# NIZAM COLLEGE (AUTONOMOUS)

# HYDERABAD-500001

# ENVIRONMENTAL / GREEN AUDIT REPORT

**Prepared by**

**Green Audit Assessment Team**
**for the year**
**2021-22**

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A Constituent College of Osmania University

## PRINCIPAL'S MESSAGE

A major concern of the nations is the increasing levels of carbon footprints and the increasing depletion of the ozone layer. Organizations are under increasing pressure to show their commitment to sustainability in a time of growing environmental concerns and the urgency of mitigating climate change. An organization's environmental impact can be assessed in-depth with a green audit, which can also be used to pinpoint areas for improvement and put plans into place for more sustainable operations.

Nizam College understands the value of sustainability and environmental responsibility in its activities. In keeping with this promise, a Green Audit was ordered to evaluate the state of affairs, pinpoint development opportunities, and create a plan for moving forward with more sustainable practices.

The Green Audit covered a wide range of Nizam College topics using a multifaceted methodology. Energy use, trash management, water usage, procurement procedures, and staff involvement in sustainability projects were among the important aspects evaluated. Site inspections, document checks, utility bills, consumption record analysis, and other methods were used to gather data.

Nizam College finds that the Green Audit is a useful tool for evaluating its environmental performance, pinpointing areas for development, and setting goals for increased sustainability. Nizam College may lessen its environmental impact, show that it is committed to ethical business practices, and help create a more sustainable future by putting the report's recommendations into reality.

The conclusions and suggestions from the Green Audit that was carried out for Nizam College are detailed in this report.

# ABOUT THE COLLEGE

Established in 1887 by the amalgamation of Hyderabad School and the Madarsa-i-Aliya, Nizam College is one of the oldest and most esteemed institutions of higher education in South India. It was affiliated to the University of Madras for 60 years after its inception and was made a Constituent College of Osmania University on 19th February 1947.

Nizam College offers both undergraduate and postgraduate courses in the Faculties of Arts, Social Sciences, Commerce, and Sciences in addition to professional courses such as MBA, MCA, M.Sc. (IS) and BCA. Several of our students are also pursuing doctoral and postdoctoral research. The college received the status of the College with Potential for Excellence both under the X Plan and the XI Plan period. The College is accredited by NAAC in March 2019 with a 'B++' grade with a CGPA of 2.92.

The Placement Centre organizes on-campus recruitments involving industries and MNCs like Wipro, Infosys, Cognizant, Satyam, Nipuna, GE, etc. totaling more than 25 to 50 reputable companies visit the college every year. Students come from a wide range of social status and different regions which creates a healthy atmosphere and an ambience of a global community with rich cultural exchange. Nizam College is foremost in the preference of students from various Asian and African countries. Foreign students constitute 25% of the total strength of the college.

# VISION AND MISSION

## Vision

To continue as a centre of excellence in education and research, and consolidate our position as a reputed Institution of Higher Education.

## Mission

• To build across the college a culture of excellence in teaching and learning, attract both global and national students and mould them into responsible future citizens through various support activities.

## Core Values

- Provide the students with a teaching-learning experience that develops in them the capacities for creativity, critical judgment, effective communication, and in-depth knowledge.
- Enhance interaction with industry/ business /academic in teaching programmes through guest lectures, seminars, adjunct faculty programs, and industrial/business/academic internships for students.
- Ensure effective evaluation of teaching/ learning curricula and co-curricular opportunities for students and teachers.
- Provide incentives to teachers/learners for research and consultancy.
- To develop an environmentally friendly campus.
- Create innovators, leaders, and entrepreneurs.
- Achieve excellence in application-oriented research in different areas to contribute to the development of the region and the nation.
- Promote co-curricular activities for the overall personality development of the students.
- Develop responsible citizenship through awareness and acceptance of value-based education.
- Provide efficient administration and responsive support for all activities of the college.
- Provide remedial courses to preferentially admitted students and special attention to the Divyangjan students.
- Ensure Gender Equity
- Build alumni, family, and friends to create a network of allegiance and support for college

## OBJECTIVES OF GREEN AUDIT

The objectives of Green or Environmental Auditing are:

- To assess the procedures employed by Nizam College (Autonomous) that help to reduce the Carbon Footprint.
- To assess investments made in increasing awareness among students regarding electricity, biodiversity, and the environment that have helped the institution achieve the required carbon dioxide emission and absorption on the campus.
- To know whether non-academic or extracurricular activities of the Institution support the collection, recovery, reuse, and recycling of solid wastes that are harmful to the environment.
- To identify gaps and suggest recommendations to improve the Green Campus status and increase the biodiversity of the institution.
- To create a report that documents baseline data of good practices and provide future strategies and action plans towards improving the environmental quality of the institution.

## CONSTITUTION FOR GREEN AUDIT

The Green Audit is carried out as per the environmental policy and Green Audit checklist.

The audit aims to check the existing practices and provide advice for the development of environmental policy and practice in the areas of:

- √ Green Policy
- √ Green Committee
- √ Green objectives
- √ Layout of college
- √ Construction area
- √ No. of trees
- √ Medicinal plants
- √ Rain harvesting pits
- √ Waste Management
- √ Water conservation and management
- √ Best practices for greenery improvement

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# Orders

The following faculty are appointed as members of the Green Audit Committee for the year 2021-22

| S. No | Name | Designation |
|---|---|---|
| 1. | B. Narayana | Chairman and Principal, Nizam College |
| 2. | Dr. G. Vijaya Bhaskar Reddy | **Coordinator** |
| 3. | Dr. C. Satyavathi | Member |
| 4. | Dr. S. Renuka | Member |
| 5. | Dr. Radhika | Member |
| 6. | Dr. B. Jyothi | Member |
| 7. | Dr. Chand Pasha | Member |
| 8. | Dr. Manju | Member |
| 9. | Dr. Humera Nazmeen | Member |
| 10. | Mrs. D. Deepika | Member |
| 11. | Mrs. Geetha | Member |
| 12. | Kavya (student) | Member |
| 13. | Sai Prakash (student) | Member |

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# Green Audit Committee

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| 7 | Dr. Chand Pasha | Member | |
| 8 | Dr. Manju | Member | |
| 9 | Dr. Humera Nazmeen | Member | |
| 10 | Mrs. D. Deepika | Member | |
| 11 | Mrs. Geetha | Member | |
| 12 | Kavya | Member | |
| 13 | Sai Prakash | Member | |

# Protocols Used for Environmental Audit

**Internal Audit Team Structure:** The team comprises the Principal as Chairman, the Vice-principal as the Vice-Chairman, one coordinator from the faculty of Botany/Zoology/ Environmental Science, and three other members from any faculty interested in environment-related activities.College can include two extra invitee members from the Forest Department / Pollution Control Board / Health Department/ etc.

