REPORT OF ENVIRONMENT AUDIT

Submitted to

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Submitted by

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1. Introduction

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

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

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

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

with the solutions for environmental degradation is managed. Environmental Management System (ISO EMS 14001:2015) should be implemented by every Organization to ensure that the eco-friendly campus is being given to the stakeholders. Eco-friendly youth leadership programmes, green campus practices, social responsibility and Institutional values comprehending the relationship with the ecosystem for a sustainable environment are being evaluated (IGBC, 2021).

Environmental auditing has a critical role to play in ensuring that organizations fulfil their policy commitments to environmental management and performance. Audits can provide key information to senior management on areas of risk, and progress towards strategic objectives and targets. This audit is to determine that how well the environmental management systems and equipment are performing. To verify compliance with the relevant national, local or other laws and regulations and to minimize the human exposure to risks from environmental, health and safety problems.

The purpose of the environmental audit is to provide an indication to the management of the improvements while environmental organization system & equipment are performing. To fulfil this purpose it is essential that audits should be seen as the responsibility of the company. The audit work can be voluntary and for the advantage of the company. The audit work can be done systematically and efficiently by the help of environmental auditing programme. It helps in the proper utilization of natural resources as a whole it improves environmental quality.

Environmental auditing is essentially an environmental management tool for measuring the effects of certain activities on the environment against set criteria or standards. Depending on the types of standards and the focus of the audit, there are different types of environmental audit. Organizations of all kinds now recognize the importance of environmental matters and accept that their environmental performance will be scrutinized by a wide range of interested parties (Goyal and Gupta, 2014). Environmental auditing is used to

- Investigate
- Understand
- Identify

These are used to help improve existing human activities, with the aim of reducing the adverse effects of these activities on the environment. . An environmental auditor will study an organization's environmental effects in a systematic and documented manner and will produce an environmental audit report. Environmental auditing is often used as a generic term covering a variety of management practices used to evaluate an organization's environmental performance. Environmental audit is for the impact of the industries and their products on natural resources and environmental quality. It is necessary to have ‘Environmental Audit’ to ensure sustainable industrial developments. Environmental Audit is a pragmatic management tool, which addresses itself to help an industry or operation, to verify compliance with environmental requirements, to evaluate the effectiveness of the environmental management system, to assess risks and to identify and correct environmental hazards. It is the examination of accounts of revenues and costs of environmental and natural resources, their estimation, depreciations and natural resources,

their estimation depreciations and values recorded in the books of accounts. Environmental organization management systems and equipment are performing with the aims of:

i. Facilitating management control of environmental practices.
ii. Assessing compliance with company policies.
iii. Facilitating professional competence

2. Role of Educational Institutions in India

In view of offering eco-friendly atmosphere to the stakeholders, Educational institutions are playing important role which starts from establishing and maintenance of eco-friendly campus without harming the environment. A clean and healthy environment in an Organization determine effective learning and provides a conducive learning environment to the students. Educational institutions are asked both Central and State Governments to give eco-friendly atmosphere to the stakeholders. In addition, all the Educational institutions are asked to save the environment for future generations and to solve the environmental problems such as recycling of solid wastes and wastewaters, plastics usage, napkin disposal water consumption, water harvesting and storage mechanisms, etc. through Environmental Education. Implementing Swachh Bharath Abhiyan Scheme launched by the Indian Government plays by 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, 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.

Similar to that of Green campus auditing, Environment auditing is a systematic process and a kind of professional eco-tools and techniques whereby an organization's environmental performance is checked against its environmental policies and compliances of the Government guidelines. This audit process is definitely useful for the Educational Institutions to maintain the eco-friendly campus in a sustainable manner and can give eco-friendly atmosphere to the students and staff members including Management people, parents, alumni and visitors. 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. There are some minor differences between Green campus auditing and Environment auditing with respect to natural and planted vegetation in the campus and carbon footprint in which carbon dioxide level is assessed in the campus in using the number vehicles, electrical energy utilization efficiency and human population (Woo and Choi, 2013).

Environmental auditing is a systematic, documented, periodic and objective process in assessing an organization's activities and services in relation to: 1) Assessing compliance with relevant statutory and internal requirements, 2) Facilitating management control of environmental practices, 3) Promoting good environmental management, 4) Maintaining credibility with the public, 5) Raising staff awareness and enforcing

commitment to departmental environmental policy, 6) Exploring improvement opportunities and 7) Establishing the performance baseline for developing an Environmental Management System (EMS). Conducting an environmental audit is no longer an option but a sound precaution and a proactive measure in today's heavily regulated environment. Indeed, evidence suggests that EA has a valuable role to play, encouraging systematic incorporation of environmental perspectives into many aspects of an organization's overall operation, helping to trigger new awareness and new priorities in policies and practices.

3. Energy and Environment Policy

The energy and environment policy aims to provide an education and awareness in a clean and green environment to the stakeholders with regards to environmental compliance. The scope of this policy applies to all employees and students of the Institution to provide an Eco-friendly atmosphere (Aerts *et al*., 2008; Abba *et al*., 2018). Policy making dealt with cleanliness on the campus is maintained through proper disposal of wastes and steps taken to recycle the biodegradable wastes. Utilization of eco-friendly supplies and an effective recycling programme to maintain the campus free from hazardous wastes. The concept of eco-friendly culture is disseminated among the students as well as rural community through various awareness programmes, seminars / conferences, reuse and recycle the waste materials. Attempts is made to limit energy usage and also replace non-renewable energy sources with renewable energy sources. The Head of the Organization, Department Heads and Senior Managers including Management Representatives are responsible for monitoring the go green initiatives of the College / University and maintain a clean/green campus. In addition, the staff and student volunteers from Nature club, Eco clubs, Science club, Fine Arts club, Youth Red cross unit, NCC and NSS units are also responsible for the implementation of the green campus and environment policy in the Organization.

4. Environment friendly campus

Eco-friendly literally means earth-friendly or not harmful to the environment. This term most commonly refers to products that contribute to green living or practices that help conserve resources like water and energy. Environment friendly processes are sustainability and marketing terms referring to goods and services, laws, guidelines and policies that claim reduced, minimal, or no harm upon ecosystems or the environment. Companies and Educational Institutions use these ambiguous terms to promote goods and services including working atmosphere / learning environment sometimes with additional, more specific certifications, such as ecolabels. Their overuse can be referred to as greenwashing and green campus. To ensure the successful meeting of Sustainable Development Goals (SDGs) companies and Educational Institutions are advised to employ environmental friendly processes in their production as well as providing good ambience to the stakeholders in their working place. The International Organization for Standardization has developed ISO 14001:2015, 14020 and ISO 14024 to establish principles and procedures for environmental labels and declarations that certifies the

environment friendly campus. In particular, these standards relate to the avoidance of financial conflicts of interest, the use of sound scientific methods and accepted test procedures, and openness and transparency in the setting of standards.

Similar to that of Green campus facilities, environment friendly campus is meant for providing eco-friendly as well as hygienic atmosphere to the stakeholders without harming the environment. Environment auditing is like a systematic process and a kind of professional tool whereby an organization's environmental performance is checked against its environmental policies and compliances of the Government guidelines. It is almost similar to that of green auditing except assessing the flora and fauna. This audit process is definitely useful for the Educational institutions to maintain the eco-friendly campus in a sustainable manner and can give eco-friendly atmosphere to the students and staff members including Management people (Aruninta *et al*., 2017; Braam *et al*., 2016). 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. In Environment auditing, carbo footprint is calculated in terms of carbon emission and carbon accumulation in the campus by means of using the number of vehicles, electrical energy utilization efficiency and human population.

In order to provide efficient eco-friendly atmosphere to the stakeholders, the organization should take responsibility in making good drinking water facility to the students and staff members, use of the organic manure, cow dung, farmyard manure and vermicompost for the cultivation of plants, avoidance of non-compostable, single-use disposable plastic items, single-use plastic utensils, plastic straws and stirrers, commitment to plastic-free alternatives to bags, boxes, containers and etc. and reduction of use of papers alternated with e-services and e-circulars, etc. and proper disposal of wastes, recycling and suitable waste management system. These parameters should be considered while implementing the environment friendly campus in an organization (Lauder *et al*., 2015; Freidenfelds *et al*., 2018).

To set a pure atmosphere in an organization campus, waste disposal management should be proper which in turn to restrict the environmental pollution. The waste disposal are the activities and actions required to manage waste from its inception to its final disposal. This includes the collection, transport, treatment and disposal of waste, together with monitoring and regulation of the waste management process. Dry waste includes paper, cardboard, glass tin cans etc. on the other hand; wet waste refers to organic waste such as vegetable peds, left-over food etc. Separation of waste is essential as the amount

of waste being generated and then segregated properly for proper recycling through the composting process and used as a fertilizing material.

5. Environmental Management Plan (EMP)

Environmental protection planning is an important component of overall planning and implementation of eco-friendly and green campus of an organization. It is addressing issues ranging from human health and sanitation to various stakeholders of an organization and protection of plants, animals and microorganisms including wildlife habitats (Ghaffarianhoseini *et al*., 2016). Environmental Management Plan (EMP) is an important integration document between the various approvals, authorizations and specific components and/ or activities that are carried out in the campus without harming the environment. EMP is committed to manage its assets with its core values to protect the health and safety of people and the environment and to comply with Environment Health and Safety laws, regulations and Health and Safety standards. A clean environment is important for the success of an organization to save for the future generations to ensure in safe use of air, land, and water resources. The management of an organization should endeavor to continually improve our environmental performance and to prevent the environmental pollution. All the stakeholders of the organization are expected to support our environmental goals while providing clean and environment friendly work culture. The main purpose of the EMP is to outline environmental protection measures to be followed during the organization development and to ensure that commitments to minimize environmental effects are met. The EMP should provide a reference document as per the legislative requirements for personnel when planning and/or conducting specific activities in the campus surroundings. In line with the Environment Policy, impact on the physical, chemical and biological environment should be determined along with statutory requirements and other environmental commitments.

Environmental Management Plan and Execution in the Organization sites

S.No.	Monitoring areas	Parameters Monitored	Monitoring frequency	Reason for monitoring parameters
1.	Dredging	Erosion, landscape, sedimentation, vegetation, disposal of dredging	Continuous	Dredging results in disturbance of Benthic community and causes soil erosion and sedimentation
2.	Marine Ecology	Biodiversity survey and conservation	Continuous	Unmitigated operations may result in loss of biodiversity as per the Indian Biodiversity Act
3.	Vegetation (Flora and Fauna)	Survey of macro and micro plants, animals (mammals, birds, moths, houseflies, reptiles, amphibians,	Continuous	Conservation of macro and micro plant, animals (mammals, birds, moths, houseflies, reptiles, amphibians, termites)

		termites) and soil and air microbial biodiversity		and soild and air microbial biodiversity conservation for future generations through modern technology
4.	Air Emission	O_2, CO, CO_2, SO_2, NO_2 level in the open, car parking and indoor areas	Monthly monitoring	Unmitigated operations may result in deterioration of air quality
5.	Solid Waste	Solid waste quality and quantity, solid waste disposal, reuse, solid waste treatment	Monthly monitoring	Compliance of Environmental Laws and Legislative policy
6.	Waste water	Primary, secondary and tertiary pollutants and their recycling, waste water minimization, storage and handling, reuse, treatment before disposal	Monthly monitoring	Minimize the water pollution and to provide quality water as per the Central Pollution Board
7.	Soil	Soil contamination, soil edaphic parameters, soil, gravel and sand composition, water holding capacity, soil erosion	Half yearly	Soil surface and water pollution cause diseases as per the Compliance of Environmental Laws and Legislative policy
8.	Noise	Noise intensity, causes and impact, remedies, standard operating procedure	Monthly monitoring	Uncontrolled noise cause nuisance which affect the health
9.	Occupational Safety & Health	Safety, health and welfare of people at occupation, measures taken, Fire safety, First aid box, Safety protocol, Hospital facility	Continuous	Department of Occupational Safety & Health
10.	Land reclamation	Soil quality, soil micro and macro elements, soil composition	Half yearly	Legal obligation and structure protection, prevention of soil erosion and sedimentation to the port

11.	Restoration of the sites	Forest vegetation, plant vegetation, visual analysis, Photographic records	Continuous	Maintain the soil fertility and soil original reclamation

6. Environmental health and safety management system

It is outlined the mitigative measures and the best management practices followed in the organization in terms of developing eco-friendly and green campus. It is recommended to carry out a complete assessment and control of all potential hazards and risks arise in the organization without harming the environment. It is to ensure that no significant adverse environmental health and safety impacts by carrying out various infrastructure facilities created to improve the human eco-system of the organization may be implemented. The facility should be designed to include fire protection systems, multiple gas, flame, smoke and low- and high temperature detectors and alarms, and automatic and manual shut-down systems in terms of planning and implementing the best practices of environmental health and safety management system.

The high level of automation, regular preventative maintenance, and safeguards the environmental pollution and the provision for safe emergency shut-downs should be should be maximized in the organization. In addition, all the employees and management people should be trained properly in studying about environmental health and safety management system which will be useful for protecting the environment without causing any adverse effect on the environment. All personnel should be will be advised to undertake an extensive workshop as well as training programmes to ensure safe operating practices such as safety operations, hazards management, safety and emergency procedures and environmental management (Murdifin *et al*., 2019).

7. Evacuation Plan in Human Eco-system of the Organization

The management of the Organization should ensure the safety measures to the stakeholders which in turn improve the human eco-system of an organization. In the eco-friendly and green campus, some of the safety measures should be undertaken. The alarm signals such as Bells, Horns, Sirens, Verbal (i.e. shouting) may be used to begin evacuation of the facility in the organization if any unfavourable situation takes places like uncertain firing, explosion of acids and gasses, earth quake, electrical current circuits explorations and etc. Evacuation map may be prominently displayed throughout the facility. The phone number of Fire stations, Police, Ambulance, State Office of Emergency Services, National Response Centre, Division of Occupational Safety and Health, Regional Water Quality Control Board, Pollution and threatened hazardous management & control board and Nearest Hospital. The internal facility alarms as well as communications systems, where applicable, to notify all facility personnel should be activated. The storage areas and disposal of waste zone, contaminated soil or surface water

regions should be demarcated in the organization. The emergency equipment like fire extinguisher, emergency notification and first aid box should be placed in all the dangerous zones to minimize the major environmental impact and problems. It should be developed and practiced a spill clean-up procedure including where to find emergency equipment and how to use it properly should be trained to all the stakeholders.

The chemical handlers, hazardous waste handlers and managers should be annually trained properly by undergoing periodical workshops, conferences, seminars and training programmes so that the latest developments in chemicals disposal methodologies and hazardous management policies development may be understand. The safe method for handling and storage of hazardous materials, Specific hazard(s) of each chemical to which they may be exposed, including route of exposure (i.e. inhalation, ingestion, absorption and etc.) and personnel rescue procedures should be known by the chemical handlers, hazardous waste handlers and managers. An area which is disturbed or polluted by means of discarding the wastewaters, effluents, solid wastes, biomedical and electronic wastes, plastic wastes, kitchen and food wastes, inert wastes, hazardous waste materials, acids and chemicals may be recovered and restored by clean-up procedures (Nascimento and Filho, 2010). These areas may be stabilized, mulched, reseeded, and fertilized as required. The temporary erosion controls may be removed and permanent landscaping and erosion control measures installed where required as part of final facility reinstatement. It also involves the planting of various vegetation covering trees, shrubs, herbs, climbers, lawns and etc. The revegetation may be performed in compliance with applicable environmental requirements and specifications which include requirements for timber removal, slash disposal, and dust control.

8. Waste Management Plan of the Organization

It provides guidelines and simplify the process of categorizing, quantifying, managing, and disposing of solid wastes in the organization. Waste management is a critical component of organization's operating policies. Waste Management Plan (WMP) includes the proper handling, collection, storage, manifesting, transportation, and disposal/recycling of the solid waste generated without harming the environment. The procedure is designed to assist in an organization wide effort to provide protection to the environment and to comply with environment laws and legislative policies and regulations regarding proper waste management. The waste management covers solid wastes, biomedical and electronic wastes, kitchen and food wastes, plastic wastes, wastes, wastewater, hazardous waste materials, acids and chemicals. The waste management plan has been developed properly in compliance with environment laws and legislative policies and regulations (Sharp, 2012; Sharma, 2020).

