ensure Miyawaki Forest system, one student one plant concern to enrich the campus Green which provide an ecofriendly campus to the stakeholders.

16. Conclusion

After the establishment of ACE, Hosur, Karnataka, Adhiyamaan College of Engineering is one of the educational institutions developed by Adhiyamaan Educational & Research Institution - a trust, in the year 1987-1988 in the pastseventeen years, it has made significant progressive contributions with respect to teaching learning, research and consultancy, innovation and transfer of technology, community service and value education, *in toto*. The ACEis to cater the needs of the nation in the development of technocrats and to provide facilities for educating and training men and women to meet the entrepreneurial and management needs. The management has created adequate infrastructural facilities and sufficient funds and is keen on developing the institution for higher education. The Organization has taken enormous efforts to maintain green campus to the students, research scholars, staff members and parents in a sustainable manner which reflects theimportance of the environment and stakeholders. It is conducting a large number of activities for the benefit of rural and tribal community people without disturbing the natural environment, topology, landscape management and vegetation. The ACE Campus is maintaining more than 70% of the green cover area after building construction along with the natural vegetation was 87.4 % and planted vegetation was 12.5%.

The natural topography and very good landscape design without disturbing the natural vegetation are being maintained by the ACE. A maximum number of more oxygen releasing and carbon dioxide assimilating plants are being maintained to provide pure atmosphere to the stakeholders. The installation of a rainwater harvesting system, percolation ponds and drip irrigation system to conserve rainwater and ground water are noteworthy in the campus. The Organization has created medicinal, herbal and ornamental gardens at small scale level for establishing a massive reforestation / afforestation planting programme in which a large number of trees and shrubs species were planted together for providing an eco-friendly atmosphere to the stakeholders in a sustainable manner.

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Annexure - I

Methodology for Flora and Fauna Identification

I. Identification of Flowering Plant Species

Various vascular plant species were identified based on the following identification key by adopting the polyphasic taxonomic approach

Key to Plant Families Identification

1a. Seeds enclosed in fruit wall, Perianth Present… 2
b. Seeds not enclosed in fruit wall, perianth absent…..... Gymnosperm
2a. Leaves usually net veined seeds-2..... 3
b. Leaves parallel veined, seeds-1… 66
3a. Petals free.....4
b. petals connate 41
4a. Corolla and calyx present… 5
b. Corolla and calyx absent….....24
5a. calyx of united sepals; ovary inferior 31
b. Calyx of distict or unit sepals; ovary syncarpous… 6
6a. Sepals imbricate in bud.....7
b. Sepals valvate in bud… 24
7a. Sepals more or less united at the base… 19
b. Sepals free.....8
8a. Stamens more than 12..... 9
b. Stamens 10 or fewer 13
9a. Sepals 2-3….....11
b. Sepals 4 or more….....10
10a. Stamens inserted on the disck… ..... Cleomaceae
b. Stamens inserted of the gynophore ..... Capparaceae
11a. Trees, Petals more or like the sepals; carpels free ..... Mangnoliaceae
b. Herbs, petals coloured unlike the sepals; carpels united… 12
12a. Plants with yellow sap, Flowers pedicelled .....Papaveraceae
B. Plants with watery sap, Flowers sessile… ..... Portulacaceae
13a. Flowers unisexual, gynoecium apocarpus….....Menispermaceae
b. Flowers bisexual, gynoecium Syncarpous… 14
14a. Petals 4, Stamens 6.....Brassicaceae
b. Petals 5, Stamens ∞.....15
15a. Ovary1, loculated.....16
b. Ovary 2-more loculated… 17
16a. Flowers actinomorphic, placentas free- central ..... Caryophyllaceae
b. Flowers zygomorphic, placentas parietal .....Viloaceae
17a. Filaments of anthers more or less united.....Polygalaceae
b. Filaments of anthers more or less united..... 18

18a. Leaves stipulate; stamens 5 or 10 19
b. Leaves exstipulate; stamens usually 8 ..... Sapindaceae
19a. Style 5; stamen 5 ..... Oxalidaceae
b. Style many; stamens 10 ..... Zygophyllaceae
20a. Leaves pellucid-gland dotted ..... Rutaceae
b. Leaves not gland dotted 21
21a. Placentas parietal; Fruit elongated ..... Moringaceae
b. Placentas axile; Fruits not elongated 22
22a. Ovules and seeds pendulous; sometimes horizontal ..... Meliaceae
b. Ovules and seeds erect or ascending 23
23a. Stamens alternate with the petals ..... Anacardiaceae
b. Stamens opposite the petals ..... Vitaceae
24a. Leaves simple; Flowers 3-merous… ..... Annonaceae
b. Leaves compound; Flowers 4-6 merous 25
25a. Filaments of anther united into a columnar toothed cup… 26
b. Filaments of anther free; rarely connate at the base in ring 28
26a. Stamens 15; anther united ..... Stericuliaceae
b. Stamens 2; anther free… 27
27a. Anther unilocular; pollen muricate ..... Malvaceae
b. Anther bilocular; pollen smooth ..... Bombacaceae
28a. Stamens 4-5; usually embraced and adnate to the base of the petal…. 29
b. Stamen many; atleast twice as many as and free from the petals 30
29a. Shrub ..... Lythraceae
b. Straggler ..... Rhamnaceae
30a. Anther dehisce by slits; fruits capsule ..... Tiliaceae
b. Anther dehisce by spores; fruits drupe ..... Elaeocarpaceae
31a. Ovary sycarpous; placentas 3-5, parietal 32
b. Ovary 1 or more free, placentas basal 33
32a. Climbing herbs tendril ..... Passifloraceae
b. Erect shrubs or trees with tendril ..... Turneraceae
33a. Ovules arising from the inner angles or from base of the carpels or loculi 34
b. Ovules pendulous form the apex of the carpels or locules… ..... Combretaceae
34a. Carpels solitary; fruits legume…. 35
b. Carpels more than 1; fruits otherwise…. 37
35a. Flowers zygomorphic; petals imbricate… 36
b. Flowers actinomorphic; petals valvate… ..... Mimosaceae
36a. Upper petals outermost stamens monodelphous or diadelphous… ..... Fabaceae
b. Upper petals innermost stamens always free ..... Caesalpiniaceae
37a. Flowers unisexual ..... Cucurbitaceae
b. Flowers bisexual 38
38a. Ovary 1-celled…. ..... Cactaceae
b. Ovary more than 1 celled…. 39
39a. Carpels free if ultimately united the styles distinct… 40
b. Carpels and styles united throughout…. ..... Myrtaceae