**Questionnaire**: This is used for acquiring basic information related to different categories to be covered in an institution.

**Check List:** This is used for providing a detailed listing of all issues to be covered in an institution.

**Photographs:** A picture speaks 1000 words. Use photographs to support findings and to highlight good practices with geo-tagging.

**Comprehensive Methods:** The detailed methodology is required for environmental audit, and it must be conducted using comprehensive protocols and fixed procedures to ensure collection and documentation of the required data and verification of facts based on the information provided.

**Relevant Measures and Standards**: The standard measures could be adjusted to be relevant to the organization or activity being audited.

**Written Reports:** Reports should contain factual observations, reasoning and the documentation of the processes. The Clarity and accuracy should be maintained while presenting the findings with the support of valid and documented evidence.

**Evidence verification**: The concept of evidence and verification of environmental deficiencies is one of the key elements in an environmental audit. Initially the Internal audit team must verify all procedures, collect data and information through direct field inspection.

**Certification and Grading:** The External audit team will assess and evaluate the internal audit report and after thorough verification certificate along with grade will be issued

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# Executive Summary

❖ Members of Biodiversity Club, Department of Botany Nizam College carried out a green audit with certain questionnaire and collected data related to Energy, Water management, Waste management etc. Based on the data we have prepared the Green or Environmental Audit of the Nizam College and submitted to local Assessment committee for further analysis and assessment.

❖ **Water management**: The source of water includes municipal water supply and three bore wells. Wastage of water is regularly monitored. Three RO plants were installed in the college premises and one in the hostel premises for purified drinking water. Waste water from RO units is utilized in wash rooms. There are five rainwater harvesting pits which are used for percolation of rain water. Student volunteers from Biodiversity club regularly monitor and rectify the tap leakages. Chemical waste water from chemistry and other labs is treated properly (Proposed Phytoremediation) and allowed for percolation.

❖ **Waste management**: Land filling is the general waste management strategy adopted by the College. Various programmes are being organized to create awareness about Waste management. College has been declared as plastic free campus. Waste bins are distributed to all the departments for collection of plastic and paper waste. Food waste from canteen and hostels are collected by biodiversity club volunteers for vermi-composting and project related activities. Many departments are now following green methods and started avoiding flexy banners, plastic carry bags and cups for social gatherings and academic programmes.

❖ **Energy management**: Management and staff are investing their maximum efforts to declare college as a model for using non-conventional energy sources in future. Proposals were submitted to install 31KW Grid connected Solar Power Plant in the Campus which will be capable of generating 1lakh units of electricity a year. In many academic Blocks and departments traditional tube lights and bulbs are replaced with CFL and LED tube lights.

3-5 star rated refrigerators and air conditioners are acquired in the laboratories and departments to conserve energy. Staff and students are encouraged to use natural light in the class rooms and many awareness programs were organized to conserve energy by switching off the lights and fans in the class rooms. Kirloskar power generator operated with diesel is being used for the power supply during power interruption. It has less fuel energy consumption and has more efficiency in power generation.

- **Landscape/Environment**: Landscape gardens, Grass lawns, Botanical garden and Herbal gardens of college have various types of indigenous, exotic and ornamental plant varieties. Biodiversity club members maintain the flora of the college. There are about 50 important medicinal plants in the herbal garden as well as in other Departmental gardens. RO waste water is mixed with normal water and is used for gardens. Beautiful lawns are maintained in different places of the college with Mexican grass, Axonopus grass, and Cynodon grass varieties.

- **Transportation**: Most of the students stay in college hostels or nearby private hostels and come to college on walk. Most of them rely on public transport or use bicycles indicating a lesser carbon footprint of the student community. Many teaching staff and nonteaching staff use four or two-wheelers and carbon foot print is more for them. After conducting many awareness programs the staff and students are using public transport or turned to carpooling.

- **Green Agenda in Syllabus**: Green agenda structure is part of the curriculum of some of the departments. Biodiversity club and Center for Environmental Studies remain active for the cause of environmental protection. One-week short-term course was conducted in collaboration with EPTRI organization.

- **Water Quality:** Some of the B. Sc students carried out the project work on the water quality of the institution as part of their project. They analyzed the quality of the drinking, tap, and pond water. The analysis revealed that most water samples are in the normal range and can be used for drinking or gardening. Rain water is harvested through harvesting pits and waste water from the laboratories is treated through phytoremediation methods.

## CONTEXT

The National Assessment and Accreditation Council, New Delhi (NAAC) has made it mandatory from the academic year 2016–17 onwards that all Higher Educational Institutions should submit an annual Environmental Audit Report. Moreover, it is part of the Corporate Social Responsibility of the Higher Educational Institutions to make sure that they contribute towards the decrease of global warming through Carbon Footprint reduction procedures.

Given the NAAC circular regarding Green Auditing/ Environmental Audit, the College has decided to conduct an external Green Evaluation by a competent Green Auditor along with a Green Audit Assessment Team headed by Principal, Nizam College (Autonomous), OU, Hyderabad.

Green Audit or Environmental Audit spotlights the Carbon Footprint reduction procedures being implemented by the College. The concept, structure, objectives, methodology, tools of analysis, time frame, and cross-cutting themes of the audit are discussed below.

## CONCEPT

The term ‘Environmental audit’ or ‘Green audit’ means different to different people. Terms like ‘assessment’, ‘survey’, and ‘review’ are also used to describe similar activities. Furthermore, some organizations believe that an ‘environmental audit’ addresses only environmental matters, whereas others use the term to mean an audit of health, safety, and environment-related matters. Although there is no universal definition of Green Audit, many leading companies/institutions follow the basic philosophy and approach summarized by the broad definition adopted by the International Chambers of Commerce (ICC) in its publication of Environmental Auditing (1989).

**The ICC defines Environmental Auditing as:**

A management tool comprising a systematic, documented, periodic, and objective evaluation of how well environmental organization, management, and equipment are performing intending to safeguard the environment and natural resources in its operations/projects.

The European Commission, in its proposed regulation on environmental auditing, has also adopted the ICC definition of Environmental Audit. However, the outcome of Green Audit should be established with solid evidence that the measures assumed and amenities in the institution under green auditing led to the reduction of Carbon Footprint, and proper utilization of available resources which has been historically defined as the total set of greenhouse gas emissions caused by an individual, event or organization and expressed as ‘carbon dioxide equivalent’.

