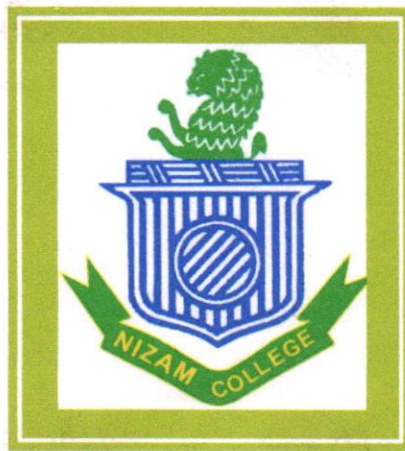


NIZAM COLLEGE (AUTONOMOUS)

HYDERABAD-500001

ENVIRONMENTAL / GREEN AUDIT REPORT



**Prepared by
Green Audit Assessment Team
for the year
2022-23**



Certificate

HYM International Certifications Pvt. Ltd.

Certified that the Environmental Management System of

NIZAM COLLEGE (AUTONOMOUS)

A CONSITUENT COLLEGE OF OSMANIA UNIVERSITY

Basheerbagh, Hyderabad - 500 001, Telangana State, India

has been assessed and found to be in accordance with the requirements of the Environmental standards

ISO 14001 : 2015

for the following scope of certification

IMPLEMENTATION OF GREENERY AND ENVIRONMENTAL PROMOTION ACTIVITIES

Further information about the scope of this certificate and applicability of ISO 14001 : 2015 requirements may be obtained by consulting the organization.

Issue Date : 10/06/2021

Renewal Date : 09/06/2024

1st Surveillance 09/06/2022

HYM

2nd Surveillance 09/06/2023



Authorised Signature

Certificate No : **E91864140231**

HYM International Certifications Pvt. Ltd

NOTE: This Certificate is Valid From 09/06/2022 to 09/06/2023

This is an accredited certificate authorized for issue by Accreditation Service for Certifying Bodies [Europe] Limited who have assessed M/s.HYM International Certifications Pvt. Ltd. against defined criteria and in cognisance of ISO 17021:2015 "Conformity Assessment - Requirements for bodies providing audit and Certification of management Systems".

www.hymcertifications.com on for checking the validation of the Certification

Regd. Office : Plot No. 265/C, Addagutta Society, Opp. JNTU, Kukatpally, Hyderabad - 500 072, Telangana State, India.
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PRINCIPAL'S MESSAGE

In an era marked by increasing environmental concerns and the urgency to mitigate climate change, organizations are under growing pressure to demonstrate their commitment to sustainability. A Green Audit serves as a comprehensive assessment tool to evaluate an organization's environmental impact, identify areas for improvement, and implement strategies for more sustainable practices.

Nizam College recognizes the importance of environmental responsibility and sustainability in its operations. In line with this commitment, a Green Audit was commissioned to assess current practices, identify areas of improvement, and develop a roadmap towards a more sustainable future.

The Green Audit employed a multi-faceted approach, encompassing various aspects of Nizam College. Key areas assessed included energy consumption, waste management, water usage, procurement practices, and employee engagement in sustainability initiatives. Data was collected through site visits, document reviews, and analysis of utility bills and consumption records.

The Green Audit serves as a valuable tool for Nizam College to assess its environmental performance, identify areas for improvement, and chart a course towards greater sustainability. By implementing the recommendations outlined in this report, Nizam College can not only reduce its environmental footprint but also demonstrate its commitment to responsible business practices and contribute to a more sustainable future.

This report outlines the findings and recommendations of the Green Audit conducted for Nizam College



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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 'B++' grade with a CGPA of 2.92.

