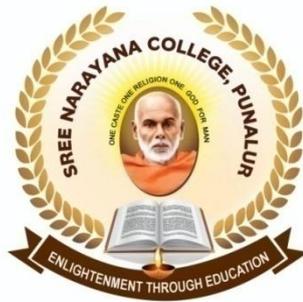


GREEN AUDIT REPORT 2021 - 2022



SREE NARAYANA COLLEGE, CHEMMANTHOOR, PUNALUR P.O, KOLLAM



Xcellogen Biotech Pvt Ltd

Where science & Technology Meets

**Xcellogen Biotech India Pvt. Ltd.
Pattoor, Thiruvananthapuram**

Executive Summary

This Green Audit Report of the demesne of Sree Narayana College, Punalur, Kollam, Kerala presents the insights of multidisciplinary green audit team with expert knowledge on the holistic green status of this esteemed higher education institution which has a history of over 57 years of excellence in contrast to being conscious of its initial objective to bring education to the doorsteps of the impoverished and underprivileged segments of society, this institution works to develop a community of young people who are compassionate, academically accomplished, ethically enlightened, and socially committed.

Sree Narayana College, founded in 1965, July 15th is an aided institution affiliated to the University of Kerala. The college is the center for higher education in the eastern alcove of Kollam district in Kerala. This institution was founded in reverent remembrance of Sree Narayana Guru, a saint, poet, philosopher, and one of Kerala's most important social reformers. The College is managed by The Sree Narayana Trusts, Kollam, one of the leading academic institutions in the region. The National Assessment and Accreditation Council (NAAC) in 2006 at "B" level, and re-accredited in 2014 with a "B" Grade (2.51), while the University Grants Commission (UGC) has given it recognition under sections 12 B and 2(f). The launch of the DST-FIST and RUSA is another indication of the institution's overall growth into a respected institution that offers top-notch education. The College offers a wide range of certificate and supplemental courses in addition to the standard university degree programmes for the students' overall growth. Numerous study groups and clubs exist to support and develop the artistic and literary abilities of their participants. The college has a multi-gymnasium set up to foster physical prowess and athletic abilities. The college has outstanding success in the University of Kerala in both academics and athletics. The College offers Degree courses in Chemistry, Physics, Zoology, Mathematics, Commerce, History, Economics and English and Communicative English. At the post-graduate level, the college offers M.Sc in Physics, Chemistry, Mathematics and World History & Historiography.

The process of conducting a "Green Audit" entails systematically identifying, quantifying, recording, reporting, and analyzing the different establishments' environmental diversity components. It tries to analyze environmental practices on the locations in question and elsewhere that may have an effect on the environment and the surrounding area. A green audit can be a helpful tool for a campus to evaluate where and how they are using the maximum

energy, water, or other resources. The institution can then deliberate of how to make improvements and save revenue. It may also be used to estimate trash amount and kind, which is useful for recycling projects or for enhancing waste minimization plans. It can enhance environmental awareness, ethical behavior, and health consciousness. Staff members and students can better comprehend the effects of being green on campus. If self-reflection is a natural and important byproduct of a quality education, then institutional self-reflection is a natural and important byproduct of a quality educational institution. In order to ensure a sustainable future, it is crucial that the Institute assess its own contributions. The function of higher educational institutions in connection to environmental sustainability is more common as environmental sustainability becomes a national issue of increasing importance.

The primary goals of the green audit are to support environmental management and conservation on the campus of the Institute. According to the relevant laws, rules, and standards, the audit's goal is to identify, quantify, explain, and prioritize the framework for environmental sustainability. The systematic identification, quantification, recording, reporting, and analysis of environmental diversity components are known as a "Green Audit." The "Green Audit" seeks to evaluate environmental activities on the campus of the Institute that will affect the environment-friendly ambiance. It was started with the intention of inspecting the work done within the firms whose operations could be hazardous to the environment and the health of the local populace. It is afterwards put into practice as a measure to improve a healthy atmosphere for practically all enterprises. Through a green audit, one can learn how to better the environment, and a number of variables have influenced how popular green audits have become. The NAAC, or National Assessment and Accreditation Council, which is an independent agency in India and classifies the institutions as Grade A, B, or C based on the scores provided during the accreditation, has green audit assigned to the criteria 7.

The green audit process at Sree Narayana College in Punalur, Kollam, includes a number of steps, including interviews with the relevant administration to acquire clarification on the college's policies, activities, and records as well as to enlist their cooperation. The auditing procedure started with interviews, followed by the gathering of necessary data using a questionnaire, reviewing of records, observation of practises, and measurement of observable results. The baseline data created for Sree Narayana College will be a helpful tool for several development criteria, including campus greening, the execution of future energy-saving projects, and the college's sustainable development.

These statistics will be more useful for the college in identifying specific areas that need improvement and in setting priorities for carrying out upcoming projects. Additionally, it offers comparisons to various policies and initiatives carried out by comparable institutions.

We are incredibly delighted to present this green audit report to the management of Sree Narayana College.

The Green Audit Team of Xcellogen Biotech Pvt Ltd

1. **Dr. Kumaran T (MSc, MPhil, PhD)**

Head, Department of Environmental Science
Muslim Arts College, Thiruvithamcode, Tamil
Nadu

2. **Anooj E S**

CEO & Managing Director

CONTENTS

SL. NO.	CONTENTS	PAGE NO.
1	INTRODUCTION	1-8
1.1	INSTITUTIONAL VISION AND MISSION	
1.2	TOTAL CAMPUS AREA	
1.3	PREVIOUS NAAC GRADING'S	
1.4	CAMPUS INFRASTRUCTURE	
2.	PRE – AUDIT STAGE	9-20
2.1	MANAGEMENT'S COMMITMENT	
2.2	SCOPE AND GOALS OF GREEN AUDITING	
2.3	OBJECTIVES OF GREEN AUDITING	
2.4	BENEFITS OF THE GREEN AUDITING	
2.5	TARGET AREAS OF GREEN AUDTING	
2.6	METHODOLOGY	
2.6.1	DATA COLLECTION	
3.	AUDIT STAGE	22-23
3.1	ONSITE VISIT	
3.2	GROUP DISCUSSION	
3.3	ENERGY, WASTE MANAGEMENT, LANDSCAPE AND CARBON FOOT PRINT ANALYSIS SURVEY	
4.	POST AUDIT STAGE	24-59
4.1	ENERGY AUDIT	
4.2	WATER QUALITY ASSESMENT	
4.3	WASTE MANAGEMENT	
4.4	GREEN CAMPUS	
4.5	TRANSPORTATION FACILITIES/ CARBON FOOTPRINT	
4.6	GREEN CAMPUS INITIATIVES	
4.7	CONSOLIDATION OF AUDIT FINDINGS	
5.	CONCLUSION AND FULL LIST OF RECOMMENDATIONS	60-63
5.1	SUGGESTIONS	
5.2	LIST OF RECOMMENDATION	
5.3	COMMITMENTS AFTER GREEN AUDITING	

Chapter – 1

INTRODUCTION

Sree Narayana College, Punalur, established by the S. N. Trusts, Kollam in respectful remembrance of the saint, philosopher, and social reformer, Sree Narayana Guru, efficiently meets the educational and intellectual demands of the community entrenched in the eastern corner of Kollam district. On July 15, 1965, Sri. R. Sankar, a former chief minister of Kerala, gave the college its official inauguration. Dr. P. Vijayaraghavan, a renowned social scientist, served as the college's first principal. The College, which is hidden on a lush 22-acre hillside, comes to life as hundreds of young people approach their temple of knowledge and enlightenment. In 2016, the college marked 50 years of striving for greatness and glory. The college is affiliated to the University of Kerala. The college's vision and mission are based on the words of the great philosopher, Sree Narayana Guru, who was a great seer, mystic poet, and social reformer. The institution instills in its students the values of love, brotherhood, and humanity by adopting the teachings and ideas of Guru and following his proclamation that "One Caste, One Religion, One God for Man". The institution is unavoidably important in educating the youth and assisting them in acquiring Knowledge of Enlightenment.

The Institution at present is working under the efficient stewardship of the Manager, Sri.Vellappally Natesan and Dr. Santhosh R, the Principal

The college offers 8 Undergraduate and 4 Post Graduate programs under Arts, Commerce and Science streams. In order to prepare and support students in their professional ambitions, the college provides certificate programs in a number of subject areas. Certificate courses are offered by the Department of English, Economics, Commerce, Mathematics and Physical Education. For the purpose of fostering students' interest and abilities in a variety of other subjects, this institution has formed a student union as well as other organizations. The college has active members of the National Service Scheme, National Cadet Corps, 12 well- functioning clubs, WWS, ASAP, SSP and Women Studies and Welfare Unit, which hold numerous competitions on campus and offer training in a variety of artistic mediums that foster students' development as responsible citizens.

This institution is also supported under the Scheme “Fund for improvement of S & T Infrastructure” (FIST) of the Department of Science & Technology and RUSA.

In addition to their regular teaching responsibilities, the college's well-educated and committed faculty members are actively involved in research, consulting, and extension projects. Among 52 Full Time faculty members, 23 are PhD holders. A team of experienced and friendly office staffs supports students and teachers related administrative needs. The seamless operation of the college is actively supported by a robust and active alumni and parent teacher association.

On the initiative of numerous organizations and groups, awareness campaigns on environmental issues, solid waste management, energy saving, and eco-friendly living are held here. The pupils eagerly participate in the "Green Campaign" sponsored by Forest Departments. The college has created cutting-edge and efficient methods for disposing of solid waste and recycling plastics. Safe and sustainable coexistence with nature is ensured by the production of organic manure through vermin-composting and pipe composting. Efficient management and rain water harvesting on this hillock campus are worth noticing.

Sree Narayana Guru awoke the sleepy underdeveloped communities and motivated them to advance socially via education. This institution, maintains Guru's vision and objectives, fostering social progress through the provision of high-quality education, and moulding our students into better future citizens.

1.1 INSTITUTIONAL VISION AND MISSION

Institutional Vision

Sree Narayana College envisage to inculcate the universal brotherhood among the students by nurturing the great philosophy "**One Caste, One Religion, and One God for men**" and to uphold the spirit of Innovation. The institution focuses at the enlightenment of young generation through quality education and strives for achieving it through offering under graduation and post graduation courses.

Institutional Mission

- ✓ To transform the students into knowledgeable, competent, honest and socially committed citizens by instilling scientific temper among them.
- ✓ To develop spirit of innovation and inherent talents among young generations and ensuring to disseminate the updates of various subjects.
- ✓ To spread the light of knowledge and life skills among the students for their sustainable development.
- ✓ To eliminate the inequality between the genders, castes and creeds and similar other evils of the community.
- ✓ To create a broader and progressive outlook in education, health and environment.

1.2 Total Campus Area

Campus Area	22 Acres
-------------	----------

1.3 Previous NAAC Grading's

SI. No.	Phase	Grade	CGPA/%	Year of Accreditation
1	Ist Phase	B	70.3	2006
2	IInd Phase	B	2.51	2014
3	IIIrd Phase	Ongoing	--	2022

Courses Offered by the College

POST - GRADUATE PROGRAMMES		
SL.NO	DEGREE	SUBJECTS
1	MSc	Chemistry
2	MSc	Mathematics
3	MSc	Physics
4	MA	World History & Historiography

GRADUATE PROGRAMMES		
SLNO	DEGREE	SUBJECTS
1	BSc	Chemistry
2	BSc	Mathematics
3	BSc	Physics
4	BSc	Zoology
5	B. Com	Elective Cooperation
6	BA	Economics
7	BA	English & Communicative English
8	BA	History

Students and Faculty Strength of the College

1	Number of Students	1440
2	Number of Full Time Teachers	52
3	Number of Non-Teaching Staffs	12
4	Librarian	1
	Total Number	1505

1.4 Campus Infrastructure

1	Departments	8
2	Laboratories	8
3	Computer Lab	4
4	Library	1
5	Women's Hostel	1
6	Canteen	1
7	Seminar Hall	1
8	Multi-Gymnasium	1
9	Ladies Amenity Centre	1
10	Auditorium	1

General Library

The college library serves as a helpful learning resource and offers the students sufficient learning materials. It provides access to a vast universe of literature, reading, knowledge, and enjoyment. The reading room, stack room, and reference room are the three rooms that make up the library. There are 21,412 books and 19 magazines in the library's collection overall. There are also seven newspapers available in the library. There are about 790 reference books. There are about 19 journals in AISHE. In addition there is about 11 Computers provided in the Library for Students and staffs reference purpose. The library is computerized and installed with licensed software – LIBSOFT.