**Physical Structure**

The college is located in about 20.47 acres of land. The built-up area of the college is 6.9 acres and the projected area is 18.1 acres (**48562.3 sq.mts**).

| Name of the Block | Safe Drinking Water Facility | Landscape Gardens | Waste Management |
|---|---|---|---|
| Administrative Block | Yes (RO Plant) | Yes | Yes |
| Multipurpose Block | Yes (RO Plant) | No | Yes |
| Centenary Block | Yes (RO Plant) | Yes | Yes |
| Social Science Block | Yes (Aqua Guard) | No | Yes |
| Life Sciences Block | Yes (Aqua Guard) | Yes | Yes |
| Physical Science Block | Yes (RO Plant) | Yes | Yes |
| Commerce and English Block | Yes (Aqua Guard) | No | Yes |
| Chemistry Extension Block | Yes (Aqua Guard) | No | Yes |
| Chemistry FYIC Block | Yes (Aqua Guard) | No | Yes |
| MBA and MCA Block | Yes (Aqua Guard) | Yes | Yes |

## COLLEGE PROFILE

Name of the College: NIZAM COLLEGE (AUTONOMOUS) OU,

Address: LB STADIUM RD, GUN FOUNDRY,

BASHEERBAGH, HYDERABAD-500001.

Contact Info: 040-23234231

**Campus Area 21.18 acres**

**Built-up Area 6.9acres**

**The student and faculty strengths of the college:**

| Strength | Male | Female | Total |
|---|---|---|---|
| No of students | 2095 | 1526 | 3621 |
| No of Teaching Staff | 149 | 94 | 243 |
| No of non-teaching staff | 105 | 63 | 168 |

**Physical Structure**

The available land of the College: 21.18 Acres and 847.2 Guntas

The built-up area of the College: 922600.8 Sq.Ft.

| | |
|---|---|
| No. of Class Rooms | 211 |
| No. of Laboratories | 56 |
| No. of Conference halls | 06 |
| Library Halls | 07 |
| Auditorium | 01 |
| Canteen | 01 |
| Any other (please specify) | Staff Rooms and Departments – 31<br>NSS & NCC<br>Principal Room<br>Vice Principal Room<br>Watchman Room<br>Committee Room<br>Technician Room<br>Stack Section<br>Women Empowerment Cell<br>Study Centre<br>E resource Centre<br>Health Centre<br>Foreign student Cell<br>IQAC Cell |

# Methodology Adopted

The methodology adopted to conduct the Green Audit/ Environmental Audit of the Institution had the following components.

**Onsite Visit**

The Green Audit Assessment Team started the audit at the Institution on 30/01/2023 which extended for about one month. Greenhouse gas emissions and carbon footprint reduction through the adoption of green energy and energy-efficient measures were assessed. The key focus was on assessing the status of the green cover of the Institution, waste and water management methods, and environmental conditions in the college premises.

**Focus Group Discussion**

The Focus Group included the Biodiversity Club members, NSS Volunteers, and staff members. The discussion was focused on identifying the attitudes and awareness towards environmental issues at the Department and institutional level. The discussion revolved around three key questions:

- Do the members of the group and other student, staff members are aware of Environmental protection and related activities?
- Do they take proper measures to maintain the institution clean and green?
- Are they following proper norms to maintain institutions to be eco-friendly?
- What are the issues that should be given top priority in concern of the environment?

A questionnaire was prepared and circulated to all the staff and student members in various departments to know about key issues related to water, greenery, and energy management.

**Carbon Footprint**

❖ Data collected from the following sources were taken into consideration to calculate carbon footprint emission and reduction. The floristic richness of the campus – the total number of plants, trees, shrubs, and herbs– was estimated. The impact of alternate green energy production and consumption to reduce fossil fuel-based energy was assessed, e.g. the number of CFL, LED, tube lights, and electronic chokes were counted. The Carbon Footprint Calculator was used to arrive at conclusions.

❖ Carbon Footprint Calculator enables the measurement of carbon emissions by the institution. Besides, by breaking down the value to key ‘carbon drivers’, the Institution can know how much of the carbon footprint comes from which type of the component (high power-consuming incandescent bulbs vs. LED lights, solid waste management, Rainwater harvest, Growing plants, and landscaping, etc.)

## Questionnaire

**1. What is the total strength of students and teachers in your college?**

- No. of Students: 3621
- No. of Teachers: 243
- No. of Non-teaching:168

**2. Total Number of vehicles used by the stakeholders of the college. (perday)**

- 200

**3. No. of cycles used**

- 08

**4. No. of two-wheelers used (average distance travelled and quantity of fuel and amount used per day)**

- 139 including College Staff and Students

**5. No. of cars used (average distance travelled and quantity of fuel and amount used per day)**

- 53

**6. No. persons using common (public) transportation (average distancetravelled and quantity of fuel and amount used per day)**

- 60-62% of total students are residential nearby hostels and college hostels.
- While 25-28% of total student's uses public transport.
- 15-20 % of population have their own vehicles

**7. No. of persons using college conveyance by the students, non-teaching staff and teachers (average distance travelled and quantity of fuel and amount used per day)**

- No college conveyance

**8. Number of visitors with vehicles per day?**

- There is data of approximately 0.2% of visitors to college not belonging to students and college staff
- i.e. 8 to 10 members are visiting the College

**9. Number of generators used per day (hours). Give the amount of fuel used per day.**

- 1 generator - petrol is used
- 20 liters petrol is used per hour
- Amount spent 2200 rupees

**10. Number of LPG cylinders used in the canteen (Give the amount of fuelused per day and amount spent).**

- 16 ltrs of 1 LPG gas cylinder used for 20-25 days
- Amount fuel used per day = 650-695 ml
- Spent amount per day = 40-42 Rupees


**11. Quantity of kerosene used in the canteen/labs (Give the amount of fuelused per day and amount spent).**

- No kerosene is used in the canteen or labs

**12. Amount of taxi/auto charges paid and the amount of fuel used per month for the transportation of vegetables and other materials to canteen.**

- 100 Liters of fuel used per month

**13. Amount of taxi/auto charges paid per month for the transportation of office goods to the college.**

- Rs 42000 paid for transportation per month

**14. Use of any other fossil fuels in the college (Give the amount of fuel used per day and amount spent).**

- Total fossil fuel use is 525 L per day
- Amount spent per day = 54550

**15. Suggest the methods to reduce the quantity of use of fuel used by the stakeholders of the college.**

- Prefer walking for closer distances
- Using public transport
- Carpooling
- Using bicycles

**16. Are the Rooms in Campus well-ventilated? Yes/No**

- Yes

**17. Window Floor ratio of the Rooms: Good/Not Enough**

- Good

## CARBON AUDIT TOOLS AND ANALYSIS

The Carbon Audit tools and analysis methodology was adopted from different web resources and based on that the audit was conducted in four major thematic areas.

