



2023-24



GREEN AUDIT REPORT

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Asansol



Green Audit – Executive Summary

Environmental audit or Green audit is a general term that can reflect various types of evaluations intended to identify environmental compliance and management system implementation gaps, along with related corrective actions. In this way, they perform an analogous (similar) function to financial audits. The term “Green” means eco-friendly or not damaging the environment. This can acronymically be called as “Global Readiness in Ensuring Ecological Neutrality” (GREEN). “Green Auditing”, an umbrella term, is known by another name “Environmental Auditing”.

There are generally two different types of environmental audits: compliance audits and management systems audits. Compliance audits tend to be the primary type in the US or within US-based multinationals.

The term "protocol" in environmental audit means the checklist used by environmental auditors as the guide for conducting the audit activities. Current technology supports many versions of computer-based protocols that attempt to simplify the audit process by converting regulatory requirements into questions with "yes", "no" and "not applicable" checkboxes.

Green Audit can be defined as the systematic identification, quantification, recording, reporting and analysis of components of environmental diversity. The ‘Green Audit’ aims to analyze environmental practices within and outside the college campus, which will have an impact on the eco-friendly ambience. It is based on exercises that can help to measure the risk to the health of inhabitants and the environment. Through Green Audit, one gets a direction as how to improve the condition of environment and there are various factors that have determined the growth of carrying out Green Audit.

This includes the plants, greenery and sustainability of the campus to ensure that the buildings conform to green standards. This also helps to monitor the Environmental Policy is enacted, enforced and reviewed using various environmental awareness programmes.

Green Audit – Executive Summary (...Contd)

The purpose of the audit was to ensure that the practices followed on the campus comply with the Green Policy adopted by the institution. The methodology includes preparation and filling up of a questionnaire, physical inspection of the campus, observation and review of the documentation, interviewing key persons and data analysis, measurements and recommendations. It works on several facets of 'Green Campus' including Water Conservation, Tree Plantation, Waste Management, Paperless Work, Alternative Energy and Mapping of Biodiversity.

'Green Audit' aims to analyse the environmental practices within and outside the college campus, which will have an impact on the eco-friendly ambience. The green audit is assigned to criteria 7 of NAAC.

There are three main pillars i.e., zero environmental footprint, positive impact on occupant health and performance and 100% graduates demonstrating environmental literacy. The goal is to reduce CO2 emissions, energy and water use while creating an atmosphere where students can learn and be healthy. The college has to work on the several facets of 'Green Campus' including Water Conservation, Tree Plantation, Waste Management, Paperless Work, Alternative Energy and Mapping of Biodiversity.

Existing data will allow the college to compare its programmes and operations with those of peer institutions, identify areas in need of improvement, and prioritize the implementation of future projects. We expect that the management will be committed to implement the green audit recommendations.

Dr. Amitava Basu,

Principal, Banwarilal Bhalotia College, Asansol

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Photographs

"The environment is home to countless living things. Its beauty is unparalleled. We must do everything we can to protect it."



CHAPTER 1

Introduction

General Information

Banwarilal Bhalotia College was established in the year 1944. Asansol became a significant industrial belt in the early 1940s, prompting the demand for improved educational facilities. Prof. Satyakali Mukherjee proposed opening the first college in Asansol to the then-chairman of Asansol Municipality, Mr. Jogendranath Roy, and the then-S.D.O., Mr. Woodford, I.C.S. The establishment of a higher education institution received substantial support from renowned persons and the general public.

Asansol College, originally located at Atwal Nagar, Asansol, was affiliated with the University of Calcutta. Later on, 20 bighas of land were donated by the late Banwarilal Bhalotia on which the main building stands tall today. The foundation stone was placed by Dr Bidhan Chandra Roy. Sri S.K. Guha, then Vice Chancellor of Burdwan University, inaugurated the newly constructed college building (now known as the Old Building) and called it Banwarilal Bhalotia College. Banwarilal Bhalotia College, associated with Kazi Nazrul University, is a top educational institution in Asansol that offers both general and technology-based courses. The college boasts a lovely campus, big classrooms, well-equipped laboratories, adequate computer labs, well-stocked libraries, and a playground.

The college offers **undergraduate** and **postgraduate** courses in Arts, Commerce, and Science streams, including subjects like Bengali, Botany, Business Administration, Chemistry, Commerce, Computer Applications, Computer Science, Economics, Education, English, Environmental Science, Geography, Hindi, History, Mathematics, Microbiology, Philosophy, Physics, Political Science, Sanskrit, Statistics, Urdu, and Zoology. It also offers training courses in dry farming, aromatic and medicinal plant cultivation, mushroom and lac cultivation, vermicomposting, sericulture, and soil water analysis to meet the changing educational needs. The college runs three distant education centres, namely, IGNOU, NSOU, and MANUU.