The organization should monitor and inspect waste management related facilities and activities directly resulting from executing the scope and amendments of Waste Management Plan. Guidelines for proper handling, categorization, recording, minimization, recycling and disposal of all types of waste associated with organization operations and projects are part of this procedure may be undertaken

(Setyowati *et al*., 2017). Additionally, abandoned materials and materials intended to be recycled are considered wastes. It should be taken into account while WMP in prepared and executed in the organization. It is very important to understand this concept, because even though something is going to be recycled, it must be managed as a waste until it is actually recycled. The wastes are categorized as hazardous and non-hazardous wastes depending upon the quantum of causing the adverse effect to the environment. The hazardous waste should be disposed properly by ignitability, corrosivity, reactivity, irritability and toxicity behaviours. In ignitability, the flash point should be less than 60°C. Similarly, in corrosivity, the pH should be less than 2.0-3.5 or greater than or equal to 12.5-13.5. Similar to that of ignitability and corrosivity, the reactivity should be inherently unstable under ordinary conditions or when exposed to water. In irritability, when in contact with body the inflammation should not be caused. Toxicity should not cause risk of injury to health of organisms or the environment. Similar to that of hazardous waste management, non-hazardous waste management is very important and may still present hazards to employees who handle them properly.

All recommended safety and handling practices must be followed properly by the Management. The waste production should be eliminated whenever and wherever possible and the material only for its intended purpose on site should be used. Attempts should be made to minimize waste production, reuse the waste materials, recycle waste on site and then dispose of waste through properly designed. All hazardous waste shall be segregated from other types of hazardous wastes as well as non-hazardous wastes at the point of generation of waste (Hertwich, 2005). At all facilities, the types of containers with colour coding for easy identification should be kept to collect and segregate common wastes across the campus. Food waste shall be collected in separate containers in the campus especially at dining hall, canteen and food courts. All containers must be properly labelled. The label must clearly mention the name or type of waste. Also, if the waste is hazardous, it should be clearly labelled on the container along with its hazardous characteristics (e.g. flammable, toxic, radioactive, etc.).

9. Methods of Disposal of wastes

Coding system for different type of waste	
Waste material	(Colour or code)
Glass	(blue);
Metals	(green);
Plastic	(white);
Oily rags	(black);
Used oil	(red);
Rubbish / trash	(yellow)

Recycling and reuse methods may be adopted to minimize the quantity of wastes that are generated from the organization requiring disposal in a proper way. Some of the wastes can be reused within the facilities while others can only be recycled in the on and off-sites. The recycling of used oils, acids, solvents and chemicals is possible in some of the laboratories; e-wastes and plastic wastes including batteries may be sent back to manufacturer or distributor for recycling. Waste shall not be sold to the unauthorized contractors / companies, who may not have proper recycling facilities, to avoid misuse and to reduce associated liabilities (Singhania and Gandhi, 2015).

On-site Disposal facilities: Burial pits may be created in which buried waste should be covered with a thick layer of soil as 'daily cover' to reduce the environmental problems, such as odour from decaying / degrading waste, spreading of waste into other areas due to wind, vermin and disease vector, flies, mosquitoes, etc.
Reserve pits: These pits are used to temporarily store drilling waste, chemical waste, oily sludge and contaminated soil. The pits should be properly designed and lined to avoid soil, groundwater and surface water contamination.
Incineration: Incinerator will also be used for disposal of waste but before burning the trash, plastics, metal, glass and any other items that are not to be burned, should be segregated first. Ash of the incinerator shall be buried in the lined landfill as it may contain heavy metals.
Evaporation Ponds: The evaporation ponds are used to dispose of produced water at some facilities by evaporation. All evaporation ponds should be lined properly.

10. Aims and Objectives of Environment Audit

The important goal of an Environment audit is to promote the environment management and conservation for future generations. The reason for the environmental audit is to perceive, quantify, describe and prioritize the framework of environment sustainability in compliance with the applicable rules, regulations and requirements. In general, Environment audit can be achieved by creating awareness on the importance of safeguarding the environment among students, faculties and staff members, including public domain. An environmental audit programme is conventionally designed and implemented properly which can enhance an industry's environmental performance in a sustainable manner. It is useful to monitor the scale of optimum utilization of the resources and evaluating the company at National and International levels. The major goals of environment audit are:

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

i. To create plastic free campus with the help of management and the stakeholders and to evolve health consciousness among the stakeholders.
j. To suggest for using alternative energy for the conservation of energy resources.
k. To evaluate the wastewater quality and determination of wastewater characteristics & their effects on the living system.
l. To classify the categories of solid waste hazardous waste their sources, quantities & characteristics with respect to the nature of environmental hazards.
m. To introduce and implement the time saving technologies in production as well as providing eco-friendly ambience in an organization following the latest IT based techniques and to minimize the wastes through modern cleaner technologies.
n. To develop 'Water conservation policy', 'Waste management policy' and 'Green campus and Environment policy' by the Organization.
o. To maintains of Labour / Occupational health & medicine followed by proper documentation of environmental compliance status.
p. Regular environmental auditing once in a year will help in producing environmentally educated & technically sound personals.

11. Scope and Goals of Environment Auditing

Environmental auditing is often used as a generic term covering a variety of management practices used to evaluate an Organization's environmental performance. Strictly, it refers to checking systems and procedures against standards or regulations, but it is often used to cover the gathering and evaluation of any data with environmental relevance - this should actually be termed an environmental review. An environmental audit is a type of evaluation intended to identify environmental compliance and management system implementation gaps, along with related corrective actions. In this way they perform an analogous function to financial audits. Environmental auditing is essentially an environmental management tool for measuring the effects of certain activities on the environment against set criteria or standards. Depending on the types of standards and the focus of the audit, there are different types of environmental audit like ISO but not confused with environmental impact assessment. Organizations of all kinds now recognize the importance of environmental matters and accept that their environmental performance will be scrutinized by a wide range of interested parties.

Environmental impact assessment is different from environmental audit which is an anticipatory tool that takes place before an action is carried out. It is a kind of an attempt to predict the impact on the environment of a future action, and to provide this information to those who make the decision on whether the project should be authorized. It is being carried out when a development is already in place, and is used to check on existing practices, assessing the environmental effects of current activities (Patriarca *et al*., 2017). It is therefore providing a 'snap-shot' of looking at what is happening at that point in time in an organization. The International Organization for Standardization (ISO) has produced a series of standards in the field of environmental auditing. These standards are basically intended to guide organizations and auditors on the general principles common to the execution of environmental audits. In order to set a pure atmosphere free from pollution to the stakeholders in an organization campus, waste disposal management for both wet and dry wastes and recycling activities should be proper which in turn to restrict the environmental pollution.

The Management of the Organization (Auditee) should be shown their inherent commitment towards making ecofriendly atmosphere through the Environment auditing and ready to encourage all types of Environment related activities. They should promote all kinds of Environment related activities such as conduct of environment awareness programmes, campus farming, planting trees, and maintenance of greening, irrigation, use of bio fertilizers and avoidance of chemical fertilizers and agrochemicals on the campus etc., before and after the Environment auditing. The management should formulate 'Green and Environment Policies' based on Environment auditing report. A clean and healthy environment should enhance an effective teaching and learning process and provides a conducive learning environment to the stakeholders (Fachrudin, *et al*., 2019). They should create the awareness on the importance of environment through environmental education among the student members. Environment Audit is the most efficient and ecological way to manage environmental problems.

Environment audit may be beneficial to the campus in improving the greenery activities which in turn useful to save the planet for future generation. Environment audit is a kind of professional care and a simple indigenized system about the environment monitoring in terms of planting a large number of trees which is the responsibility of each and every individual who are the part of economical, financial, social, environmental factors. It is necessary to Environment audit frequently at least once in three years in campus because students and staff members should aware of the Environment audit and its advantages to save the planet by means of 'Go green concept' and help the institution to set environmental examples for the community, and thereby to educate the young learners. Environment audit is a professional and useful tool for an Organization to determine how and where they are maintaining the campus eco-friendly manner. It can also be used to implement the mitigation measures is a win-win situation for all the stakeholders and the planet. It gives an opportunity for the development of ownership, personal and social responsibility for the stakeholders.

In addition, the scope of an audit can vary from simple compliance testing to a more rigorous examination, depending on the perceived needs of the management. The technique is applied not only to operational environmental, health and safety management including monitoring, but increasingly also to product safety and product quality management, and to areas such as loss prevention. In environmental studies, it includes the site history, storage of materials in above ground and below ground, the disposal of liquid or hazardous wastes properly in onsite and offsite. It also pays attention in oil or chemical spill prevention. In the subset of safety it includes Special procedures for confined space entry, work on electrical equipment, breaking into pipelines, having firefighting equipment's, conducting safety training programmers for the stakeholder's and etc. (Costantino *et al*., 2018).

The waste disposal management covering collection, transport, treatment and disposal of waste and converting the waste into fertilizing materials should be proper in the organization campus. Dry waste includes paper, cardboard, glass tin cans etc. on the other hand; wet waste refers to organic waste such as vegetable peds, left-over food etc. which will be segregated based on the nature of degradability for recycling through the composting process and converting into a fertilizing material.

12. Environmental Audit Schemes and their Components

This particular tool is very important aspect of the environmental audit for the total management system in terms of its being an asset or a liability for the industry`s environmental performance (Peters and Romi, 2014). Environmental system is with a broad aim for a green environment.

- It helps in reducing all types of solid, water, electronic and biomedical wastes.
- It helps in assessing compliance with regulatory requirement.
- It also helps in prevention control of effect of pollutant in water and soil.
- It promotes relationship between qualified technicians, professionals and individuals,
- State Pollution Control Board, other public authorities and industrial association etc. responsible for the conduct of environmental audit as well as environmental audit schemes
- Environmental Audit Scheme has three following components such as 1) State Pollution Control Board, 2) Internal Auditor Board from the own organizations and 3) External Auditor Board from Audit agencies.

State Pollution Control Board:- It plays active role in implementing the environmental audit effectively. The steps involved in state pollution control board are mentioned. To prepare format of audit report on all the aspect of environmental protection. The board appoints some internal auditors to prepare industries audit report and then evaluation followed by verification of audit reports. Initiating the action on evaluated report of environmental audit is also equally important in terms of implementation.

Internal Auditor:- The selection of auditor consist of experienced experts from various backgrounds. A qualified auditor should be required as per the rules of State Pollution Control Board with well-equipped laboratory facility for analysis of water and air samples.

External Auditor:- Team should be approved by State Pollution Control Board based of their experience and expertise. Evaluated and verified reports have to send their comments to State Pollution Control Board for further action.

13. Role of Environmental Audit and Environmental Management System

One role of an environmental audit is to identify areas for improvement, but an audit does not, in itself, provide the means to implement changes. In order to do this, an environmental audit should be set in the framework of an environmental management system (Choy and Karudan, 2016, Arora, 2017). An environmental management system (EMS) provides a mechanism for systematically managing the environmental effects of an Organization. EMSs provide a framework to:

- Identify the environmental effects and document regulatory requirements
- Set objectives and targets for future environmental performance
- Implement procedures and measures for achieving the objectives and targets
- Undertake audits to assess environmental performance and the effectiveness of measures to achieve the defined objectives and targets.

In order to ensure that any other stakeholders understand the environmental management system usually rely heavily on documentation and verification. Environmental effects, environmental regulations, objectives and targets, and the procedures are usually all documented.

14. Target Areas of Environmental Auditing

- Auditing for Water Management (Wastewaters and Industrial effluents)
- Auditing for Waste Management (Solid, Electronic and Biomedical)
- Auditing for Energy Management (Electrical energy and Fossil Fuel use)
- Auditing for Soil Analysis (Soil health, degradation and conservation)
- Auditing for Carbon Footprint (Electrical, vehicles and human population)
- Auditing for Green Campus facility (Correlated with Green Campus Audit)
- Auditing with the Organization's Management for financial allotment
- Auditing with the Stakeholders for their contribution on environment studies
- Environmental Education and Implementing Swachh Bharath Abhiyan Scheme

15. Procedures followed in Environment Audit

15.1. Environment Systems Audit

Environmental audit involves monitoring an Organization concerning about the green campus, environment, sanitation and hygiene policies. It is a regular process that is conducted periodically by a regulated entity to check whether an Organization meets the requirements of environmental compliance. The process of environmental audit includes examining, collecting, evaluating, documenting data and analyzing various components related to environmental aspects (IGBC, 2021; WGBC, 2021). Environmental audit was carried out as per the procedures mentioned of the Manual of Gnanamangai *et al*. (2021). The environmental audit possesses the following characteristic features in which various aspects of wastes generation and steps taken by the Organization to reduce both solid and liquid wastes without harming the environment.

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

15.2. Carbon footprint by measuring Carbon dioxide level in the Campus

The level of Carbon dioxide is measured in different places across the Organization campus using a portable CO_2 Analyzer (Non dispersive infra-red meter). In addition, CO_2 meter is also displayed the readings of atmospheric temperature, relative humidity and dew point in the places, where the level CO_2 is measured. The meter started measurements of CO_2 level in the atmosphere after powered ON and updated the readings every second in the display screen. If the operating environment is changed (example from high to low temperature) which took 30 seconds for CO_2 sensor to respond and 30 minutes for flexibility in relative humidity. The meter features an audible alarm to give warnings when CO_2 concentration exceeds the set limit. It emits beeps (Abt.80dB) when CO_2 level goes over the set value and stops when any key (except SET) is pressed or the readings fall below the set values. The Carbon footprint per year is calculated (www.carbonfootprint. com) based on electricity usage per year in which CO_2 emission from electricity and the sum of transportation per year in terms of number of the shuttle buses service operated by the Organization and number of cars, motorcycles and trucks entering in the Organization campus. These factors are multiplied with total number of trips in each day and approximate travel distance of vehicles covered in each day (in kilometers) with a coefficient (0.01) to calculate the emission of CO_2 in metric tons per year.

15.3. Steps involved in the Process of Environmental Audit

Step #1: Opening meeting among the audit team and auditees, discussed about the audit procedure and document verification.
Step #2: Visited the on-site of the audit along with the audit team and auditees.
Step #3: Walked around campus to check the facility as walk-through audit and took photographs for preparing the audit report.
Step #4: Monitor the components as per the environmental audit checklist (Sanitation and hygiene, water conservation, waste management and green campus and environment policies).
Step #5: Noted down what all components are present and what are all not available in the campus as of environmental audit components listed by NSF ISO- EMS checklist.
Step #6: Identified the issues in the campus with respect to the environmental compliance and strengths and weaknesses of the Auditee's Management controls and risks associated with the audit.
Step #7: Looked into other items to be monitored as per the NSF checklist with respect to Ecology and Environment studies.
Step #8: Exit meeting held after the audit in which the audit findings with the members of the Organization was discussed.
Step #9: Prepared and distributed the findings as a Report and Certificate along with the recommendations including the best practices followed by the Auditee.
Step #10: Comparison between the last audit report with the present audit report in which the number of suggestions and recommendations were taken into consideration and rectified significantly by the Management.
Step #11: Observed the audit process undertaken by the certifying agency between the last audit and current audit processes, whether the same certifying agency has undertaken the audit process or not?.

Meeting with the Faculty Team of SVKM's Usha Pravin Gandhi College of Arts, Science and Commerce and Nature Science Foundation

16. Benefits of an Environmental Audit

- Environmental audit provides the following benefits to the Organization:
- Discover various issues related to the environment in the Organization.
- Compute the issues, identify and assess the impact of the issues.
- Provide suggestions to minimize the issues found in the Organization. On conducting an Environmental audit, it provides the following results:
- Conservation of resources and reduction of raw materials.
- Minimizing wastes, control of pollution and reduction of costs.
- Improvement in working conditions and improvement in process efficiency.
- Corporate image and marketing opportunities.
- Concern about the environmental impact of the Organization.
- Development of ownership, personal and social responsibility for the College and its environment.
- Preparation of Environmental management plan and monitoring.
- Assessment of environmental input and risks to the ecosystem.
- Identifying areas of strength and weakness for improvements.
- Evaluation of pollution control status in the campus.
- Verification of compliance with environment laws.
- Assuring safety of plant, environment and human beings.
- Enhancement of loss prevention, manpower development and marketing.
- Budgeting for pollution control, waste prevention, reduction, recycling and reuse methods.
- Providing an opportunity for management to give credit for good environmental performance.
- As a whole environmental audit plays an important role in minimizing the environmental problem locally, regionally, nationally and internationally.

- Identification of various sources to generate wastes and types of wastes
- Types of degradable and non-degradable wastes in the campus.
- Setting up the target for reduction of wastes and source of waste generation without affecting the environmental health through policy.

17. Phases of an Environmental Audit

The environmental audit encompasses three phases such as pre-audit, during- audit and post-audit. These phases involve various components to resolve the problems in the campus as well (Arora, 2017; Gnanamangai *et al*., 2021).