Canteen

The college canteen runs efficiently on campus, feeding students and faculty member's nutritious vegetarian and non-vegetarian food for lunch and snacks. The canteen is completely outfitted with separate seating areas for faculty and students.

Multi-Gymnasium

The college's multi-gymnasium is the heart of sports aimed at the overall health of students and employees. To perform a variety of strength training and cardiovascular exercises, it is equipped with a twelve-station multi gym, fitness treadmill, spin bike, smith machine, functional trainer machine, squat stand, hack squat machine, kettle weights, free weights, barbells, dumbbells, abdominal crunches, etc. "A healthy mind exists in a healthy body", and that is the goal of this training platform for our students and educators.

Classrooms

The college offers its pupils well-ventilated, large classrooms. For a successful teaching and learning process, the classrooms are equipped with enough desks, benches, lighting, fans, and a raised platform with a podium stand, whiteboards, and green boards. Smart Classrooms are also offered.

Laboratories

The college has separate laboratories for Physics, Zoology, Botany and Chemistry. All laboratories are sufficiently furnished in accordance with University standards.

College Auditorium

An open auditorium and an indoor auditorium are also available at the institution. One thousand pupils can sit in the indoor auditorium. The indoor auditorium is where the majority of important and official events take place. Six exits, hand fire extinguishers, and a generator for backup power are all present. The auditorium is where the college holds many of its academic and cultural events. It serves as the typical location for conferences, workshops, and seminars. Additionally, it serves as a multi-use indoor facility for activities including badminton, shuttle, yoga, and aerobics. In addition to its interior auditorium, the college also boasts an outdoor auditorium where events like cultural competitions are performed.



Seminar Hall

The college includes a well-appointed, large seminar room with seating for 100 persons at once. The seminar room, which has a projector, smart board, audio-visual aids, amplifiers, and a contemporary sound system, is where the institution's private meetings are held. The room is ideal for holding conferences and seminars. The seminar room is used for staff meetings as well as a variety of academic and cultural events. The institution maintains the seminar room on a regular basis.

IQAC Room

The IQAC room is a cutting-edge location for executive meetings and presentations. It houses the offices of the IQAC, academic, and UGC coordinators. To maintain high standards of work in academia and administration, the internal quality assurance cell offers recommendations and directives to the administration. The cell keeps track on the quality aspects of all the institution's academic and extracurricular endeavors.

College Hostel

The college offers female students hostel accommodations. The dormitory has enough furniture, a fireplace that is smoke-free, restroom facilities, a biogas plant, an incinerator, and other amenities that make the students feel more at home. Inside the hostel, there is also a designated rest space. Every room has constant access to electricity, and it is routinely maintained. Supporting personnel hired by the college clean the rooms and hostel grounds.



Chapter - 2

PRE - AUDIT STAGE

A pre-audit meeting offered the chance to reiterate the audit's goals and scope, and practical issues related to the audit were discussed. As the first opportunity to meet the auditee and address any concerns, this encounter is a pre requisite for the green audit. The meeting was held at Sree Narayana College, Punalur, Kollam on 13th July 2022. The meeting provided a chance to collect a variety of data that the audit team could review before visiting the college site. At this meeting, the audit protocol and audit plan were distributed and discussed in advance of the audit itself. Before the audit procedures began, the pre-audit meeting was successfully held, and the required papers were obtained directly from the college. In the pre-audit meeting, the actual planning of the audit processes was discussed. To assure completion within the brief and scope of the audit, the audit team collaborated together under the leadership of the lead auditor.

2.1 Management's Commitment

During the pre-audit meeting, the college administration and principal expressed their complete support and commitment to performing the green audit. The management made the decision to implement a number of environmentally friendly programmes, including rainwater harvesting and water conservation techniques, efficient energy and water use habits, the purchase of electronic goods with low energy consumption, proper waste segregation and disposal techniques, environmental club activities, distribution of tree saplings to the community, and so on. On the basis of the conclusions and recommendations from the green audit report, the management was also eager to implement sustainable practices. The administration is devoted to inculcate virtues amongst students in conservation and environmental preservation values.

2.2 Goals and Scope of a Green Audit

An environment that is clean and healthy promotes learning effectiveness and creates a

favorable setting for learning. A green audit can be used to find potential for sustainable development methods that would improve environmental quality, decrease liabilities, and promote moral values while also enhancing health, hygiene, and safety. One of most effective and sustainable method of handling environmental issues is through a green audit. Environmental audits can be a highly beneficial tool for colleges in a variety of ways to enhance their environmental, economic, and reputational performance while minimizing wastage and operating expenses. Following the auditing process, baseline data can be created and used as a point of departure for subsequent campus greening activities. As a result, it aids the college in comparing its programmes and those of other institutions, identifying areas for improvement and establishing priorities for the execution of future initiatives. By identifying the existing rates of resource usage and their associated costs, these data will also serve as a foundation for evaluating the economic advantages of resource conservation efforts.

In order to compile baseline data and monitor the environmental performance of Sree Narayana College, Punalur, Kollam, a very simplistic indigenous system was devised.

The objectives of Green Auditing are to assist the institution in implementing sustainable development methods, serve as role models for the community, and inspire the next generation of leaders.

2.3 Objectives of a Green Audit

The primary goals of this Green Audit are to create a baseline report on the environmental quality, biodiversity, and other resources, to identify strategies being used by Sree Narayana College in Punalur, Kollam to reduce resource waste and improve resource quality, and to improve sustainable practices.

The specific objectives are;

- ✓ To monitor the energy consumption pattern of the college
- ✓ To create a database of flora diversity found on and around the college campus
- ✓ To estimate the quantity of water usage within the college campus
- ✓ To assess the quality of the water in the college
- ✓ To calculate the amount of liquid and solid waste produced and to implement the necessary plants on campus

- ✓ To evaluate if the extracurricular exercises of the institution assist the collection, recovery, and reuse of solid waste.
- ✓ To analyze the carbon footprint or transportation of the college
- ✓ To offer suggestions for ways to enhance biodiversity on the college campus.
- ✓ To identify the gap areas and propose solutions to enhance the Sree Narayana College in Punalur, Kollam's green campus status

2.4 Advantages of Green Auditing

- ✓ To establish a green campus
- ✓ Empower the organization to frame a better environmental performance
- ✓ To establish a basis for increased sustainability
- ✓ Enhanced resource management
- ✓ To facilitate waste management through waste generation reduction, solid-waste recycling, and water recycling
- ✓ To eliminate plastic from campus and raise stakeholder awareness of health
- ✓ Identify ways to reduce costs by minimizing and managing waste.
- ✓ Summarize the ongoing and upcoming complications.
- ✓ Authenticate conformity with the implemented laws
- ✓ Increase awareness of environmental regulations and obligations
- ✓ Guidelines for environmental protection programmes
- ✓ Promote environmental education by using a methodical approach to environmental management and raising environmental standards.
- ✓ Enhancement of college profile
- ✓ Establishing and environmental ethics and value systems in youngsters

2.5 Areas of Green Auditing to Focus On

Green audit forms an important part of a resource management approach.

Despite the fact that these are isolated occurrences, the true assessment of a green audit is how it is carried out throughout time during defined stretches. The notion of an eco-campus is largely concerned with the efficient use of water and energy, the reduction of waste formation

or pollution, and also economic efficiency. In the process of "Green Auditing this Educational Institution," all these indications are evaluated.

Eco-campus prioritizes emissions reduction, secures a cost-effective and reliable energy supply, promotes individual responsibility, lowers institute consumption of water and energy, reduces waste to landfills, and incorporates environmental concerns into all contracts and services deemed to have a significant environmental impact. This green auditing has energy, water, wastes, green campus, and carbon footprint as its target areas.

Energy Audit

Energy conservation is a core part of campus management that is also linked to the carbon footprint of the campus. Energy usage, energy sources, energy monitoring, lighting, appliances, and automobiles are all included in an energy management audit. Additionally, it oversees approaches for environmental preservation and use reduction. Therefore, it is a significant necessity that any institution that cares about the environment examines its energy usage practices.

Water Management Audit

All living creatures depend on water since it is a vital natural resource and is regarded as a universal solvent. In different natural contexts, water resources are unreservedly accessible; yet, in human settlements, consumable (drinking) water is less readily available. An audit of the water management system reveals information about water use, water sources, irrigation, storm water, appliances, and fixtures. Small drips from a leaking tap might waste water even if they are not very large. Aquifer depletion and water poisoning are occurring at previously unheard-of rates. Therefore, a water management audit is an essential requirement for any institution that cares about the environment to check its water use procedures. By collecting water samples from the campus, the concerned auditing team also examined the water quality.

Waste Management Audit

The waste stream of an organization is examined using a waste management audit

method. The objective is to determine the types and amounts of waste (paper, plastic, food, etc.) that you generate during a specified period of time. Human activities generate garbage, and how this material is managed, stored, gathered, and disposed of can pose risks to the environment and public health. Pollution from waste is aesthetically offensive and causes a lot of litter in our communities, which can harm well-being. Solid waste can be isolated into three classes: Bio-degradable, non-biodegradable and hazardous waste. Bio- degradable wastes incorporate food waste, canteen waste, wastes from microbiology lab, latrines and so on. Non-biodegradable wastes incorporate what is normally discarded in homes and schools, for example, plastic, tins, glass bottles and so on. Because cleaning products, acids, and petroleum include hazardous waste, there is likely to be a risk to both the environment and the health of all living thing. When these wastes are handled informally, like by being dumped in pits or copied, they may release harmful toxins into the soil and water supplies and produce ozone-depleting compounds, each of which contributes to global environmental change. Anaerobic assimilation can be applied to successfully utilize biodegradable waste for energy generation purposes or convert it to manure. Recycling and reuse can be employed to make use of non-biodegradable waste. Therefore, reducing solid waste to a minimum is important for maintaining a healthy campus. Unscientific landfills might contain dangerous pollutants that seep into the ground and water supplies and release greenhouse gases that contribute to climate change. The auditors examine the most common methods for removing waste and suggest the best course of action.

Green Campus Management Audit

Humans and all other plant and animal species are interconnected in a complex web of life; this diversity is essential to our survival. Healthy ecosystems and, ultimately, a healthy world depend on biodiversity. It maintains the quality of the air and water, controls our climate, and provides us food, clothing, housing, and medicines other useful products. When one component of this intricate network weakens or vanishes, each component suffers a slight loss. The trees work hard to maintaining the quality of the air we breathe. Like sponges, they are. Their leaves absorb a large amount of the air's deadly undesired carbon dioxide and exchange it with the oxygen we require for good health. Photosynthesis is the process of absorbing gases that all plants use to produce food. In this process, the plants convert carbon dioxide (CO₂) into food for themselves with the aid of sunshine, water, minerals, and the

green substance known as Chlorophyll within the leaves. They are releasing oxygen into the atmosphere, which is necessary for all life on Earth. The plant no longer produces food at night when there is no sunlight, thus it does not emit as much oxygen. People frequently advise against sleeping with plants in their rooms since they consume all of the oxygen. Even while photosynthesis occurs at night, plants also slumber, so very little oxygen is taken in from the air and very little harm may be done to a person who is sleeping.