In 2010, the college was declared a “**Centre with Potential for Excellence**” by the UGC. In 2011, it received Rs. 50,000 as seed money for the development of Basic Scientific Research (BSR). In 2012, the UGC introduced three career-oriented courses in Functional English, Mobile Repairing and Vermicomposting, which were run successfully by the college for three years.

In the first cycle, the college was accredited by the **NAAC** with a grade of **A** in 2007. The college has been re-accredited (cycle 2) with a grade of B+ in 2020. We are confident that, with honest and diligent effort, we will scale greater heights in future.

The college provides hostel facilities for both males and girls. The Boys' Hostel is one of our college's oldest structures, with approximately 32 rooms and over 85 students. The college also houses the Promila Devi Women's Hostel, which has 38 rooms and serves as a home away from home for over 90 females.

An abiding concern for the environment in tune with a global problem, underscores the college's present ethos and culture. In this regard, an ongoing River Project on Urban Rivers in Asansol has been undertaken by Banwarilal Bhalotia College.

1.1 Vision and Mission

Vision

The vision of Banwarilal Bhalotia College is to provide comprehensive education to enable the understanding of human values, professionalism, social responsibilities and political awareness; thus inculcating a scientific bent of mind in all sections of students, including scheduled castes, scheduled tribes, other backward communities, economically challenged students and religious minorities, with special focus on female students.

Mission

- To provide profuse scope for versatile development of the youth irrespective of caste faith, gender, economic background and religious political affiliations
- To provide quality education to the students of all shifts and streams
- To develop academic programmes based on local/regional/national needs
- To pursue student-centric learning for self-development and skill development among students
- To nature social and environmental awareness and responsibilities among students
- To introduce advanced technology into our existing academic system
- To create a more affable atmosphere in the academic periphery

1.2 Total Campus Area & College Building Spread Area

Campus area	3.20 ha (approx)
Built up area	0.63 ha (approx)

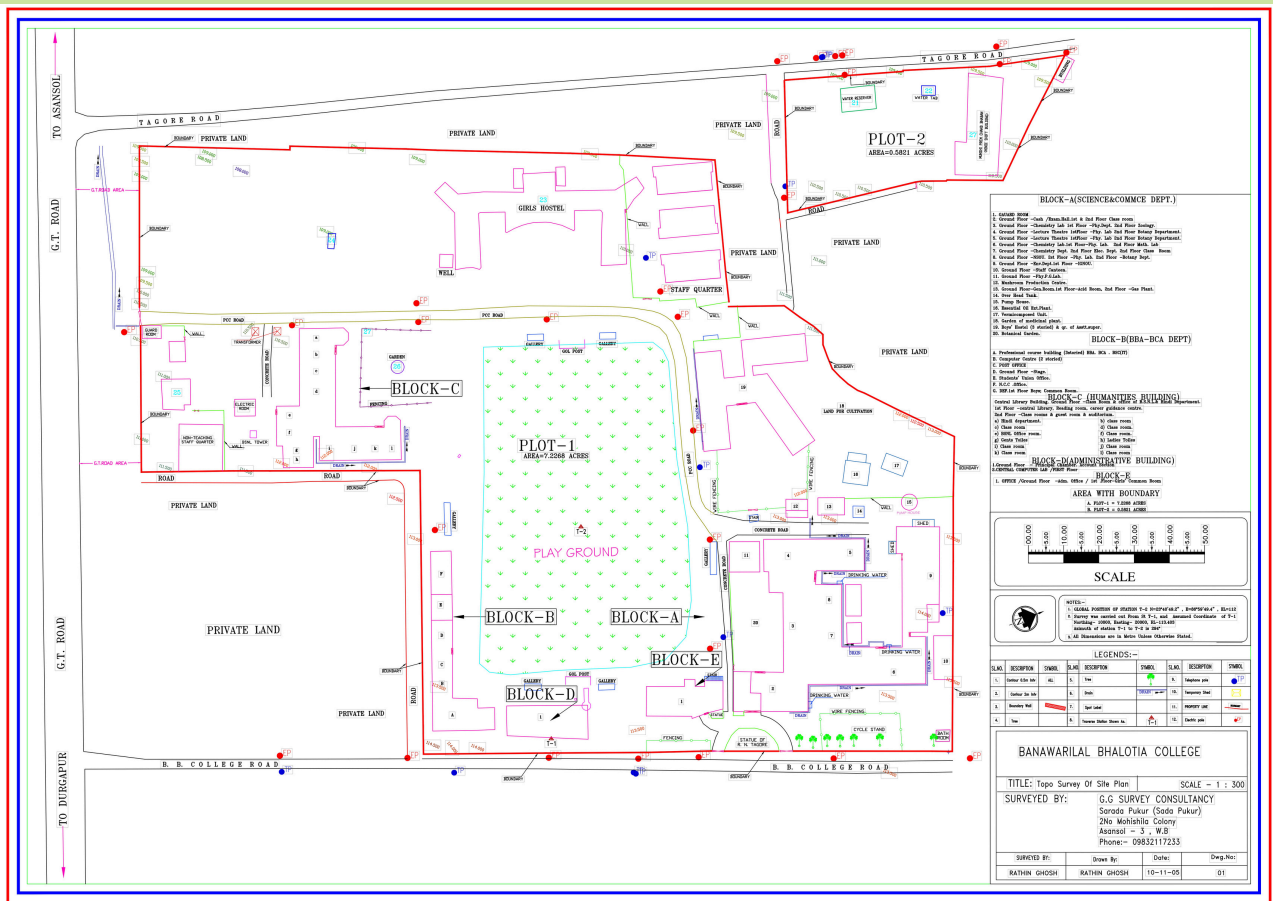
The college has taken initiatives to develop the Butterfly Garden and the Medicinal Plants Garden which not only adds to the greenness of the college but also aids in the augmentation of biodiversity and wellness of the local populace. Additionally, the trees in the college have been placed as a linear pathway, thereby overlapping the built-up and the open space.