17.1. Pre-Audit

Pre-audit involves the following components:

- ✓ Planning the environmental audit
- ✓ Selecting the audit team based on experience and expertise
- ✓ Scheduling the audit facility and venue of audit
- ✓ Scrutinizing the audit application and checklist
- ✓ Opening meeting between audit team and auditee
- ✓ Acquiring the background information of the organization
- ✓ Visiting the site of audit by the audit team and coordinators
- ✓ Audit programme and briefing
- ✓ Collection of data and documents verification
- ✓ Discussion with the auditee for data verification

17.2. During-Audit

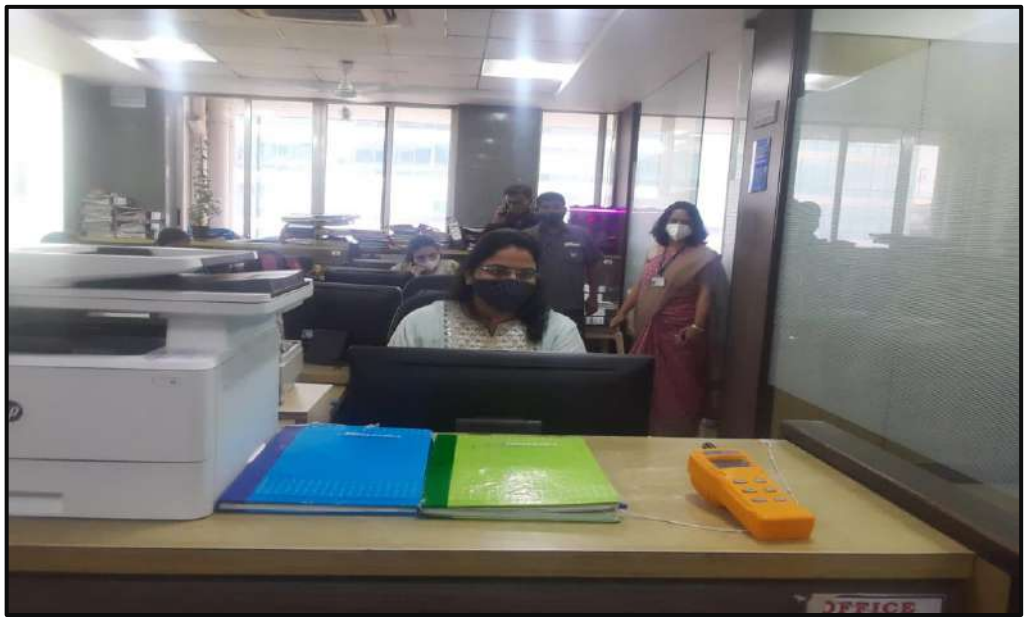
During the audit, the following components are involved:

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

17.3. Post-Audit

Post-audit involves the following components:

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



Environment Audit at SVKM's Usha Pravin Gandhi College of Arts, Science and Commerce by Nature Science Foundation, Mumbai, Maharashtra by measuring Carbon dioxide level in the room using Carbon dioxide Analyzer.

18. Components of an Environmental Audit

Environmental audit has five components, namely:

1) Sanitation and hygiene policy
2) Green and Environment policy
3) Water conservation policy
4) Water management policy
5) Waste management policy
6) Rainwater harvesting policy
7) Environment conservation policy
8) Waste management initiatives
9) Environment management policy
10) Environment monitoring policy

18.1. Sanitation and Hygiene Policy

In this component, the following are being considered:

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

18.2. Water Conservation Policy

In this component, the following are being considered:

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

18.3. Rainwater Harvesting Policy

In this component, the following are being considered:

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

18.4. Waste Management Policy

In this component, the following are being considered:

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

18.5. Waste Management Initiatives

In this component, the following are being considered:

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

18.6. A good environmental audit

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

- Waste minimization opportunities realized, that contributes to reduction in operating price.
- Increased worker cognizance of environmental standards and responsibilities.
- Improve employee relations and morale.
- Improve the image of organization and its good will.
- Maintenance of sustainable stage of improvement.

19. About the Organization

Usha Pravin Gandhi College of Arts Science and Commerce is blossoming into an institution par excellence. With over a decade of fruitful and dedicated service, it has earned an enviable reputation. It is only possible because of untiring efforts of the faculty and staff of the institution, with good team work of faculty, the healthy cooperation of the students and the unstinting support of the Management. The college has been achieving distinction in academics and winning laurels in sports, cultural events and social work. With University rankers to boast of, UPGCASC is definitely a place for all aspiring students.

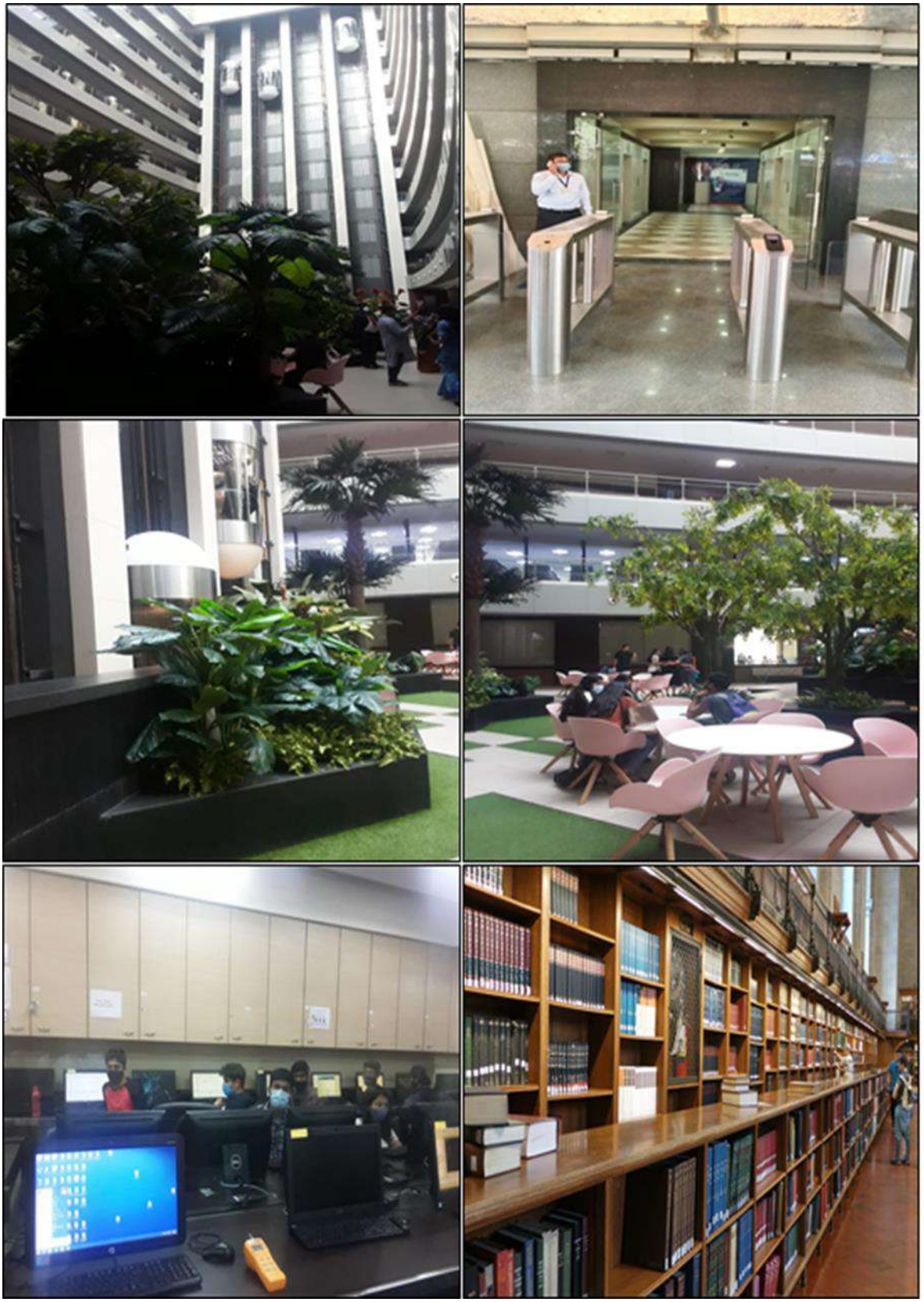
Along with sports, co-curricular and extra-curricular activities, the institute has a placement cell too, which interacts with the leading industries, arranges campus interviews and offers ample job opportunities and internships to students of all disciplines. In addition to curricular development, great emphasis is laid on character-building, discipline and life skills in students.

Ever since the inception of this college in 2003, we have been striving for academic excellence in areas of Mass Media, Information Technology (Graduation and Post-Graduation) and Management studies and at the same time marching forward with a mission of professional, intellectual, personal and social development of students.

UPGCASC had hosted and organized an International Conference, with the theme “Spirituality of Workplace”. The conference resulted in an A spiritual and secular environment in all areas and avenues in life is the only answer to man’s quest for peace and harmony.

19.1. Total Campus Area, Building Spread Area, Vehicles and human population

S.No.	Details of Area	Total area
1.	Total Campus area	15958.80 sq.mt
2.	Total number of Girl students	941
3.	Total number of Boy students	834
4.	Total number of Teaching Staff	25
5.	Total number of Non-teaching staff	16



Facilities at SVKM's Usha Pravin Gandhi College of Arts, Science and Commerce, Mumbai, Maharashtra.

20. Audit Details

Date/Day of Audit	**: 20.12.2021 (Monday)**
Venue of Audit	**: SVKM's Usha Pravin Gandhi College of Arts Science and Commerce,** Mumbai - 400 056, Maharashtra, India.
Audited by	**: Nature Science Foundation,** Coimbatore - 641 004, Tamil Nadu, India.
Audit type	**: Energy Audit**
Name of ISO EMS Auditor	**: Mrs. S. Rajalakshmi,** Chairman & ISO QMS, EMS Auditor, NSF.
Name of Lead Auditors	**: Dr. R. Mary Josephine,** Board of Directors, NSF**.** **Dr. R. Balu,** Certified Lead Environment Auditor, NSF. **Dr. Sunayana J Kadle,** Certified Lead Environment Auditor, NSF.
Name of Energy Auditors	**: Er. D. Dinesh Kumar,** BEE Certified Energy Auditor, NSF. **Er. B. Vijayalakshmi** Certified Lead Energy Auditor, NSF.
Name of IGBC AP Auditor	**: Dr. B. Mythili Gnanamangai,** Vice-Chairman & ISO EMS Auditor, NSF IGBC AP, Indian Green Building Council.

21. Qualitative and quantitative measurements of the Environment Audit

It covers both qualitative and quantitative measurements including physical observation of eco-friendly environment set-up. The qualitative and quantitative measurements such as achievement of environmental objectives and targets by implementing agency (Auditee), appointment of Environmental Engineers and Agriculture Staff working for environment monitoring, Drinking water / RO water / Borewell water / Open well water / Pond water / Municipal or Corporation water facility to the stakeholders and periodical checking of drinking water quality through Physico-chemical properties analysis, Wastewater treatment facility, Hazardous and toxic material disposal facility, Solid waste management facility, Renewable energy utilization (Solar panel, wind mill, solar water heater, etc,), Air ventilation at Indoor / Outdoor auditorium, seminar / conference halls, classrooms, hostel, canteen, staff rooms, laboratories, restrooms, etc., Availability of Biogas plant, Rain harvesting system, water reservoirs, etc. Incinerator for napkin disposal use, Housekeeping, storage, areas, piping, plumping and etc. facility, Sign boards indicating plastic free campus, tobacco free campus, don't waste water, don't walk on the lawns, don't plug flowers, etc. The ratio of Environment sustainability courses (Environmental Science, Engineering, Technology, Management, Monitoring, Climate change, Global warming, etc.) to total courses / subjects to under graduate and post graduate course students including research scholars, Per capita water consumption per day and carbon footprint in the Organization campus due to an extensive use of vehicles, electricity usage and human population load are also analysed during the environment audit. These qualitative and quantitative measurements are playing important role in environment sustainable development in the campus.

An account of a large number of Oxygen producing and Carbon-di-oxide absorbing 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. 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 and NSS bodies may be involved in green campus as well as eco-friendly atmosphere initiatives, planning and efforts among stakeholders. Outreach programmes may be conducted for dissemination of natural resources management, environmental pollution studies, green and eco-friendly atmosphere pledge initiatives to rural, tribal and urban people across the country. Signing of MoU with Govt. and NGOs to ensure ecofriendly campus maintenance, conduct of awareness programmes and cultural activities for environmental monitoring 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-carbon emitting vehicles, battery operated vehicles, bicycles, biofuel use and control of car smokes and exhaust with respect to routine FC services, steps taken to take care of daylighting, AC machine heat and carbon dioxide emission & carbon sequestration, Eco-friendly Refrigerants, instruments and materials use including Energy efficiency measures taken, Mosquitos, vectors and predators identified in the campus which are the root cause of various diseases spreading to students and impactful organization programmes on climate change, global warming and environmental protection are taken into account while environment audit is carried out. In addition, academic credentials like taking up major and minor Projects, Dissertations, Thesis work and Scholarly publications on environmental science, engineering, technology and management domains carried out by students and staff members may be taken into account towards environment sustainability management. Best practices followed on green campus and eco-friendly set-up initiatives, planning and efforts in the Organization and recommendations for improvement are illustrated in the audit report as well.

21.1. Qualitative Measurements

S.No	Requirements and checklists of the audit	Conformity		
		Yes	No	NA
1.	Have Internal Environment Audit procedures been developed and implemented in the Organization?	√		
2.	Have programmes for the achievement of environmental objectives and targets been established and implemented as on today?	√		
3.	Have responsibilities been assigned for programmes at each appropriate function and level? (Environmental Engineer and Agriculture Staff working for environment monitoring in the campus)		√	

4.	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. Hazardous and toxic material disposal facility		√	
	d. Solid waste management facility	√		
	e. Renewable energy utilization (Solar panel, wind mill, solar water heater, etc.)	√		
	f. Air ventilation at Indoor / Outdoor auditorium, seminar / conference halls, classrooms, hostel, canteen, staff rooms, laboratories, restrooms, etc.	√		
	g. Acoustic proof in indoor auditorium, seminar / conference halls	√		
	h. Availability of Biogas plant		√	
	i. Rain harvesting system, water reservoirs, etc.	√		
	j. Incinerator for napkin disposal use		√	
	k. Housekeeping, storage, areas, piping, plumping and etc. in a proper way	√		
	l. Sign boards indicating plastic free campus, tobacco free campus, don't waste water, don't walk on the lawns, don't plug flowers, etc.	√		
	m. The ratio of Environment sustainability courses (Environmental Science, Engineering, Technology, Management, Monitoring, Climate change, Global warming,) to total courses / subjects	√		
	n. Per capita water consumption per day	√		
5.	Signing of MoU with Govt. and NGOs to ensure ecofriendly campus maintenance	√		
6.	Implementation of Government schemes (Swachh Bharath Abhiyan under Clean India Mission)	√		
7.	Functioning of Nature club, Eco club, Cell, Forum, Association, NCC, NSS bodies and Social Service League for students and staff members on environment conservation, pollution control and nature protection.	√		
8.	Conduction of awareness programmes and cultural activities for environmental monitoring and ecosystem maintenance to the stakeholders	√		
9.	Conduction of outreach programmes for dissemination of natural resources and environmental pollution	√		
10.	Implementation of composting pits, vermicompost unit, recycling of kitchen wastes collected from hostels, canteens, and other places	√		

11.	Steps taken for organic, inorganic, toxic, e-waste, biomedical, food, sewage waste management, segregation of wastes and reuse methods		√	
12.	Public transport, low-carbon emitting vehicles, battery operated vehicles, bicycles, biofuel use and control of car smokes and exhaust with respect to routine FC services	√		
13.	Observation on the site preservation, soil erosion control and landscape management	√		
14.	Projects and Dissertation works and Scholarly publications on environmental science, engineering, technology and management carried out by students and staff members	√		
15.	Steps taken to take care of daylighting, AC machine heat and carbon dioxide emission & carbon sequestration*			√
16.	Eco-friendly Refrigerants, instruments and materials use including Energy efficiency measures taken *			√
17.	Mechanism of monitoring environmental parameters (Temperature, Relative humidity, Rainfall, Sunshine, Wind speed, dew point)*			√
18.	Are the required resources (e.g. personnel skill development, procurement, finance, etc.) for implementation and control of the environmental management system provided by Management?		√	
19.	Any mosquitos and vectors and predators identified in the campus which are the root cause of various diseases spreading to students?	√		
20.	Any Digital / Automatic technology is adopted to reduce consumption of paper, gas, water, energy, etc.		√	
21.	Are all monitoring equipment appropriately maintained and calibrated?	√		
22.	Impactful Organization programmes on climate change, global warming, environmental protection, etc.	√		
23.	New initiatives to decrease private vehicles on campus to reduce carbon emission		√	