40a. Flowers in dichasial – polychasial cyme… ..... Molluginaceae
b. Flowers in clustered, cymes or solitary ..... Aizoaceae
41a. Ovary inferior, stamens as many as the corolla lobes… 42
b. Ovary superior, stamens numerous 43
42a. Anther free; ovary 2-loculed; stipulate… ..... Rubiaceae
b. Anther syngenesious; ovary 1-loculed, exstipulate… ..... Asteraceae
43a. Ovary 1-loculed; placentation free central ..... Plumbaginaceae
b. Ovary 2-many loculed; placentation axile or parietal 44
44a. Ovary 3 or more carplelled…..... Sapotaceae
b. Ovary 2-carpelled…..... 45
45a. Corolla actinomorphic…..... 46
b. Corolla zygomorphic…..... 50
46a. Plants leafless; parasitic… ..... Cuscutaceae
b. Plants leafy ; not parasitic 47
47a. Leaves opposite; stamens 2…… - 48
b. Leaves alternate; stamens 4 or more 49
48a. Leaves not scabrid, corolla tube white: fruits berry ..... Oleaceae
b. Leaves scabrid; corolla tube orange; fruits capsules ..... Nyctanthaceae
49.a. Anther inseperratable; corona present ..... Asclepidiaceae
b. Anther seperatable; corona absent ..... Apocyanaceae
50a. Corolla lobes imbricate ;fruit drupe ..... Boraginaceae
b. Corolla lobes plicate; fruit capsule ..... Convolvulaceae
51.a Ovary cells many ovulated..... Solanaceae
b. Ovary cells 1-4 ovuled…..... 52
52.a Carpels 2 or more ovulated ; fruits dehiscent 53
b. Carpels 1 –ovulated ; fruits indehiscent 57
53.a Fruits dehiscent; seeds supported on reticulae… ..... Acanthaceae
b. Fruits indehiscent; seeds not supported on reticulae…..... 54
54.a. Leaves compound; fruits elongated; seeds winged ..... Bignoniaceae
b. Leaves simple;fruits not elongated, seeds not winged… 55
55.a. Ovules many on swollen placentas; seeds albuminous ..... Scropulariaceae
b. Ovules 2 lobed placenta ; seeds not albuminous… 56
56.a Flowers solitary; axile placentation ..... Pedaliaceae
b. Flowers raceme; axile placentation ..... Marytiniaceae
57.a Ovary entire, style terminal..... Verbinaceae
b. Ovary 4 –lobed, style gynobasic..... Lamiaceae
58.a Flower bisexual..... 59
b. Flower unisexual 62
59.a. Ovary inferior..... 60
b. Ovary superior 61
60.a Ovary 4-6 loculated; ovules many..... Aristolochiaceae
b. Ovary 1-loculated; ovules 1-4..... Santalaceae

61.a Perianth not tubular ..... Amarathaceae
b. Perianth trubular ..... Nyctaginaceae
62a. Leafless trees; brachlets ribbed and joined at the nodes… ..... Casuarinaceae
b. Leaves well developed ; brachlets not ribbed and not joined at the nodes…..... 63
63 a. Ovary 1- loculed; ovules 1-2 in each loule…..... 64
b. Ovary 2 or more loculed;ovules 1 or 2 in each locule…..... 65
64a. Leaves glandular… ..... Euphorbiaceae
b. Leaves eglandular…..... Urticaceae
65a. Filaments inflexed in bud with reversed anther…..... Moraceae
b. Filaments not inflexed in bud, not with reversed anther..... Ulmaceae
66a. Terrestrial or epiphytic…..... 67
b. Aquatic, marsh or riparian ..... Cyperaceae
67a. Arbrorescent woody; leaf blade many nerved articulate with sheath. Bambusaceae
b. Herbs with herbaceous culms; leaf blade sessile not articulate with sheath…..... 68
68a. Perianth 0 or reduced to scale…..... Araceae
b. Perianth present…..... 69
70a. Plant armed… 71
b. Plant unarmed… 72
71a. Plants Xerophytic; leaves fibrous… ..... Agavaceae
b. Plants not xerophytic; leaves nor fibrous… ..... Lilliaceae
72 a. Perianth segments connate… ..... Amaryllidaceae
b. Perianth segments free…..... 73
73a. Outer perianth calycine; inner coroline… ..... Commelinaceae
b. Outer and inner perianth… 74

II. Identification of Non-Flowering Plant Species

Lichen samples were identified based morphological, biochemical and anatomical features and representative samples were compared with the voucher specimens at the Lichen Herbarium Centre of National Botanical Research Institute (NBRI), Lucknow, Uttar Pradesh, India.