Deep-rooted roots of trees bind the soil together, keeping it from being washed or blown away by wind and rain. This is crucial because the earth only has a very thin layer of rich soil covering it-rarely more than one foot. The ground would turn into a desert if this were to be washed, blown, or worn away, leaving only rock or sand on which no vegetation could thrive. Soil erosion is the process through which this topsoil is removed. Around the world, scientists are looking for solutions to stop soil erosion. One of the most significant methods is to increase the number of trees planted.

Through their leaves, trees release water vapour into the atmosphere. This vapour transforms into raindrops when it comes into contact with the cool air above. They endow us with grace, colour, and greenery. This is something that we frequently ignore and fail to appreciate. Numerous birds, animals, and insects call them home. Each of these plays a crucial role in preserving nature's delicate equilibrium. Trees give us food, and juice to drink. Trees are the source of countless items we use every day or that are essential for our health, including ropes, medicines, wood, paper, and so much more.

Carbon Footprint Management Audit

A person, organization, company, state, or nation's carbon footprint is the total amount of greenhouse gases (GHGs) they emit in units of carbon dioxide. Typically, carbon footprint is expressed in tonnes of CO₂ equivalent annually. Basic information regarding direct and indirect sources of greenhouse gas emissions is required for the calculation of carbon footprint. Every day, the way we travel and commute to and from college has an influence on the environment since burning fossil fuels releases greenhouse gases into the sky (such as petrol). The most prevalent greenhouse gases are ozone, nitrous oxide, methane, water vapour, and carbon dioxide. The most noticeable greenhouse gas is carbon dioxide, which makes up 402 ppm of the Earth's atmosphere. The term "carbon emissions" refers to the release of

carbon dioxide gas into the atmosphere as a result of human activity.

2.6 Methodology

The methodology includes developing the questionnaire, collecting responses, physically inspecting the locations, reviewing and analyzing the pertinent data and documentation, interviewing end users and personnel in charge, and doing the necessary measurements and counts. To gather information from the many sources required for the audit, a comprehensive survey was carried out. The team members visited locations where various environmental operations were taking place repeatedly and gathered information.

The methodology includes; preparation and filling up of questionnaire, physical inspection of the campus, observation and review of the document, interviewing responsible persons and data analysis, measurements and recommendation.

2.6.1 Data Collection

In initial data collection phase, exhaustive data collection was performed using different approaches comprising observation, survey communicating with responsible persons and measurements. The target areas specific to the college was evaluated through a questionnaire circulated to the Xcellogen team members for data collection.

Five categories of questionnaires were distributed.

The formats of these are given below:

1. Survey form for auditing energy management

1. List ways that you use energy in your college. (Electricity, LPG, firewood, others).

2. Electricity charges for last one year (Bi-monthly payment for one year)
3. Amount paid for LPG cylinders for last one year and numbers used
4. Weight of firewood used per month and amount of money spent?
5. Are there any energy saving methods employed in your college? If yes, please specify. If no, suggest some.
6. How much money does your college spend on energy such as electricity, gas, firewood, etc. in a month.
7. How many CFL bulbs has your college installed? Mention use (Hours used/day for how many days in a month)
8. Energy used by each bulb per month? (kwh).
9. How many LED bulbs has your college installed?
 - Mention use (Hours used/day for how many days in a month)
10. Energy used by each bulb per month? (kwh).
11. How many incandescent (tungsten) bulbs has your college installed?
 - Mentions use (Hours used/day for how many days in a month)
12. Energy used by each bulb per month? (kwh).

2. Survey for Auditing Water Management

1. List uses of water in your college.
2. What are the sources of water in your college?
3. How many wells are there in your college?
4. No. of motors with HP, used for pumping water from each well?
5. What is the depth of each well?
6. What is the present depth of water in each well?

7. How does your college store water?
8. Quantity of water stored in your overhead water tank? (In litres)
9. Quantity of water pumped every day? (In litres)
10. If there is water wastage, specify why.
11. Where does waste water come from?
12. Where does the waste water go?
13. What are the uses of waste water in your college?
14. What happens to the water used in your labs? Whether it is mixing with ground water?
15. Is there any treatment for the lab water?
16. Are your labs practicing green chemistry methods?
17. Water charges paid to water connections if any
18. No. of water coolers. Amount of water used per day? (in litres)
19. No. of bath rooms in staff rooms, common, hostels.
20. Amount of water used per day?
21. No. of toilet, urinals. Amount of water used per day?
22. No. of water taps in the canteen. Amount of water used per day?
23. Amount of water used per day for garden use.
24. No. of water taps in laboratories. Amount of water used per day in each lab?
25. At the end of the period, compile a table to show how many litres of water have been used in the college for each purpose
26. Is there any water used for agricultural purposes?
27. Does your college harvest rain water?
 - If yes, how many rain water harvesting units are there? (Approx. amount)
28. How many of the taps are leaky? Amount of water lost per day?

3. Survey form for Auditing Waste Management

1. What is the total strength of students, teachers and non-teaching staff in your college?
2. Which of the following are available in your college? Give area occupied and number
 - Garden area
 - Garbage dump (number)
 - Playground area
 - Laboratory
 - Kitchen Canteen
 - Toilets (number)
 - Car/scooter shed area
 - Number of class rooms Office rooms
 - Others (specify)
3. Does your college generate any waste?
 - If so, what are they? How much quantity? Number or weight
 - E-waste
 - Hazardous waste (toxic)
 - Solid waste
 - Canteen waste
 - Liquid waste
 - Glass
 - Unused equipment
 - Medical waste if any

- Napkins
 - Others (Specify)
4. Is there any waste treatment system in the college?
 5. Is there any treatment for toilet/urinal/sanitary napkin waste?
 6. What is the approximate amount of waste generated per day?
 - (In Kilograms) (approx.) Biodegradable non-biodegradable
 7. How is the waste generated in the college managed? Methods -
 - Composting, Recycling,
 - Reusing, Others (specify)
 8. Do you use recycled paper in College?
 9. Can you achieve zero garbage in your college?
 - (Reduce, Recycle, Reuse, Refuse) If yes, how

4. Survey form for Auditing Green Campus Management

1. Is there a garden in your college? Area?
2. Do students spend time in the garden?
3. List the plants in the garden, with approx. numbers of each species.
4. List the species planted by the students, with numbers.
5. Whether you have displayed scientific names of the trees in the campus?
6. Are there any plantations in your campus? If yes specify area and type of plantation.
7. Is there any vegetable garden in your college? If yes how much area?
8. Is there any medicinal garden in your college? If yes how much area?
9. How much water is used in the vegetable garden and other gardens?

10. Who is in charge of gardens in your college?
11. Whether you are using any type of recycled water in your garden?
12. List the name and quantity of pesticides and fertilizers used in your gardens?
13. Do you have any composting pit in your college? If yes, what are you doing with the compost generated?
14. What are you doing with the vegetables harvested? Do you have any student market?
15. Is there any botanical garden in your campus? If yes give the details of campus flora.
16. Name number and names of the medicinal plants in your college campus.
17. Any threatened plant species planted/conserved.
18. Is there a nature club in your college? If yes what are their activities?
19. Is there any arboretum in your college? If yes details of the trees planted.
20. Are there any fruit yielding plants in your college? If yes details of the trees planted.
21. Are there any groves in your college? If yes details of the trees planted.
22. Is there any irrigation system in your college?
23. What is the type of vegetation in the surrounding area of the college?
24. Share your IDEAS for further improvement of green cover

5. Survey form for Auditing Carbon Footprint

1. What is the total strength of students and teachers in your College?
 - No. of Students
 - No. of Teachers
 - No. of Non-teaching staff

- Total
2. Total Number of vehicles used by the stakeholders of the college. (Per day)
 3. No. of cycles used
 4. No. of two wheelers used (average distance travelled and quantity of fuel and amount used per day)
 5. No. of cars used (average distance travelled and quantity of fuel and amount used per day)
 6. No. persons using common (public) transportation (average distance travelled and quantity of fuel and amount used per day)
 7. No. of persons using college conveyance by the students nonteaching staff and teachers (average distance travelled and quantity of fuel and amount used per day)
 8. Number of parent-teacher meetings in a year? Parent turn out (approx.)
 9. Number of visitors with vehicles per day?
 10. Number of generators used every day (hours). Give the amount of fuel used per day.
 11. Number of LPG cylinders used in the canteen (Give the amount of fuel used per day and amount spent).
 12. Average amount of taxi/auto charges paid per month by the stakeholders of the college.
 13. Use of any other fossil fuels in the college (Give the amount of fuel used per day and amount spent).
 14. Suggest the methods to reduce the amount of use of fuel by the stakeholders/students/teachers/non-teaching staff of the college.

Chapter- 3

AUDIT STAGE

Members of the Xcellogen biotech team performed a green audit. The green audit started with the teams walking through all the different facilities at the college to identify the various types of utilities and appliances (such as taps, toilets, etc.), measure usage per item (such as the amount of water used from a tap or the amount of electricity used by an appliance), and identify relevant consumption patterns (such as how frequently an appliance is used) and their effects. To learn more about the usage, occurrence, or general characteristics of specific appliances, the faculty and students were interviewed. Data was gathered in the waste, greening, carbon footprint, and water consumption sectors. Several times, college records and documentation were checked to make sure the information from surveys and discussions.

3.1 Onsite Visit

One week field visit was conducted by the Green Audit Team. The key focus of the visit was on assessing the status of the green cover of the Institution, the waste management practices and energy conservation strategies etc. The sample collection (water) was carried out during the visits. The water sample from one open well source was taken. The sample collection, preservation and analysis were done in a scientific manner as prescribed by the standard procedures.

3.2 Group Discussion

Group discussions on various aspects of the Green Audit were held with members of the Nature Club, Bhoomitrasena Club, Environmental Activities Club, Science Club, Staff, and Management. Identification of attitudes and awareness of environmental issues at the institutional and local levels was the main topic of discussion.

3.3 Energy, waste management, landscape and carbon foot print analysis Survey

The audit team has assessed the waste generation, disposal and treatment facilities as well as the pattern of energy consumption of the college with the aid of teachers and students.

Chapter- 4

POST AUDIT STAGE

Green Audit Report

4.1 Energy audit

An energy audit is an examination, survey, and analysis of energy flows for the purpose of locating areas where energy can be saved in a building, process, or system without having a negative impact on the output.

➤ Need for energy audit

An energy audit is a study of plant or other structure to ascertain how and where energy is used as well as to find ways to save energy. The energy conservation methods assist in reducing the cost of any construction and saving energy. Our ecosystem loses out from each unit of energy usage due to pollution, the depletion of conventional energy sources, and increased need for generating capacity. Saving a unit of energy benefits the environment and energy resources in addition to saving money.