* Applicable for Industrial sectors
** A minimum of 50% criteria should be attained
*** Not Applicable

21.2. Quantitative Measurements

S.No	Requirements and checklists of the audit	Numbers / Percentage
1.	Number of RO water Plant in the campus for drinking water	Available is sufficient quantity
2.	Number of Borewell water and Open well water facility	Not possible at Cities like Mumbai
3.	Number of Percolation Pond and Check Dam facility	Not possible at Cities like Mumbai
4.	Number of Wastewater treatment facility	Nil
5.	Number of Solid waste management facility	1
6.	Number of Renewable energy utilization (Solar panel and solar water heater)	1
7.	Number of Rain harvesting system and water reservoirs	2
8.	The ratio of Environment sustainability courses (Environmental Science, Engineering, Technology, Management, Monitoring, Climate change, Global warming) to total courses / subjects	80:20
9.	Functioning of Nature club, Eco club, Association, and NSS on environment conservation, environmental pollution, nature protection and natural resources maintenance.	8
10.	Signing of MoU with Govt. and NGOs to ensure ecofriendly campus maintenance	2
11.	Implementation of Government schemes (Swachh Bharath Abhiyan under Clean India Mission) programmes conducted	10
12.	Number of composting pits and vermicompost unit for recycling of kitchen wastes and plant leaf litters degradation	1
13.	Per capita water consumption per day	14.5 lit/day
14.	Carbon footprint in the campus due to Electrical energy usage	2455.06 m/t
15.	Carbon footprint in the campus due to Vehicles usage	5.24 m/t
16.	Carbon footprint in the campus due to Petroleum gas usage	7.20 m/t
17.	Carbon footprint in the campus due to Human population load	4.57 m/t
18.	Carbon footprint in the campus due to use of Petrol and Diesel for operating Generators for power generation	4.09 m/t

22. Observations of the Environment Audit

22.1. Plastics use and their impact on the environment

The Ministry of Environment, Forest and Climate Change, Government of India has notified the Plastic Waste Management Rules, 2016. A Central Pollution Control Board report indicated that the total annual plastic waste generation in India at a humungous is around 3.3 million metric tonnes per year for which the data were collected from 60 major cities in India. The country generates around 26,000 tonnes of plastic waste a day out of which 60% of plastic produced is recycled. But the problem with plastic is that most of it isn't biodegradable. It doesn't rot, like paper or food, so instead it can hang around in the environment for hundreds of years. More than eight million tonnes of plastic enters the world's oceans each year and most of that escapes from land. It is observed that 96% of plastic wastes are collected and segregated by the respective urban bodies in which the recyclable plastic waste are sold to the recyclers and non-recyclable plastic waste are sent for co-incineration in cement plants. People should be asked to use reusable items and initiate models which allow up-cycling of waste items for better use. This will help reduce plastic waste from urban local bodies, as well as curb the value for waste among the citizens. Plastic waste management is very important, because plastic destroys food chains, only 9 percent of the total plastic waste in the world is recycled.

People use plastic bags and plastic ware items every dayto hold objects like meals, clothes, grocery and stationary items, which can be bought from shops. Generally, the plastic items are non- degradable in nature that lead to soil pollution and affect the soil health significantly (Lazarevic *et al*., 2010). Most of the plastic items are considered as solid waste. This has resulted in many damaging environmental effects inclusive of animal choking, pollution, blockage of channels, rivers and streams, and landscape disfigurement. According to the World Health Organization (WHO) report, plastic items take at least 400 years to decompose completely in the soil which illustrates the subsequent effects on the environment. Plastic pollutants form a basis for damage to humans, animals and flora through toxic pollution. It can take masses or even heaps of years for plastic to break down so the environmental harm is lengthy-lasting. It impacts all organisms in the food chain from tiny species to big ones. There is a need to reduce the plastic use to effectively limit plastic waste in the campus (Eriksson *et al*., 2016).

SVKM’s Usha Pravin Gandhi College of Arts, Science and Commerce has taken sufficient attempts not to use plastics in the campus and displayed a slogan ‘Plastic free campus’ in places like canteen, hostel dining halls, seminar halls, corridors, etc. to the students, parents and public. The SVKM’s Usha Pravin Gandhi College of Arts, Science and Commerce Campus Management insisted the people use eco-friendly bags made from

organic materials like plant fibres which are easily decomposable in nature. These efforts are very much essential to keep the environment neat and clean to conserve nature.

22.2. Solid Waste Management Practices at SVKM's Usha Pravin Gandhi College of Arts, Science and Commerce Campus

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

The Ministry of Environment, Forest and Climate Change, Government of India has notified the Solid Waste Management Rules, 2016. As per the rules, solid waste means solid or semi-solid domestic waste, sanitary waste, commercial waste, institutional waste, catering and market waste and other non-residential wastes, street sweepings, silt removed or collected from surface drains, horticulture waste, agriculture and dairy waste, treated bio-medical waste excluding industrial waste, bio-medical waste and e-waste, battery waste, radio-active waste generated in the area under the local authorities. As per the rules, the local bodies are responsible for the collection, treatment and disposal of solid wastes (Irwansyah, 2017; Irwansyah *et al*., 2017). The 'Central Board of Solid Waste Management' is the monitoring authority under the said rules and is responsible for granting authorization to local bodies for processing and disposal of solid waste.

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

Solid Waste Management Facility at SVKM's Usha Pravin Gandhi College of Arts, Science and Commerce, Mumbai, Maharashtra.

22.2.1. Waste Management Practices

Waste management has a common mandate that the "Producer Owns the Responsibility". The community that generates waste should develop more responsibility in handling the waste with more care thus reducing negative impact on the environment. In a study conducted in 2013 by 'M/S Hand in Hand India Ltd.' in SVKM's Usha Pravin Gandhi College of Arts, Science and Commerce Campus had quantified a daily average of wastes in which food waste is about 37%, recyclable waste is about 27% and other organic waste is about 36%. The study revealed that the solid wastes needs to be professionally handled. The solid wastes are collected from different places of SVKM's Usha Pravin Gandhi College of Arts, Science and Commerce Campus and segregated based on bio-degradable and non-degradable materials subsequently subjected for recycling and degradation processes like composting. Details of the waste management practices in SVKM's Usha Pravin Gandhi College of Arts, Science and Commerce Campus are 1) Bio-degradable waste handling, 2) Sewage Treatment Plant 3) Bio-gas

plant, 4) Disposal of E-Waste and 5) Rain Water Harvesting System. Regarding the food wastes, a portion of food wastes being pulverized and used in the bio-gas digester and the balance quantity is sent to piggeries. Organic wastes like dry leaves, vegetable cuttings, etc. are sent for bio-composting.

22.2.2. Bio-degradable and Non-degradable waste materials Management Practice

For the purpose of segregation of waste (Organic, recyclable, non-recyclable and e-waste) at source and collecting the same in 'Waste Bins' are placed at designated locations in the Campus *viz*. Students hostels, Staff quarters, Department Laboratories, Canteen, Foot court and common places. A Contractor (M/s Metro Support Services, Mumbai) is engaged for the collection, segregation and shifting of waste materials generated in the campus on MoU signed between the Contractor and Organisation Biodegradable wastes are converted into organic compost for its reuse.

Bio-degradable and Non-degradable waste materials Management Practice at SVKM's Usha Pravin Gandhi College of Arts, Science and Commerce, Mumbai.

22.2.3. Disposal of e-Waste at SVKM's Usha Pravin Gandhi College of Arts, Science and Commerce Campus

The Ministry of Environment, Forest and Climate Change, Government of India notified the E-Waste Management Rules, 2016. Electronic waste or e-waste comprises old and end of life electrical and electronic appliances such as telephones, cellular telephones, computers, laptops, television sets, refrigerators, washing machines, air-conditioners, fluorescent and other mercury containing lamps etc. The rules apply to every Manufacturer, Producer, Consumer, Bulk Consumer, Collection Centre, Dealer, E-Retailer, Refurbisher, Dismantler and Recycler involved in the manufacture, sale, transfer, purchase, collection, storage and processing of e-wastes or electrical and electronic equipment. As per the Rules, the producer of the electrical and electronic equipment shall be responsible for collection and channelization of e-wastes generated from the 'end-of-life' of their products under Extended Producer Responsibility (EPR).

E-Waste Management at SVKM's Usha Pravin Gandhi College of Arts, Science and Commerce, Mumbai, Maharashtra

In compliance to the E-Waste Management Rules, 2016, Government of India, e-waste materials were collected from SVKM's Usha Pravin Gandhi College of Arts, Science and Commerce are being segregated and then sold to Authorised Agencies which are approved by the Pollution Control Board (PCB) for handling e-waste. Due to this e-waste activity disposal, the e-waste pollution is significantly reduced in the SVKM's Usha Pravin Gandhi College of Arts, Science and Commerce Campus. However, a proper method of e-waste disposal should be done in coming years in collaboration with Maharasthra State Pollution Control Board as per the E-Waste Management Rules, 2016.

22.2.4. Construction & Demolition of Waste Management

The Ministry of Environment, Forest and Climate Change, Government of India has notified the Construction and Demolition Waste Management Rules, 2016. These Rules are notified exclusively to manage waste from construction activities. These Rules apply to every waste resulting from construction, re-modelling, repair and demolition of any civil structure of individual or organization or authority, which generates construction and demolition wastes such as building materials, debris and rubble. According to the Rules, the local bodies need to ensure proper management of construction and demolition wastes (Handy *et al*., 2002). State Pollution Control Board is to grant authorization for the waste processing facility and to monitor the implementation of these Rules.

22.2.5. Hazardous Waste Management

The Ministry of Environment, Forest and Climate Change, Government of India, New Delhi has notified the Hazardous and Other Wastes (Management and Trans boundary Movement) Rules, 2016 under the Environment (Protection) Act, 1986. As per the rules, hazardous waste means "any waste which by reason of characteristics such as physical, chemical, biological, reactive, toxic, flammable, explosive or corrosive, causes danger or is likely to cause danger to health or environment, whether alone or in contact with other wastes or substances". The hazardous waste generator shall follow the steps namely prevention, minimization, reuse, recycling, recovery, utilization including co-processing and safe disposal of hazardous waste (Nascimento and Filho, 2010). The Board of 'Hazardous Waste Management' is taking effective steps in handling and management of hazardous wastes, its treatment and disposal in an environmentally safe manner.

SVKM's Usha Pravin Gandhi College of Arts, Science and Commerce has taken pioneering efforts to dispose the hazardous waste properly that are generated from various Department laboratories. Acids, solvents, salts, reagents and cancer-causing substances (carcino chemicals) will cause cancer to the stakeholders those who doing research and/or experiments that are disposed properly. The other carcinogenic materials such as Alcoholic beverages, Areca nut, Asbestos (all forms) and mineral substances (such as talc or vermiculite) that contain asbestos, Coal, indoor emissions from household combustion, Glass wool fibers (inhalable), Leather dust, Ionizing radiation (all types), Solar radiation, X- and Gamma-radiation, Iron and steel founding (workplace exposure), Isopropyl alcohol manufacture using strong acids, Tobacco smoke, second hand, Welding fumes, Wood dust, Painter (workplace exposure), Rubber manufactured materials, Silica dust, Crystalline, in the form of quartz or cristobalite will cause various types of cancer to the students and staff members that are disposed properly as per the guidelines of Nascimento and Filho (2010). The observation need to be strengthen in terms of proper disposal of hazardous waste without harming the environment and land.

Acids and Reagents should be carefully mixed with 2 to 5 gallons of water and poured the diluted solution down the sink, flushing with large amounts of water. It should be done slowly to avoid splashes. It's very important to always add the chemical to the water and not the water to the chemical. It is important to dispose of acids with very low pH (<2) safely. If the acid doesn't have heavy metals or other toxic substances dissolved in it, neutralizing the pH to a less acidic level (pH 6.6-7.4) allows to dispose of the substance in the standard sewer system.

Chemical wastes are regulated by the Environmental Protection Agency (EPA) through the Resource Conservation and Recovery Act (RCRA). It cannot be disposed of in regular trash or in the sewer system. Most chemical wastes must be disposed of through the World Hazardous Waste Programme safely without affecting the environment, soil health and water quality. Carcinogenic substances should never be disposed of from the Department laboratories directly through drains or by evaporation into the atmosphere, nor should they be buried since they might be released later.

Carcinogenic substances should be treated in such a way that the degradation products are non-toxic and non- carcinogenic; the procedures involved for treatment and

disposal do not result in exposure to these substances of personnel in charge of the work; and the procedures involved for treatment and disposal do not result in contamination of equipment or space (Nascimento and Filho, 2010). Biological wastes and animal wastes, human or animal blood and body fluids can be poured down the drain (sanitary sewer), under running water after it has been decontaminated by autoclave or chemical means. In addition, animal wastes and microorganisms including some biological waste materials should be disinfected with liquid detergents and disinfectant solution and then poured down the drainage after dilution with water (pH 6.6-7.4).

SVKM's Usha Pravin Gandhi College of Arts, Science and Commerce has a certain protocol to dispose waste as well as expiry chemicals in a proper way. But there is no proper record for disposing of acids, reagents, carcinogenic and hazardous chemicals as per the rule of Central Pollution Control Board (CPCB) for verification. It is suggested to keep a proper record for the disposal of all utilized as well expiry chemicals as per the CPCM norms of 'Waste Disposal and Tracking Form & Record' without harming the environment especially water, land and air. E-waste, biomedical wastes and human wastes should be disposed properly based on the offsite and on-site disposal facility.

22.2.6. Waste Disposal and Tracking Form

Name of the Organization : SVKM's Usha Pravin Gandhi College of Arts, Science and Commerce
Address of the Organization : Mumbai – 400 056, Maharashtra.
Date of Waste Disposal : From April 2018 to March 2021
Reporting Team and details : IQAC and NAAC Teams

S.No.	Types of Waste	Approximate Quantity / Unit Disposed	Disposal Location (On-site / Off-site)	Authorized Company responsible for recycling
1.	Acids and Bases	Data available with the Respective staff	Off-site	--
2.	Aerosol Cans (Empty)	Not Applicable	--	--
3.	Agriculture Waste	Not Applicable	--	--
4.	Aluminium, Metal Cans, Tins	Not Applicable	--	--
5.	Asbestos	Data available with the Respective staff	--	--
6.	Batteries (Dry)	No data available	--	--
7.	Batteries (Lead Acid)	No data available	--	--
8.	Biomedical Waste	Not Applicable	--	--
9.	Car exhaust	Not Applicable	--	--
10.	Charcoal	Not Applicable	--	--
11.	Clinical Waste	Not Applicable	--	--

12.	Cloth Materials Waste	Not Applicable	Off-site	--
13.	Construction Waste	Data available	Off-site	Mumbai Corporation
14.	Condensate Waste	Not Applicable	--	--
15.	Crude Oil	Not Applicable	--	--
16.	Descaling Acids	Not Applicable	--	--
17.	Drilling Fluids / Solids	Not Applicable	--	--
18.	Drums and Containers (Empty)	Not Applicable	--	--
19.	Effluents from major equipment	Not Applicable	--	--
20.	Electrical Waste (Wires, Switches, Fans, A/C machines, Holders, Meters, Coils, etc.)	Data available with the Respective Officer	Off-site	--
21.	Electronic Waste (Computer, Laptop, CD, Pen drive, Key boards, Mouse, Printers, UPS)	Data available with respective Departments	Off-site	-do-
22.	Fertilizer Waste	Not Applicable	--	--
23.	Filters	Not Applicable	--	--
24.	Fluorescent Light Tubes	Data available with the Respective staff	Off-site	--
25.	Food Waste	Data available with the Hostel / Canteen	Off-site	-do-
26.	Furniture Items	Data available with the Respective staff	Off-site	-do-
27.	Garbage and Cardboards	Data available with the Respective staff	Off-site	-do-
28.	Glass Bottles	Data available with the Respective staff	Off-site	-do-
29.	Glassware items Waste	Data available with the Respective Departments	Off-site	-do-
30.	Glycols	Not Applicable	--	--
31.	Hazardous Waste	Not Applicable	--	--
32.	Household items	Not Applicable	--	--
33.	Human Waste	Municipal Corporation	On-site	--
34.	Inert Waste	Not Applicable	--	--