Key to identify the Lichen Genera

Key to Genera

1 a. Photobiont cyanobacteri urn..... *Leptogium cyanascens.*
1 b. Photobiont green alga..... 2
2. Thallus leprose, crustose…….. Group I
3. Thallus foliose… ..... Group II
4. Thallus fruticose…..... Group III

Group I

1 a. Thallus leprose, ... *Chrysothrix chlorina*
1 b. Thallus crustose. ..... *Graphis* sp

Group II

1 a. Lower side of thallus pseudocyphellae, photobiont Nostoc ..... *Pseudocyphellaria*
1 b. Thallus lacking pseudocyphellae 2

2 a. Upper cortex thick walled longitudinally oriented, conglutinate hyphae… 3
2 b. Upper cortex otheriwse… 4
3 a. Thallus lower side canaliculated zeorin, norstictic and salazinic acids, and unknown pigments and triterpenoids present… ..... *Heterodermia leucomelos*
3 b. Thallus lower side no canaliculated only in medulla……*Heterodermia diademata*
4 a. Cilia bulbate at the base, thallus grey to grey brown .....*Bulbothrix*
4 b. Cilia present or absent, not bulbate..... 5
5 a. Rhizines dichotomously branched present throughout the margins. ..*Hypotrachyna*
5 b. Rhizines restricted to center of lower surface, margin bare, smooth shining….....6
6 a. Lobes narrow, long, dichotomously branched, canaliculate.....*Everniastrum*
6 b. Lobes otherwise. 7
7 a. Lobe margins ciliate….....8
7 b. Lobe margins eciliate….....9
8 a. Salazinic acid present K+ Red cortex….....10
8 b. Salazinic acid absent.....11
9 a. Thallus with isidia… .....*Parmotrema tinctorum*
9 b Thallus with soredia… 12
10 a. thallus emaculate….....*P.stuppeum*
10 b. thallus maculate… ..... *P.reticulatum*
11 a. Protolichesternic acid in medulla.....*P.grayanam*
11 b. Alectoronic acid in medulla….....*P. nilgherrense*
12 a. Thallus large lobed, loosely attached, mainly corticolous.....*P. austrosinense*
12 b. Thallus smaller, closely to strongly attached, saxicolous .....*P.defectum*

Group III

1 a. Squamules in thallus ..... *Cladonia* sp
1 b. Squamules absent in thallus.....2
2 a. Thallus flat, strap shaped or palmately lobed. ..... *Ramalina*
2 b. Thallus round to angular in section 3
3 a. Thallus bright yellow to orange, K+ purple. ..... *Teloschistes*
3 b. Thallus greenish grey or yellowish grey pendent or erect….....4
4 a. Medulla K+ red Stictic acid present ..... *Usnea stigmatoides*
4 b. Medulla K- norstictic psoromic acid present ..... *Usnea dasaea*

III. Identificayion of Algae Genera

Algae identification key consists of couplets of characteristics using algal description of the specimen based on morphological characterization from 58 Genera to species level identification as per the comprehensive key.

Key to identify the Algae species

1A. Plant pigments contained in chromatophores or chloroplasts---------- 10
IB. Plant pigments not contained, but diffused through protoplast ---------- 2
2A. Plants filamentous; cells arranged in trichomes ---------- 4
2B. Plants colonial, not filamentous 3
3A. Cells in regular rows, in multiples of four; ----------*Agmenellum*
3B. Cells somewhat evenly arranged toward periphery of spherical colony; barely

visible gelatinous strands radiate from center of colony to cells *Gomphosphaeria*
3C. Colony asymmetrical; cells very dense and unevenly distributed --- *Anacystis*
4A. Filaments straight or slightly flexed 64B.
Filaments curved, twisted, or spiralled --- 5
5A. Heterocysts and akinetes present --- *Anabaena*
5B. Heterocysts absent *Raphidiopsis* 6A.
Heterocysts present 96B.
Heterocysts absent 77A.
Filaments without a sheath; cells discoid --- *Oscillatoria*
7B. Filaments with distinct sheath 8 8A.
Trichomes tangled; sheaths confluent --- *Phormidiwn*
8B. Trichomes separate; sheaths not confluent ---*Lyngbya*
9A. Heterocysts terminal --- *Cylindrospermum*
9B. Heterocysts intercalary ---*Ahphanizomenon*
10A. Cell walls without punctae or striae --- 31
10B. Cell walls rigid, ornamented with punctae or striae --- 11
11A. Frustules adiametric, two or more times longer than wide, elongate --- 15
11B. Frustules isodiametric, generally shorter in length than in diameter, round or elliptical or ovoid or nearly so 12
12A. Frustules elliptical or ovoid or nearly so --- 14
12B. Frustules discoid or nearly so 13
13A. Valves radially punctate --- *Stephanodiscus*
13B. Valves with two concentric regions, the inner being smooth --- *Cydotella*
14A. Frustules with marginal keel containing a raphe --- *Surirella*
14B. Frustules with a pseudoraphe or with a raphe not in a marginal keel--- *Cocconeis*
15A. Frustules cylindrical arranged end to end into filament --- *Melosira*
15B. Frustules not arranged into filaments --- 16
16A. Frustules with a raphe in at least one valve --- 21
16B. Frustules without a raphe in either valve, pseudoraphe evident --- 17
17A. Frustules united in zigzag chains --- *Tabellaria*
17B. Frustules not in zigzag chains --- *Pseudoraphe*
18A. Frustules united laterally *Fragilaria* 18B.
Frustules not united laterally 1919A.
Frustules united apically forming spokelike colony --- *Asterionella*
19B. Frustules not forming spokelike colony --- 20
20A. Frustules needle shaped without costae ---*Synedra*
20B. Frustules with prominant costae --- *Diatom*
21A. Frustules sigmoid or "S" shaped --- *Gyrosigma*
2IB. Frustules not sigmoid 22
22A. Frustules longitudinally symmetrical, other than lunate in valve view --- 25
22B. Frustules with raphe in both valves, longitudinally asymmetrical, lunate ---23
23A. Valves with transverse costae --- *Epithemia*
23B. Valves without transverse costae 24
24A. Raphe a smooth curve with well defined central and polar nodules--- *Cymbella*
24B. Raphe not a smooth curve, gibbose with marginal central nodule --- *Amphora*
25A. Frustules with raphe in both valves --- 27
25B. Frustules with pseudoraphe in one valve and raphe in other valve --- 26