➤ Electricity consumption of the college

1. Electricity charges per month – ~ Rs. 40,000/ month
2. Number of Gas cylinder – 4 cylinders
3. Cost of gas cylinder – Rs. 3,768/month
4. Number of Generators – 3
5. Cost of Generator Fuel – Rs. 10,000 /month

Checklist of Electrical/Electronic Equipments in the Institution

SL.No	Devices	No.
1.	CFL bulbs	2
2.	LED bulbs	62
3.	Tube Lights	264
4.	Incandescent Bulbs	3
5.	Fans	220
6.	Computers/Laptops	120
7.	Refrigerators	4
8.	Water Pump	4
9.	Photostat Machine	4
10.	Printers	17
11.	Projector	12
12.	Inverters	2
13.	Generator	3
14.	Scanner	10
15.	Water Purifier	4
16.	Router	2
17.	CCTV	1
18.	Induction Stove	1
19.	Amplifier	4
20.	Induction Cooker	1

Checklist of Laboratory Equipments in the Institution

SL.No	Instruments	No.
1.	Laser set up	1
2.	e/k	1
3.	J.J Thomson	2
4.	Hall Effect	1
5.	G M Counter	1
6.	Photo Electric Effect	1
7.	Steffans Cons	1
8.	Spectrometer for Absorption Spectrum	2
9.	Ultrasonic Dufractometer	2
10.	Quinck's Method Apparatus	1
11.	UV Vis Spectrophotometer	1
12.	Laboratory Oven	1
13.	Industrial Oven	1
14.	Spectrophotometer	1

15.	Colorimeter	1
16.	Digital pH Meter	1
17.	Magnus Microscope	2
18.	Microtome	1
19.	Autoclave	1
20.	Incubator	1
21.	Muffle Furnace	1
22.	Hot Air Oven	1
23.	High Speed Centrifuge	1
24.	Electric Weigh Balance	1
23.	UV Visible Spectrophotometer	1
24.	Centrifuge	1
25.	Digital Polari meter	1
26.	Digital MP Apparatus	1
27.	Digital Colorimeter	1
28.	Digital Water bath	1
29.	Potentiometer	1
30.	Conductometer	1
31.	pH meter	1
32.	Double Distillation Unit	1
33.	Electronic Balance	1
34.	FTIR Spectrophotometer	1
35.	Hot Air Oven	1
36.	Heating Mantle	1
37.	Hot Plate	1
38.	Magnetic Stirrer	1
39.	Rotary Evaporator	1
40.	Ultrasonic eleoner	1
41.	CHN Instrument	1

Energy Usage Audit Sheet

1. Energy usage of CFL bulbs

Department/Area	Number of CFL bulbs	Power Consumed (watts)	Power in (Kw)	Working Time (Hours per Day)	Energy Usage per month (kWh)
Principal's Office	1	15	0.015	8	2.64
Room No. 56	1	15	0.015	6	1.98
Total Energy Usage per Month (kWh)					4.62

2. Energy usage of LED bulbs

Department/Area	Number of LED bulbs	Power Consumed (watts)	Power in (Kw)	Working Time (Hours per Day)	Energy Usage per month (kWh)
Principal's Office	4	10	0.01	8	7.04
Office Room	6	10	0.01	8	10.56
Staff Room 1 (Commerce)	6	10	0.01	8	10.56
Staff Room 2 (Oriental Languages)	3	10	0.01	8	5.28
Room No. 52	8	8	0.008	6	8.448
Room No. 53	8	8	0.008	6	8.448
Room No. 54	8	8	0.008	6	8.448
Room No. 55	8	8	0.008	6	8.448
Room No. 14	1	8	0.008	6	1.056
Room No. 13	2	8	0.008	6	2.112
Room No. 12	2	8	0.008	6	2.112
Hall	6	10	0.01	8	10.56
Total Energy Usage per Month (kWh)					83.072

3. Energy usage of Fans

Department/Area	Number of Fans	Power Consumed (watts)	Power in (Kw)	Working Time (Hours per Day)	Energy Usage per month (kWh)
Principal's Office	4	40	0.04	8	35.2
Office Room	8	40	0.04	8	56.32
Staff Room 1 (Commerce)	3	40	0.04	8	21.12
Staff Room 2 (Oriental Languages)	2	40	0.04	8	14.08
Staff Room 3 (Mathematics)	4	40	0.04	8	28.16
Staff Room 4 (Zoology)	6	40	0.04	8	42.24
Staff Room 5 (Chemistry)	9	40	0.04	8	63.36
Staff Room 6 (Physics)	3	40	0.04	8	21.12
Staff Room 7 (History)	3	40	0.04	8	21.12
Auditorium	13	40	0.04	5	57.2
NCC Room	1	40	0.04	4	3.52
IQAC Room	2	40	0.04	6	10.56
Seminar Hall	6	40	0.04	5	26.4
Hall	1	40	0.04	4	3.52
Examination Section	4	40	0.04	8	28.16
1 DC BSc Physics	3	40	0.04	6	15.84
2 DC BSc Physics	4	40	0.04	6	21.12

3 DC BSc Physics	4	40	0.04	6	21.12
1 st MSc Physics	2	40	0.04	6	10.56
2 nd MSc Physics	2	40	0.04	6	10.56
BSc Physics Lab	10	40	0.04	4	35.2
MSc Physics Lab Electronics	4	40	0.04	4	14.08
MSc Physics Lab General	3	40	0.04	3	7.92
Computer Lab	2	40	0.04	6	10.56
Language Lab	2	40	0.04	5	8.8
Zoology Lab	9	40	0.04	5	39.6
Instrumentation Lab Zoology	3	40	0.04	4	10.56
MSc Chemistry Lab	12	40	0.04	4	42.24
3 DC BSc Chemistry	6	40	0.04	6	31.68
Store Room Chemistry	1	40	0.04	4	3.52
BSc Chemistry Lab	15	40	0.04	4	52.8
Store Room Chemistry Lab	4	40	0.04	4	14.08
1 st MSc Chemistry	2	40	0.04	6	10.56
2 nd MSc Chemistry	2	40	0.04	6	10.56
Chemistry Library	2	40	0.04	2	3.52
Research Lab	2	40	0.04	6	15.84
Room No.4	5	40	0.04	6	26.4
Room No.9	3	40	0.04	6	15.84
Room No.10	3	40	0.04	6	15.84
Room No. 11	3	40	0.04	6	15.84
Room No. 13	3	40	0.04	6	15.84
Room No. 14	3	40	0.04	6	15.84
Room No. 15	3	40	0.04	6	15.84
Room No. 16	3	40	0.04	6	15.84
Room No. 17	3	40	0.04	6	15.84
Room No. 18	3	40	0.04	6	15.84
Room No. 20	3	40	0.04	6	15.84
Room No. 33	2	40	0.04	6	10.56
Room No. 34	2	40	0.04	6	10.56
Room No. 43	2	40	0.04	6	10.56
Room No. 44	2	40	0.04	6	10.56
Room No. 52	3	40	0.04	6	15.84
Room No. 53	3	40	0.04	6	15.84
Room No. 54	3	40	0.04	6	15.84
Room No. 55	3	40	0.04	6	15.84
Room No. 56	2	40	0.04	6	10.56
Room No. 57	2	40	0.04	6	10.56
Room No. 58	2	40	0.04	6	10.56
Room No. 59	2	40	0.04	6	10.56
Library and Reading Room	6	40	0.04	8	42.24
Reference Room	2	40	0.04	8	14.08

Stack Room	4	40	0.04	8	28.16
Canteen	4	40	0.04	8	28.16
Hostel	32	40	0.04	10	281.6
Regional Development Committee Room	2	40	0.04	6	10.56
Total Energy Usage per Month (kWh)					1560.24

4. Energy usage of Tube lights (CFL)

Department/Area	Number of Tube lights	Power Consumed (watts)	Power in (Kw)	Working Time (Hours per Day)	Energy Usage per month (kWh)
Principal's Office	3	40	0.04	8	7.04
Office Room	8	40	0.04	8	21.12
Staff Room 1 (Commerce)	4	40	0.04	8	28.16
Staff Room 2 (Oriental Languages)	1	40	0.04	8	7.04
Staff Room 3 (Mathematics)	2	40	0.04	8	14.08
Auditorium	13	40	0.04	3	34.32
Seminar Hall	6	40	0.04	3	15.84
NCC Room	1	40	0.04	5	4.4
IQAC Room	3	40	0.04	4	10.56
Examination Section	3	40	0.04	4	10.56
2 DC BSc Physics	1	40	0.04	6	5.28
1 st MSc Physics	1	40	0.04	6	5.28
2 nd MSc Physics	1	40	0.04	6	5.28
BSc Physics Lab	8	40	0.04	4	28.16
MSc Physics Lab Electronics	4	40	0.04	4	14.08
MSc Physics Lab General	4	40	0.04	4	14.08
Computer Lab	4	40	0.04	5	17.6
Computer Lab (Attached with IQAC Room)	4	40	0.04	5	17.6
2 nd MSc Chemistry	1	40	0.04	4	3.52
Room No. 12	1	40	0.04	6	5.28
Room No. 13	1	40	0.04	6	5.28
Room No. 14	2	40	0.04	6	10.56
Room No. 15	3	40	0.04	6	15.84
Room No. 16	3	40	0.04	6	15.84
Room No. 17	2	40	0.04	6	10.56
Room No. 18	2	40	0.04	6	10.56
Room No. 33	2	40	0.04	6	10.56
Room No. 34	2	40	0.04	6	10.56
Room No. 52	2	40	0.04	6	10.56
Room No. 53	2	40	0.04	6	10.56
Room No. 54	2	40	0.04	6	10.56

Room No. 55	2	40	0.04	6	10.56
Library and Reading Room	6	40	0.04	6	31.68
Reference Room	4	40	0.04	6	21.12
Stack Room	10	40	0.04	5	44
Ladies Amenity Centre	4	40	0.04	3	10.56
Regional Development Committee Room	2	40	0.04	5	8.8
Total Energy Usage per Month (kWh)					517.44

5. Energy usage of Tube lights (LED)

Department/Area	Number of Tube lights	Power Consumed (watts)	Power in (Kw)	Working Time (Hours per Day)	Energy Usage per month (kWh)
Principal's Office	3	9	0.09	8	31.68
1 DC BSc Physics	3	9	0.09	6	35.64
2 DC BSc Physics	2	9	0.09	6	23.76
3 DC BSc Physics	3	9	0.09	6	35.64
1 st MSc Physics	2	9	0.09	6	23.76
2 nd MSc Physics	3	9	0.09	6	35.64
Corridor	5	9	0.09	5	49.5
Staff Room 4 (Zoology)	6	9	0.09	8	95.04
Staff Room 5 (Chemistry)	9	9	0.09	8	142.56
Staff Room 6 (Physics)	3	9	0.09	8	53.46
BSc Physics Lab	6	9	0.09	4	47.52
MSc Physics Lab Electronics	2	9	0.09	4	142.56
Zoology Lab	10	9	0.09	5	99
Instrumentation Lab Zoology	5	9	0.09	4	39.6
3 DC BSc Chemistry	6	9	0.09	6	71.28
1 st MSc Chemistry	2	9	0.09	6	23.76
2 nd MSc Chemistry	1	9	0.09	6	11.88
BSc Chemistry Lab	20	9	0.09	4	158.4
MSc Chemistry Lab	14	9	0.09	4	110.88
Store Room Chemistry	1	9	0.09	4	17.82
Store Room Chemistry Lab	5	9	0.09	4	4.05
Chemistry Library	2	9	0.09	4	15.84
Ground Floor	4	9	0.09	8	63.36
First Floor	7	9	0.09	8	110.88
Room No. 33	1	9	0.09	6	11.88
Room No. 34	1	9	0.09	6	11.88
Room No. 35	2	9	0.09	6	23.76

Room No. 43	2	9	0.09	6	23.76
Room No. 44	2	9	0.09	6	23.76
Room No. 57	1	9	0.09	6	11.88
Room No. 59	2	9	0.09	6	23.76
Total Energy Usage per Month (kWh)					1574.19

