



SHRI G.P.M. DEGREE COLLEGE
M.G. ROAD, VILE PARLE (EAST) MUMBAI - 400057



ENVIRONMENT AUDIT REPORT

2022-2023

PREPARED BY
QUALITY CARE ALLIANCE

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QUALITY CARE ALLIANCE

(ISO 9001/ ISO 14001 / ISO 45001 / ISO 50001 Certified)

Office no. 37/1, 1st Floor, Dharmveer Complex, Naupada, Thane – 400602.MH.

qualitycare.in@gmail.com | www.isocertifications.co.in



ENERGY



AIR QUALITY



WATER



WASTE

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CONTENTS

S.No.	Details of Reports	Page No
1.	Introduction	1
2.	Role of Educational Institutions in India	3
3.	Energy and Environment Policy	4
4.	Environment friendly campus	4
5.	Environmental Management Plan (EMP)	6
6.	Environmental health and safety management system	8
7.	Evacuation Plan in Human Eco-system of the Organization	8
8	Waste Management Plan of the Organization	9
9.	Methods of Disposal of wastes	10
10.	Aims and Objectives of Environment Audit	11
11.	Scope and Goals of Environment Auditing	12
12.	Environmental Audit Schemes and their Components	14
13.	Role of Environmental Audit and Environmental Mgt. System	14
14.	Target Areas of Environmental Auditing	15
15.	Procedures followed in Environment Audit	15
16.	Benefits of an Environmental Audit	17
17.	Phases of an Environmental Audit	18
18.	Components of an Environmental Audit	19
19.	About the Organization	21
20.	Audit Details	23
21.	Qualitative and quantitative measurements of the Eco Audit	23
21.1	Qualitative Measurements	24
21.2	Quantitative Measurements	27
22.	Observations of the Environment Audit	28
22.2.1	Waste Management Practices	30
22.2.2	Bio-degradable and Non-degradable waste materials Management Practice	31
22.3.	Vermicompost, Organic and Green manures	39
22.4.	Oxygen producing and Carbon dioxide absorbing plants to give pure atmosphere to the Stakeholders	40
22.5.	Establishment of Eco-friendly Campus at SGDC	41
23	List of Environmental Promotional Activities	61
24.	Best Practices on Environment Audit initiatives followed in the Organization	64
25.	Recommendations for sustainable environment	65
26.	Conclusion	66
27.	Acknowledgement	67
28.	Annexure - Certificates of Environment Audit	74
29.	Annexure – Campus Photos	79

1. INTRODUCTION – Environment

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. 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. 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

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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, twigs 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.

**QUALITY CARE | ENVIRONMENT AUDIT REPORT OF
SHRI G.P.M. DEGREE COLLEGE**

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 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.

**QUALITY CARE | ENVIRONMENT AUDIT REPORT OF
SHRI G.P.M. DEGREE COLLEGE**

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, 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. 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. 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, carbon 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-

**QUALITY CARE | ENVIRONMENT AUDIT REPORT OF
SHRI G.P.M. DEGREE COLLEGE**

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.

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. 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.

**QUALITY CARE | ENVIRONMENT AUDIT REPORT OF
SHRI G.P.M. DEGREE COLLEGE**

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 soil 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

**QUALITY CARE | ENVIRONMENT AUDIT REPORT OF
SHRI G.P.M. DEGREE COLLEGE**

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.	Occupation al 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 bestpractices 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 operatingpractices 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 place 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 understood. 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).

QUALITY CARE | ENVIRONMENT AUDIT REPORT OF SHRI G.P.M. DEGREE COLLEGE

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.



Additionally, abandoned materials and materials intended to be recycled are considered wastes. It should be taken into account while WMP is 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

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

**QUALITY CARE | ENVIRONMENT AUDIT REPORT OF
SHRI G.P.M. DEGREE COLLEGE**

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

QUALITY CARE | ENVIRONMENT AUDIT REPORT OF SHRI G.P.M. DEGREE COLLEGE

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..