1.3 Previous NAAC grading

Cycle 1: 2007; Accreditation - A

Cycle 2: 2020; Accreditation – B+

1.4 Campus Infrastructure



List of facilities on the College Campus

- Water pollution testing (pertaining to a few parameters)
- Butterfly garden
- Hybrid energy unit source comprising of solar energy and energy obtained from the electricity supply corporation
- Online internal examination and subsequent entry of its marks
- Equal opportunities centre has been taken care of by the women cell
- Management of biodegradable waste as in working vermicompost pits
- Presence of medicinal garden
- Availability of smart classrooms in chemistry and zoology department and physics department
- Presence of ladies hostel
- Surveillance cameras have been installed throughout the campus
- Modern library facility with assistance under MP lad scheme
- NLIST, Inflibnet, smart library automation system
- Eco friendly and green campus with ever expanding green cover
- Presence of pedestrian friendly pathways



"It is our collective and individual responsibility to preserve and tend to the world that we live in."



CHAPTER 2

Pre-Audit Stage

A pre-audit meeting is required for the green audit since it provides the first opportunity to meet with the auditee and address any issues. This took place on September 12, 2023 at Banwarilal Bhalotia College in Asansol. It provided an opportunity to collect documentation that the audit team could review before arriving on site. The audit process and audit plan were presented at this meeting and discussed prior to the audit itself. The meeting allowed for a review of the audit's scope and objectives, as well as discussions about the audit's practical aspects.

The green audit activities of Banwarilal Bhalotia College Asansol had been previously carried out without the umbrella of a well formed audit committee. To carry out the work in a more systematic and scientific manner the Green audit committee, various works were distributed among the respective members.

Resolutions of the meeting:

1. Preparation of Green Audit Report for the years 2022-23 and 2023-24.
2. To discuss further activities of the committee throughout the year.
3. To observe world ozone day in association with the beagle Nature club unit of Banwarilal Bhalotia College
4. To determine the quality of ambient air and ambient noise within the college campus.

Actions taken:

1. Various works have been distributed among the respective members listed as under:
 - Preparation of Biodiversity Catalogue/Register: Dr. Chanchal Biswas, Dr. Animesh Mondal, Dr. Sucheta Mondal, Dr. Rajrupa Ghosh, Dr. Sangita Lahiry.