5. Flora and Carbon footprint reduction
6. Water usage and harvest
7. Waste management practices
8. Awareness among students about green practices

## FLORA AND CARBON FOOTPRINT REDUCTION

**Carbon footprint** is historically defined as the total set of greenhouse gas emissions caused by an individual, event, organization or product, expressed as **carbon dioxide equivalent**.

**Floristic status of the institution**

The Nizam College is located in about 20.47 acres of land in the heart of Hyderabad city, the capital of Telangana State. After deducting the built-up area along with playgrounds, the projected area available to develop various types of flora is 18.1 acres.

There are about 205 plant species of Trees, shrubs and herbs with 68 Genera under **44 families,** (including potted plants) are present in the campus.

- 87 species of trees
- 12 species of shrubs
- 110 species of herbs
- 08 species of climbers (including creepers)

About 185 to 980 fully grown trees are located in various places of campus. The Biodiversity Club members of the College counted the number of plants: full-grown trees (above 10 years), semi-grown trees (below 10 years), shrubs and lawn (18000 sq.ft. area).

| Sl. No. | Particulars of Flora | Number/area |
|---|---|---|
| 1 | **Full-grown trees** | **980** |
| 2 | **Semi-grown trees** | **662** |
| 3 | **Bushes (including floriculture plants)** | **4752** |
| 4 | **Herbecious plants (Wild and Ornamental)** | **700 (3+4=5420)** |
| 5 | **Grass Lawn** | **18,000 sq.ft.** |

## TOOLS TO MEASURE CARBON DIOXIDE ABSORPTION

**Assumptions**

1. Number of mature trees in campus = 980
2. The carbon absorption capacity of 980 trees is equivalent to carbon emitted by a speeding car for 26,000 miles
3. 26,000 miles = 41,843 km
4. Average kilometers covered by a car per litre of petrol is 20 km
5. Total quantity of petrol consumed by the car (41,843/20) = 2092 litres

The carbon dioxide emitted by a car due to consumption of 1 litre of petrol is 2.3 kg $CO_2$. At this rate the total quantity of carbon emitted by 2092 litres of petrol (2092 × 2.3 kg) = 4812 kg $CO_2$ or 4.8 tonnes of $CO_2$. Therefore, the carbon absorption of one full-grown tree is 4812/700 = 6.8 kg $CO_2$.

The footprint calculation is based on the standard unit of 1 litre petrol = 2.3 kg $CO_2$.

### I.I Carbon dioxide absorption by flora in the Institution

Carbon absorption capacity of one full-grown tree = 6.8 kg $CO_2$.

1. Therefore, the carbon absorption capacity of 980 full-grown trees on the campus of the Institution (980 × 6.8 kg $CO_2$) = **6664 kg or 6.66 tons of $CO_2$.**
2. The carbon absorption capacity of 662 semi-grown trees is 50% of that of full-grown trees. Hence, the carbon absorption **(662 × 3.4 kg $CO_2$) = 2,250.8 kg or 2.25 tons of $CO_2$.**
3. There are 4752 bushes of various species being raised in the gardens of the Institution. Carbon absorption of bush plants varies widely according to the species. Certain bushes absorb as high as 49,000 g $CO_2$ per plant, whereas some others absorb as low as 150 g $CO_2$ per plant. In the absence of a detailed scientific study and botanical survey, the per-plant carbon absorption was assumed to be 200 g (in consultation with environment scientists). Based on this, the total carbon absorption of 4752 plants was calculated to be **4752 × 200 g = 9,50,400 g or 950.4 kg or 0.95 tons of $CO_2$.**

4. The lawns of Axonopus grass, Mexican grass and indigenous grass species (*Cynodon ductylon*) are being raised and maintained in the lawn. The total area of the lawn is 18,000 sq.ft. The carbon absorption capacity of a 10-sq.ft. area of lawn is 1 g $CO_2$. Hence, 18,000 sq.ft. of lawn absorbs 8**00 g or 3 kg $CO_2$ per day.** At this rate, the total carbon absorption per year (3 kg × 365) = 1095 kg or 1**.9 tons per year.**

The grand total of carbon dioxide absorption by the flora in the campus of Nizam college is (1+ 2+ 3+ 4) = **11.76 tons.**

**This is the sink effect of the flora in the campus.**

## I.II Tool to measure oxygen emission by flora in the campus

According to the Arbor Day Foundation, **'**a mature leafy tree produces as much oxygen in a season as 10 people inhale in a year**'**.

A person breathes 7 or 8 litres of air per minute. Air is about 20% oxygen. But the exhaled air has about 15% oxygen, and hence the net consumption is about 5%. Therefore, a person uses about 550 litres of pure oxygen each day.

## Calculation of oxygen emission by flora

The number of liters in 1 kilogram depends on the density of the substance being measured. Liter is a unit of volume, and kilogram a unit of mass. Litres and kilograms are approximately equivalent when the substance measured has a density of close to 1 kilogram per litres.

On average, one full-grown tree produces nearly 260 pounds or 117.6 kg of oxygen each year. Two mature trees can provide enough oxygen for a family of four.

1. Total oxygen emitted by 980 full-grown trees per year (117.6 kg × 980) = 1,15,248 kg or **115.248 tons.**
2. Total oxygen emitted by semi-grown trees (58.8 kg × 662) = 38,925.6 kg or **38.9 tons** (oxygen emission is 50% of that of the full-grown tree).
3. Total oxygen emitted by 4752 bushes is calculated based on the following oxygen-inhaling requirement per person per day. A normal human being requires 550 litres of oxygen per day. 400 bushes produce enough oxygen per day to enable a person to breathe adequate quantity of oxygen of 550 litres. Total quantum of oxygen produced by 400 plants per day is 550 litres of oxygen.

- Taking 400 plants as one unit, the number of units of bushes in the campus (4752/400) = 11.88.
- Total quantity of oxygen produced by 13 units is (13 × 550 litres) = 6534 litres of oxygen per day.
- The annual production of oxygen at this rate (6534 × 365) = 23,84,910 litres or kg of oxygen, which is approximately **2384 tons of oxygen.**

Lawn is an incredible oxygen-making machine. A 25-sq.ft. area will supply enough oxygen to support one person for a day. Quantitatively speaking, this area of grass produces 550 litres of oxygen per day.