The Placement Centre organises on-campus recruitments involving industries and MNC's like Wipro, Infosys, Cognizant, Satyam, Nipuna, GE, etc. totaling to more than 25 to 50 reputed 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, co-curricular opportunities of students and teachers
- Provide incentives to teachers/learners for research and consultancy
- To develop an environment-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



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OBJECTIVES OF GREEN AUDITING

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 in 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



ORDERS

The following faculty are appointed as members for the Green Audit Committee for the year 2022-23

1	Prof. B. Bhima	Chairman & Principal, Nizam College
2	Dr. C. Satyavathi Reddy	Coordinator
3	Dr. S. Renuka	Member
4	Dr. M. Radhika	Member
5	Dr. B. Joythi	Member
6	Dr. Chand Pasha	Member
7	Dr. B. Manjul	Member
8	Dr. Humera Nazmeen	Member
9	Dr. Sandhya Jagathap	Member
10	Dr. B. Kavitha	Member
11	Dr. K. Sudeepa	Member
12	Ms. Ratna (Student)	Member
13	Mr. Pavan (Student)	Member



Green Audit Committee

The following faculties are appointed as members for the Green Audit Committee for the year 2022-23

S. No	Name	Designation	Signature
1	Prof. B. Bhima	Chairman & Principal, Nizam College	
2	Dr. C. Satyavathi Reddy	Coordinator	
3	Dr. S. Renuka	Member	
4	Dr. M. Radhika	Member	
5	Dr. B. Jothi	Member	
6	Dr. Chand Pasha	Member	
7	Dr. B. Manju	Member	
8	Dr. Humera Nazmeen	Member	
9	Dr. Sandhya Jagtap	Member	
10	Dr. B. Kavitha	Member	
11	Dr. K. Sudeepa	Member	
12	Ms. Rathana	Student (Team – A)	
13	Mr. Pavan	Student (Team – B)	



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PROTOCOLS USED FOR ENVIRONMENTAL AUDIT

Audit Team: External agency along with the internal team comprising of the Principal as Chairman, Vice-principal as the Vice-Chairman, one coordinator from faculty of Botany/Zoology/ Environmental Science and three other members from any faculty interested in environment related activities and students. College can include two extra invitee members from Forest Department / Pollution control board / Health Department/ etc.

Survey: 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. 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, collected 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 a grade will be issued.

EXECUTIVE SUMMARY

❖ Members of the Biodiversity Club, Department of Botany Nizam College carried out a survey 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 the data to the external 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 to washrooms and gardens. There are five rainwater harvesting pits which are used for percolation of rainwater. Student volunteers from the Biodiversity Club regularly monitor and rectify the tap leakages. Chemical wastewater from chemistry and other labs is treated properly (Proposed Phytoremediation) and allowed for percolation.

❖ **Waste management:** Landfilling is the general waste management strategy adopted by the College. Various programs are being organized to create awareness about Waste management. The college has been declared as a plastic-free campus. Waste bins are distributed to all the departments for collection of plastic and paper waste. Food waste from the canteen and hostels is collected by biodiversity club volunteers for vermin-composting and project-related activities. Proposals were submitted to establish Biogas plants for effective management of organic waste generated from canteen, and hostels. Many departments are now following green methods and started avoiding flexy banners, plastic carry bags, and cups for social gatherings and academic programs.

❖ **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 classrooms. 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 Gardens, and Herbal gardens of the 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:** A good number of students stay in college hostels or nearby hostels and come by walk to college. Many other students rely on public transport or use bicycles indicating a lesser carbon footprint of the student community. Teaching and non-teaching staff continue to use private transport.
- ❖ **Green Agenda in Syllabus:** Many departments have started emphasizing on bringing about a change in the students through curriculum components and other activities to save the Green Cover and add to the greenery on the campus. Biodiversity club and Center for Environmental Studies remain active for the cause of environmental protection. NSS students actively participate in green activities such as clean and green, planting trees, etc.,
- ❖ **Water Quality:** The quality of water from drinking taps, ponds, and other regularly used water bodies is checked by TDS meters. The analysis revealed that the readings of these samples are in the standard range and can be used for drinking and gardening purposes. Rainwater is harvested through harvesting pits and wastewater 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 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 on 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**). The following are the Blocks and management of environmental resources.