- Water Management Survey: Dr. Animesh Mondal, Ms. Sudeshna Mitra, Mr. Sayantan Dutta.
- Energy and E-Waste Management Survey: Mr. Rajarshi Das, Dr. Siddhartha Singh Deo.
- Biochemical and Biomedical Waste Management Survey: Dr. Arnab Ganguli, Dr. Sutanuva Mondal, Ms. Sudeshna Mitra, Dr. Sucheta Mondal.
- Air Quality Management Survey: Mr. Sayantan Dutta, Ms. Disha Sengupta.
- Green Area Management Survey: Ms. Sohini Neogy, Ms. Disha Sengupta.
- Preparation/Amendment of Green Policy: Dr. Amitava Basu, Dr. Sudipta Das, Mr. Rajarshi Das, Mr. Sayantan Dutta.

2. The world was Ozone day was observed on 16 September 2022 in association with the Nature club unit of the college. The occasion was marked by carrying out paper presentation, competition and poster making competition among the students. Converting waste to wealth was also conducted.

3. The draft reports obtained from the various committee members were gathered and discussed. This helped to generate an idea regarding the environmental performance of the College.

4. Air-quality of the College was analysed using high volume sampler and noise level was determined using noise meter by a local environmental monitoring laboratory named Eco Care.

Another meeting was conducted on 7th November, 2023 with the following resolutions:

- Resolutions:

1. Reviewing the paper usage situation in the College and determining a few strategies to reduce paper usage.

2. Analysing the success of the No vehicle campaign observed on the second Saturday of every month.
3. Reviewing the situation of energy consumption within the College premises.
4. Up taking green campus initiatives.
5. Analysing the water quality of 2 drinking water samples collected from within the college water filters.

Actions taken:

1. Paper usage situation was reviewed and staff and students were being encouraged to use less paper and switch over to Digital communications.
2. Observance of No vehicle day was continued on a regular basis as per resolution.
3. Staff and students were regularly notified regarding switching off, unnecessary lights and fans when not in use.
4. Measures were taken to regularly monitor the previously planted saplings.
5. Water samples were collected and sent to CMERI Durgapur for analysis.

2.1 Scope and Goals of Green Auditing

A clean and healthy atmosphere promotes effective learning and creates an appropriate learning setting. Various initiatives are underway around the world to address environmental education challenges. Green auditing is one of the options available to educational institutions. A very basic indigenous system has been developed to monitor the environmental performance which includes a series of questions to be answered on a regular basis. This novel system is user-friendly and entirely voluntary. The goal is to assist the institution in setting environmental examples for the community while also educating young learners.

The ultimate goals would include the following:

- Implementing targeted interventions to reduce pollution and improve water quality.
- Expanding biodiversity surveys to include more comprehensive assessments of riverine fauna and flora.
- Advocating for policy changes and stricter enforcement of environmental regulations.
- Scaling up community-based conservation initiatives and fostering partnerships with grassroots organizations.
- Continuing public awareness campaigns and educational programs to promote a culture of river stewardship.

2.2 Benefits of Green Auditing

- To build a green campus with efficient resource management
- To facilitate waste management by reducing waste generation, solid waste, and water recycling
- To develop a plastic-free campus and increase health consciousness among stakeholders
- To establish a foundation for increased sustainability

2.3 Target Areas of Green Auditing

- Auditing for Water Management

Water is a natural resource; all living things rely on it. Potable water is abundantly available in many natural areas, but less so in human communities. We must utilize water properly to guarantee that everyone has access to safe drinking water now and in the future. This indicator covers water use, water sources, irrigation, stormwater, appliances, and fixtures. Aquifer depletion and water contamination are occurring at unprecedented rates. It is consequently critical that any environmentally conscious organization examines its water consumption policies.

- Auditing for Energy Management

This indicator focuses on energy consumption, energy sources, energy monitoring, lights, appliances, and automobiles. A traditional incandescent light bulb requires between 60 and 100 watts, but an energy-efficient light emitting diode (LED) uses less than 10 watts. Energy use is clearly an important part of campus sustainability, therefore its inclusion in the assessment needs no explanation.

- Auditing for Waste Management

This indicator focuses on trash generation and disposal, plastic waste, paper waste, food waste, and recycling. When waste is stacked up and not treated, it pollutes the environment and harms your health. As waste decomposes or breaks down in a landfill, the soil and ground water gets highly contaminated.

Unscientific landfills may contain toxic chemicals that leak into soil and water systems and emit greenhouse gasses, leading to global climate change. Furthermore, solid waste frequently contains wasted material resources that could have been better utilized through recycling, repair, and reuse. Thus, reducing solid waste is critical to a sustainable institution.

- Auditing for Green Campus Management

Maintaining a biologically diverse ecosystem is essential for a healthy world and human well-being. By evaluating the habitats, species, and areas of that surround us, one may establish how ecologically varied our environment is, but more significantly, 'how green our carbon footprint is'.