26A. Frustules wedge-shaped in girdle view and cuneate in valve *Rhoicosphenia*
26B. Frustules shaped otherwise ---------- *Achnanthes*
27A. Raphe extended length of valve; polar nodules; central nodules lacking -*Eunotia*
27B. Raphe restricted to polar regions 28 28A. Raphe located in a canal *Nitzschia* 28B. Raphe not located in a canal 29 29A. Frustules with symmetrical valves 30 29B. Frustules with valves symmetrical but asymmetrical ---------- *Gomphonema*
30A. Valves with transverse costae ---------- *Pinnularia*
30B. Valves with transverse punctae ---------- *Navicula*
31A. Cells solitary 45
31B. Cells colonial or grouped 32
32A. Cells enclosed in conical to cylindrical lorica; joined lorica have treelike appearance *Dinobryon*
32B. Cells and lorica without treelike appearance ---------- 33
33A. Colony discoid, one cell in thickness; cells in concentric rings -------- *Pediastrum*
33B. Colony not discoid 3434A. Colonies spherical or globose 40 34B. Colonies not spherical 35 35A. Colony with elongate cells radiating from common center ---------- *Actinastrum*
35B. Colony with cells not radiating from common center ----------36
36A. Colony with four to eight cells positioned in linear series ---------- *Scenedesmus*
36B. Colony with cells not in linear series ----------37
37A. Colony with arcuate to lunate cells with apices acutely----------*Selenastrum*
37B. Colony with spherical to broadly ellipsoidal cells ----------38
38A. Cells without spines or setae ---------- *Crucigenia*
38B. Cells with spines or setae 39
39A. Cells quadrate, closely apposed; free face of each cell with spines ----*Tetrastrum*
39B. Cells quadrate and united; free face cell with long delicate setae--- *Micractinium*
40A. Colony with biflagellated cells ----------*Pandorina*
40B. Colony with nonflagellated cells 41
41A. Cells lunate to sickle shaped ----------*Kirchneriella*
41B. Cells spherical or nearly so 42
42A. Cells borne terminally on dichotomously branched threads ----- *Dictyosphaerium*
42B. Cells not on dichotomously branched threads ----------43
43A. Colony a hollow sphere *Coelastrum*43B. Colony not a hollow sphere 44 44A. Colony surrounded by gelatinized and expanded parent cell wall ---------- *Oocystis*
44B. Colony with cells equidistant and toward periphery----------*Sphaerocystis*
45A. Cells with median constriction dividing cell into two distinct halves -*Cosmarium*
45B. Cells without pronounced median constriction ---------- 46
46A. Cells nonflagellated 53 46B. Cells flagellated 4747A. Cell walls without polygonal plates ---------- 49
47B. Cell walls with polygonal plates 48 48A. Cells walls of thick plates with distinct sutures ----------*Peridinium*
48B. Cells walls with faintly distinct plates and sutures ---------- *Glenodinium*

49A. Cells uniflagellate 52 49B. Cells biflagellate 5050A. Cells with two flagella of equal length ---------- *Chlamydomonas*
50B. Cells with two flagella of unequal length ---------- 51
51A. Cells with single chromatophore ---------- *Chroomonas*
51B. Cells with 2 large chromatophores ---------- *Cryptomonas*
52A. Cells surrounded by distinct lorica ---------- *Trachelomonas*
52B. Cells without lorica; fusiform to acicular shaped; posterior end ---------- *Euglena*
53A. Cells acicular to fusiform with ends tapering into long spines -------- *Schroederia*
53B. Cells without ends tapering into long spines ---------- 54
54A. Cells without setae 56 54B. Cells with setae 5555A Cells with subpolar or both subpolar and equatorial long setae ---------- *Chodatella*
55B Cells with multiple peripheral long delicate setae ---------- *Golenkinia*
56A Cells long, slender, and tapered at both ends ---------- *Ankistrodesmus*
56B Cells flattened or isodiametric, triangular, quadrangular ---------- *Tetraedron*

IV. Identification of Major Groups of Mushrooms

Mushrooms are belonging to fungal kingdom which are edible and non-edible in nature. They represented in various colours starting from white, black, brown, red and pale yellow rot fungi. They are identified based on the following characterization key