35.	Laboratory Wastes	Data available with the Respective Departments	Off-site	--
36.	Lights and Bulbs	Data available	Off-site	Mumbai Corporation
37.	Kitchen Waste	Data available with the Hostel Office	On-site	--
38.	Metal Waste	No data available	--	--
39.	Napkins	Human Resource	On-site	--
40.	Oil Contaminated Soil	Not Applicable	--	--
41.	Oily Sludge & Rags (Used)	Not Applicable	--	--
42.	Packaging Waste	Data available	Off-site	Mumbai Corporation
43.	Paint Waste	Data available	Off-site	Mumbai Corporation
44.	Paper Waste	Data available	Off-site	Mumbai Corporation
45.	Pathological Wastes	Not Applicable	--	--
46.	Pigging Wastes	Not Applicable	--	--
47.	Plant Wastewater	Not Applicable	--	--
48.	Plastic Waste	Data available with the Respective Engineer Office	Off-site	Mumbai Corporation
49.	Plasticware items Waste	Data available with the Respective Engineer Office	Off-site	-do-
50.	Produced Water Waste	Not Applicable	--	--
51.	Radioactive Waste	Not Applicable	--	--
52.	Rinsate Waste	Not Applicable	--	--
53.	Rubber Waste	Not Applicable	--	--
54.	Salts used in Laboratories (Used & Expiry Chemicals)	Data available with the Respective Departments	Off-site	Mumbai Corporation
55.	Sanitary Wastewater	Data available with the Respective Engineer Office	On-site	--

56.	Scale (Pipe and Equipment)	Data available with the Respective Engineer Office	Off-site	--
57.	Sewage Sludge	Data available with the Respective Engineer Office	On-site	--
58.	Solvents	Data available with the Respective Departments	Off-site	--
59.	Sludge and allied	Not Applicable	On-site	--
60.	Trash (i) Glass (ii) Metal (iii) Plastic (iv) Oils (v) General Trash	Data available in appropriate places	Off-site	Mumbai Corporation
61.	Synthetic Dyes, other items	Data available with Textile Department	Off-site	-do-
62.	Textile Waste	Data available with Textile Department	Off-site	-do-
63.	Used Engine Oil	No data available	--	--
64.	Wastewaters (Liquid Waste: Detergents, Soap, Oil, etc)	No data available	--	--
65.	Wood Waste	No data available	--	Mumbai Corporation

22.2.7. Auditing for Energy Conservation and Management

Energy cannot be seen, but we know it is there because we can see its effects in the forms of heat, light and power. This indicator addresses energy consumption, energy sources, energy monitoring, lighting, appliances, and vehicles. Energy use is clearly an important aspect of campus sustainability and thus requires no explanation for it inclusion in the assessment (Ingle *et al*., 2014). An old incandescent bulb uses approximately 60W to 100W while an energy efficient light emitting diode (LED) uses only less than 10 W. Energy auditing deal with the conservation and methods to reduce its consumption in terms of 1) Reducing the risk of energy scarcity, 2) Reducing the greenhouse gas emissions, 3) Renewables have overhead costs too and 4) Energy Management saves costs. An energy audit is a useful tool for developing and implementing comprehensive energy management plans of an Organization. The aim of an energy audit is to identify the energy efficiency, conservation and savings opportunities at the premises of the audit sites in a systematic manner. The audit process is carried out to review of energy saving opportunities and

measures implemented in the audit sites and to identify the various energy conservation measures and saving opportunities. In addition, Implementation of alternative energy resources for energy saving opportunities and decision making in the field of energy management along with creating awareness among the stakeholders on energy conservation and utilization are being carried out.

SVKM's Usha Pravin Gandhi College of Arts, Science and Commerce has a substantial the energy conservation initiatives with very good savings opportunities. Energy efficient lighting schemes, awareness created among stakeholders and necessary power backups are being practiced by the institution. There are some best Practices followed on Energy Audit in the Organization like Transformers, Generators and UPS are protected properly with fencing and kept awareness boards on 'Dangers' and 'Warnings'. It is observed that the most of places, sign board of 'Switch ON' and 'Switch OFF' are kept towards saving energy measures to the stakeholders. Electrical wires, switch boxes and stabilizers are properly covered without any damage which will cause any problems to the staff and student members. Adaptation of drip and sprinkler irrigation and solar street-lights in the campus to minimize the energy potential are well appreciated. Few recommendations, in addition, can further improve the energy savings of the Organization. This may lead to the prosperous future in context of Energy Efficiency Campus and thus sustainable environment and community development to the stakeholders in coming years to come.

Energy Conservation and Management Activities at SVKM's Usha Pravin Gandhi College of Arts, Science and Commerce, Mumbai, Maharashtra.

22.3. Vermicompost, Organic and Green manures

Natural or eco-friendly methods should be used to grow plants vigorously in the campus which could reduce the environmental pollution. Use of biofertilizers, organic manures (cow dung, vermicompost and plant wastes and litters) and green manures to grow healthy plants 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 (Dominguez *et al*., 2019). 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. Biofertilizers such as Nitrogen fixing bacteria, Potassium and Phosphorus solubilizing bacteria, Potassium mobilizing fungi (VAM), farm yard manure, dried cow dung manure, vermicompost manures and biofungicides and biopesticides are extensively used in of SVKM's Usha Pravin Gandhi College of Arts, Science and Commerce to cultivate plants. Agrochemicals, chemical fertilizers, 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.

SVKM's Usha Pravin Gandhi College of Arts, Science and Commerce has established a small Vermicomposting unit in which all the degradable items such as leaf litters, vegetable wastes obtained from Campus hostels and canteen along with farm yard manure and dried cow dung manure are used to produce vermicompost. The solid wastes are collected from different places of the campus and segregated based on bio-degradable and non-degradable materials subsequently subjected for recycling and degradation processes like composting materials. Suitable bioinoculants may be used to degrade the solid wastes effectively in the composting unit.

Vermicompost and Organic Manure Production Facilities at SVKM's Usha Pravin Gandhi College of Arts, Science and Commerce, Mumbai, Maharashtra.

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

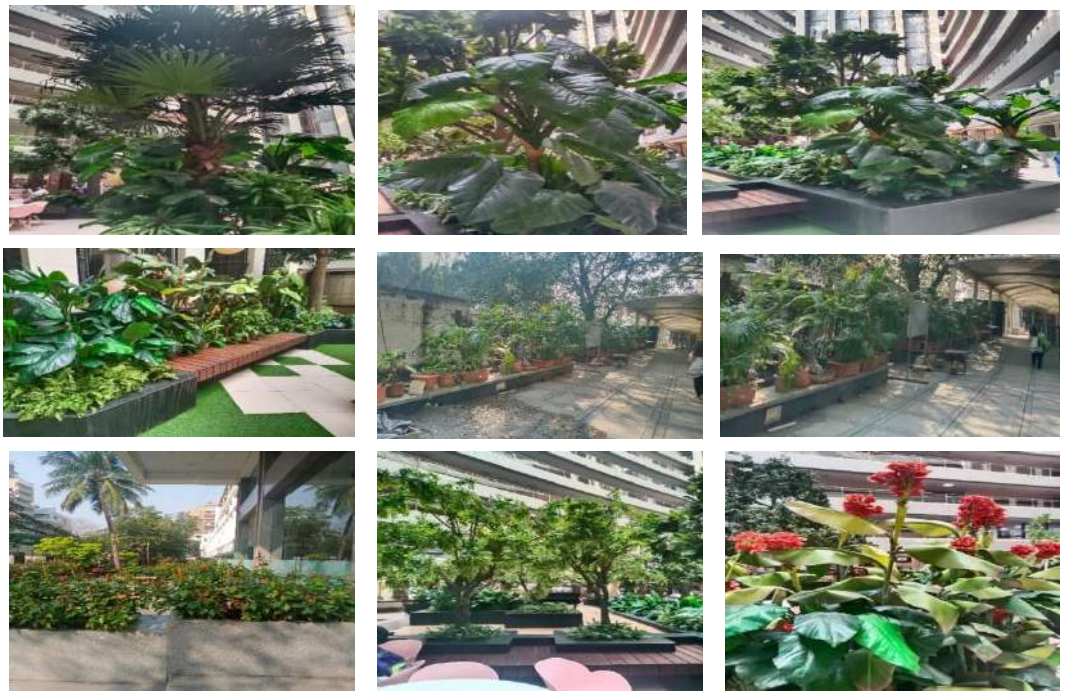
Attempts are being made to give a pure atmosphere without any air contaminants to the stakeholders for which a large number of oxygen producing and CO_2 absorbing plants are planted in the SVKM's Usha Pravin Gandhi College of Arts, Science and Commerce campus. There are some plants which are being considered highly efficient in oxygen production and carbon-di-oxide absorption which in turn reflected the air quality of the green campus. If more oxygen is made available in the campus naturally, the stakeholders may be free from cardiovascular and pulmonary problems including breathing troubles. The oxygen producing and CO_2 absorbing plants available in the campus are Snake plant (*Sansevieria zeylanica*), Gerbera Daisy (*Gerbera jamesonii*), Portia tree (*Thespesia populnea*), Golden tree (*Cassia fistula*), Hop brush (*Dodonaea viscosa*), Malabar plum (*Syzygium cumini*), Sacred fig (*Ficus religiosa*), Veldt grape, devil's backbone (*Cissus quadrangularis*), Flame tree(*Gloriosa superba*), Hoary Basil (*Ocimum americanum*), cuban pink trumpet (*Tabebuia pallida*) and witch weed (*Striga densiflora*). The predominant families of various monocot and dicot plants of oxygen producing and CO_2 absorbing plants found in the SVKM's Usha Pravin Gandhi College of Arts, Science and Commerce are Acanthaceae, Anonaceae, Arecaceae, Bignoniaceae, Caesalpiniaceae, Combretaceae, Cycadaceae, Euphorbiaceae, Fabaceae, Lythraceae, Malvaceae, Meliaceae, Moraceae, Myrtaceae, Nyctaginaceae, Phyllanthaceae, Polygalaceae, Rutaceae, Rubiaceae, Turneraceae, Verbenaceae and Vitaceae.

Oxygen producing and Carbon dioxide absorbing plants [Sacred fig tree (*Ficus religiosa*) Indian Sandalwood tree (*Santalum album*)]

22.5. Establishment of Eco-friendly Campus at SVKM's Usha Pravin Gandhi College of Arts, Science and Commerce

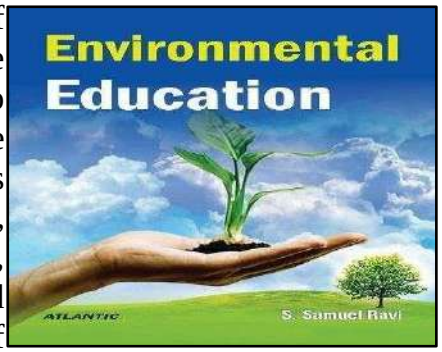
Eco-friendly literally means earth-friendly or not harmful to the environment. It is very important in any Organization is concern in terms of protection of earth planet. This term most commonly refers to products that contribute to green living or green practices that help conserve resources like water and energy. Go green concept is the ideal examples to conserve the environment. Eco-friendly products also prevent contributions to air, water and land pollution to a greater extend. It is being designed to have little or no damaging effect on the environment. Basically, it is all about doing things without harming the environment. Products, events, and services that are eco-friendly lead less cost without harming the earth as well as lead less pollution. Environmentally friendly products are market-oriented products that cause minimal environmental degradation and their production is linked to a product development process that is structured in a way that considers the impacts that can be caused to the environment throughout their life cycle. The harmful activities of humans like deforestation, pollution, global warming is a major threat to the environment. Air pollution is caused by solid and liquid particles and certain gases that are suspended in the air. They are more durable, reusable, less toxic, less resource-intensive, and safer for the environment, wildlife, and people.

Eco-friendly, all natural products ensure safety from all dangerous chemicals, and allows families to avoid risky additives that can cause any of these issues. Using eco-friendly products improves quality of life in terms of mortality, age, diseases, and illnesses. They ensure the safety of families and the planet. In order to save the environment, SVKM's Usha Pravin Gandhi College of Arts, Science and Commerce Campus has taken sufficient attempts by means of creating environment awareness programme to the rural, tribal and urban people across the country and also offering various core and elective courses to the students and scholars in their curriculum.



Eco-friendly Campus made available in the SVKM's Usha Pravin Gandhi College of Arts, Science and Commerce Campus

22.6. Environmental Education



An environmental study is the learning principle of the ecosystem and how it will expand sustainable techniques to defend the surroundings. It enables people to develop an understanding of the environment in which we live and helps to overcome tough environmental troubles affecting nature (Alba-Hidalgo *et al*., 2018). In addition, the physical aspects of the environment should be studied, it also emphasizes the need to conserve biodiversity and undertake an extra sustainable way of life and make use of sources in a responsible manner (Shriberg, 2012). To create attention amongst today's generation on pressing environmental troubles, the University Grants Commission (UGC) in India has made it mandatory for the Universities and Autonomous Colleges to introduce a course in 'Environmental studies' and teach to the students about the ecosystem, pollution and problems associated with the environment. Environmental education refers to organized efforts to teach how natural environments function, and particularly, how human beings can manage behaviour and ecosystems to live sustainably. It is a multi-disciplinary field integrating disciplines such as Biology (Botany and Zoology), Chemistry, Physics, Ecology, Environmental Science &Engineering, Earth Science, Atmospheric Science, Mathematics, and Geography

Environmental Education: Journals, magazines and Books made available at SVKM's Usha Pravin Gandhi College of Arts, Science and Commerce Campus

Courses Related to Environmental SVKM's Usha Pravin Gandhi College of Arts, Science and Commerce, Mumbai, Maharashtra.

Unit	Name of the Topic	No. of Lect.
Unit I	**Environmental Concepts:** Environment: Definition and composition, Lithosphere, Atmosphere, Hydrosphere, Biosphere Biogeochemical cycles - Concept and water cycle. Ecosystem & Ecology; Food chain, food web & Energy flow pyramid. Resources: Meaning, classification(Renewable & non-renewable), types & Exploitation of Natural resources in sustainable manner.	12
Unit II	**Environment degradation:** Degradation-Meaning and causes, degradation of land, forest and agricultural land and its remedies. Pollution – meaning, types, causes and remedies (land, air, water and others) Global warming: meaning, causes and effects. Disaster Management: meaning, disaster management cycle. Waste Management: Definition and types -solid waste management, anthropogenic waste, e-waste & biomedical waste (consumerism as a cause of waste)	13
[illegible] III	**SUSTAINABILITY AND ROLE OF BUSINESS** **Sustainability:** Definition, importance and Environment Conservation. Environmental clearance for establishing and operating Industries in India. EIA, Environmental auditing, ISO 14001 Salient features of Water Act, Air Act and Wildlife Protection Act. Carbon bank & Kyoto protocol.	13
[illegible] IV	**INNOVATIONS IN BUSINESS- AN ENVIRONMENTAL PERSPECTIVE** Non-Conventional energy sources- Wind, Bio-fuel, Solar, Tidal and Nuclear Energy. Innovative Business Models: Eco-tourism, Green marketing, Organic farming, Eco-friendly packaging, Waste management projects for profits, other business projects for greener future.	12