The total area of lawn in the campus is 18,000 sq.ft. In units, the value (18,000/25) = 720 units, which produce (720 × 550 litres of oxygen) = 3,96,000 litres of oxygen per day. Total quantity of oxygen produced by the 18,000 sq.ft. of lawn per year (3,96,000 litres/day × 365) = 2,00,750 litres or approximately 221.288 **tonnes.**

**Carbon dioxide absorption**

| Sl. No. | Flora | Quantity of $CO_2$ (tonnes) |
|---|---|---|
| **1** | 980 full-grown trees | 6.66 |
| **2.** | 662 semi-grown trees | 2.25 |
| **3** | 4752 bushes | 0.95 |
| **4** | 18000 sq.ft. of lawn | 1.9 |
| | **Total** | **11.76** |

**Oxygen emission by flora**

| Sl. No. | Flora | Quantity of $O_2$ (tonnes) |
|---|---|---|
| **1.** | 980 full-grown trees | 115.2 |
| **2.** | 662 semi-grown trees | 38.9 |
| **3.** | 4752 bushes | 2384 |
| **4.** | 18,000 sq.ft. of lawn | 221.28 |
| | **Total** | **2759.38** |

# GREEN CAMPUS MANAGEMENT

1. Is there a garden in your college? Area?

   YES

   - Principal Block: Approx.350sq.mts.
   - Centenary Block: Approx.4235sq.mts.
   - Botanical garden: Approx.2991sq.mts.

2. Do students spend time in the garden?

   YES

3. List the plants in the garden, with approx. numbers of each species.

   - Approx.500 plants.
   - Bamboo-5
   - Pomegranate-1
   - Ashoka-30
   - Neem-16
   - Aloevera-10
   - Subabul trees-30
   - Jamun-2
   - Mango-2
   - Bryophyllum-1
   - Finger millet-
   - Royal palm-13
   - Indian almond-8
   - Lilly-30

- Rose-5
- Marigold-50
- Gangaraavi-5
- Pogada-3
- Shiv tree-4
- Yellow flame-5
- Indian beech-1
- Paper flower-3
- Raavi-5
- Grow stick-2
- Coconut-6
- Sandal wood-1
- Tamarind -5
- Seema chintakaya-4

4. Suggest plants for your campus. (Trees, vegetables, herbs, etc.)

MEDICINAL HERBS: Tulsi, Aloe vera, wild ginger, basal,…etc. VEGETABLE PLANTS: Tomato, Brinjal, Spinach, Coriander, …etc.

5. List the species planted by the students, with numbers.

Approx: 50 plants were planted by the students.

6. Whether you have displayed scientific names of the trees in the campus?

   YES.

**SCIENTIFIC NAMES:**

- Thespesia populnea
- Parkia biglandulosa wight
- Mimusops elengi
- Polyalthia longifia
- Peltophorum pterocarpum
- Cassia siamea vogel
- Ixora coccinea
- Azardirachta indica
- Pongama pinnata
- Bougainvillea glabra choisy
- Ficus religiosa
- Gliricidia sepium
- Sapindus emarginatus vahl
- Santalum album
- Albizia lebbeck
- Albizia saman
- Acacia nilotica
- Pithecellobium dulce

7. Is there any plantation in your campus? If yes specify area and type of plantation.
   YES. Avenue Plantation.

   Area: Approx-1000.sq.mts.

8. Is there any vegetable garden in your college? If yes how much area?

   NO.

9. Is there any medicinal garden in your college? If yes how much area?

   YES. Herbal Garden
   Area: Approx-760.sq.mts.

10. What are the vegetables cultivated in your vegetable garden? (Mentionthe quantity of harvest in each season)

    As there is no vegetable garden, we do not cultivate vegetables.

11. How much water is used in the vegetable garden and other gardens?(Mention the source and quantity of water used).

    No vegetable garden.
    Other gardens – 20,000 litres.

12. Who is in charge of gardens in your college?

    Mr. N. Naveen is incharge of gardens.

13. Are you using any type of recycled water in your garden?

    NO.

14. List the name and quantity of pesticides and fertilizers used in your gardens.

    Neem cake, Urea, DAP.

15. Whether you are doing organic farming in your college? How?

    NO.

16. Do you have any composting pits in your college? If yes, what are youdoing with the compost generated?

    YES. We are using it for our college garden.

17. What do you do with the vegetables harvested? Do you have anystudent market?

    NO.

18. Is there any botanical garden on your campus? If yes give the details of campus flora.

    YES. Aloe vera, Bryophyllum, Mimosa pudica…etc.

19. Give the number and names of the medicinal plants on your college campus.

Neem, Aloevera, Amla.

20. Any threatened plant species planted/conserved?

NO.

21. Is there a nature club in your college? If yes what are their activities?

YES. We have a Bio-diversity Club.
ACTIVITIES: Bringing Awareness about the importance of the environment.

22. Is there any arboretum in your college? If yes, details of the trees planted.

NO.

23. Are there any fruit-yielding plants in your college? If yes, details of the trees planted.

YES. Guava, Mango, Custard apple, Coconuts, Jamun…etc.

24. Are there any groves in your college? If yes details of the trees planted.

NO.

25. Is there any irrigation system in your college?

NO.

26. What is the type of vegetation in the surrounding area of the college?

NO. There is no vegetation in the surrounding area of the college.

27. What are the nature awareness programs conducted on the campus?

Bio-diversity club, Nizam College conducts green campaign programs on our campus.

28. What is the involvement of students in the green cover maintenance?

- Students play an extensive part in cleaning their surroundings.
- Plantation of saplings in entire the campus.