Key to identify the Mushrooms species

1. Mushroom growing on other mushrooms or the decayed remains--------- *Mycotrophs*
2. Growing shelflike on wood (or, if not, then gills *concentric* rather than radial); mushroom *very* tough and leathery, corky, or woody (try tearing it in half); gills tough and hard, sometimes maze-like; cap frequently (but not always) with concentric zones of colour *Polypores*
3. Gills running down the stem, not platelike and thus not easily separable from the cap and stem (try removing an entire "gill" with your fingers or a sharp object); mushroom usually *not* growing on wood ---------- *Chanterelles and Trumpets*
4. Gills not as above; mushroom growing on wood or elsewhere ---- *Gilled Mushrooms*
5. Stem absent--or, if present, lateral, Flesh in stem tough ---------- *Polypores*
6. Raphe a smooth curve with well defined central and polar nodules ---------- *Cymbella*
7. Raphe not a smooth curve, gibbose with marginal central nodule ---------- *Amphora*
8. Frustules with raphe in both valves 27
9. Frustules with pseudoraphe in one valve and raphe in other valve ---------- 26
10. Colony with cells not radiating from common center ---------- 36
11. Colony with four to eight cells positioned in linear series ---------- *Scenedesmus*
12. Colony with cells not in linear series ---------- 37
13. Colony with arcuate to lunate cells with apices acutely ---------- *Selenastrum*
14. Cells acicular to fusiform with ends tapering into long spines ---------- *Schroederia*
15. Cells without ends tapering into long spines ---------- 54
16. Cells without setae 56
17. Cells with setae 55
18 Cells with subpolar or both subpolar and equatorial long setae ---------- *Chodatella*
19. Raphe extended length of valve; polar nodules; central nodules lacking ---- *Eunotia*

20. Raphe restricted to polar regions 28
21. Raphe located in a canal ..... *Nitzschia*
22. Filaments with distinct sheath 8
23. Trichomes tangled; sheaths confluent ----------*Phormidiwn*
24. Trichomes separate; sheaths not confluent---------- *Lyngbya*
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26. Heterocysts intercalary ---------- *Ahphanizomenon*
27. Cell walls without punctae or striae 31
28. Cell walls rigid, ornamented with punctae or striae---------- 11
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30. Frustules isodiametric, generally shorter than round or elliptical or ovoid --------12
31. Frustules elliptical or ovoid or nearly so ----------14
32. Frustules discoid or nearly so 13
33. Valves radially punctate ----------*Stephanodiscus*
34. Valves with two concentric regions, the inner being smooth---------- *Cydotella*
35. Frustules with marginal keel containing a raphe ----------*Surirella*
36. Frustules with a pseudoraphe or with a raphe not in a marginal keel ---- *Cocconeis*
37. Cap round in outline; pore surface not running down the stem, or only slightly running down the stem; spore print not white---------- *Boletes*
38. Mushroom with spines or "teeth"--either on the underside of a cap, or hanging from a branched structure, or clumped in an indistinct mass ----------*Toothed Mushrooms*
398. Mushroom covered in some part with a foul-smelling slime; arising from a soft underground "egg"; variously shaped (like a club or stick, like crab claws, like a lantern, like a Wiffle ball, etc.); frequently found in woods ----------*Stinkhorns*
40. Mushroom more or less shaped like a ball, or like a ball raised up on a stem, or like a ball set on a starfish ..... *Puffballs*
41. Cap shape convex to centrally depressed or vase-shaped; undersurface, smooth, wrinkled, or gill-like; fruiting embedded---------- *Chanterelles*
42. Cap shape oval, pointed, lobed, saddle-shaped, irregular, or thimble-like (never vase-shaped or convex); undersurface absent, or hard to see or define; many (but definitely not all) species fruiting---------- *Trumpets*
43. Stem completely hollow, or hollow with cottony fibers inside; cap with pits and ridges, or longitudinally wrinkled, or fairly smooth (never lobed or convoluted); without reddish or reddish brown shades; found in spring----------*Morels & Verpas*
44. Found in summer and fall (or spring in warm coastal areas); cap lobed, saddle-shaped, or irregular and whitish, greyish, brownish, or black; stem surface ribbed or "pocketed" in some species - ..... *Saddles*
45. Found in summer and fall (or spring in warm coastal areas); cap lobed, saddle-shaped, or irregular and whitish, greyish, brownish, or black-------- *Oddballs & Misfits*

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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:	chairmanof@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.

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For any assistance, you may contact:

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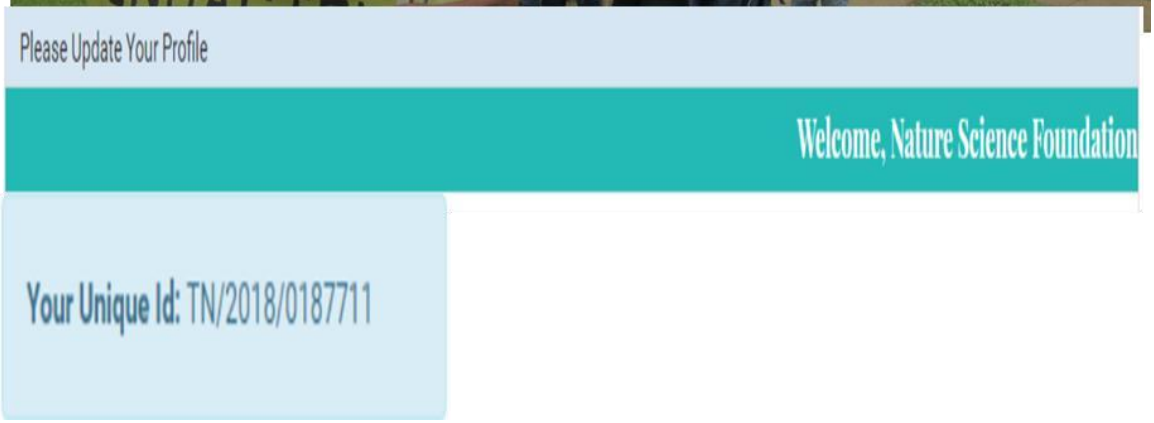
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PROCEEDINGS OF THE COMMISSIONER OF INCOMETAX (EXEMPTIONS),
III FLOOR, ANNEXE BLDG, NO.121, MAHATMA GANDHI SALAI, CHENNAI-34

Present : G.M.DOSS, I.R.S
Commissioner of Income Tax (Exemptions)

** URNo. AACTN7857J/05/18-19/T-1105 Dated:03/09/2018

Sub: Registration u/s. 12AA of the Income tax Act 1961 - in the case of

"Nature Science Foundation"
LIG-II, 2669, Gandhimaa Nagar, Peelamedu, Coimbatore – 641 004.