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 20.47 acres

Built-up Area 6.9acres

Is the building having ventilators for natural air flow in all rooms: Yes/No --- **YES**

The student and faculty strength of the college:

Strength	Male	Female	Total
No of students	2071	1524	3595
No of Teaching Staff	133	87	220
No of Non-Teaching staff	102	61	163

No. of Class Rooms	213
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 NSS & NCC Principal Room Vice Principal Room Watchman Room Committee Room Technician Room Stack Section Women Empowerment Cell Study Centre E resource Centre Health Centre Foreign student Cell 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 four key questions:

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

A survey was conducted among 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 component (high power-consuming incandescent bulbs vs. LED lights, solid waste management, Rainwater harvest, Growing plants and landscaping, etc.)





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QUESTIONNAIRE

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

- No. of Students: 3595
- No. of Teachers: 220
- No. of Non-teaching: 163

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

- 245

3. No. of cycles used

- 08

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

- 160 including College Staff and Students

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

- 77

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

- Around 55% of total students stay in hostels and reside near hostels.
- Approximately 25% of total students use public transport.
- While 20 % of the population have their 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 1% of visitors coming to college i.e. approximately 40-50 members visit the College.

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

- 1 generator - petrol is used.
- 10 liters of petrol is used per hour.
- Amount spent 1100 rupees.

9. Number of LPG cylinders used in the canteen (Give the amount of fuel used per day and amount spent).

- 25 ltrs of 1 LPG gas cylinder used for 20-25 days
- Amount fuel used per day = 750-795 ml
- Spent amount per day = 45-50 Rupees



10. Quantity of kerosene used in the canteen/labs (Give the amount of fuel used per day and amount spent).

- No kerosene is used in the canteen or labs.

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

- 120 Liters of fuel used per month.

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

- Rs 45000 paid for transportation per month

13. 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 480 L per day.
- Amount spent per day = 51000.

14. 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

15. Are the Rooms in Campus well Ventilated? Yes/No

- Yes

19. 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 three major thematic areas.

1. Flora and Carbon footprint reduction
2. Water usage and harvest
3. Waste management practices
4. Awareness among students about green practices

Floristic status of the institution

The Nizam College is 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.

- 85 species of trees
- 10 species of shrubs
- 105 species of herbs
- 05 species of climbers (including creepers)

About 185 to 980 fully grown trees are 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.)

The following table will illustrate these figures

SL.NO	Particular of Flora	Number/ area
1	Full- grown trees	980
2	Semi – grown trees	660
3	Bushes (including floriculture plants)	4750
4	Herbecious plants (Wild and Ornamental)	5420
5	Grass Lawn	1800 sq.ft.

TOOLS TO MEASURE CARBON ABSORPTION

Assumptions

1. Number of mature trees on 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 liter of petrol is 20 km
5. Total quantity of petrol consumed by the car $(41,843/20) = 2092$ liters

The carbon emitted by a car due to consumption of 1 litre of petrol is 2.3 kg CO₂. At this rate the total quantity of carbon emitted by 2092 litres of petrol $(2092 \times 2.3 \text{ kg}) = 4812 \text{ kg CO}_2$ or 4.8 tonnes of CO₂. Therefore, the carbon absorption of one full-grown tree is $4812/700 = 6.8 \text{ kg CO}_2$.

The footprint calculation is based on the standard unit of 1-litre petrol = 2.3 kg CO₂ **Carbon absorption by flora in the Institution**

The carbon absorption capacity of one full-grown tree = 6.8 kg CO₂.

1. Therefore, the carbon absorption capacity of 980 full-grown trees on the campus of the Institution $(980 \times 6.8 \text{ kg CO}_2) = \mathbf{6664 \text{ kg or 6.66 tons of CO}_2}$.
2. The carbon absorption capacity of 660 semi-grown trees is 50% of that of full-grown trees. Hence, the carbon absorption $(660 \times 3.4 \text{ kg CO}_2) = \mathbf{2,244 \text{ kg or 2.24 tons of CO}_2}$.
3. There are 4750 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 CO₂ per plant, whereas some others absorb as low as 150 g CO₂ 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 $\mathbf{4750 \times 200 \text{ g} = 9,50,000 \text{ g or 950 kg or 0.95 tons of CO}_2}$.