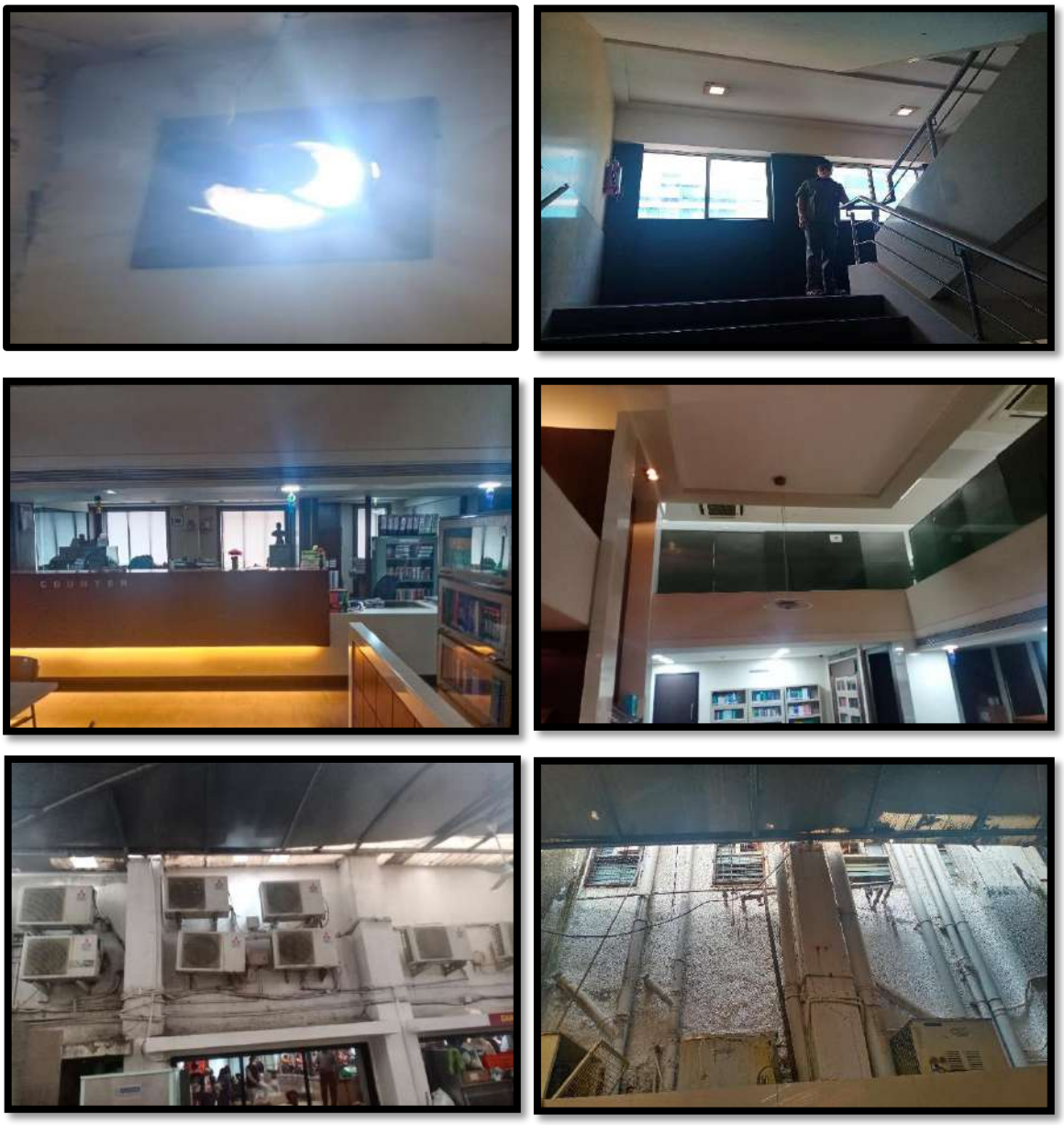
22.7. Napkin disposal facility

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

The Management of SVKM's Usha Pravin Gandhi College of Arts, Science and Commerce is implementing the safe practices of disposing of napkins using small scale incinerators in ladies hostels. Incinerators facility and disposal structures in the proper directions and other social stigmas connected to menstruation influences the sanitary waste disposal conduct of women within the campus is very much appreciated. The Campus is taking care of adolescent girls and ladies significantly in their personal hygiene.

22.8. Ventilation and Exhaust systems in Buildings

Ventilation is necessary in buildings to remove 'stale' air and replace it with 'fresh' air. This helps to moderate internal temperatures, reduce the accumulation of moisture, odours and other gases that can build up during occupied periods. In addition, it create air movement which improves the comfort of occupants. Mechanical (or 'forced') ventilation tends to be driven by exhaust fans to replace stable air with fresh air along with moderating the optimum temperature to the occupants. Natural ventilation is driven by 'natural' pressure differences from one part of the building to another. Internal partitions may block the air paths, hence the creation of draughts adjacent to openings for more flow of air circulation. Natural ventilation can be wind driven, or buoyancy driven. If air quality is poor, nature ventilation by means of opening windows may be adopted to use in the building. It may also be useful to reduce the noise level to a greater extent. It is recorded that SVKM's Usha Pravin Gandhi College of Arts, Science and Commerce has a large number of ventilators for effective air circulation.



Ventilation and Exhaust system Facilities in Buildings towards air circulation and heat exchange phenomena at SVKM's Usha Pravin Gandhi College of Arts, Science and Commerce

22.9. Measurement of Carbon dioxide level in the Campus

The long-term heating of Earth's climate system is changed now-a-days due to a massive increase in global warming and environmental changes including human population and human activities. In addition, primarily fossil fuel burning and an extensive usage increases heat-trapping greenhouse gas levels in Earth's atmosphere which lead to assimilation of carbon dioxide in the atmosphere. Climate change includes both global warming driven by human-induced emissions of greenhouse gases and the resulting large-scale shifts in weather patterns (Sovacool and Brown, 2010). It is playing an important role to act as a global indicator for checking the purity of the atmosphere. In general, a portable CO_2 Analyzer is used to measure the level of carbon dioxide in the atmosphere at different places across the SVKM's Usha Pravin Gandhi College of Arts, Science and

Commerce campus. The observation showed that the concentration of CO_2 in the atmosphere is found to be low which did not exceeds the critical limit of CO_2. It is further revealed that all the selected locations are having pure air without any air contaminants with good air exchange/circulation in the campus. Some of the places like Bank, Post Office, ATM Centre and Examination Centre are recorded with high level of carbon dioxide level due to student mobilization and the maximum number of electrical items fixed from which the carbon dioxide emission and poor ventilation were observed followed by all laboratories and seminar and auditorium halls (Table 1).

Measurement of Carbon dioxide concentration in the SVKM's Usha Pravin Gandhi College of Arts, Science and Commerce

S.No.	Different locations of the Organization's Campus	Carbon dioxide level (ppm)	Remarks
1.	Classroom	452	CO_2 level is low
2.	Office	469	CO_2 level is low
3.	Staffroom	460	CO_2 level is low
4.	Auditorium	589	CO_2 level is low
5.	Library	568	CO_2 level is low
6.	Parking	398	CO_2 level is low
7.	Open Space	370	CO_2 level is low

Reference of Set values of CO2 level

- 350-1000 ppm: Typical level found in occupied spaces with good air exchange along with pure air.
- 1000-2000 ppm: Moderate level associated with complaints of drowsiness and poor air quality.
- 2000-5000 ppm: Critical level associated with headaches, sleepiness, and stagnant, stale, stuffy air. Poor concentration, loss of attention, increased heart rate and slight nausea may present.

22.10. Auditing for Carbon Footprint at Educational Institutions

Carbon footprint means of measuring and recording the GHG emissions of an organization or building within a defined system boundary. The carbon footprint is also an important component of the Ecological Footprint, since it is one competing demand for biologically productive space. Carbon emissions from burning fossil fuel accumulate in the atmosphere if there is not enough bio capacity dedicated to absorb these emissions (Huang *et al*., 2017). Commutation of stakeholders has an impact on the environment through the emission of greenhouse gases into the atmosphere consequent to burning of fossil fuels (such as petrol, diesel and kerosene). The most common greenhouse gases are carbon dioxide, water vapor, methane, nitrous oxide and ozone of all the greenhouse gases, carbon dioxide is the most prominent greenhouse gas, comprising 402 ppm of the Earth's atmosphere. The release of carbon dioxide gas into the Earth's atmosphere through human activities is commonly known as carbon emissions.

An important aspect of doing an audit is to be able to measure your impact so that we can determine better ways to manage the impact. In addition to the water, waste, energy and biodiversity audits we can also determine what our carbon footprint is, based on the

amount of carbon emissions created. One aspect is to consider the distance and method travelled between home and organization every day. It undertakes the measure of bulk of carbon dioxide equivalents exhaled by the organization through which the carbon accounting is done (Sovacool and Brown, 2010). It is necessary to know how much the organization is contributing towards sustainable development. It is therefore essential that any environmentally responsible institution examine its carbon footprint.

The observation on carbon footprint due to electricity usage per year at SVKM's Usha Pravin Gandhi College of Arts, Science and Commerce Campus showed 5488.12 metric tons. It is calculated based on CO_2 emission from electricity per year in kWh/1000 units. The carbon footprint due to transportation (Shuttle services) per year at SVKM's Usha Pravin Gandhi College of Arts, Science and Commerce Campus showed 10.22 metric tons. It is calculated based on the number of the shuttle bus in the Campus multiplied with total trips for shuttle bus service each day and approximate travel distance of a vehicle each day inside campus (in kilometers), wherein, 365 is the number of working days per year is taken into account. Similar to that of the carbon footprint due to transportation in shuttle services, Carbon footprint due to car usage per year is calculated based on the number of cars entering into the Campus multiplied with the approximate travel distance of a vehicle each day inside campus (in kilometers), wherein, 365 is the number of working days per year is taken into account. The recorded value of carbon footprint due to car usage per year is 803 metric tons. The Carbon footprint due to Motorcycles usage per year is 803 metric tons which is derived based on the number of motorcycle entering into the Organisation multiplied with the approximate travel distance of a vehicle each day inside campus (in kilometres). The overall results indicated that total carbon emission at SVKM's Usha Pravin Gandhi College of Arts, Science and Commerce Campus per year is 2163 metric tons which is the sum of the carbon emission from electricity plus transportation (bus, car, motorcycle) per year. The carbon footprint

Calculation of Carbon Footprint Per Year at SVKM's Usha Pravin Gandhi College of Arts, Science and Commerce Campus

The Carbon footprint calculation can be conducted based on the stage of calculation as stated in www.carbonfootprint.com, which is the sum of electricity usage per year and transportation (shuttle bus services and Car and Motorcycles) per year.

a. Electricity usage per year

The CO2 emission from electricity
= (electricity usage per year in kWh/1000) x 0.84
= (169973 kWh/1000) x 0.84
= 142.777 metric tons
Notes:
Electricity usage per year = 169973 kWh
0.84 is the coefficient to convert kWh to metric tons.

b. Transportation per year (Shuttle)

= (Number of the shuttle bus in the campus x total trips for shuttle bus service each day x approximate travel distance of a vehicle each day inside campus only (in kilometers) x 365/100) x 0.01

= [(10 x 2 x 5.5 x 365)/100)] x 0.01
=4.01 metric tons

Notes:

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

c. Transportation per year (Car)

= (Number of cars entering the Campus x 2 x approximate travel distance of a vehicle each day inside campus only (in kilometers) x 365/100) x 0.02
= [(1000 x 2 x 5.5 x 365)/100)] x 0.02
= 803metric tons

Notes:

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

d. Transportation per year (Motorcycles)

= (Number of motorcycle entering the Campus x 2 x approximate travel distance of a vehicle each day inside campus only (in kilometres) x 365/100) x 0.01
= [(2000 x 2 x 5.5 x 365)/100)] x 0.01
= 803 metric tons

Notes:

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

e. Total Carbon emission per year

= total emission from electricity usage + transportation (bus, car, motorcycle)
= 142.77+ (4 + 803 + 803) / 0.81 (Constant Factor)
= 2163.91 metric tons

Photos taken while measuring the Carbon Footprint at various Laboratories of, Mumbai, Maharashtra.

22.11. Auditing for Water Management at SVKM's Usha Pravin Gandhi College of Arts, Science and Commerce Campus

Water is a natural resource which is an essential resource for all life in the planet. It is observed that on earth only three percent of it is fresh and two-thirds of the freshwater is locked up in ice caps and glaciers. Of the remaining one percent, a fifth is in remote, inaccessible areas and much seasonal rainfall in monsoonal deluges and floods cannot easily be used (Senior and Brightman, 2015). At present only about 0.08 percent of all the world's fresh water is exploited by mankind in ever increasing demand for sanitation, drinking, manufacturing, leisure and agriculture. All living matters depend on common thing (i.e) water. Water management is important since it helps determine future irrigation expectations. It is the management of water resources under set policies and regulations. Water, once an abundant natural resource, is becoming a more valuable commodity due to droughts and overuse. While freely available in many natural environments, in human settlements potable (drinkable) water is less readily available. We need to use water wisely to ensure that drinkable water is available for all, now and in the future. A small drip from a leaky tap can waste more than 180 liters of water to a day that is a lot of water to waste - enough to flush the toilet eight times! Aquifer depletion and water contamination are taking place at unprecedented rates in a sustainable manner.

22.12.1. Water Management Activities

It is therefore essential that any environmentally responsible institution should examine its water use practices. Water auditing is conducted for the evaluation of facilities of raw water intake and determining the facilities for water treatment and reuse. The concerned auditor investigates the relevant method that can be adopted and implemented to balance the demand and supply of water (Senior and Brightman, 2015). SVKM's Usha Pravin Gandhi College of Arts, Science and Commerce Campus is taking enough attempt to manage wastewater that are coming out from various Department laboratories, hostels and canteens. In general, water management activities are very important in terms of conserving water and its resources for future generations which in turn useful to reduce the land contamination.

22.12.2. Role of Higher Education Institutions in Water Conservation

- Build consensus on the need for water conservation on campus with students, administration, faculty and other internal as well as external stakeholders.
- Build consensus on the need for water conservation on campus with village residents, village administration, grama sabha and other internal as well as external stakeholder institutions like schools, self-help groups, health centres, village banks, panchayats.
- Facilitate design of specific interventions for making the campus water sufficient and water efficient by following best available standards and accepted parameters.
- Facilitate design of specific interventions for making the village water sufficient and water efficient by following best available standards and accepted parameters
- Monitor the existing water management in the campus with participation and transparency
- Present a step-by-step guide for conserving water on the campus and village
- Generate case studies on best water conservation practices adopted on the campus and in the villages the campuses are engaged with. These instances can serve as models for other institutions and villages to adopt.

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

22.12.3. Physical Appearance and Overall Ambience on Water Conservation

Water Conservation

* Adequacy of Water
* Plumbing adequacy of water taps and Sanitary fixtures
* Water Efficient Toilets
* Dedicated Staff for Water Maintenance
* Dedicated Staff for Water Inspection
* Periodic mending and repairs of leaks in taps and pipes
* Two levels of flushing in all the toilets
* Planting indigenous variety of plants and less water requiring plants
* Organising water conservation workshops to the faculty and students on the campus

Rainwater Harvesting

* Installation of rain gauge and rain recording system
* Steps taken for implementing rainwater harvesting inside the campus
* Digging rainwater harvesting pits on the campus
* Educating on Water Harvesting through workshops/seminars

Renovation of Traditional and other Water Bodies/Tanks

* Groundwater recharge & Maintenance of water balance
* Reuse and recharge structures & Preservation of water bodies
* Watershed development & Biomass management
* Land management & Water management

Other Interventions

* Technological and sociological interventions
* Planning, Preparing and Reporting Mechanism
* Appropriate display, publicity, sharing knowledge
* Treating personnel/workers with respect and looking into their welfare
* Adhering to Reporting Mechanisms
* Designated Officer Monitoring and taking Corrective measures for Water Management

Leakages

* Leakage represents the largest share of wastage as well as unauthorized water use.
* Each source meter needs to be reviewed for accuracy, either by reviewing available meter test results or retesting the meter.
* System valves need to be checked periodically for malfunction. For instance, altitude control valves on storage tanks might be broken or set improperly, allowing the tank to overflow. These valves need periodic inspection, moreso when there is observed leakage or overflow
* Pressure relief valves which are set too low might cause spill when pressures reach the high range. These pressure relief valves need to be calibrated accordingly
* When problems are discovered during routine inspections, possible water losses need to be estimated and corrective action can be taken up immediately.

22.12.4. Water Quantity Estimation

The quantity of water required for municipal uses for which the water supply scheme has to be designed requires following data:

1. Water consumption rate (Per Capita Demand in litres per day per head)
2. Population to be served.

Quantity = Per capita demand x Human population

22.12.5. Water Consumption Rate

It is very difficult to precisely assess the quantity of water demanded by the public, since there are many variable factors affecting water consumption by various stakeholders of an organization. The various types of water demands, which a city may have, may be listed into following classes:

Water Consumption for Various Purposes at SVKM's Usha Pravin Gandhi College of Arts, Science and Commerce Campus

S.No	Types of Consumption	Normal Range (lit/capita/day)	Average	Percentage
1.	Domestic Consumption at Hostel and Canteen	65-300	160	35
2.	Industrial and Commercial Demand at Laboratories	45-450	135	30
3.	Public Uses including Fire Demand, Transport washes	20-90	45	10
4.	Losses and Waste as routine consumption	45-150	62	20
5.	Daily use (Day-to-day use)	20-40	15	05

22.12.6. Estimation of Water requirements for drinking and domestic use

(Source: National Building Code 2016 BIS)

As a general rule the following rates per capita per day may be considered for domestic and non-domestic needs. For Communities with population 20,000 to 10,000 together with flushing the per capita per day rates may be considered for domestic and non-domestic needs.

100 to 135 lphd (135- Avg) system.