6. Energy usage of Computer/Laptop

Department/Area	Number of Computer/Laptop	Power Consumed (watts)	Power in (Kw)	Working Time (Hours per Day)	Energy Usage per month (kWh)
Principal's Office	2	250	0.25	8	88
Office Room	5	250	0.25	8	220
Staff Room 1 (Commerce)	3	250	0.25	8	132
Staff Room 2 (Oriental Languages)	3	250	0.25	8	132
Staff Room 3 (Mathematics)	36	250	0.25	8	1584
Staff Room 4 (Zoology)	2	250	0.25	8	88
Staff Room 5 (Chemistry)	19	250	0.25	8	836
Staff Room 6 (Physics)	11	250	0.25	8	484
Staff Room 7 (History)	2	250	0.25	8	88
Economics	2	250	0.25	8	88
English	2	250	0.25	8	88
Language Lab	15	250	0.25	8	660
Physical Education	1	250	0.25	6	33
Examination Section	2	250	0.25	6	66
IQAC Room	1	250	0.25	8	44
Library	11	250	0.25	8	484
Laptops	3	60	0.06	6	23.76
Total Energy Usage per Month (kWh)					5138.76

7. Electrical Equipments and their Energy Consumption

Department/Area	Name of the appliance/ Equipment	Number of appliance/ equipment	Power consumed (watts)	Power in (kW)	Working Time (Hours per Day)	Energy Usage per month (kWh)
Principal's Office	Photostat	1	1000	1	4	88
	Table Fan	1	52.7	0.0527	6	6.9564

	UPS	3	900	0.9	8	475.2
	Amplifier	1	500	0.5	4	44
	Television	2	150	0.15	2	13.2
	Printer	1	40	0.04	4	3.52
Office Room	Photostat	1	1000	1	4	88
	Printer	5	40	0.04	6	26.4
	Inverter	1	3000	3	6	396
	Induction Cooker	1	1600	1.6	4	140.8
	Speaker	1	1000	1	1	22
	UPS	1	5	0.05	8	8.8
Staff Room 1 (Commerce)	Printer	1	40	0.04	4	3.52
	UPS	1	900	0.9	8	158.4
Staff Room 3 (Mathematics)	UPS	3	900	0.9	8	475.2
	Printer	1	40	0.04	4	3.52
Staff Room 4 (Zoology)	Printer	2	40	0.04	4	7.04
	Exhaust Fans	2	60	0.06	4	10.56
	UPS	2	900	0.09	8	31.68
Staff Room 5 (Chemistry)	Scanner with Printer	1	25	0.025	4	2.2
	UPS	1	900	0.9	8	158.4
Staff Room 7 (History)	UPS	1	900	0.9	8	3.52
	Printer	1	40	0.04	4	3.52
Staff Room 8 (English)	UPS	1	900	0.9	8	3.52
	Printer	1	40	0.04	4	3.52
Staff Room 6 (Physics)	Projector	1	1200	1.2	4	105.6
	Printer	1	40	0.04	4	3.52
	UPS	1	900	0.09	8	15.84
	Table Fan	1	55	0.055	6	7.26
	Tower Fan	1	110	0.11	6	14.52
Language Lab	UPS	15	5	0.05	6	99
Maths-Computer lab	UPS	1	5	0.05	6	6.6
Physics Lab	UPS	1	5	0.05	6	6.6
ChemistryComputer Lab	UPS	1	3	0.03	6	3.96
Chemistry Instrumentation	UPS	1	3	0.03	6	3.96
BSc Physics Lab	UPS	3	900	0.09	8	47.52
	Printer	1	40	0.04	4	3.52
	Speaker	1	1000	1	1	22
	Inverter	1	3000	3	6	396
	Filament Bulb	1	60	0.06	3	3.96
	Tower Fan	1	110	0.11	6	14.52
	Potentiometer	3	40	0.04	3	7.92
	Heating Mantle	2	450	0.45	3	59.4
MSc Physics Lab Electronics	Printer	1	40	0.04	3	2.64
	Inverter	1	3000	3	6	396

	Filament Bulb	1	60	0.06	3	3.96
MSc Physics Lab General	Electronic Balance	1	5	0.005	3	0.33
	Centrifuge	1	180	0.18	3	11.88
	Heating Mantle	5	450	0.45	3	148.5
	Magnetic Stirrer	2	600	0.6	3	79.2
	Induction Cooker	1	1600	1.6	3	105.6
	Filament Bulb	1	60	0.06	3	3.96
	Potentiometer	2	40	0.04	3	5.28
	Spectrometer (Bulb)	4	240	0.24	3	63.36
	SVL Transformer	2	100	0.1	3	13.2
	Zener Diode Experiment	2	10	0.01	3	1.32
	Laser set up	1	450	0.45	3	29.7
	e/k	1	1000	1	3	66
	J J Thomson	2	1	0.001	3	0.132
	Hall Effect	1	500	0.5	3	33
	GM Counter	1	100	0.1	3	6.6
	Photo electric Effect	1	12	0.012	3	0.792
	Steffans cons	1	60	0.06	3	3.96
	Spectrometer for absorption spectrum	2	12	0.012	3	1.584
	Ultrasonic dufractometer	2	50	0.05	3	6.6
	Quinck's method Apparatus	1	200	0.2	3	13.2
UV VIS Spectrophotometer	1	250	0.25	3	16.5	
Instrumentation Lab (Zoology)	Air Oven	2	2200	2.2	3	290.4
	Centrifuge	1	180	0.18	3	11.88
	Spectrophotometer	1	30	0.03	3	1.98
	Colorimeter	1	0.6	0.0006	3	0.0396
	Digital pH meter	1	5	0.005	3	0.33
	Magnus Microscope	2	100	0.1	3	13.2
	Microtome	1	30	0.03	3	1.98
	Autoclave	1	1500	1.5	3	99
	Incubator	1	200	0.2	3	13.2
	Muffle furnace	1	3000	3	3	198
	Electric Weigh Balance	1	5	0.005	3	0.33
	UV visible Spectrophotometer	1	150	0.15	3	9.9
	High Speed Centrifuge	1	500	0.5	3	33
	Digital Polarimeter	1	1	0.001	3	0.066
	Digital MP Apparatus	1	100	0.1	3	6.6
	Digital Colorimeter	1	12	0.012	3	0.792
Digital Waterbath	1	1480	1.48	3	97.68	
MSc Chemistry Lab	Potentiometer	2	40	0.04	3	5.28
	Conductivity Meter	4	180	0.18	3	47.52

	Air Oven	3	2200	2.2	3	435.6
	Inverter	7	3000	3	3	1386
	Electric Stove	20	1800	1.8	3	2376
	Refrigerator	2	780	0.780	24	1123.2
	pH Meter	1	5	0.005	3	0.33
	Double Distillation Unit	1	5.5	0.0055	3	0.363
	Electronic Balance	1	5	0.005	3	0.33
	FTIR Spectrophotometer	1	24	0.024	3	1.584
	Heating Mantle	1	450	0.450	3	29.7
	Hot Plate	1	750	0.750	3	49.5
	Magnetic Stirrer	1	8.5	0.0085	3	0.561
	Rotary Evaporator	1	1060	1.06	3	69.96
	Ultrasonic eleoner	1	100	0.1	3	6.6
	CHN Instrument	1	250	0.25	3	16.5
Store Room Chemistry	UPS	1	900	0.9	5	99
Room No. 20	Printer	2	40	0.04	5	8.8
	Music System	2	1000	1	5	220
	UPS	1	900	0.9	5	99
Room No. 11	Scanner with Printer	1	50	0.05	4	4.4
Room No. 56	Printer	1	40	0.04	4	3.52
	Speaker	1	100	0.1	5	11
	Filament Bulb	1	60	0.06	2	2.64
	Electric Bell	1	0.5	0.0005	6	0.066
Examination Section	Photostat	1	1000	1	5	110
Hostel	Refrigerator	1	780	0.780	24	561.6
	Television	1	220	0.220	4	19.36
	Mixer Grinder	1	750	0.750	4	45
	Incinerator	1	1200	1.2	6	108
Canteen	Refrigerator	1	780	0.780	24	561.6
	Water Purifier	1	60	0.06	24	43.2
Ladies Amenity Centre	Incinerator	1	1200	1.2	6	158.4
Auditorium	Amplifier	1	500	0.5	5	55
First Floor	Water Purifier	1	60	0.06	8	10.56
Corridor	Speaker	2	100	0.1	5	22
	Electric Bell	1	0.5	0.0005	6	0.066
Total Energy Usage per Month (kWh)						12483.09

The Total Energy Utilization of the college for different purposes is approximately **21361.41 kWh/month.**

Renewable Sources of Energy

Solar Panel

Sree Narayana College, Punalur, Kollam has a 5.2 KW solar panel which is an indication that the institution recognizes the value of energy conservation and encourages the use of non-conventional sources of electricity. JRR Sine Solar Pvt Ltd is the company that has constructed the solar panel system.

Solar Energy is an important source of Alternative Energy Source. Emissions of Green House gas can be minimized into the atmosphere while using the solar panels and thus electricity can be generated.

FSA, a vibrant alumni organisation of the college, provided financial assistance for the installation of a 5.2 KW on-grid solar plant. It decreased the monthly electricity bill by about 8000. Due to its installation on the roof of the third floor of the main building, which is located in the most prominent location on the college grounds, the plant has the highest efficiency possible. Punalur in particular is the hottest spot in Kerala, hence the solar constant—a measure of the solar energy received from the sun per unit area per second in mean distance from earth at noon—is at its highest value there.

Wheeling to the Grid

The energy output of the solar panels is used to meet the university's energy needs. The solar panels are also connected to the KSEB's power grid, which receives a subsidy from the KSEB for the university's energy usage, allowing them to supply any excess electricity they produce.

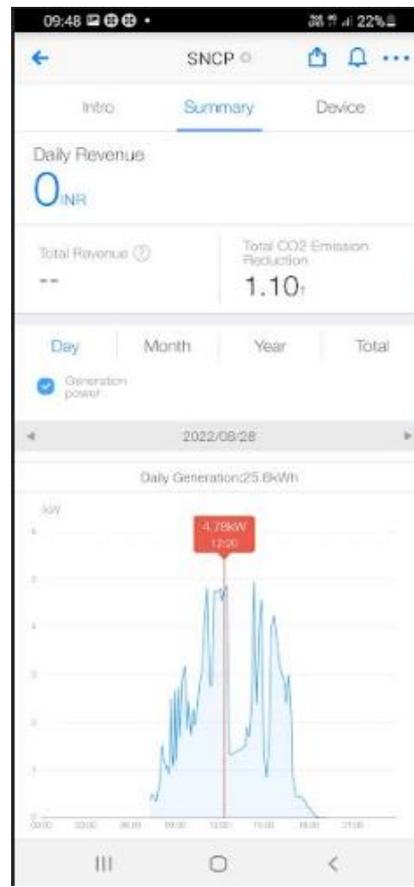
The panel sells its excess power to KSEB on non-production days to make extra money. Using an Android app and the internet, a wi-fi connected inverter may be used to monitor power generation in real time.

Solar panel installed on the roof top



Bidirectional meter for on grid solar system





Front end of the android app-Solar man.

Energy conservation measures to be adopted

1. Use of more energy-efficient LED tubes in place of conventional tube light.
2. Incorporate as much natural light as possible
3. Encourage employees and students to turn off their electronics when not in use
4. Installing a master switch outside a room can make it simple for someone to turn off all the appliances in the room in the event that someone forgets to do so before leaving. This could contribute to greater energy efficiency.
5. All the Incandescent bulbs have to be replaced by LED Bulbs.
6. Older wiring if necessary should be replaced, in order to prevent electricity leakage and also to protect the college and its appliances from potentially dangerous or expensive damage that may arise due to faulty wiring.

4.2 Water Quality Assessment

Consuming water is a social and environmentally sensitive issue. Our ability to efficiently implement water conservation measures is aided by careful observation of the water use patterns. Every year, from March to April, when they get plenty of solar radiation, there is a peak in water usage. Conserving water and using available water wisely are the only ways to deal with the water problem during that time. Some of the crucial practises are given below, and the college has already implemented a number of them on campus:

- Collecting rainwater
- Encouraging kids to use less water by enlightening them about water conservation
- Water-saving methods are introduced in the curriculum.
- Installing hand sanitizers
- Posters cautioning or educating people about water conservation

On our campus, we actively pursue water conservation measures. A 20,000-liter reservoir tank on campus is used to hold rainwater from building roofs, which is then treated and made available for regular consumption. Additionally, the college has water harvesting and recharging facilities where rainwater is gathered, stored, and used on campus as well as to replenish the groundwater table. The college has two rainwater collection wells installed. The rain water collected is conserved further for future use. The rainwater is used for a multitude of purpose in this way.