Ref : Application in form 10 A filed on 28/03/2018

ORDER UNDER SECTION 12AA OF THE INCOME TAX ACT 1961.

1. The above **Trust/~~Society/Association/ Company/ others/~~,** bearing **PAN AACTN7857J** was constituted by **Trust Deed / ~~Memorandum of Association~~** dated **29/11/2017** registered with **Sub-Registrar's Office/ ~~Registrar of Societies~~**/~~Registrar of Companies/others~~ on **29/11/2017.**

2. ~~The Trust Deed / Memorandum of Association has subsequently been amended / modified / altered by a Codicil / Supplementary Deed / Amendment Deed / Alteration to Memorandum of Association/others dated XX/XX duly registered on XX/XX.~~

3. The above **TRUST** filed an application seeking Registration u/s 12 AA of the Income tax Act, 1961.

4. On going through the objects of the **TRUST** and its proposed activities as enumerated in the **Trust Deed / ~~Memorandum of Association,~~ I** am satisfied about the genuineness of the **TRUST** as on date.

5. The application has been entered at **Sl.No.1105** maintained in this office. The above **Trust** is accordingly registered as a **PUBLIC CHARITABLE TRUST** u/s 12 AA of the Income Tax Act, 1961 with effect from **29/11/2017**.

6. It is hereby clarified that the Registration so given to the **Trust/~~Institution~~** is not absolute. Subsequently, if it is found that the activities of the **Trust/~~Institution~~** are not genuine or are not being carried out in accordance with the objects and clauses of the **Trust Deed / ~~Memorandum of Association~~** submitted at the time of registration or modified with the approval of the **Commissioner of Income-tax (Exemptions), Chennai** or there is a violation of the provisions of Section – 13, **the** Registration so granted shall be cancelled as provided u/s 12 AA (3) or 12AA(4) of the Income Tax Act. Further, this approval is also subject to the **Trust/Society/Association/Company/ ~~Others~~/** complying to the provisions of the proviso to sec 2(15) of the Income Tax Act 1961.

7. **Granting of Registration u/s 12AA** does not confer any automatic exemption of income from taxation. The **Trust/~~Institution~~** should conform to the parameters laid down in Sections 11, 12, 13 and 115 BBC of the I.T. Act, 1961, to claim exemption of its income on year to year basis before the Assessing Officer.

** This Unique Registration No. URNo. **AACTN7857J/05/18-19/T-1105** Should be mentioned in all your future correspondence.

Sd/-
(G.M.DOSS, I.R.S)
Commissioner of Income-tax(Exemptions), Chennai.

Copy to:
1. The Assessee.
2. The ACIT(Exemptions), Coimbatore Circle.
3. Office Copy.

//CERTIFIED TRUE COPY//

(N SRINIVASA RAO)
Asst. Commissioner of Income-tax (H.Qrs)(Exemptions),
Chennai.

F.2984

GOVERNMENT OF INDIA
INCOMETAX DEPARTMENT
OFFICE OF THE COMMISSIONER OF INCOME TAX (EXEMPTIONS)
Aayakar Bhawan, Annexe III Floor, 121 M.G. Road, Chennai 600 034

URNo. AACTN7857J/05/18-19/T-1105/80G

Date: 10.04.2019

Name of the Trust ~~/Society /Company/Institution~~	:	NATURE SCIENCE FOUNDATION
Address	:	LIG II 2669, GANDHIMAA NAGAR, PEELAMEDU, COIMBATORE - 641 004
PAN	:	AACTN7857J
Date of Application	:	12.11.2018

Received
17/07/19
Regd. 17/07/2019

APPROVAL UNDER SECTION 80G(5)(vi) OF THE INCOME TAX ACT, 1961

The aforesaid Trust ~~/Society/Company/Institution~~ has been registered u/s.12AA of the Income Tax Act with effect from **29.11.2017** vide **AACTN7857J/05/18-19/T-1105** dated **03.09.2018.** It is certified that donation made to **NATURE SCIENCE FOUNDATION** at **LIG II 2669, GANDHIMAA NAGAR, PEELAMEDU,COIMBATORE - 641 004** shall qualify for deduction u/s 80G(5)(vi) of the Income Tax Act, 1961, subject to the fulfillment of conditions laid down in clauses [i] to [v] of sub-section (5) of section 80G of the I.T Act, 1961.

2. This approval shall be valid in perpetuity with effect from **A.Y. 2019-20** unless specifically withdrawn. **The details and validity of the certificate is available @ office.incometaxindia.gov.in**

3. The Return of Income along with the Income & Expenditure Account, Receipts and Payments Account and Balance Sheet should be submitted annually **to** the Assessing Officer having jurisdiction over the case.

4. No change in the Trust Deed/~~Memorandum of Association~~ shall be effected without the prior approval of the undersigned i.e. **Commissioner of Income Tax (Exemptions), Chennai**.

5. Every receipt issued to a donor shall bear the **Unique Registration Number** i.e. **URNo. AACTN7857J/05/18-19/T-1105/80G** and date of this order i.e. **10.04.2019.**

6. Under the provisions of section 80G(5)(i)(a), the institution/fund registered u/s.12A, u/s.12AA(1)(b) or approved u/s.10(23C), 10(23C)(vi)(via), etc., shall have to maintain separate books of accounts in respect of any business activity carried on and shall intimate this office within one month about commencement of such activity.