4. The lawns of Axonopus grass, Mexican grass, and indigenous grass species (*Cynodon dactylon*) 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 the lawn is 1 g CO₂. Hence, 18,000 sq. ft. of lawn absorbs **800 g or 3 kg CO₂ per day**. At this rate, the total carbon absorption per year ($3 \text{ kg} \times 365$) = 1095 kg or **1.9 tons per year**.

The total carbon absorption by the flora in the campus of Nizam College is $(1 + 2 + 3 + 4) = 11.75$ tons.

This is the sink effect of the flora on the campus.

Tool to measure oxygen emission by flora on 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 liters of air per minute. The 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 is 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 ($117.6 \text{ kg} \times 980$) = 1,15,248 kg or **115.248 tons**.
2. Total oxygen emitted by semi-grown trees ($58.8 \text{ kg} \times 660$) = 38,808 kg or **38.8 tons** (oxygen emission is 50% of that of the full-grown tree).

3. Total oxygen emitted by 4750 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 $(4750/400) = 11.87$.

Total quantity of oxygen produced by 12 units is $(12 \times 550 \text{ litres}) = 6600$ litres of oxygen per day.

The annual production of oxygen at this rate $(6600 \times 365) = 24,09,000$ litres or kg of oxygen, which is approximately **2409 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 $(720 \times 550 \text{ litres of oxygen}) = 3,96,000$ litres of oxygen per day. Total quantity of oxygen produced by the 18,000 sq.ft. of lawn per year $(3,96,000 \text{ litres/day} \times 365) = 2,00,750$ litres or approximately 221.288 **tons**.

Carbon dioxide absorption

Sl.No.	Flora	Quantity of CO ₂ (tons)
1	980 full – grown trees	6.66
2.	660 semi – grown trees	2.24
3.	4750 bushes	0.95
4.	18000 sq. ft. of lawn	1.9
	Total	11.75

Oxygen emission by flora

Sl.No	Flora	Quantity of O ₂ (tonnes)
1	980 full – grown trees	115.24
2	662 semi – grown trees	38.8
3	4752 bushes	2409
4	18,000 sq.ft. of lawn	221.28
	Total	2784.32

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
- Alovera-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, Alovera, 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 longifolia*
- *Peltophorum pterocarpum*
- *Cassia siamea* vogel
- *Ixora coccinea*
- *Azadirachta indica*
- *Pongamia pinnata*
- *Bougainvillea glabra* choisy
- *Ficus religiosa*
- *Gliricidia sepium*
- *Sapindus emarginatus* vahl
- *Santalum album*
- *Albizia lebbek*
- *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? (Mention the 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 in charge 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 you doing 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 any student market?

NO.

18. Is there any botanical garden in 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 in your college campus.

Neem, Aloe vera, 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 Bio-diversity Club.

ACTIVITIES: Tree plantation, Awareness programmes, clean and green drives, educational tours and extension activities outside the college.

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, Coconut, 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 programmes conducted in the campus?