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. 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. 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 CO₂ Analyzer (Non dispersive infra-red meter). In addition, CO₂ meter is also displayed the readings of atmospheric temperature, relative humidity and dew point in the places,

where the level CO₂ is measured. The meter started measurements of CO₂ 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 CO₂ sensor to respond and 30 minutes for flexibility in relative humidity. The meter features an audible alarm to give warnings when CO₂ concentration exceeds the set limit. It emits beeps (Abt.80dB) when CO₂ 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 CO₂ 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 CO₂ in metric tons per year.

16 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 QCA 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

**QUALITY CARE | ENVIRONMENT AUDIT REPORT OF
SHRI G.P.M. DEGREE COLLEGE**

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?.

| 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.

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

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

SHRI G.P.M. DEGREE COLLEGE M.G. ROAD, VILE PARLE (EAST) MUMBAI - 400057

Shri G.P.M. Degree College, established in the year 2005 by Smt. Shyampatidevi Mishra Educational Trust, is a Co-educational Hindi Linguistic Minority Institution affiliated to the University of Mumbai. The college offers BEST education by nurturing human values, ethics with life skills. The college nurtures and supports a unique system of education, structured on the UoM syllabi, combining the tenets of academic excellence and corporate exposure with professionalism.

The college offers a wide range of Undergraduate Programs in Commerce, Science, Mathematics, Computer Science, Mass Communication and Management where students from surrounding schools and colleges, various districts and neighbouring states seek admission.

Our holistic approach to education sets our brand equity as a trusted name for value-based education and integrated learning. Discipline which is a non-negotiable factor of students' life on our campus inculcates value of time management and punctuality. Apart from integrating value education into the main curriculum, several motivational talks, leadership programs, and regular group and personal counseling sessions are conducted by well qualified counselors to nurture the emotional intelligence of the students making them confident and competitive to take on the challenges of life ahead. The students during the process of education in college emerge as well qualified and socially responsible citizens of India.

The college has made significant contributions in the last decade since its inception & has been at the forefront in practicing innovative teaching methods. Besides the theoretical knowledge that our students imbibe from our well-qualified & energetic faculty, they also receive sound practical training to support their knowledge. In **Shri G.P.M. Degree College** students are encouraged to pursue their studies vigorously while also participating in a variety of extra-curricular, intellectual, cultural, sporting & community service activities. We are committed towards building a new generation of smart & sound individuals with honesty, sincerity, integrity & knowledge.

ABOUT COLLEGE (CAMPUS INFRASTRUCTURE)

Green Audit Report of SGDC has been prepared by Quality Care Alliance based on review of findings of internal green & environmental audits conducted by College, desktop review of documents/records, virtual tour of the College campus and telephonic interviews of faculty, non-teaching staff & students.

The audit was conducted in **March 2023**.

The Green Audit Report also presents green initiatives followed and taken up by the College and provides suggestions and recommendations to improve environmental sustainability.

College campus consists of two buildings, one is operational and another is under construction. As the under- construction building is non-operational, it is not considered in the Green Audit Scope.

College building has classrooms, well-equipped laboratories, a library and an auditorium. College Sports ground has indoor and outdoor games facilities. There are 4 gardens in the campus including an herbal garden. The area details of the College building is presented in Table 1.

Table1: Facilities Details,

Floor	Facilities
Ground floor	Principal Cabin, Administration Office, 8 ICT Classrooms, Naac Room, Staff Room, Waiting Area, Water Room, Parking for Students & Staffs, IT Lab, Library, Girls Common Room, Girls Wash Room, Staff Washroom, Boys Common Room, Boys Wash Room, Examination Room.
Terrace	

TABLE: Internal Audit Team

Sr. No.	Name	Department/Section
1	Mr. Atul Yadav	Principal
2	Mr. Ajay Singh	NAAC Coordinator
3	Ms. Anjali Yadav	Department of Environment Science
4	Ms. Siddhi Sawant	Assistant Horticulturist

20. 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, staff rooms, 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-dioxide 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, 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

**QUALITY CARE | ENVIRONMENT AUDIT REPORT OF
SHRI G.P.M. DEGREE COLLEGE**

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. 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 day to 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).