Sd/-
(G.M.DOSS, I.R.S)
Commissioner of Income Tax (Exemptions)
Chennai.

Copy to:
1. The applicant
2. Guard File
3. The DCIT(Exemptions) Coimbatore Circle.

//Certified True Copy//

(N. SRINIVASA RAO)
Assistant Commissioner of Income-tax (H.qrs)
(Exemptions), Chennai.

FORM NO. 10AC

(See rule 17A/11AA/2C)

Order for registration

1	PAN	AACTN7857J
2	Name	NATURE SCIENCE FOUNDATION
2a	Address	
	Flat/Door/Building	LIG-II, 2669
	Name of premises/Building/Village	GANDHIMAA NAGAR
	Road/Street/Post Office	Coimbatore South
	Area/Locality	COIMBATORE
	Town/City/District	Gandhimaanagar S.O
	State	Tamil Nadu
	Country	INDIA
	Pin Code/Zip Code	641004
3	Document Identification Number	AACTN7857JE2021501
4	Application Number	739995830271021
5	Unique Registration Number	AACTN7857JE20215
6	Section/sub-section/clause/sub-clause/proviso in which registration is being granted	01-Sub clause (i) of clause (ac) of sub -section (1) of section 12A
7	Date of registration	03-11-2021
8	Assessment year or years for which the trust or institution is registered	From AY 2022-23 to AY 2026-2027
9	Order for registration:	
	a. After considering the application of the applicant and the material available on record, the applicant is hereby granted registration with effect from the assessment year mentioned at serial no 8 above subject to the conditions mentioned in row number 10.	
	b. The taxability, or otherwise, of the income of the applicant would be separately considered as per the provisions of the Income Tax Act, 1961.	
	c. This order is liable to be withdrawn by the prescribed authority if it is subsequently found that the activities of the applicant are not genuine or if they are not carried out in accordance with all or any of the conditions subject to which it is granted, if it is found that the applicant has obtained the registration by fraud or misrepresentation of facts or it is found that the assessee has violated any condition prescribed in the Income Tax Act, 1961.	
10	Conditions subject to which registration is being granted	
	The registration is granted subject to the following conditions:-	

	o. This certificate cannot be used as a basis for claiming non-deduction of tax at source in respect of investments etc. relating to the Trust/ Institution.	
	p. All the Public Money so received including for Corpus or any contribution shall be routed through a Bank Account whose number shall be communicated to Office of the Jurisdictional Commissioner of Income Tax.	
	q. The applicant shall comply with the provisions of the Income Tax Act, 1961 read with the Income Tax Rules, 1962.	
	r. The registration and the Unique registration number has been instantly granted and if, at any point of time, it is noticed that form for registration has not been duly filled in by not providing, fully or partly, or by providing false or incorrect information or documents required to be provided under sub-rule (1) or (2) of rule 17A or by not complying with the requirements of sub- rule (3) or (4) of the said rule, the registration and Unique Registration Number (URN), shall be cancelled and the registration and URN shall be deemed to have never been granted or issued.	
	Name and Designation of the Registration Granting Authority	Principal Commissioner of Income Tax/ Commissioner of Income Tax (Digitally signed)

Digitally Signed by SIBICHEN K MATHEW
Date: 2021.11.03 15:52:36 IST

Certificates of Green Campus Auditors

1. ISO Environment Management System (14001:2015) of Mrs. S. Rajalakshmi, Chairman of NSF.
2. ISO Environment Management System (14001:2015 TUV NORD) of Dr. A. Geethakarthi, NSF Environment Auditor.
3. Indian Green Building Council (IGBC AP) Accredited Professional of Dr. B. Mythili Gnanamangai, Vice-Chairman of NSF.
4. Associated Chambers of Commerce and Industry of India (ASSOCHAM), of Dr. B. Mythili Gnanamangai, Vice-Chairman of NSF.
5. Associated Chambers of Commerce and Industry of India (ASSOCHAM), of Er. Ashutosh Kumar Srivastava, Board of Directors (North Zone) of NSF.
6. Botanist and Subject Expert of Plant Taxonomy of Dr. D. Vinoth kumar, Joint Director of NSF.
7. Bureau of Energy Efficiency (BEE) and National Productivity Council of Er. N. Dineshkumar and Dr. N. Balasubramanian, Energy Auditors of NSF.

Certificate of Training

TNV hereby certifies that

S. Rajalakshmi

has successfully completed the 5 days

Auditor / Lead Auditor Training Course which meets the training requirements of the Exemplar Global and has been declared as competent in the following competency units

- EM: Environmental Management System
- AU: Management Systems Auditing
- TL: Leading Management Systems Audit Teams

ISO 14001:2015

Issue Date: 17th Jun. 2021
Training Date : 20th to 24th May. 2021
Certificate Number : 2106170721010105

Authorised Signatory
(Pragyesh Singh)

This course is certified by Exemplar Global vide registration number TN006669

Note: The course conforms to the principles and practice of audits of Management Systems for compliance with standards. This certificate remains the property of TNV and this certificate is recognized by Exemplar Global. For verification of this certificate, please write to Mail: info@isoindia.org

TÜV NORD

PR315: ISO 14001:2015 Lead Auditor (Environmental Management Systems) Training course

Certificate of Achievement

Geethakarthi Alagarsamy

has successfully completed the above mentioned course and examination.