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

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

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

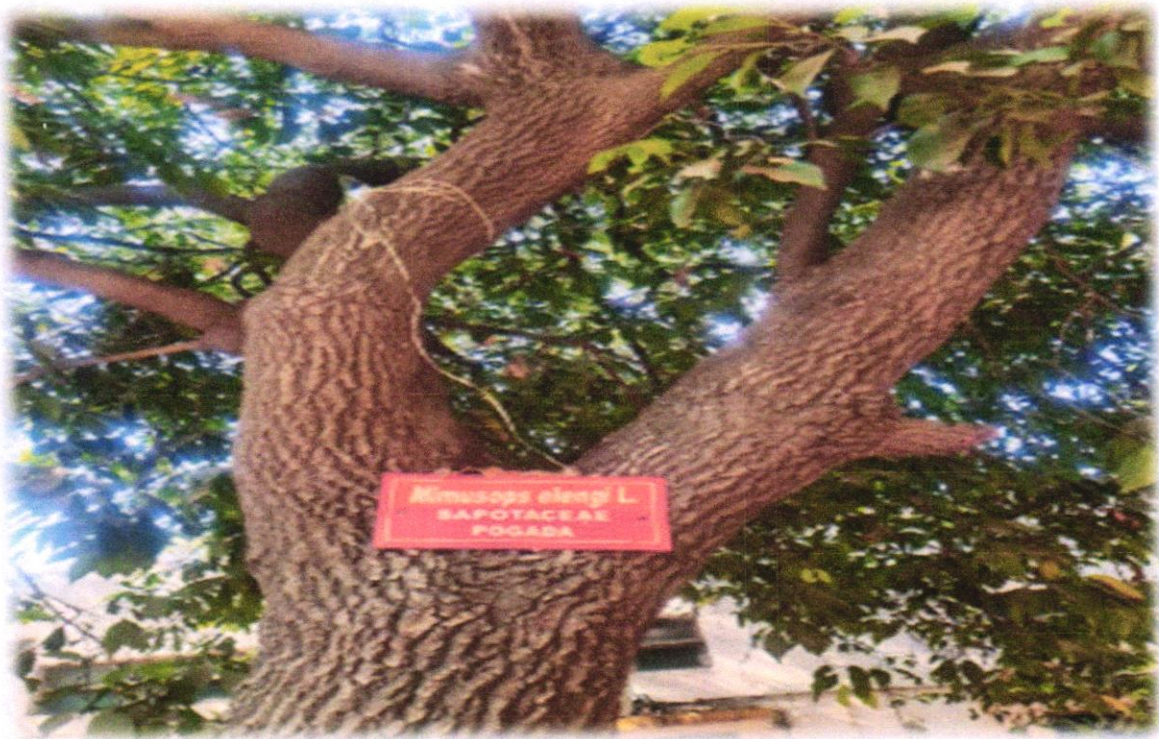
29. What is the total area of the campus under tree canopy?

AREA: 25,000 sq.mts.

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

- Planting more trees
- Plastic free campus
- Restricted entry of automobiles inside the campus
- Green campaigns
- Use of solar energy
- Awareness programmes should be conducted in public places.
- Sharing ideas about Green Campus through social media.











WATER AUDIT

The audit establishes the quantity/volume of water being used, wastage if any, leakages existing, excess use, etc., and identifies areas where consumption can be reduced. It critically examines existing treatment systems and practices and recommends changes to improve efficiency and reduce usage.

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 Hyderabad. Hence, the total volume of water received on the 48562 sq. ft. area of the terrace ($100 \text{ mm} \times 48562 \text{ sq.ft.}$) = 4856200 litres per year.

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

Observations:

- Conservation of rainwater through rainwater harvesting system is practiced by the college. The total open terrace area of the buildings amounts to 48562 sq.ft.
- The total volume of water received on the 48562 sq.ft. area of the terrace ($100 \text{ mm} \times 48562 \text{ sq.ft.}$) = 4856200 litres per year.
- Rainwater is channelized through a PVC pipe drainage system to the ground water table directly
- Remaining water recharges the ground water table and also used for maintaining greenery in the college.

Water management

S.No		Wise water	Leakage repairs	Water managememe	Water purification	Rain harvest	Water coolers	Water use in lt.	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	Urdu	√	√	√	√	√	√	10	√
31	Zoology	√	√	√	√	√	√	100	√
32	Hostels	√	X	√	√	√	√	4000	√

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	Urdu	√	X	√	X	√	√
31	Zoology	√	X	√	X	√	√
32	Hostels	√	X	√	X	√	√

SOLID 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.

Dustbins are installed in various places on the campus so that students can deposit solid waste in them. 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.

The College management and the faculty deserve appreciation for their efforts to reduce Carbon Footprint through installation of various energy-efficient measures. One example is replacing incandescent and fluorescent bulbs with less energy-consuming CFL and LED bulbs.

E-WASTE DISPOSAL AND MANAGEMENT

The use of electronic equipment is growing faster due to advancement in technology. The quantity of E-waste generation is increasing as people buy advance electronic equipment while dumping old one. E-waste carries health risks as it contents toxic materials such as cadmium, chromium, PCBs. E-waste generation is minimum in college campus. E-waste generated in college is simply handed over to scrap collector from Osmania University as proper e-waste collection facility is not available.