SGDC 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 SGDC 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.

23 SOLID WASTE MANAGEMENT PRACTICES AT SGDC

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 solidwaste 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. 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.

SGDC 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 extent.

Solid Waste Management Facility.

23.1.1. 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 SGDC 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 SGDC 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 SGDC 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 foodwastes, 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.

23.2. *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 and common places.

23.2.1. Disposal of e-Waste at SGDC

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, Refurbished, Dismantler and Recycler involved in the manufacture, sale, transfer, purchase, collection, storage

QUALITY CARE | ENVIRONMENT AUDIT REPORT OF SHRI G.P.M. DEGREE COLLEGE

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).



In compliance to the E-Waste Management Rules, 2016, Government of India, e-waste materials were collected from SGDC 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 SGDC. However, a proper method of e-waste disposal should be done in coming years in collaboration with Maharashtra State Pollution Control Board as per the E-Waste Management Rules, 2016.

23.3. **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.

23.4. **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

**QUALITY CARE | ENVIRONMENT AUDIT REPORT OF
SHRI G.P.M. DEGREE COLLEGE**

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.

SGDC 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 talcor 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

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).

SGDC 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.

23.5. 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 its 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.

SGDC 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.

23.6. 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. 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 SGDC 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.

SGDC 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.

24 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 CO₂ absorbing plants are planted in the SGDC. 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 CO₂ 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 CO₂ absorbing plants found in the SGDC 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*)]

24.1. Establishment of Eco-friendly Campus at SGDC

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 example to conserve the environment. Eco-friendly products also prevent contributions to air, water and land pollution to a greater extent. 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, SGDC 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 SGDC

24.2. Environmental Education

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

24.3. 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 SGDC 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.

24.4. 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 SGDC 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 SGDC

24.5. 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 CO₂ Analyzer is used to measure the level of carbon dioxide in the atmosphere at different places across the SGDC. The observation showed that the concentration of CO₂ in the atmosphere is found to be low which did not exceeds the critical limit of CO₂. 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).

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 airquality.
- 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.

24.6. 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 SGDC showed 5488.12 metric tons. It is calculated based on CO₂ emission from electricity per year in kWh/1000 units. The carbon footprint due to transportation (Shuttle services) per year at SGDC 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 SGDC 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

24.7. Auditing for Water Management at SGDC

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.

24.8 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). SGDC 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.

24.8.1. 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.

24.8.2. Physical Appearance and Overall Ambience on 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 WaterManagement

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, more so 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.

24.9 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.

$$\text{Quantity} = \text{Per capita demand} \times \text{Human population}$$

24.10 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 SGDC

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

24.10.1. Estimation of Water requirements for drinking and domestic use

(Source: National Building Code 2016 BIS)

As a general rule the following rates per capita per day may be considered for domestic and non-domestic needs. For Communities with population 20,000 to 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 Institution water requirements	Domestic use (lphd)	Flushing (lphd)	Total use (lphd)
1.	Without Boarding Facility	25	20	45
2.	With Boarding Facility	90	45	135

24.10.2. 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	$Q (L/min)=4637 - 0.01 \square P)$	41760
2.	Kuchling's Formula: per capita fire demand	$Q (L/min)=3182 \square P$	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	$Q (kilo liters/d)=100 P > 50000$	31623

24.10.3. 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 sewerage 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.

24.10.4. 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

$$\begin{aligned} &= 1.5 \times \text{average hourly demand} \\ &= 1.5 \times \text{Maximum daily demand}/24 \\ &= 1.5 \times (1.8 \times \text{average daily demand})/24 \\ &= 2.7 \times \text{average daily demand}/24 \\ &= 2.7 \times \text{annual average hourly demand} \end{aligned}$$

24.10.5. 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

- **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 displeasing 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).

- **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 (SGDC) 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 SGDC. 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 SGDC for the collection, transport, treatment and scientific disposal of the biomedical waste. The SGDC consists of autoclave, shredder, incinerator and secured land fill facilities.

- ***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 SGDC

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

- **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. SGDC 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 SGDC

- **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 SGDC 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 pandemic situation to the students and both teaching and non-teaching staff members.