For non-potable purposes, such as toilet flushing, landscaping, gardening, and laboratory applications, the college used to collect rainwater. They always take care in the accurate disposal of lab waste water in order to preserve green protocol. The college campus has three water coolers built, one of which is in the waiting area, allowing students, instructors, and staff to fill up reusable water bottles instead of purchasing bottled water.

Results of water quality

SL. NO	Parameters	Well Water	Standard Value (BIS)
1	Dissolved Oxygen	6.82	6 – 8

2	Acidity (Mg/L)	52	200
3	Alkalinity (Mg/L)	10	200
4	Chloride (Mg/L)	32.4	250
5	Turbidity	Nil	1
6	Hardness (Total)	Nil	200
7	Conductivity (μ s)	125.3	
8	pH	6.9	6.5-8.5
9	Total Dissolved Solids (Ppm)	97	500
10	Salinity (Ppt)	0.0123	
11	Total Coliforms	Nil	0
12	Any Presence of Faecal Matters (Coliforms)	Nil	0

Water management

There is two wells, one bore well and water connection on the college site. They have water storage tanks with capacity of 24000L. They actively encourage their students to engage in projects that promote sustainable living in order to preserve water conservation techniques. Posters encouraging students to save water. Increasing awareness of the prudent use of water resources, which will be a challenging task in the future, is more crucial.

Sl.No	Parameters	Response
1.	Well	2
2.	Bore Well	1
3.	Water Connection	1
4.	Water Pumps	4
5.	Tanks	6
6.	Capacity of Tanks	24000L
7.	Water Usage Quantity Per Day (Institution)	6000L
8.	Water Usage Quantity Per Day (Hostel)	3000L
9.	Water Usage for Gardening	500L
10.	Water Purifier	150L
11.	Rain Water Harvest Unit	NIL
12.	Leaking Taps (Institution)	2
13.	Leaking Taps (Hostel)	1
14.	Toilets (Institution)	32

15.	Toilets (Hostel)	4
16.	Toilet Flush (Institution)	17
17.	Toilet Flush (Hostel)	1
18.	Health Faucet's (Institution)	4
19.	Health Faucet's (Hostel)	NIL
20.	Urinals for Boys	8
21.	Water Taps (Institution)	30
22.	Water Taps (Hostel)	26
23.	Wash Basins (Institution)	17
24.	Wash Basins (Hostel)	5
25.	Unused Well	NIL
26.	Water Pumped Quantity Per Day (Institution)	7000L
27.	Water Pumped Quantity Per Day (Hostel)	4000L
28.	Water Charges (If any)	

Future strategy

- Water treatment plans

4.3 Waste Management

For a campus to be eco friendly, waste management is vital. Different wastes are produced in colleges, and managing their collection and disposal is exceedingly difficult. The information below gives specifics on the waste produced and the disposal strategy used by the college.

The college follows the Green Protocol in all of its projects and operations. For the Protocol to be implemented effectively on the college grounds, the 3R waste management principle (Reduce, Reuse, and Recycle) is employed.

Solid Waste Management

The institution has a solid waste management system that is efficient. Waste is mainly divided into biodegradable and non-biodegradable categories. A biogas plant at the campus processes biodegradable trash into biogas and biofertilizer. The canteen and dorm rooms at the college use biogas for cooking. In the campus garden, biofertilizer is used as manure for the trees and plants.

Plastic and other non-biodegradable debris are gathered and transferred to a partner for proper disposal. The university urges academics, non-teaching staff, and students to refrain from using non-biodegradable materials like plastics and flex boards in accordance with state government regulations. Under N.S.S. and N.C.C. outreach programmes including Bharath Abhiyan campaigns, Swachatha hi Seva campaigns, Poshan Pakwada, and Swatch Pakwada, extensive solid waste collection is also done on a regular basis. Colleges and dormitories have sanitary napkin incinerators installed for the careful disposal of sanitary napkins.

Liquid Waste Management

To treat liquid waste produced on campus from the dormitory, canteen, wash area, and restrooms, the campus contains subsurface drainage systems and leach pits. The Department of Chemistry takes great care to guarantee that any liquid waste water produced in labs does not expose users to chemical risks.

E-Waste Management

In order to efficiently reuse the electronic equipment, special attention is paid to its repair and maintenance. To ensure optimal use, all the electronic gadgets need routine maintenance. The providers themselves guarantee proper maintenance and upkeep. E-waste produced by the institute is collected from various departments and securely stored until a deal is struck with a company that recycles E-waste.

Biomedical Waste Management

On campus, no biomedical waste is produced. The college's women's restrooms are close to a

facility where sanitary pads can be burned. To get rid of discarded sanitary pads, there are two electric incinerators and one manual incinerator.

There are trash cans in every classroom, lab, staff room, hostel room, and office. In order to ensure their participation in all phases of waste management procedures, students are made aware of the importance of proper trash disposal.

Hazardous Chemicals and Radioactive Waste Management

Different types of waste generated in the college and their disposal

Types Of Waste	Particulars	Disposal Method
E – waste	Computers, electrical and electronic parts	Direct selling
Plastic waste	Pen, refill, plastic water bottles and other plastic containers, wrappers etc	Collected by Punalur Municipality
Solid wastes	Damaged furniture, paper waste, paper plates, food waste	Reuse after maintenances energy conservation
Chemical wastes	Laboratory wastes	Neutralise with water
Waste water	Washing, urinals, bathrooms	Soak pits
Glass waste	Broken glass wares from the Labs	Direct selling
Sanitary napkins		Napkin incinerators

Biodegradable waste

Composting pits are used to treat biodegradable wastes created on college campuses that are gathered from various locations such as canteens, laboratories, offices, hostels, food leftover by students and employees, and from the campus clean-up procedure. The biodegradable waste is treated using a variety of techniques, including vermi-composting and pit composting. Hazardous wastes produced by the college, such as chemical wastes from laboratories, E-wastes, plastics, glass, and tin wastes, can be collected appropriately and disposed of safely. It is sold out of electronic trash, plastic and glass bottles, other plastic waste, cans, shattered glass items, tins, etc.

The Sree Narayana College, Punalur, Kollam, is committed to handling the biological wastes gathered from the research and practical laboratories of Chemistry and Zoology in a manner that is both safe and considerate of the environment and complies with all applicable centre and state government regulations.

Bio gas plant

In order to reduce the cost of garbage transportation, two fiber-made portable biogas plants were erected in various locations throughout the college grounds. As a result, waste produced in various blocks was used in the nearest biogas plant. Additionally, cutting the pipe's length aids in achieving the most pressure at the burning end.

In the hostel, a one-meter-cube portable biogas plant with a water jacket type and an eight-kg solid bio-waste capacity was placed. This plant produces one and a half hours' worth of gas and feeds all the food waste produced by the hostel and the college's main building.

Another bio gas plant with the same specifications has been erected close to the canteen and is fed by the food waste from both the canteen and the Chemistry block. The canteen uses the gas that plant produces.

Utilizing environmentally friendly green energy from biogas plants helps to cut down on the amount of petroleum fuel used on campus and also supports the waste-to-wealth program in the college.

Bio gas plant in Canteen and Hostel



Bio gas used in Canteen and Hostel



Existing waste management methods practiced

- Routine daily campus cleaning.
- Sorting waste into biodegradable and non-biodegradable categories by the cleaning staff
- Garbage cans are positioned in the staff rooms, offices, and hallways.
- Sanitary napkin burning incinerators.
- Paper scraps for recycling through the Bhoomitrasena Club.
- Safe disposal of plastic and e-waste.
- Promote recycling, reusing, and waste reduction
- Distribution and sewing of cotton carry bags

Future strategy

- Waste containers of various colours will be provided to make waste sorting simple.
- Install appropriate sign boards to facilitate waste disposal.

4.4 GREEN CAMPUS

To guarantee that the campus complies with environmental regulations, a green campus comprises plants, environmental features, and greenery. Additionally, this aids in ensuring that the Environmental Policy is implemented, upheld, and evaluated through various environmental awareness initiatives. When there are enough trees on campus, the general microclimate and the amount of energy required for heating and cooling are improved. Green campuses dramatically reduce greenhouse gas emissions and energy costs, promote academic enthusiasm, and improve teacher and student health. Benefits like clean air, healthy lighting, and secure outdoor areas are essential because children spend two-thirds of their waking hours inside college campuses.

Biodiversity audit is the first step of an eco-audit. It was accomplished by classifying the campus's flora and fauna. The campus's vegetation was named, and the number of species was

noted. The scientific names of the trees on the name boards enable students learn about various plants, which inspire them to protect vegetation.

The 22-acre college campus is surrounded by luxuriant, greenery on all sides. The institution is located away from the busy town in a tranquil setting. Due to its location in the foothills of the Western Ghats, which are recognized by UNESCO as a World Heritage Site, the campus is rich in biodiversity and home to several species of flora and fauna. There are about 400 distinct plant species, including trees, shrubs, and herbs.

There are numerous common herbs, including *Euphorbia heterophylla* (Wild poinsettia), *Tridax procumbens* (Tridax daisy), and *Cyanthillium cinereum* (Little iron weed). *Senna alata*, *Chassalia curviflora* (Curved flower woody chassalia), and *Clerodendrum infortunatum* (Hill glory bower) are all shrubs. *Senna alata* is a type of candle bush. Additionally, the campus is planted with and conserved economically significant trees like *Tectona grandis* (Teak). The biodiversity is enhanced by lower plants like ferns and bryophytes. Common pteridophytes include *Pteris* and *Selaginella*. A garden of attractive plants, including *Auracaria heterophylla* (Monkey's Puzzle), *Cyrtostachys renda* (Ornamental Palm), *Bauhinia purpurea* (Purple Bauhinia), *Murraya paniculata* (Orange Jasmine), and *Cassia fistula* (Golden shower tree), can be found in the college campus. The campus contains a variety of medicinal plants, including *Achyranthes aspera* (pricky chaff flower), *Azadirachta indica*, and *Andrographis paniculata* (Green chiretta). Food-producing plants such as *Manihot esculenta* (tapioca), *Pisum sativum* (pea), *Amaranthus sp.* (amaranth), *Mangifera indica* (mango), and *Artocarpus heterophyllus* are abundant on campus (jack fruit).