29. What is the total area of the campus under tree canopy?

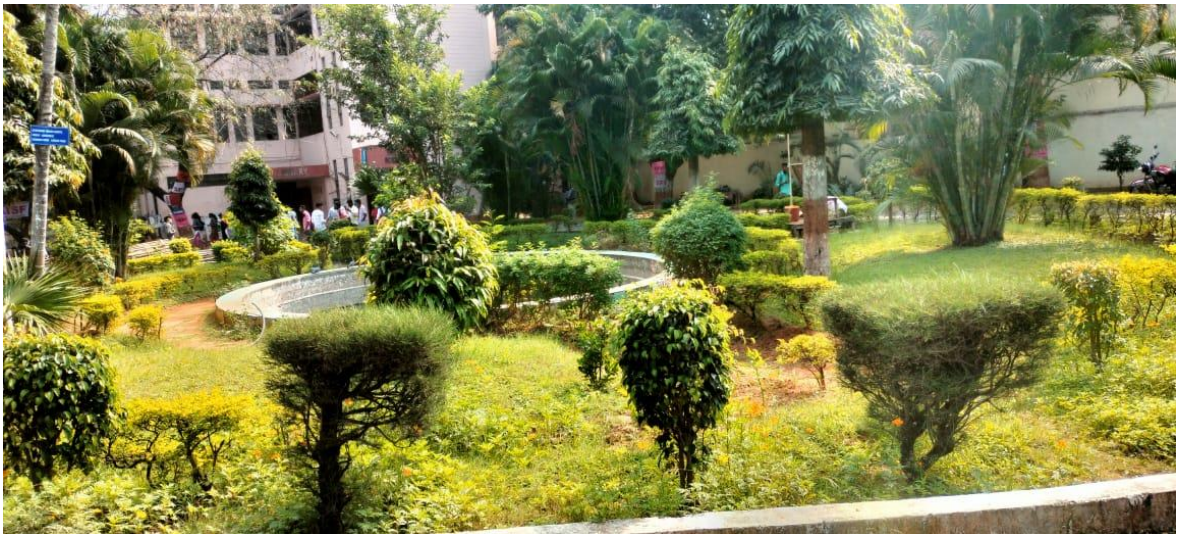
AREA: 25,000 sq.mts.

30. Share your IDEAS for further improvement of green cover.

- Haritha haram
- Green campaigns
- Awareness programmes like ‘Go Green’ should be conducted in public places.
- Sharing ideas about Green Campus through social media.

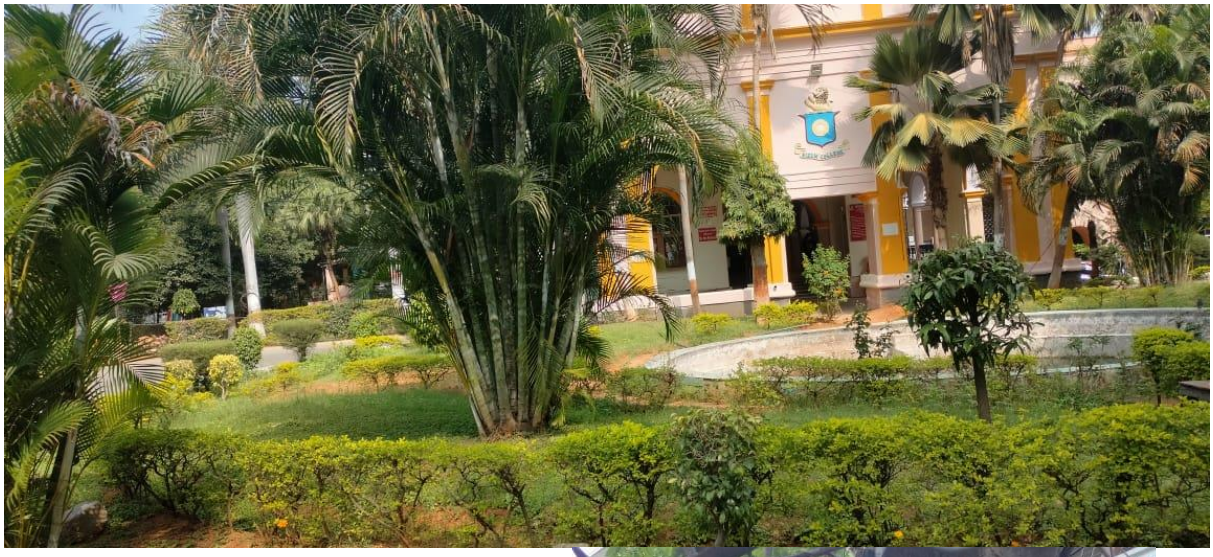

HYOPHORBE INDICA GAERTN
FAMILY : ARECACEAE
COMMON NAME : GARDEN PALM


POLYALTHIA LONGIFOLIA (SONN.) THWAITES
FAMILY : ANNONACEAE
COMMON NAME : NARASINGAMARAM




MIMUSOPS ELENGI L.
FAMILY : SAPOTACEAE
COMMON NAME : POGADA


Ficus religiosa L.
MORACEAE
RAAVI




PELTOPHORUM PTEROCARPUM (DC.) K. HEYNE
FAMILY : FABACEAE
COMMON NAME : YELLOW FLAME


## II. Water Audit

Conservation of rain water through rainwater harvesting system is practiced by the college. The total open terrace area of the buildings amounts to 48562 sq.ft.

**Rainfall calculator**

A 10 sq.ft. area receives 1 litre of water if the rainfall is 1 mm. The average rainfall per year is 100 mm in the Hyderabad. Hence, the total volume of water received on the 48562 sq.ft. area of the terrace (100 mm × 48562 sq.ft.) = 4856200 litres per year.

At present the rain water is channelized through a PVC pipe drainage system to the ground water table directly. The remaining water not only recharges the groundwater table but also provides adequate water to the flora in the campus during the summer season.