23rd - 27th March 2019

COIMBATORE, INDIA

Certificate No. 35242817 02

Delegate No. 171136

for TÜV NORD CERT GmbH

Essen, 2019-04-26

The course is certified by CQI and IRCA (Certification No. 18125). The learner meets the training requirements for those seeking certification under the IRCA EMS Auditor certification scheme.

TÜV NORD CERT GmbH Langemarckstraße 20 45141 Essen www.tuev-nord-cert.com

CQI | IRCA

CERTIFIED COURSE

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

GEM Certificate

ASSOCHAM

Celebrating 101 Years

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

GEM Certificate

ASSOCHAM hereby certifies that

Mr. Ashutosh Kumar Srivastava

has successfully passed the

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

with

"Good Performance"

on

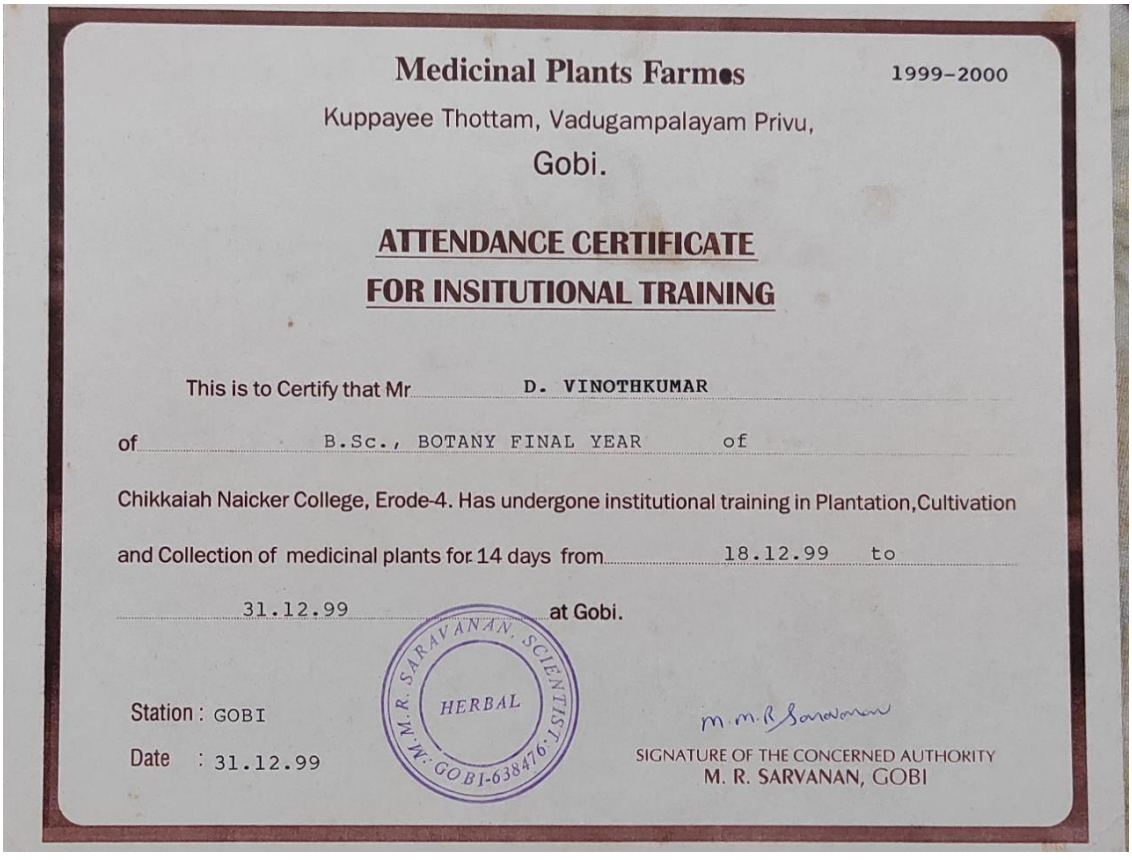
03 September, 2021

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 20/666

Deepak Sood
Secretary General, ASSOCHAM



Medicinal Plants Farmes 1999-2000

Kuppayee Thottam, Vadugampalayam Privu,

Gobi.

ATTENDANCE CERTIFICATE

FOR INSITUTIONAL TRAINING

This is to Certify that Mr D. VINOTHKUMAR

of B.Sc., BOTANY FINAL YEAR of

Chikkaiah Naicker College, Erode-4. Has undergone institutional training in Plantation,Cultivation and Collection of medicinal plants for 14 days from 18.12.99 to 31.12.99 at Gobi.

Station : GOBI

Date : 31.12.99

M.M.R. SARAVANAN, SCIENTIST, GOBI-638476 HERBAL

SIGNATURE OF THE CONCERNED AUTHORITY

M. R. SARVANAN, GOBI

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 (*l*) 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			

Regn. No. EA-7391

Certificate No. 5093

National Productivity Council

(National Certifying Agency)

PROVISIONAL CERTIFICATE

This is to certify that Mr. / Ms. N.Balasubramaniam

son / daughter of Mr. M.Nanjukuttigounder

has passed the National Certification Examination for Energy Auditors held in December - 2009, conducted on behalf of the Bureau of Energy Efficiency, Ministry of Power, Government of India.

He / She is qualified as Certified Energy Manager as well as Certified Energy Auditor.

He / She shall be entitled to practice as Energy Auditor under the Energy Conservation Act 2001, subject to the fulfillment of qualifications for the Accredited Energy Auditor and issue of certificate of Accreditation by the Bureau of Energy Efficiency under the said Act.

This certificate is valid till the issuance of an official certificate by the Bureau of Energy Efficiency.

Place : Chennai, India

Date : 11th February 2010

Controller of Examination

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

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.

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