LIST OF PLANTS IN THE CAMPUS

HERBS AND CLIMBERS

SL.No	Scientific Name	Common name	Family
1.	<i>Desmostachya bipinnata</i> (L.) Stapf	Big cord grass, Darbha	Poaceae
2.	<i>Cymbopogon nardus</i> (L.) Rendle	Lemon grass	Poaceae
3.	<i>Pennisetum polystachium</i> (L.) Schult	Pennisetum	Poaceae

4.	<i>Spermococe ocymoides</i> Burm.f.	Purple leaved button weed, Taravu	Rubiaceae
5.	<i>Clitoria ternatea</i> L.	Butterfly Pea	Faboideae
6.	<i>Coccinia grandis</i> L. Voigt	Coccinia	Cucurbitaceae
7.	<i>Mikania micrantha</i> Kunth.	Mikenia	Asteraceae
8.	<i>Acalypha indica</i> L.	Indian Acalypha, Kuppamani	Euphorbiaceae
9.	<i>Acalypha ciliate</i> Forssk	Acalypha	Euphorbiaceae
10.	<i>Achyranthes aspera</i> L.	Prickly Chaff Flower	Amaranthaceae
11.	<i>Ageratum conyzoides</i> L.	White weed	Asteraceae
12.	<i>Alternanthera bettzickiana</i> (Regel) G. Nicholson	Calico plant	Amaranthaceae
13.	<i>Alysicarpus vaginalis</i> (L.) DC.	Alyce Flower	Faboideae
14.	<i>Alternanthera brasiliana</i> (L.) Kuntze	Brasilian joyweed	Amaranthaceae
15.	<i>Andrographis paniculata</i> (Burm.fil.) Nees	Kalmegh	Acanthaceae
16.	<i>Bridelia stipularis</i> (L.) Blume	Bridelia	Phyllanthaceae
17.	<i>Centrosema molie</i> Benth.	Centrosema	Faboideae
18.	<i>Euphorbia hirta</i> L.	Asthma weed	Euphorbiaceae
19.	<i>Chassalia curviflora</i> Wall (Thawaitea)	Chassalia	Rubiaceae
20.	<i>Costus speciosus</i> J. (Koenig) Sm.	Costus	Costaceae
21.	<i>Curculigo orchiodes</i> Gaertn.	Black Musli	Hypoxidaceae

22.	<i>Cyanotis cristata</i> (L.) D. Don	Crested Fat Ears	Commelinaceae
23.	<i>Cyclea peltata</i> Hook. F. & Thoms	Raj Patta	Menispermaceae
24.	<i>Indigofera linnaei</i> Ali	Birdsville indigo	Fabaceae
25.	<i>Ipomoea hederifolia</i> L.	Red morning glory	Convolvulaceae
26.	<i>Laportea interrupta</i> (L. Chew	Laportea	Urticaceae
27.	<i>Sida acuta</i> Burm. f.	Sida	Malvaceae
28.	<i>Mimosa pudica</i> L.	Touch me not	Fabaceae
29.	<i>Mimosa diplotricha</i> Sauvallae	Gaint sensitive plant	Fabaceae
30.	<i>Mollugo pentaphylla</i> L.	African chickweed	Molunginaceae
31.	<i>Olderlandia umbellata</i> L.	Chay root	Rubiaceae
32.	<i>Oxalis corniculata</i> L.	Creeping Oxalis	Oxalidaceae
33.	<i>Spilanthes acmella</i> (L.) Murrey	Spilanthes	Asteraceae
34.	<i>Peporomia pellucida</i> (L. Kunth	Silverbush	Piperaceae
35.	<i>Pilea microphylla</i> (L. Liebm	Gun powder plant	Urticaceae
36.	<i>Synedrella nodiflora</i> (L.) Gaertn.	Synedrella weed	Asteraceae
37.	<i>Vernonia cinerea</i> L.	Ash fleabane	Asteraceae
38.	<i>Zingiber zerumbet</i> (L.) Roscoe ex Sm.	Bitter ginger	Zingiberaceae

SHRUBS

SL.No	Scientific Name	Common Name	Family
1.	<i>Ixora coccinea</i> L.	Garden Flame	Rubiaceae

2.	<i>Melastoma malabathricum</i> (L.) Smith	Melastoma	Melastomaceae
3.	<i>Croton bonplandianus</i> Baill.	Ban Thulsi	Euphorbiaceae
4.	<i>Clerodendrum infortunatum</i> L.	Hill glory bower	Verbenaceae
5.	<i>Cyrtostachys renda</i> Blume.	Sealing wax palm	Aracaceae
6.	<i>Helicteres isora</i> L.	East Indian Screw tree	Malvaceae
7.	<i>Leea indica</i> (Burm.f.) Merr.	Bandicoot Berry	Vitaceae
SL.No	Scientific Name	Common name	Family
8.	<i>Melicope lunu-ankenda</i> (Gaertn.)T.G.Hartley	Melicoppe	Rutaceae
9.	<i>Senna alata</i> (L.) Roxb.	Candle bush	Fabaceae

TREES

SL.No	Scientific Name	Common name	Family
1.	<i>Acacia nilotica</i> (L.) Delile	Gum Arabic Tree	Terminalia paniculata
2.	<i>Adenantha pavonine</i> L.	Red Lucky seeds	Mimosaceae
3.	<i>Agave angustifolia</i> Haw.	Variegated caribbean Agave	Asparagaceae
4.	<i>Alstonia scholaris</i> (L.)R. Br	Blackboard tree, Devils tree	Apocynaceae
5.	<i>Aporosa lindleyana</i> (Wight.) Baill.	Lindley's aporosa	Euphorbiaceae
6.	<i>Atrocarpus heterophyllus</i> Lam	Jackfruit	Moraceae

7.	<i>Atrocarpus hirsutus</i> Lam.	Wild Jack	Moraceae
8.	<i>Ficus auriculata</i>	Giant Indian Fig	Moraceae
9.	<i>Auracaria columnaris</i> (J. R. Frost.) Hook.	Christmas tree	Araucariaceae
10.	<i>Azadirachta indica</i> A. Juss.	Indian Lilac	Meliaceae
11.	<i>Bauhinia variegata</i> L.	Purple bauhinia	Caesalpiniaceae
12.	<i>Careya arborea</i> Roxb.	Kumbi	Lecythidaceae
13.	<i>Carica papaya</i> L.	Papaya	Caricaceae
14.	<i>Caryota urens</i> L.	Fishtail Wine palm	Aracaceae
15.	<i>Cassia fistula</i> L.	Golden shower tree	Caesalpiniaceae
16.	<i>Cinnamomum tamala</i> (Buch.-Ham) Th. G. G. Nees	Indian bay leaf	Lauraceae
17.	<i>Cocos nucifera</i> L.	Coconut	Aracaceae
18.	<i>Cupressus macrocarpa</i> Hartw. Ex Gordon	Monterey cypress	Cupressaceae
19.	<i>Cyrtostachys renda</i> Blume	Sealing wax palm	Aracaceae
20.	<i>Delonix regia</i> (Boj.ex Hook.) Rafin.	Gulmohar	Caesalpiniaceae
21.	<i>Dyopsis lutescens</i> (H.Wendl.)Beentje & J. Dransf.	Bamboo palm	Areca palm
22.	<i>Erithrina variegata</i> L.	Indian Coral Tree	Fabaceae
23.	<i>Ficus auriculata</i> Lour.	Roxburgh Fig	Moraceae
24.	<i>Ficus benghalensis</i> L. var <i>benghalensis</i>	Indian Banyan	Moraceae

25.	<i>Ficus benjamina</i> L.	Weeping Fig	Moraceae
26.	<i>Ficus racemose</i> L.	Cluster fig	Moraceae
27.	<i>Garcinia gummi-gutta</i> (L.) Robs.var gummi-gutta	Malabar tamarind	Clusiaceae
28.	<i>Hevea braziliensis</i> (Willd. Ex A. Juss.) Muell.-Arg	Rubber	Euphorbiaceae
29.	<i>Holarrhena pubescens</i> Wall. Ex G. Don	Indrajao	Apocynaceae
30.	<i>Lagerstroemia speciosa</i> (L.) Pers	Pride of India	Lythraceae
31.	<i>Macaranga peltate</i> (Roxb.) Mull. Arg.	Macaranga	Euphorbiaceae
32.	<i>Mangifera indica</i> L.	Mango tree	Anacardiaceae
33.	<i>Morinda citrifolia</i> L.	Noni	Rubiaceae
34.	<i>Murrayya paniculata</i> (L.) Jacq	Orange Jessamine	Rutaceae
35.	<i>Peltophorum pterocarpum</i> (DC.) Backer ex Heyne	Yellow flame tree	Caesalpiniaceae
36.	<i>Phyllanthus emblica</i> L.	Gooseberry	Euphorbiaceae
37.	<i>Plumeria alba</i> L.	Frangipani	Apocynaceae
38.	<i>Psidium guajava</i> L.	Guava	Myrtaceae
39.	<i>Pterocarpus marsupium</i> Roxb.	Indian Kino tree	Fabaceae
40.	<i>Rhapis excelsa</i>	Lady Palm	Aracaceae
41.	<i>Albizia saman</i> (Jacq.) Merr.	Rain Tree	Fabaceae
42.	<i>Roystonea regia</i> (Kunth O.F. Cook	Royal palm	Aracaceae
43.	<i>Senna condolleana</i>	Golden cassia	Caesalpiniaceae

44.	<i>Simarouba glauca</i> D. C.	Paradise tree	Simaroubaceae
45.	<i>Swietenia macrophylla</i> King.	Mahagani	Meliaceae
46.	<i>Syzygium cumini</i> L. Skeels var. <i>cumini</i>	Malabar Plum	Myrtaceae
47.	<i>Tectona grandis</i> L. f.	Teak	Lamiaceae
48.	<i>Terminalia paniculata</i> Roth.	Flowering Murdah,	Combretaceae
49.	<i>Tabernaemontana gamblei</i> Subramanyan & A. N. Henry	Gamble's crape jasmine	Apocynaceae

Routine Green Practices

Every year college celebrates World Environment Day, World Water Day, World Wetland Day and Ozone Day in the campus. The major goals of these programs were to raise students' awareness of the value of the environment, its preservation, and environmentally responsible resource usage. Seminars, poster presentations, outdoor activities, competitive quizzes, and other field-oriented activities are used to carry out the programs.

4.5 TRANSPORTATION FACILITIES/ CARBON FOOTPRINT

1.	Number of persons using cars	12
2.	Number of persons using two wheelers	198
3.	Number of persons using other transportation	253
4.	Number of vehicles in the college	NIL
5.	Total number of students in the college	1440

The majority of students on campus use public transportation, reducing the carbon footprint of the student community. Students are not allowed to drive their cars on campus, although there are parking lots set up for them outside. Staff members have parking available for their personal automobiles on campus.

4.6 GREEN CAMPUS INITIATIVES

The campus's Green Campus, Energy, and Environment Policies were established to support innovative new co-curricular and extracurricular activities that inspire students to take the initiative in bringing about positive change.

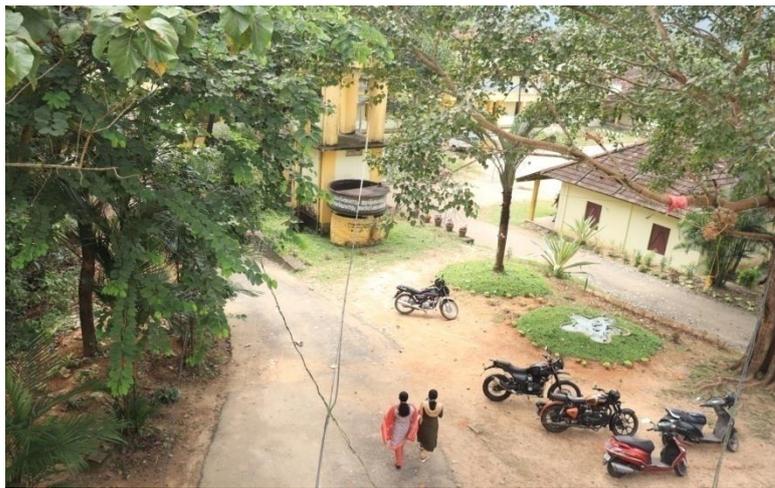
The key topics are

1. Plastic Free Campus

The college prohibits the use of single-use plastics in its premises to create a "Plastic Free Campus" in light of the Government of India's decision to outlaw all single-use plastics due to the harmful effects of plastic use and pollution.