Water requirements calculation

S.No	Educational Institutions water requirements	Domestic use (lphd)	Flushing (lphd)	Total use (lphd)
1.	Without Boarding Facility	25	20	45
2.	With Boarding Facility	90	45	135

22.12.7. Fire Fighting Demand

The per capita fire demand is very less on an average basis but the rate at which the water is required is very large. The rate of fire demand is sometimes treated as a function of population and is worked out from following empirical formulae:

Per capita fire demand calculation

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

22.12.8. Factors affecting per capita demand of water consumption:

a. Size of the city: Per capita demand for big cities is generally large as compared to that for smaller towns as big cities have sewered houses.
b. Presence of industries.
c. Climatic conditions.
d. Habits of people and their economic status.
e. Quality of water: If water is aesthetically $ medically safe, the consumption will increase as people will not resort to private wells, etc.
f. Pressure in the distribution system.
g. Efficiency of water works administration: Leaks in water mains and services; and unauthorized use of water can be kept to a minimum by surveys.
h. Cost of water.
i. Policy of metering and charging method: Water tax is charged in two different ways: on the basis of meter reading and on the basis of certain fixed monthly rate.

22.12.9. Fluctuations in Rate of Demand

Average Daily per Capita Demand = Quantity Required in 12 Months/ (365 x Population)

If this average demand is supplied at all the times, it will not be sufficient to meet the fluctuations.

Seasonal variation: The demand peaks during summer. Firebreak outs are generally more in summer, increasing demand. So, there is seasonal variation.

Daily variation depends on the activity. People draw out more water on Sundays and Festival days, thus increasing demand on these days.

Hourly variations are very important as they have a wide range. During active household working hours i.e. from six to ten in the morning and four to eight in the evening, the bulk of the daily requirement is taken. During other hours the requirement is negligible. Moreover, if a fire breaks out, a huge quantity of water is required to be supplied during short duration, necessitating the need for a maximum rate of hourly supply.

So, an adequate quantity of water must be available to meet the peak demand. To meet all the fluctuations, the supply pipes, service reservoirs and distribution pipes must be properly proportioned. The water is supplied by pumping directly and the pumps and distribution system must be designed to meet the peak demand (Astriani, 2016). The effect of monthly variation influences the design of storage reservoirs and the hourly variations influences the design of pumps and service reservoirs. As the population decreases, the fluctuation rate increases.

Maximum daily demand = 1.8 x average daily demand
Maximum hourly demand of maximum day i.e. Peak demand
= 1.5 x average hourly demand
= 1.5 x Maximum daily demand/24
= 1.5 x (1.8 x average daily demand)/24
= 2.7 x average daily demand/24
= 2.7 x annual average hourly demand

22.12.10. Design Periods and Population Forecast

This quantity should be worked out with due provision for the estimated requirements of the future. The future period for which a provision is made in the water supply scheme is known as the design period.

Design period is estimated based on the following:

- Useful life of the component, considering obsolescence, wear, tear, etc.
- Expandability aspect in the surrounding area.
- Anticipated rate of growth of population, including industrial, commercial developments and migration-immigration.
- Available resources in and around the campus.
- Performance of the system during initial period.
- Population density in the organization and its surrounding area

22.13. Auditing for Waste Management

Waste management reduces the effect of waste on the environment, health, and so on. It can also help reuse or recycle resources, such as; paper, cans, glass, and so on. There is various type of waste management that include the disposal of solid, liquid, gaseous, or hazardous substances. Pollution from waste is aesthetically unpleasing and results in large amounts of litter in our communities which can cause health problems. Plastic bags and discarded ropes and strings can be very dangerous to birds and other animals. The most important reason for waste collection is the protection of the environment and the health

of the population. Rubbish and waste can cause air and water pollution. Rotting garbage is also known to produce harmful gases that mix with the air and can cause breathing problems in people. This indicator addresses waste production and disposal, plastic waste, paper waste, food waste, and recycling. Solid waste can be divided into two categories: general waste and hazardous waste. General wastes include what is usually thrown away in homes and schools such as garbage, paper, tins and glass bottles. Hazardous waste is waste that is likely to be a threat to health or the environment like cleaning chemicals and petrol. Unscientific landfills may contain harmful contaminants that leach into soil and water supplies, and produce greenhouse gases contributing to global climate change. Furthermore, solid waste often includes wasted material resources that could otherwise be channelled into better service through recycling, repair, and reuse. Thus the minimization of solid waste is essential to a sustainable college. The auditor diagnoses the prevailing waste disposal policies and suggests the best way to combat the problems. It is therefore essential that any environmentally responsible institution examine its waste processing practices (Verma *et al*., 2012; Wang *et al*., 2013).

22.14.1. Biomedical Waste

The Ministry of Environment, Forest and Climate Change, Government of India has notified the Bio-Medical Waste Management Rules, 2016. As per the rules, bio-medical waste means any waste, which is generated during diagnosis, treatment or immunization of human beings or animals or research activities pertaining there to or in the production or testing of biological or in health camps. The bio-medical waste generator and the operator of the common bio-medical waste treatment and disposal facility (CBMWTF) shall be responsible for safe handling and disposal of the bio-medical waste. The State Government of Health shall ensure for implementation of the rule in all health care facilities. SPCB shall issue authorization to the health care facilities and CBMWTF. It shall monitor the compliance of various provisions of the rules. Both central and state Governments have so far authorized a large number of Private and Government hospitals in the State under the rules and have made agreement with the CBMWTF for the collection, transport, treatment and scientific disposal of the biomedical waste. The CBMWTF consists of autoclave, shredder, incinerator and secured land fill facilities (Setyowati *et al*., 2017).

22.14.2. Climatic condition

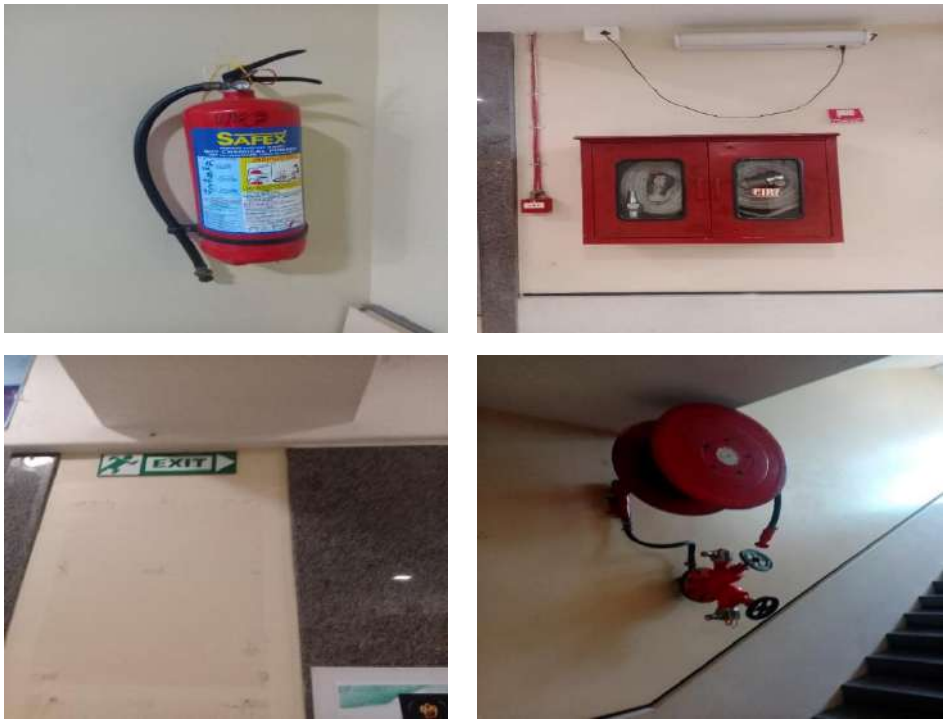
Temperature begins increasing after March. May is the hottest month with near daily maximum temperature of 33˚C and maximum of 25-26˚C. The maximum and minimum temperature may go up to 36˚C and 16.4˚C; respectively. The average rainfall received in the Mumbai district is 2,317mm - 2,514mm, for the past 20 years. Due to the presence of the mountain pass major parts of the district from the south west monsoon in the months from June to August. The rainfall of the south west monsoon is irregular as the masses of clouds are intercepted only very little rain in September. After a warm, humid September, the regular monsoon starts from October lasting till early November. In October north east monsoon sets in heaviest rains are usually or the end of October and throughout November. Out of the total rainfall 25% is received during south west monsoon 49% during October and November and remaining 21% during September.

Environmental conditions of SVKM's Usha Pravin Gandhi College of Arts, Science and Commerce Campus

Environmental parameters		
1.	Minimum Temperature	20-25°C
2.	Maximum Temperature	30-35°C
3.	Minimum Relative humidity	66-80%
4.	Maximum Relative humidity	7-100%
5.	Annual Average Rainfall	60-70 cm/avg.year
6.	Annual Average Sunshine	3-6 hrs/avg.day
7.	Wind speed	15.2-17.8 km/hr

22.14.3. Safety measures and Green building conservation code

The personal and environmental safety measures are very important in colleges buildings for college students and staff members that requires vigilance and awareness. Colleges and Universities work to foster safe environments, but students share responsibility. Now that your student has had some time to acclimate to their new campus and life, it's a good idea to check in about what they do on a daily basis to keep themselves safe. What is the relationship between their campus and the surrounding area (whether it's rural or urban)? The Management of the Colleges and Universities should extend by supplying good advice and the best safety tools in the campus. The organization should have a police force, escort services, call boxes, first aid box, fire extinguishers, fire alarms, security systems and staffs towards the safety measures. SVKM's Usha Pravin Gandhi College of Arts, Science and Commerce Campus has very good safety measures as per the Green building conservation code such as fire extinguisher and fire bell and alarms in all the places. In addition, in all the places, 'Exit', 'Entry' and other sign boards kept across the places to give cent percent safety to the stakeholders.



Safety measures made available as per the Green building conservation code at SVKM's Usha Pravin Gandhi College of Arts, Science and Commerce Campus

22.14.4. COVID-19 protocol set-up and Safety measures at the Organization campus

The novel coronavirus is still spreading across the world and information is changing rapidly. Life as we knew it has changed dramatically since the Government has encouraged the people to practice social distancing by keeping the distance as much as possible and avoiding crowds in order to help slow the spread of COVID-19. In addition, the Government is advised us to wear face mask and use sanitizers regularly to stay safe and healthy. College Xpress is actively monitoring COVID-19's impact on the college search, financial aid, student life, and more to provide the most up-to-date and accurate information to provide the health environment to the students and staff members. The Management of SVKM's Usha Pravin Gandhi College of Arts, Science and Commerce has taken enormous efforts to follow the COVID-19 protocols and made available in sanitizers, face masks, towels, dustbins for disposing used face masks across the campus. It is also observed that automatic sanitizer systems are made available at campus to give safety measures against the COVID-19 pandemics situation to the students and both teaching and non-teaching staff members.

COVID-19 protocol set-up and Safety measures at SVKM's Usha Pravin Gandhi College of Arts, Science and Commerce Campus

23. Implementing Swachh Bharath Abhiyan Scheme under Clean India Mission

Swachh Bharath Abhiyan under Clean India Mission is the new initiative and a step towards sanitation, solid waste management and cleanliness to promote cleanliness across India. It is the country-wide campaign applied on a large scale in India for both the rural and urban places, producing needs for the bathrooms and providing hygienic atmosphere amongst the population by household member's was the main purpose of this. This scheme is implemented by the Educational Institutions covering Universities, Colleges and Schools, Government Departments, Companies and Public sectors across the country to give a safe pollution free environment, eliminate the open defecation, improve solid waste management and sanitation and refining drinking water quality to the stakeholders. The initiative is easily attainable by the support of Government employees, management representatives, staff members and students. The students of SVKM's Usha Pravin Gandhi College of Arts, Science and Commerce Campus conduct more awareness programmes on cleanliness, use of plastics, solid waste management and sanitation and importance of environment to the rural people across Mumbai District of Maharasthra through NCC and NSS units. The students collected and disposed of the wastes in the trash by using eco-friendly covers. They created awareness among the rural and urban people to keep the surroundings clean and hygiene. A sizable number of programmes and rallies are conducted periodically during the celebration of various events such as 'Independence Day', 'Republic Day', 'World Environmental Day' and 'Biodiversity Conservation Day' events.

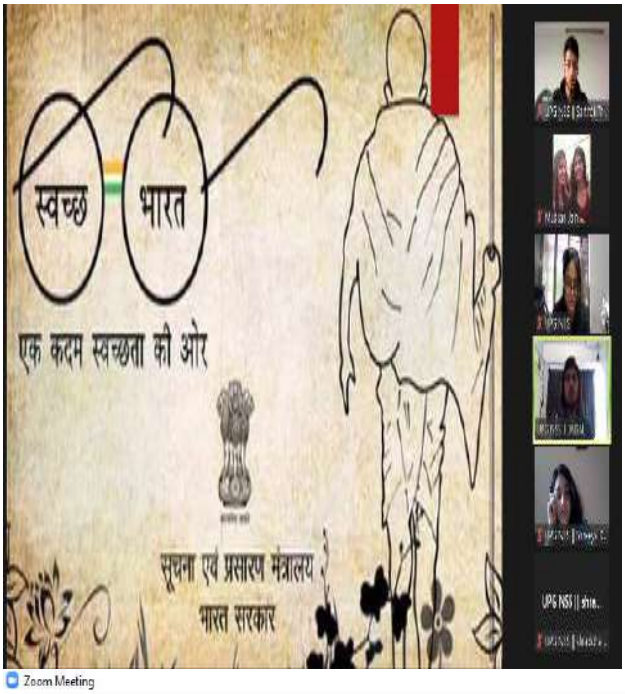
Professional implementation of all the Eco plans in the campus should be done through the Eco clubs, Nature clubs, Science clubs, Youth Red cross units, Fine Arts clubs, Women cell, Associations, Forums, SSL, NCC (National Cadet Corps) and NSS (National Service Scheme). All the students, members of staff 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. SVKM's Usha Pravin Gandhi College of Arts, Science and Commerce Campus has well developed NCC, NSS, Swacht Bharath Abhiyan under Clean India Mission. These bodies are actively involved in tree planting programmes and cleaning the surrounding areas of tribal, rural and urban people across Mumbai, Erode and Nilgiris Districts of Maharasthra. SVKM's Usha Pravin Gandhi College of Arts, Science and Commerce Campus is conducting a large number of activities to conserve the nature and to teach about the importance of environment to rural, tribal and urban people.

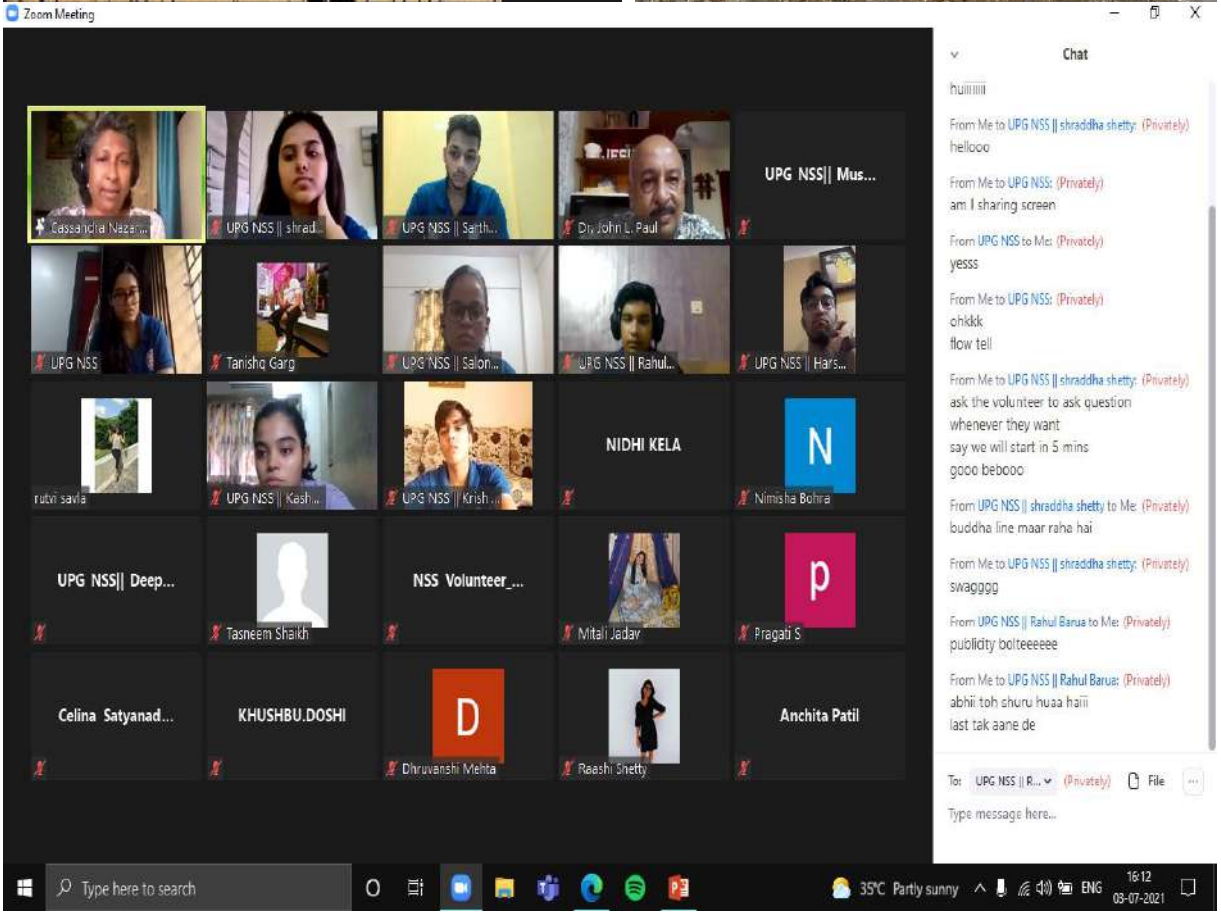
Awareness programmes on the green campus initiatives and dissemination of green motto and pledges are accounted in a sustainable manner. Its benefits and self-sustainability are being projected for wider centric on earth and Ecology conservation. Innovative practices that add up credentials in implementing the green campus which needs to be promoted in the awareness programme to the students and staff members including public domain (York and Rosa, 2003). 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. SVKM's Usha Pravin Gandhi College of Arts, Science and Commerce Campus has taken sufficient attempts to disseminate the green campus motto and green pledge as well as awareness programmes such as 'Don't cut trees', 'Don't use plastic bags', 'Don't waste waters', 'Plastic Free Zones' and 'Preserve the Natural Resources' and etc. among the students and staff members in the campus.