BEST PRACTICES

Adopting trees by the faculty

Trees play a vital role in our environment. They help purify the air we breathe, filter the water we drink, and provide habitat for countless species of plants and animals. It is every human's duty and responsibility to conserve and plant trees to protect the generations to come. Nizam College has also initiated this and encourages the faculty to adopt trees. The departments of the institutions take part in this cause and bring a sampling to plant in front of their departments, encouraging the students also to do the same.

Presenting a sampling instead of a bouquet

The University colleges are known for their huge grounds and widespread lawns and greenery. It's a privilege for the students to study in such an environment and the institution must uphold its green and healthy premises and it has been encouraging its faculty and students to do so. The students and teachers take an active part in adopting trees and sending out a message about planting and adopting trees by presenting a small sampling to the guests for events, instead of a flower bouquet.



RECOMMENDATIONS

A green audit of any academic institution reveals ways by which institute can reduce energy consumption, water use and reduction in emission of carbon dioxide in the environment. It is a process to look into and ask us whether we are also contributing to the degradation of the environment and if so, in what manner and how we can minimize this contribution and bring down to zero and preserve our environment for future generation. This process of green audit enables us to assess our lifestyle, action and assess its impact on the environment. Green auditing is the process of identifying and determining whether institutional practices are ecofriendly and sustainable. Traditionally, we are good and efficient users of natural resources. But over the period excess use of resources, viz., energy, water, chemicals are become habitual for everyone especially, in common areas. Now, it is necessary to check whether our activities are consuming more than required resources? Whether we are handling waste carefully? Green audit regulates all such practices and gives an efficient way of natural resource utilization. In the era of climate change and resource depletion it is necessary to verify the processes and convert it into a green and clean one.

- ✚ As an outcome effort will be made to reduce carbon foot prints by using electrical vehicles in the campus, and green computing in the administration and examination.
- ✚ Focus to assess the consumption of energy, electricity, water as well as disposal of liquid waste, solid waste, hazardous waste, e-waste and an inventory of trees in the campus is also prepared to check how much CO₂ is sequestered and O₂ is released.
- ✚ Various awareness programmes will be helpful to motivate all the staff members for optimized sustainable use of available resources.
- ✚ More than 12 acres of land area is available to raise horticulture gardens, fruit-bearing trees and shade-giving trees.
- ✚ Compostable solid waste shall be collected and deposited in solid waste collection tanks. This waste shall be profitably converted into compost and applied to gardens and trees to reduce the application of chemical-based fertilizers and pesticides.