RAIN WATER
HARVESTING

# Water management

| S.No | | Wise usage of water | Leakage/repairs | Water management | Water purification | Rain harvest | Water coolers | Water use in lts. | Water storage |
|---|---|---|---|---|---|---|---|---|---|
| 1 | Arabic | √ | √ | √ | √ | √ | √ | 50 | √ |
| 2 | Biotechnology | √ | √ | √ | √ | √ | √ | 500 | √ |
| 3 | Botany | √ | √ | √ | √ | √ | √ | 5000 | √ |
| 4 | Chemistry | √ | √ | √ | √ | √ | √ | 500 | √ |
| 5 | Commerce | √ | √ | √ | √ | √ | √ | 100 | √ |
| 6 | Computer Science | √ | √ | √ | √ | √ | √ | 100 | √ |
| 7 | Economics | √ | √ | √ | **X** | √ | √ | 100 | √ |
| 8 | English | √ | √ | √ | √ | √ | √ | 50 | √ |
| 9 | French | √ | √ | √ | **X** | √ | √ | 50 | √ |
| 10 | Genetics | √ | √ | √ | √ | √ | √ | 100 | √ |
| 11 | Geography | √ | √ | √ | √ | √ | √ | 100 | √ |
| 12 | Hindi | √ | √ | √ | √ | √ | √ | 50 | √ |
| 13 | History | √ | √ | √ | √ | √ | √ | 60 | √ |
| 14 | Marketing | √ | √ | √ | **X** | √ | √ | 50 | √ |
| 15 | Mathematics | √ | √ | √ | √ | √ | √ | 50 | √ |
| 16 | MBA | √ | √ | √ | **X** | √ | √ | 50 | √ |
| 17 | MCA | √ | √ | √ | √ | √ | √ | 500 | √ |
| 18 | Microbiology | √ | √ | √ | √ | √ | √ | 500 | √ |
| 19 | Persian | √ | √ | √ | **X** | √ | √ | 50 | √ |
| 20 | Philosophy | √ | √ | √ | √ | √ | √ | 60 | √ |
| 21 | Physical education | √ | √ | √ | √ | √ | √ | 200 | √ |
| 22 | Physics | √ | √ | √ | √ | √ | √ | 200 | √ |
| 23 | Political science | √ | √ | √ | √ | √ | √ | 60 | √ |
| 24 | Psychology | √ | √ | √ | √ | √ | √ | 30 | √ |
| 25 | Public administration | √ | √ | √ | √ | √ | √ | 60 | √ |
| 26 | Sanskrit | √ | √ | √ | √ | √ | √ | 50 | √ |
| 27 | Sociology | √ | √ | √ | √ | √ | √ | 50 | √ |
| 28 | Statistics | √ | √ | √ | √ | √ | √ | 20 | √ |
| 29 | Telugu | √ | √ | √ | √ | √ | √ | 50 | √ |
| 30 | Theater Arts | √ | √ | √ | √ | √ | √ | 20 | √ |
| 31 | Urdu | √ | √ | √ | √ | √ | √ | 10 | √ |
| 32 | Zoology | √ | √ | √ | √ | √ | √ | 100 | √ |
| 33 | Hostels | √ | **X** | √ | √ | √ | √ | 4000 | √ |


WASTE WATER
MANAGEMENT

# Waste management

| S.No | | Organic waste/day | Non plastic waste/day | Plastic waste/day | E-waste | Management of organic waste | Management of other waste |
|---|---|---|---|---|---|---|---|
| 1 | Arabic | √ | X | x | X | √ | √ |
| 2 | Biotechnology | √ | X | √ | X | √ | √ |
| 3 | Botany | √ | X | √ | X | √ | √ |
| 4 | Chemistry | √ | X | √ | √ | √ | √ |
| 5 | Commerce | √ | X | √ | √ | √ | √ |
| 6 | Computer Science | √ | X | √ | √ | √ | √ |
| 7 | Economics | √ | X | √ | X | √ | √ |
| 8 | English | √ | X | √ | X | √ | √ |
| 9 | French | √ | X | √ | X | √ | √ |
| 10 | Genetics | √ | X | √ | X | √ | √ |
| 11 | Geography | √ | X | √ | X | √ | √ |
| 12 | Hindi | √ | X | √ | X | √ | √ |
| 13 | History | √ | X | √ | X | √ | √ |
| 14 | Marketing | √ | X | √ | X | √ | √ |
| 15 | Mathematics | √ | X | √ | √ | √ | √ |
| 16 | MBA | √ | X | √ | X | √ | √ |
| 17 | MCA | √ | X | √ | √ | √ | √ |
| 18 | Microbiology | √ | X | √ | X | √ | √ |
| 19 | Persian | √ | X | √ | X | √ | √ |
| 20 | Philosophy | √ | X | √ | X | √ | √ |
| 21 | Physical education | √ | X | √ | X | √ | √ |
| 22 | Physics | √ | X | √ | √ | √ | √ |
| 23 | Political science | √ | X | √ | X | √ | √ |
| 24 | Psychology | √ | X | √ | X | √ | √ |
| 25 | Public administration | √ | X | √ | X | √ | √ |
| 26 | Sanskrit | √ | X | √ | X | √ | √ |
| 27 | Sociology | √ | X | √ | X | √ | √ |
| 28 | Statistics | √ | X | √ | X | √ | √ |
| 29 | Telugu | √ | X | √ | X | √ | √ |
| 30 | Theater Arts | √ | X | √ | X | √ | √ |
| 31 | Urdu | √ | X | √ | X | √ | √ |
| 32 | Zoology | √ | X | √ | X | √ | √ |
| 33 | Hostels | √ | X | √ | X | √ | √ |

**Waste Management**

Management of solid waste is an important driver in Green Audit. Solid waste if not properly managed leads to the degradation of the environment which, in turn, affects the flora and fauna. Keeping this in mind, the College has been strictly implementing scientific solid waste management to maintain the green status of the campus.

Small buckets numbering 20 have been kept in various places on the campus so that students can deposit the solid waste in the buckets. Apart from that, there are bins used for the collection of solid waste from the departments. Vermicompost units are constructed for the conversion of organic waste collected from the Hostel and gardens. Proposals were submitted for the construction or installation of a biogas plant in the hostel. Organic waste generated in the hostel can be used effectively in biogas plants and slurry can be used in vermicomposting units.

Plastic waste and glass bottle waste are collected from the various science labs separately and disposed them properly by taking certain measures. Many science departments are segregating plastic or glass waste and organic waste at the department level and organic waste will be sent to vermin composting units whereas solid waste is disposed of in one corner of the college.

Organic waste is also collected by the B.Sc. final year students for their project execution and to find out various solutions for proper conversion or utilization of organic waste.