SVKM's Usha Pravin Gandhi College of Arts, Science and Commerce Campus 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 Marudhamalai hills. These activities are very important in view of the immediate vicinity to take up developmental activities and conducted Participatory rural appraisal programmes. It is involving the socioeconomic status of the inhabitants, natural resources, traditional knowledge systems, cropping patterns, etc. of the rural and tribal people living in Marudhamalai hills. SVKM's Usha Pravin Gandhi College of Arts, Science and Commerce Campus is also focusing on the development of women, youth, children and dalits and to identify the extension and training needs of the target group through the Department of Women Studies and Career Guidance. It provides the vocational training to marginal farmers to overcome the problem of seasonal employment. Some of areas identified are goat farming, mushroom cultivation, vermicomposting, bee keeping, ornamental fisheries, organic farming and medicinal plant cultivation.

SVKM's Usha Pravin Gandhi College of Arts, Science and Commerce Campus 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 enhances the social interaction, inter-personal communication skills and develop emotional maturity of students. It also helps students in total and integrated personality development. SVKM's Usha Pravin Gandhi College of Arts, Science and Commerce Campus facilitates to prepare the students for future life, by developing qualities such as cooperation, team spirit, leadership, discipline and development of creative talents including to boost the self-confidence of student.

Activities of NSS, SVKM's Usha Pravin Gandhi College of Arts, Science and Commerce Campus, Mumbai, Maharashtra towards Plastic Waste Management, Clean and Green (Social Upliftment), Mission Swatchh (Swachh Bharat) during 2021





Activities of NSS, SVKM's Usha Pravin Gandhi College of Arts, Science and Commerce Campus, Mumbai, Maharashtra towards the Prem Nagar Clean up Drive, Waste to Wonder, Juhu Kolliwada clean up drive, waste collection, clean up drive at Dadar Beach during 2020-2021

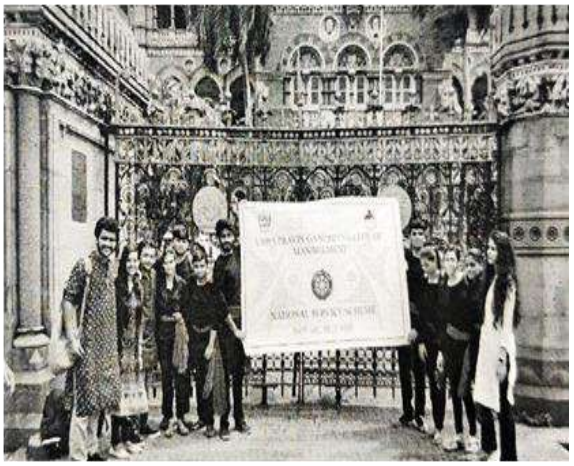
NSS Activities, SVKM's Usha Pravin Gandhi College of Arts, Science and Commerce Campus, Mumbai, Maharashtra towards the Vangani Village Clean up drive , Tetra Park Cleaning, River Cleaning – Mithi Clean up, Area Juhu Koliwada Clean-up Drive, Cleaning – Tata Comound during 2019-2020






NSS Activity, SVKM's Usha Pravin Gandhi College of Arts, Science and Commerce Campus, Mumbai, Maharashtra towards Spit in Bin Campaign, Beach Cleaning Drive at Dadar Chowpatty, Beach Cleaning Drive at Juhu Beach, Recycle and Reuse Campaign, Nirmalya the Garlant Waste, Tetra pack cleaning during 2018-2019

NSS Activity, SVKM's Usha Pravin Gandhi College of Arts, Science and Commerce Campus, Mumbai, Maharashtra Waste to Compost, Swachh Bharat Seminar, Adopted Village Cleaning (Swachh Bharat), Swachh Bharat- IDF (Swachh Bharat) , Swacch Bharat (Wall Painting) Street Play- Swachh Bharat CSMT during 2017 - 2018



24. Best Practices on Environment Audit Initiatives followed in the Organization

1. ‘Eco Club’ and ‘Nature Club’ along with NSS Units of SVKM’s Usha Pravin Gandhi College of Arts, Science and Commerce Campus, Mumbai, Maharashtra are functioning well and conducting a large number of awareness programmes related to nature conservation and environmental protection.

2. NSS Unit have conducted ‘Plastic Waste Management’, ‘Clean and Green (Social Upliftment)’ and ‘Mission Swatchh (Swachh Bharat)’ regularly. In addition, Prem Nagar Clean up Drive programme, Waste to Wonder, Juhu Kolliwada clean up drive, waste collection, clean up drive at Dadar Beach by the NSS Unit was organized well. Vangani Village Clean up drive programme, Tetra Park Cleaning, River Cleaning – Mithi Clean up, Area Juhu Koliwada Clean-up Drive, Cleaning – Tata Comound programmes were organized well.

3. Spit in Bin Campaign, Beach Cleaning Drive at Dadar Chowpatty, Beach Cleaning Drive at Juhu Beach, Recycle and Reuse Campaign, Nirmalya the Garlant Waste, Tetra pack cleaning during 2018-2019 were very well organized by SVKM’s Usha Pravin Gandhi College of Arts, Science and Commerce Campus, Mumbai, Maharashtra.

4. The Waste to Compost, Swachh Bharat Seminar, Adopted Village Cleaning (Swachh Bharat), Swachh Bharat- IDF (Swachh Bharat), Swacch Bharat (Wall Painting) Street Play- Swachh Bharat CSMT during 2017 - 2018 were very well organized by the College.

5. It is observed that the Organization is created massive facilities for solid waste management and wastewater treatment to purify the wastewaters to manage both solid wastes and wastewaters effectively without harming the environment as per the Environment and Energy conservation building codes.

6. The dust bins and ecofriendly trashes are kept in different places across the campus to provide a dust free atmosphere to the stakeholders which are labelled properly for the indication of degradable and non-degradable items.

7. There is a Reverse Osmosis (RO) water unit to produce RO water which is periodically tested for the physico-chemical properties.

8. A compositing unit is made available for decomposing the degradable wastes naturally and converting them into organic manures which are utilized efficiently for cultivation of gardening plants in the SVKM’s Usha Pravin Gandhi College of Arts, Science and Commerce Campus.

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

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

11. Natural Ventilation and Exhaust fans are made available in all buildings to replace 'stale' air with 'fresh' air which helps to moderate internal temperatures, reduce the accumulation of moisture, odours and other gases that can build up during the occupied periods as per the Environment and Energy conservation building codes.

12. The carbon footprint with respect to the concentration of CO_2 in the atmosphere is found to be low which did not exceeds the critical limit of CO_2 coinciding with pure air circulation without any contaminants in the campus.

13. SVKM's Usha Pravin Gandhi College of Arts, Science and Commerce Campus are being offering various courses related to environmental sciences, safety and safeguard, pollution and nature protection to the students and research scholars by the affiliated University.

25. Recommendations for sustainable environment

- A proper steps may be taken to minimize the environmental degradation by means of developing 'Sanitation and hygiene policy', 'Water conservation policy', 'Waste management policy' and 'Green campus and Environment policy' in collaboration with Governmental and Non-Governmental Organizations.

- Helpline numbers for waste collection may be made available in the SVKM's Usha Pravin Gandhi College of Arts, Science and Commerce Campus which may be useful for door-to-door collection of wastes thus avoiding improper disposal by individuals.

- The concept of eco-friendly culture and sensitize the students to minimize the use of plastics, non-biodegradable materials and exploitation of natural resources which pose the environmental hazards may be carried out. It will be useful for the students to implement the process in their native places to provide ecofriendly atmosphere to the public through their education.

- Policy on paper usage may be initiated with certain guidelines to reduce the number of papers that are being used by the students for assignments, mini-projects and final year projects which in turn to reduce 60% usage of paper as a commitment to curb the environmental damage.

- The waste disposal management for dry wastes such as paper, cardboard, glass tin cans etc. and wet wastes such as vegetable peds, leaf litter, left-over food, etc. should be proper in which collection, transport, treatment and disposal of waste, together with monitoring and regulation of the wastes may be undertaken.

- Attempts may be made to segregate the wastes and to convert organic wastes into fertilizing material through recycling and composting processes which may be used for vegetation purpose in large scale level.

- Organisation can operate some bicycles and battery cars for internal mobility for all stakeholders who wish to use it coming from neighbouring places to minimize the car smokes and exhaust to a greater extend towards to minimize the carbon emission.

- 'Rainwater harvesting system' and small scale 'Percolation ponds' to recharge wells and ground water status by collecting rainwaters from the campus coinciding with the contour of the terrain and natural drains.

- 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. The biogas produced from the plant are utilized for cooking, and the residual dung and digested slurry are used as manuring.

- Students may be taken to some industrial areas including the waste management sites to teach about the recycling of wastewaters, solid wastes, natural ecosystem, pollution-free environment and environmental education.

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

26. Conclusion

SVKM's Usha Pravin Gandhi College of Arts, Science and Commerce Campus, Mumbai, Maharasthra is a well-established Institute in India in terms of academic activities, efforts are continuously made in providing an eco-friendly atmosphere to the students, research scholars, parents and staff members. The environmental protection initiatives are substantial by means of creating solid waste management, wastewater treatment and sanitation in the Campus without harming the environment. The College has some Technology Missions related to Green Campus and Environment sustainability as well. A campus ecosystem is supported a rich biodiversity of flora and fauna which is making a sustainable environment and eco-friendly campus as per the Environment and Energy conservation building codes. Swachh Bharath Abhiyan is implemented effectively by the College to promote sanitation and cleanliness to rural and tribal people across the city, Mumbai.

NSS Unit of SVKM's Usha Pravin Gandhi College of Arts, Science and Commerce Campus, Mumbai have conducted several programmes such as 'Plastic Waste Management', 'Clean and Green (Social Upliftment)' Prem Nagar Clean up Drive programme, Waste to Wonder, Area Juhu Koliwada, Juhu Kolliwada and Vangani Villages clean up drive programmes, Clean up drive at Dadar Beach, Tetra Park Cleaning, River Cleaning at Mithi Clean up and Clean up drive at Tata Comound programmes. In addition, spit in Bin Campaign, Waste to Compost, Beach Cleaning Drive at Dadar Chowpatty and Juhu Beach, Recycle and Reuse Campaign, Nirmalya the Garlant Waste, Tetra pack cleaning cleaning were very well organized by the College.

Environmental audit is carried out to provide an indication to the Management about how the environmental Organization system is performing. As a result the best practicable means can be applied to preserve air, water, soil, plant and animal life from the adverse effect. To conclude an environment audit report, the SVKM's Usha Pravin Gandhi College of Arts, Science and Commerce Campus is an eco-friendly campus and providing pure atmosphere to the stakeholders and supports the nation as a whole in future generations.

27. Acknowledgement

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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
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: 2020[illegible]1.03 15:52:36 IST

INCOME TAX DEPARTMENT

Certificates of Environment Auditors

1. ISO Environment Management System (14001:2015) of Mrs. S. Rajalakshmi, Founder & 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, and Er. Ashutosh Kumar Srivastava, Board of Directors (North Zone) of NSF.

5. Energy and Environment Engineering (EEE Auditor) of Er. B. Vijayalakshmi, Deputy Director of NSF.

6. Bureau of Energy Efficiency (BEE) Certificates of Er. D. Dineshkumar and Dr. N. Balasubramanian, Energy Auditors of NSF.

7. LEED AP and GRIHA, Maharasthra Fire and Rescue Service Certificates of Er. D. Dinesh kumar and Er. S. Srinivash, Energy Auditors of NSF.

Exemplar Global

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 TN006

Note: The course conforms to the principles and practice of auditing of Management Systems for compliance with standards. This certificate remains valid for a period of 3 years. To verify this certificate is recognized by Exemplar Global, for certificate verification, please write to Mail: info@isoindia

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

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 25/666

Deepak Sood
Secretary General, ASSOCHAM

TAMILNADU FIRE & RESCUE SERVICES

THIRUVALLUR DISTRICT

THIRUVALLUR

CERTIFICATE

This is to certify that Mrs. / Mr S. SRINIVASH s/o B. SWAMIYAPPAN
4/855, ST. Xavier's Street, Paonur, Thiruvallur District has under gone the "Basic Fire Fighting & Rescue Operation" Training course conducted from 11.08.2016 to 26.08.2016 by Tamil Nadu Fire & Rescue Services Department at Thiruvallur District, Thiruvallur as per G.O.M.S. No.713, dated 17.08.2005 Home (Police XVII) Department, Government of Tamil Nadu.

Station: Thiruvallur.
Date: 20.9.16

District Officer 20.9.16
Fire & Rescue Services
Thiruvallur District,
Thiruvallur

Sl.No.: 0010669

TAMIL NADU AGRICULTURAL UNIVERSITY
COIMBATORE

On the recommendation of the
Academic Council and the Board of Management
hereby admits

VIJAYALAKSHMI, B.
to the degree of
Bachelor of Technology
(Energy and Environmental Engineering)

he / she having qualified to receive the same
securing an Overall Grade Point Average
of **7.61** out of **10.00** in the year **2017**
together with all the honours and distinctions belonging
to this degree given under the seal of the University

COIMBATORE
Date : 26.02.2019

N. KUMAR
Vice Chancellor

ANNA UNIVERSITY

CHENNAI - 600 025

PROVISIONAL CERTIFICATE

Folio No.: **AUO2359635**

This is to certify that the following candidate has qualified for the award of Degree as detailed below:

Name	: **VIJAYALAKSHMI B**
Registration Number	: **412718416013**
Degree	: **M.E.**
Branch/Specialization	: **Environmental Engineering**
Month and Year of Passing	: **April 2020**
Classification	: **FIRST CLASS WITH DISTINCTION**

Controller of Examinations Chennai 600 025 Anna University

Chennai - 600 025.
Date : 02/11/2020

Controller of Examinations i/c

V122065190828B

BUREAU OF ENERGY EFFICIENCY

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

Certificate Registration No. : 9176

Certificate For Certified Energy Manager

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

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

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

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

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

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

Secretary
Bureau of Energy Efficiency
New Delhi

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

BUREAU OF ENERGY EFFICIENCY

Examination Registration No. : EA-7391 Serial Number 7192

Certificate Registration No. : 7192

Certificate For Certified Energy Manager

This is to certify that Mr./Mrs./Ms. N.Balasubramaniam Son/Daughter of Mr./Mrs. M.Nanjukuttigounder who has passed the National Examination for certification of energy manager held in the month of December 2009 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 7192 being maintained by the Bureau of Energy Efficiency under the aforesaid regulations.

Mr./Mrs./Ms. N.Balasubramaniam 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

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

Regn. No. EA-7391

Certificate No. 5093

National Productivity Council

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, 11 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