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 SGDC 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 Maharashtra through 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. 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. SGDC has well developed, Swachh Bharath Abhiyan under Clean India Mission. These bodies are actively involved in tree planting

**QUALITY CARE | ENVIRONMENT AUDIT REPORT OF
SHRI G.P.M. DEGREE COLLEGE**

programmes and cleaning the surrounding areas of tribal, rural and urban people across Mumbai, Erode and Nilgiris Districts of Maharashtra. SGDC 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. 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. SGDC 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.

SGDC is implemented the Government schemes (Swachh 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 Mumbai. 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 Mumbai. SGDC 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.

SGDC 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. SGDC 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.

List of Environmental Promotional Activities

Academic Year 2022 -2023

List of Environmental Promotion Activities

Sr. No.	Date	Title of event	Department	No of students participated
1	06-06-2018	World Environment Day	NSS/DLLE	60
2	05-08-2018	Tree Plantation at College Campus	NSS	25
3	10/10/2018	College Campus Cleaning Activity	NSS	30
4	06-06-2019	World Environment Day	NSS	35
5	05-08-2019	Tree Plantation at College Campus	NSS	35
6	10/10/2019	College Campus Cleaning Activity	NSS	25
7	08-11-2020	Online Awareness E-waste collection	NSS	30
8	16/10/2021	Online Awareness towards Eco-Friendly Products and Its Impact an Environment	NSS	30
9	29/01/2022	Best Out of Waste	NSS/DLLE	30
10	21/02/2022	Collection of plastic waste to recycle organised by NSS	NSS	55
11	25/03/2022	Session on harmful effects of throwing plastic activity organised by NSS	NSS	45
12	05/08/2022	Tree Plantation at College Campus	NSS	35
13	17/09/2022	International cleaning day awareness organised by NSS	NSS	40
14	30/09/2022	Paper Bag Making and Distribution Drive	NATURE CLUB	25
15	29/01/2023	Best Out of Waste	NSS	25
16	16/02/2023	Anti Plastic awareness & collection activity	NSS	25

**QUALITY CARE | ENVIRONMENT AUDIT REPORT OF
SHRI G.P.M. DEGREE COLLEGE**



World Environment Day Organized by NSS dated 06/06/2018



Tree plantation at college campus organized by NSS 13/6/2018



College Campus Cleaning Activity Organized by NSS dated 10th Oct 2018



World Environment Day Organized by NSS dated 06/06/2019

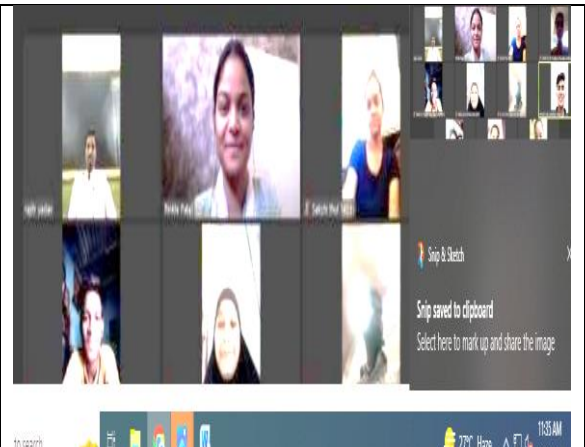


Tree plantation at college campus organized by NSS dated 13/6/2018



College Campus Cleaning organized by NSS dated 10th Oct 2019

**QUALITY CARE | ENVIRONMENT AUDIT REPORT OF
SHRI G.P.M. DEGREE COLLEGE**



Online Awareness E-waste collection organized by NSS dated 08/11/ 2020

Online Awareness towards Eco- Friendly Products and Its Impact an Environment 16/10/2021



Best Out of Waste Activity organised by DLLE dated 09/01/2022

Session on harmful effects of throwing plastic activity organised by NSS dated 25/03/2022



**QUALITY CARE | ENVIRONMENT AUDIT REPORT OF
SHRI G.P.M. DEGREE COLLEGE**

**Collection of plastic waste to recycle
organised by NSS 21/02/2022**



**Tree plantation at college campus organized
by NSS dated 05/08/2022**



**International cleaning day awareness organised
by NSS 17/09/2022**



**Paper Bag Making and Distribution
Drive Organized by Nature Club dated
30/09/2022**



**Best Out of Waste Activity organised by DLLE
29/01/2023**

**Anti Plastic awareness & collection
activity organized by NSS dated
16/02/2023**

Keep Your Campus green Activity

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 SGDC is an eco-friendly campus and providing pure atmosphere to the stakeholders and supports the nation as a whole in future generations.