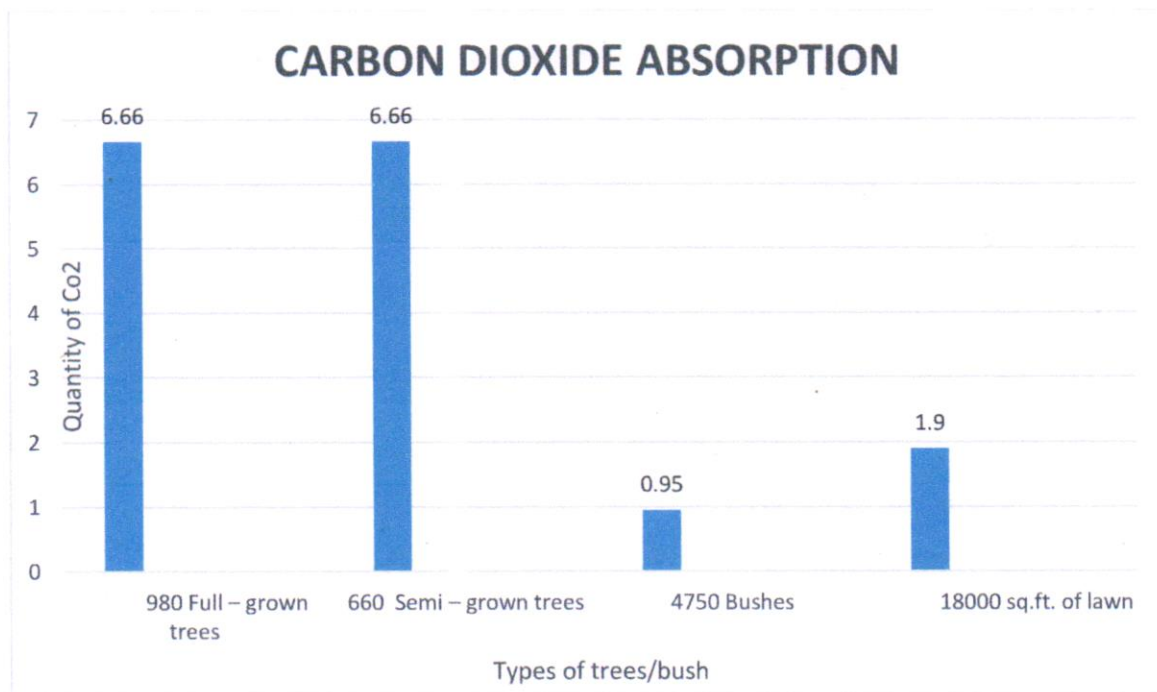
- ✚ More solar panels shall be installed on top of the buildings to produce another 10,000 KW of electricity. To enhance solar power productivity, aluminum foil-based reflectors shall be installed on the eastern and western sides of the solar panel.
- ✚ Energy-efficient measures such as replacement of all incandescent bulbs with LED lamps, old electrical regulators of fans with energy-efficient electronic regulators, air-conditioning units with all-star rated systems need to be undertaken.
- ✚ Water Management the water sources are safe in terms of contamination. The water can be recharged with rainwater from rooftops of new buildings. Water can be harvested from the roof area of buildings.
- ✚ 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 wastage of water. All toilets shall be fitted with dual-flush water closets, which will reduce water consumption by 40%.
- ✚ Environment education shall be imparted to all college students through 1-hr life-skill classes once a week. This will create a wide-level environment 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.