Vermi-Compost pit

# ANNEXURE I

## Abstract of Green Audit of Nizam College (Autonomous) for the period 2021-22

### CARBON DIOXIDE ABSORPTION

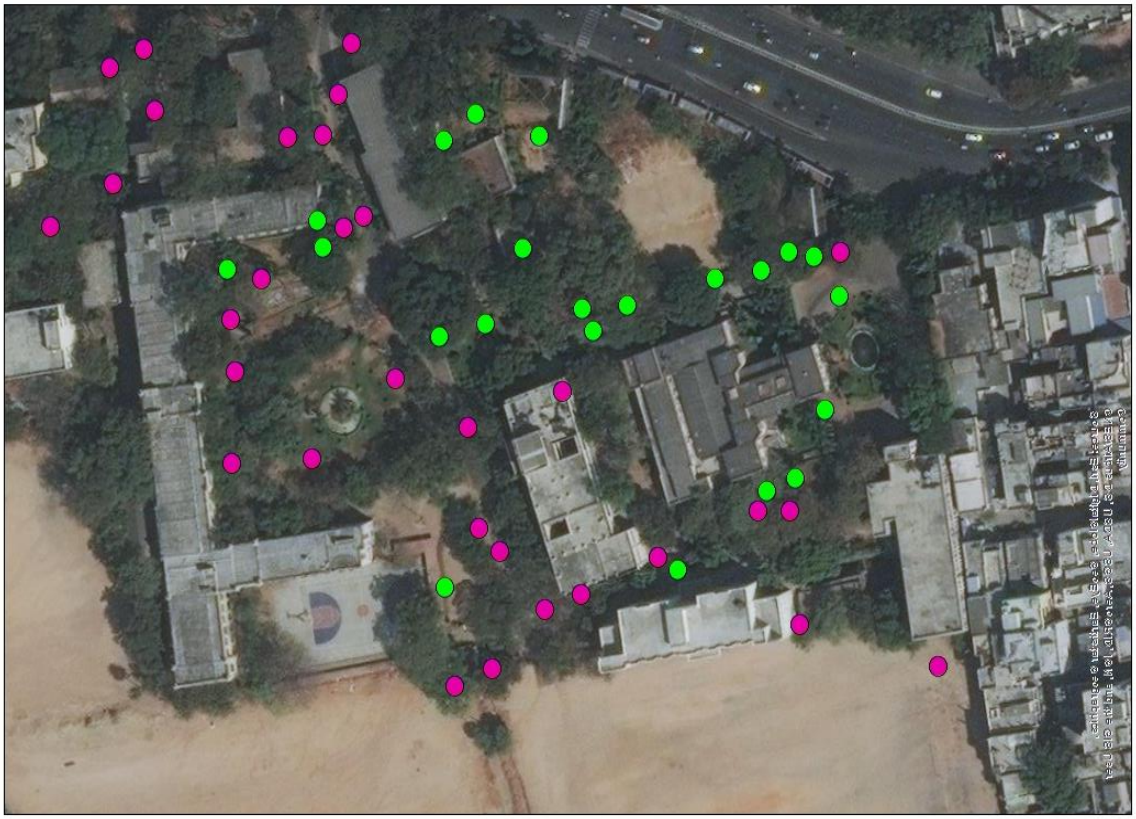
| Sl.no. | Types of trees/bush | Quantity of $CO_2$ (tonnes) |
|---|---|---|
| 1 | 980 Full-grown trees | 6.66 |
| 2. | 662 Semi-grown trees | 2.25 |
| 3 | 4752 Bushes | 0.95 |
| 4 | 18000 sq.ft. of lawn | 1.9 |
| | Total | 11.76 |

### OXYGEN EMISSION BY FLORA

| Sl.no. | Types of trees/bush | Quantity of $CO_2$ (tonnes) |
|---|---|---|
| 1 | 980 Full-grown trees | 115.2 |
| 2. | 662 Semi-grown trees | 38.9 |
| 3 | 4752 Bushes | 238.4 |
| 4 | 18000 sq.ft. of lawn | 221.28 |
| | Total | **2759.38** |

## CARBON FOOTPRINT REDUCTION MEASURES

| Sl.no. | Source | $CO_2$ reduction (tons) |
|---|---|---|
| **1** | CFL | 23.1 |
| **2** | LED lamps | 3.8 |
| **3** | Solar energy | 0.8 |
| **4** | Solid waste management (vermicompost) | 2 |
| | **Total** | **29.7** |



**GPS mapping of important tree species of nizam college**

# BEST PRACTICES

## 1. Green Initiatives and Environment-Friendly Campus

We believe that the best practices of our institution find validation in the fact that, each year, numerous students, their number always higher than the previous year, apply for admission to our college. Besides the pursuit of academic excellence, societal and academic reforms are meant to motivate students so that they can develop themselves into educated men and women, ready to carve a niche for themselves in society. Keeping the growing ecological concerns in mind, there is a dire need for immediate action to be carried out and promote eco-friendly practices.

## 2. Green Development and Community Outreach:

The college firmly believes that, when it comes to environmental conservation, awareness must be followed by sustainable practices. In this endeavor, different departments, along with the institution's very own Bio Diversity Club and various associated and dedicated committees, have undertaken several initiatives and organized different activities to reduce our institutional and societal carbon footprint and inculcate greener practices. The staff and students of the college participate in several awareness rallies and also organizes programmes such as planting trees, sapling distribution, adopting trees, etc. The NSS units of Nizam college actively participate in all such activities.

## Suggestions and Recommendations

There exists vast scope to improve the green campus status of the College through biodiversity promotion and tapping green energy sources.

1. More than 12 acres of land area is available to raise horticulture gardens, fruit-bearing trees, and shade-giving trees. About 6,000 such trees and 15,000 plants shall be raised in the Campus in the next 3 years. Through transplantation of branches from 8-year-old trees, 2,000 trees shall be raised in a year. Within 6 months, the Campus will get 2.5-year-old trees numbering 2,000.

2. Another 15,000 sq. ft. area of lawn shall be raised through the involvement of Eco Club and students from NSS or NCC to enhance oxygen emission by another 40%.

3. Compostable solid waste shall be collected and deposited in solid waste collection tanks. These wastes shall be profitably converted into compost and applied to gardens and trees to reduce the application of chemical-based fertilizers and pesticides.

4. More solar panels shall be installed on top of the buildings to produce another 10,000 KW of electricity. To enhance solar power productivity, aluminum foil-based reflectors shall be installed on the eastern and western sides of the solar panel.
5. Energy-efficient measures such as the replacement of all incandescent bulbs with LED lamps, old electrical regulators of fans with energy-efficient electronic regulators, and air-conditioning units with all-star rated systems need to be undertaken.

6. It is proposed that students from the Computer Science Department should be trained as e-waste managers to manage e-waste. These e-managers shall be in constant touch with schools, orphanages, and parish houses through social media and inform them of the outdated computer systems that shall be used by them. They also shall dispose of the less efficient, damaged, and non-functioning e-waste to the vendors.

7. Biogas plants shall be installed on the campus using solid waste in the campus. The biogas shall be used by the Hostel Kitchen and College canteen.

8. A water quality testing laboratory will be installed in one part of the laboratory to test the potability of the drinking water to ensure the students are free from water-borne diseases. All the water taps shall be fitted with high-efficiency aerator taps to reduce waste of water. All toilets shall be fitted with dual-flush water closets, which will reduce water consumption by 40%.

10. Environment education shall be imparted to all college students through 1-hr life-skill classes once a week. This will create a wide-level environmental consciousness among the student community. They will be sensitized to encourage pillion riding with their peers or use public transport instead of two-wheelers. Moreover, they will also motivate their parents to replace all the incandescent or fluorescent bulbs with energy-efficient LED bulbs.