25. Acknowledgement

Quality Care Alliance, Thane, Maharashtra is grateful to the Management and Principal of SGDC, for providing us necessary facilities and co-operation during the energy audit process. This helped us in making the audit a success. Further, we hope that the best practices on sustainability followed by the Organization and recommendations and suggestions given by the QCA will boost the new generations to take care of the Electrical energy conservation, Energy saving measures and sustainability in compliance with the applicable regulations, policies and standards in SGDC.

CERTIFICATE OF AUDIT



Consultancy & Services
qualitycare.in@gmail.com

Cert. No.: QC/EVA/22-23/068

Environment Audit Certificate

This is to certify that

SHRI G.P.M. DEGREE COLLEGE

M.G. ROAD, VILE PARLE (EAST), MUMBAI - 400057 Maharashtra.

has successfully undergone the "Environment Audit" during the period of Feb to April 2023 under our supervision and the efforts taken by the management and the faculty towards the Eco-friendly campus are highly appreciable.

Certificate issued on : 10 April 2023

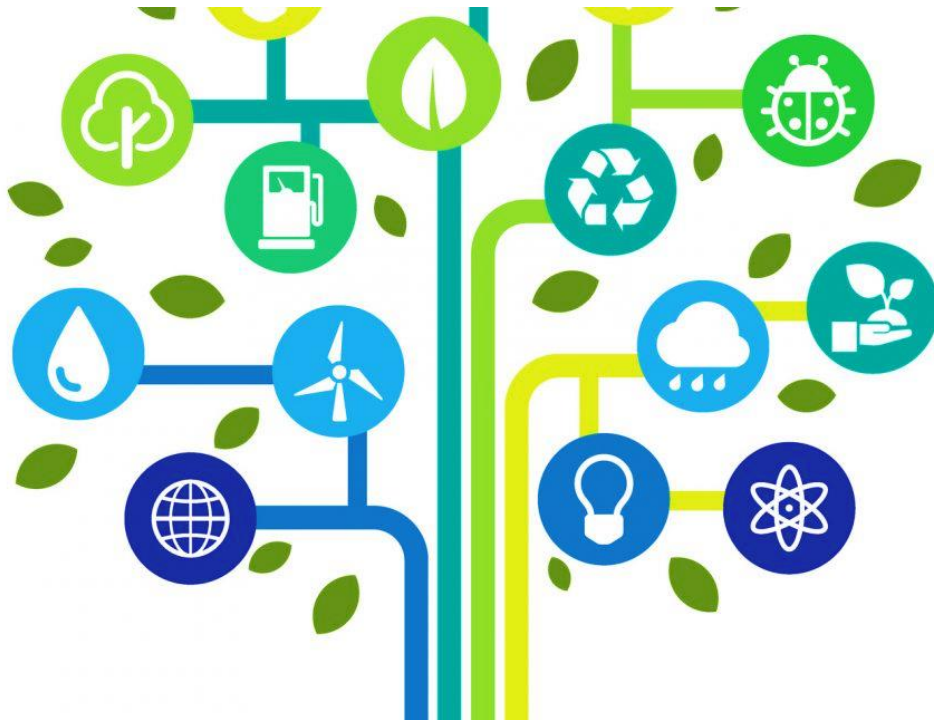


Project Head & QEHS Auditor

QUALITY CARE ALLIANCE

QUALITY | ENVIRONMENT | SAFETY | ENERGY CONSULTANTS

An Environment and Energy Consultancy developing healthy and sustainable Environment



**Think
GREEN**