The necessity to always keep single-use plastics or anything containing plastic out of reach is one that is strongly emphasized by the students, instructors, and other campus stakeholders. They adhere strictly to the College Green Protocol, which is in line with recommendations made by Kerala's very concerned higher education administration. The audit also revealed that the students adhere strictly to their promise to ban plastics. Plastic should be avoided in all situations, even while thanking guests at events. In order to get support for their campaign to entirely avoid plastics and adopt "Kerala's Green Philosophy," the students have ventured out into the towns and villages under the NSS banner and approached their own houses and neighbourhoods





Throughout the audit inspections, the audit team was unable to locate any plastics lying around the campus. Along with the avoidance of plastics, the College's working strategy for waste disposal or re-use has progressively evolved into a "lifestyle step-up" that the students have learned from their studies there. All of the students (day scholars) have made an effort to stop using plastic water bottles and lunch boxes, and the majority of them have switched to safer steel alternatives.

2. Restricted Entry of Automobiles

The institution implemented a restriction on vehicle admittance to prevent large cars from unintentionally entering the campus. Many of the personnel and students on this campus use carpooling to go to and from locations around the city and in the suburbs. This approach

reduces both pollutants and fuel usage.

3. Use of bicycles/ Battery-powered vehicles



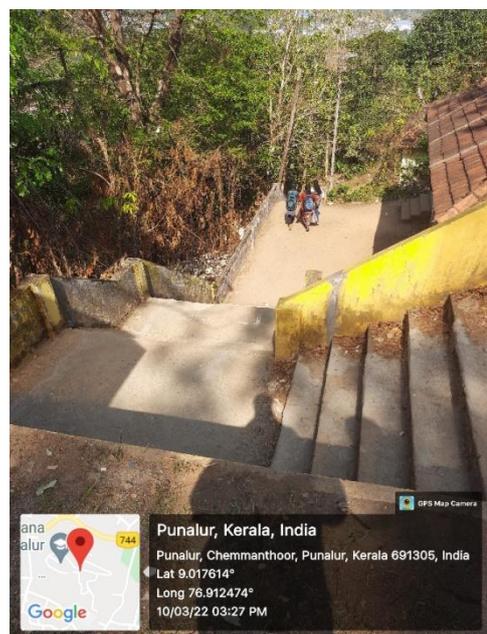
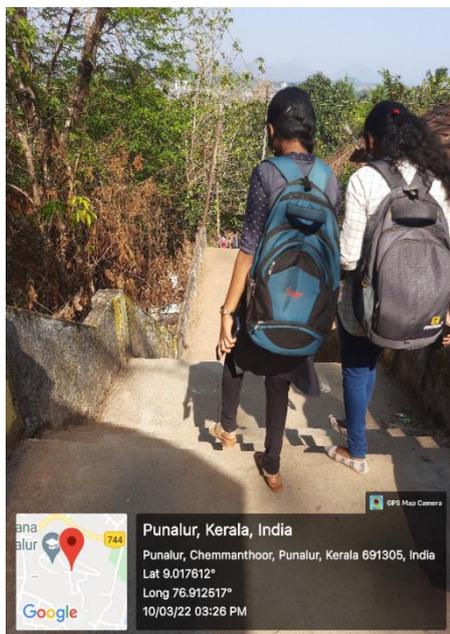
In Kerala, there are a lot of streets that lack wide enough, clear-of-obstruction, continuous footpaths or cycling tracks, even in Municipal Corporations. The fact that Kerala has the highest population density among the Indian states is also well recognized. To rely too heavily on unfettered walking or secure bicycling is thus unwise. With a population of 35 million, Kerala has more than 15 million registered motor vehicles, and the state reports close to 50,000 traffic accidents each year. This fact has an impact on how parents decide on their children's way of transportation to institutions. Although there are more than 10 million 2-wheelers on the road, they belong to the working women, young people, and students. Staff members and students wander between various activity areas inside the institution during working hours as well as from the dormitory to the college.

In order to promote environmental sustainability and reduce pollution, the college has taken steps to promote battery-powered vehicles, creating an eco-friendly campus.



4. Pedestrian Friendly Pathways

The campus is thoughtfully designed to include all necessary structures, playgrounds, internal roadways, dormitories, living areas, etc., while still leaving enough space for landscaping, gardening, and shaded walks connecting the various activity areas. The paths are even and level for casual strolling, brisk jogging, or leisurely passing while conversations are in progress. The 25-acre property is covered in several hundreds of trees that have a noticeably dense and expansive canopy. No frequent motor vehicle movements are allowed along the internal pathways, except occasional scooters and cars at times. The campus was exceedingly safe, hassle-free, and made for a rewarding study atmosphere, according to the audit.



Students and employees can move about easily on the other roads since they are level, tiled, tarred, turfed, and constantly cleaned. This allows for ongoing conversations and narratives. The activity zones are well connected by surfaced roads, although a public road divides them without hindering connectivity. The campus's hostellers, other important workers, and their families can move about easily to the buildings and grounds thanks to the sufficient number of street lights.

4.7 CONSOLIDATION OF AUDIT FINDINGS

Green Audit will increase understanding and appreciation of how college actions affect the environment. Through a number of auditing operations, Sree Narayana College in Punalur, Kollam, has been successful in identifying the environmental implications. The green auditing activity stimulated thought and offers suggestions for doable strategies to lessen adverse environmental effects. Those who took part in this green auditing process learned more about the necessity of sustainability on college campuses.

Preparation of action plan

In order to fully understand the scope of the green audit report, management's policies about the College and approach to resource use must be taken into account. The college administration should create an environmental policy. The institution should have a policy on green awareness raising or training programmes for students and staff. This policy should cover everyone from kitchen staff to management's procurement policy. The college should have an action plan based on the policies. The action plan will be developed using the green auditing report as a starting point.

Follow Up Action and Plans

The process of conducting a green audit produces a significant amount of useful management data. It is important to make sure that the audit's conclusions and recommendations are taken into account at the appropriate level within the organization and that action plans and implementation programs are developed as a result of the findings in order to be able to justify the time, effort, and cost involved in the exercise. Follow-up on audits is a step in the larger process of ongoing improvement. The audit becomes an isolated event without follow-up, quickly forgotten due to the demands of organizational priorities and

the passage of time.

Environmental Education

The following environmental education program might execute in the college before the subsequent green auditing:

- Training programmes in the management of solid waste, liquid waste, the establishment of a nursery for medicinal plants, the management of water, the cultivation of vegetables, the cultivation of paddy, the planting of trees, the management of energy and the landscape, the methods for monitoring pollution, and the methods for collecting rainwater
- Increase the amount of signs promoting environmental awareness, such as “plastic free campus”, “save water”, “save electricity”, “don’t waste food or water”, and “don't smoke” etc.
- Activate the environmental clubs
- For the intent of providing proper training to the students , set up a model rainwater collection system, rainwater pits, vegetable garden, medicinal plant garden, paddy fields, etc.
- Conduct exhibition of recyclable waste products
- Install a chemical treatment system for laboratory waste water.

Awareness on carbon consumption

- The carbon consumption awareness programmes on carbon emission at individual as well as social level would help to avoid air and noise pollution in the campus due to automobiles.
- Staff and students may be aware about the pollution that comes from automobiles.



Chapter- 5

Conclusion and Full List of Recommendations

The most effective and environmentally friendly method of resolving environmental issues on campuses is through green audit. It is a particular professional approach that comes under the purview of everyone who is the part of educational, business, finance, social work, and the environment. Conducting a green audit on college campuses is essential because it educates students about the benefits of saving the environment and helps them develop into responsible citizens. The green audit aids in evaluating performance in the environmental arena and is quickly turning into a vital tool for decision-making in a college. In recent years, the college has made a conscious effort to act responsibly toward the environment by taking into account the environmental effects of the majority of its decisions. Despite the fact that the college performs quite well, the recommendations in this report identify a number of ways in which it might work to enhance its behaviour and develop into a more sustainable institution.

5.1 Suggestions

Some of the very important suggestions are:

- Adopt the suggested Environmentally Responsible Purchase Policy and endeavour to develop and implement a plan to lessen the impact of its purchasing decisions on the environment.
- Increase Awareness of Environmentally Sustainable Development- Use every opportunity to raise public, government, industry, foundation, and university awareness by openly addressing the essential need to progress toward an environmentally sustainable future publicly at every opportunity.
- Establish programmes to provide competence in environmental management, sustainable economic development, population, and related subjects in order to ensure that all university graduates are environmentally literate and have the awareness and understanding to be ecologically responsible citizens.
- Increase reduce, reuse, and recycle education on campus

- Establish institutional ecology policies and practises for resource conservation, recycling, waste reduction, and environmentally sound operations to set an example of environmental responsibility.
- Collaborate to develop multidisciplinary approaches to curricula, research efforts, operations, and outreach activities that support an environmentally sustainable future. Bring together university faculty, administrators, and environmental practitioners.
- Adopt the suggested Environmentally Responsible Purchase Policy and endeavour to develop and implement a plan to lessen the impact of its purchasing decisions on the environment.
- Spread awareness about recycling on campuses.

5.2 List of recommendation

- Enhance the College's reporting on and monitoring of water and energy use, and give campus visitors better feedback and information.
- Take into account using "green curriculum."
- Explain to all students the UGC Environmental Science programme.
- Install systems for managing water, waste, and energy.
- Increase the number of seminars and focus groups you hold for environmental education.
- Install a unit for recycling water so that it can be utilised for gardening in hostels and colleges.
- Expand the medicinal and vegetable gardens and gradually transform the area into a nursery.
- Develop a botanical garden that inspires respect for the diversity of flora and fauna.
- Hold exhibitions on the environment and sustainable practises for the general public and parents.
- Organize earn while learn eco-friendly programmes.
- Construct sensitive taps in place of damaged ones, if possible.
- Install rainwater collection systems in every building.
- There will be more awareness campaigns about water conservation.
- If water filtration is utilised, such as RO filtration, reduce water and electricity use as much as possible and make sure the equipment is frequently maintained.

- It's important to maintain solar panels properly and combine them with other renewable energy sources.
- Conduct additional staff and student awareness campaigns about energy conservation.
- Switch to LED monitors in favour of computers and TVs.
- More energy efficient fans need to be installed.
- Each year, observe a power-saving day.
- Systems for automatic power switches off could be introduced.
- To reduce power loss due to eddy current, electricity in campus buildings should be disconnected from the main building supply after occupancy.
- Establish a plastic free campus.
- It is important to continue the waste segregation practise that was started.
- Establish enough easily accessible collection locations for recyclable waste, with responsibility for recycling clearly defined.
- More waste should be composted via vermicomposting.
- Refrain from using plastic or thermocol plates and glasses at college-level or departmental events.
- Implement a car-pooling programme for the faculty to cut down on the number of four-wheelers entering the campus.
- Introduce college transportation options to the faculty and staff.
- Promote the use of cycles among employees and students.
- Discourage the students who commute on two wheels.
- More frequent use of generators should be avoided.
- LPG usage in the canteen needs to be reduced.

5.3 Commitments after Green Auditing

The Sree Narayana College, Punalur, Kollam, should implement some improvements to its vision and mission statements that support adherence to environmental laws and regulations for the college's long-term survival. This is in view of the green audit.

Vision Statement

The college is dedicated to rising to the top among academic institutions as an innovative leader in the fields of environmental education and research as well as in the actual management and stewardship of the environment. The college is required to adhere to the principle of sustainable development and will use its resources in a way that does not endanger the capacity of the college's and the world's future generations to meet their needs.

Mission Statement

With the aim of identifying, quantifying, describing, and prioritising the framework of environmental sustainability in accordance with the relevant regulations, policies, and standards, the college is committed to promoting environmental management and conservation on the college campus and in the local community.

Audit Team

The green audit is a team effort which was led by the faculties and students of Sree Narayana College in collaboration with Xcellogen Biotech Team.

Xcellogen Biotech team members

1. Dr. Kumaran T (MSc, MPhil, PhD)
Head, Department of Environmental Science Muslim Arts College,
Thiruvithamcode, Tamil Nadu
2. Anooj E S
Managing Director