ANNEXURE I

Abstract of Green Audit of Nizam College (Autonomous)
For the period 2022 -23

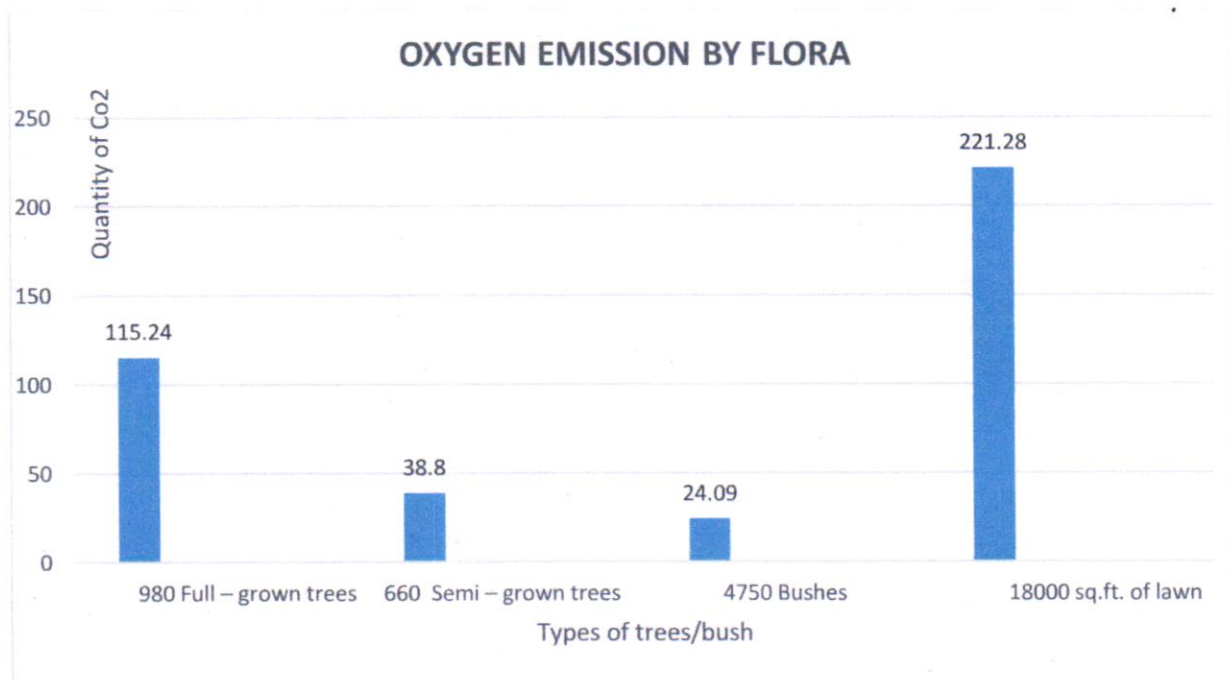
CARBON DIOXIDE ABSORPTION

Sl.No.	Types of trees/ bush	Quantity of CO ₂ (tones)
1	980 Full – grown trees	6.66
2	660 Semi – grown trees	2.24
3	4750 Bushes	0.95
4	18000 sq.ft. of lawn	1.9
Total		11.75



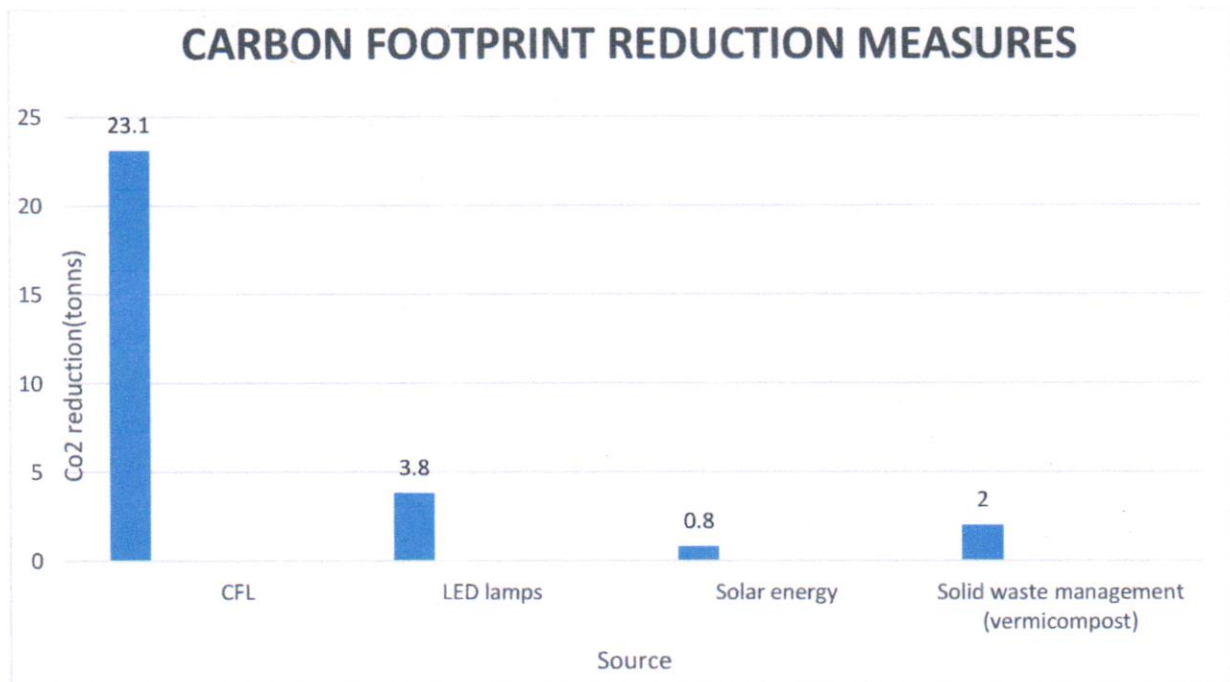
OXYGEN EMISSION BY FLORA

Sl.no.	Types of trees / bush	Quantity of Co ₂
1	980 Full - grown trees	115.24
2	660 Semi - grown trees	38.8
3	4750 Bushes	24.09
4	18000 sq.ft.of lawn	221.28
Total		2784.32



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





The mapping of important tree species of Nizam College