All plant and animal species, including humans, are connected in a complex web of life; we rely on biodiversity for survival. Biodiversity is the foundation for healthy ecosystems and, ultimately, a healthy world. It keeps air and water clean, manage our climate, and provide us with food, housing, clothing, medication, and other necessities. When one part of this complicated web weakens or disappears, every other section suffers slightly.

- Auditing for Carbon Footprint

Auditing the carbon footprint of a college campus is a critical step in understanding and mitigating the environmental impact of academic institutions. A comprehensive carbon footprint audit enables campuses to identify the primary sources of their emissions, assess their sustainability practices, and develop targeted strategies to reduce their overall carbon footprint. By implementing such audits, colleges can not only improve their environmental performance but also lead by example in the global effort to combat climate change.

Five categories of questionnaires were distributed. The formats of these are given below.

2.4 Survey forms

1. Auditing for Water Management

- List uses of water in your college.
- What are the sources of water in your college?
- How many wells are there in your college?
- No. of motors used for pumping water?
- What is the total horse power of each motor?
- What is the depth of each well?
- What is the present depth of water in each well?
- How does your college store water?
- Quantity of water stored in your overhead water tank? (in liters)
- Quantity of water pumped every day? (in liters)
- If there is water wastage, specify why.
- How can the wastage be prevented / stopped?
- Where does waste water come from?
- Where does the waste water go?
- What are the uses of waste water in your college?
- What happens to the water used in your labs? Whether it is mixing with ground water?
- Is there any treatment for the lab water?
- Whether your labs are practicing green chemistry methods?

- Write down four ways that could reduce the amount of water used in your college.
- Record water use from the college water meter for six months.
- Bimonthly water charges paid to water connections if any
- No. of water coolers. Amount of water used per day? (in liters)
- No. of water taps. Amount of water used per day?
- No. of bath rooms in staff rooms, common, hostels.
- Amount of water used per day?
- No. of toilet, urinals. Amount of water used per day?
- No. of water taps in the canteen. Amount of water used per day?
- Amount of water used per day for garden use.
- No. of water taps in laboratories. Amount of water used per day in each lab?
- Total use of water in each hostel?
- At the end of the period, compile a table to show how many litres of water have been used in the college for each purpose
- Is there any water used for agricultural purposes?
- Does your college harvest rain water? If yes, how many rain water harvesting units are there? (Approx. amount)
- How many of the taps are leaky? Amount of water lost per day?
- Are there signs reminding people to turn off the water? Yes No
- day?(Approx)
- Is there any waterless toilets?
- How many water fountains are there?
- How many water fountains are leaky?
- Is drip irrigation used to water plants outside?
- How often is the garden watered?
- Amount of water used to watering the ground?
- Amount of water used for bus cleaning? (liters per day)

- Amount of water for other uses? (items not mentioned above)
- Area of the college land without tree/building canopy.
- Is there any water management plan for the college?
- Are there any water saving techniques followed in your college? What are they?
- Please share Some IDEA for how your college could save more water.

2. Auditing for Energy Management

- List ways that you use energy in your college. (Electricity, electric stove, kettle, microwave, LPG, firewood, Petrol, diesel and others).
- Electricity bill amount for last one year
- Amount paid for LPG cylinders for last one year
- Weight of firewood used per month and amount of money spent? Also mention the amount spent for petrol/diesel/ others for generators?
- Are there any energy saving methods employed in your college? If yes, please specify. If no, suggest some.
- How much money does your college spend on energy such as electricity, gas, firewood, etc. in a month.(Record monthly for the year 2016).
- How many CFL bulbs has your college installed? Mention use (Hours used/day for how many days in a month)
- Energy used by each bulb per month? (for example- 60 watt bulb x 4hours x number of bulbs = kWh).
- How many LED bulbs has your college installed? Mention use (Hours used/day for how many days in a month)
- Energy used by each bulb per month? (kwh).
- How many incandescent (tungsten) bulbs has your college installed? Mentions use (Hours used/day for how many days in a month)

- Energy used by each bulb per month? (kwh).
- How many fan has your college installed? Mention use (Hours used/day for how many days in a month)
- Energy used by each fan per month? (kwh)
- How many air conditioner has your college installed? Mention use (Hours used/day for how many days in a month)
- Energy used by each air conditioner per month? (kwh).
- How many electrical equipment including weighting balance has your college installed? Mentions use (Hours used/day for how many days in a month)
- Energy used by each electrical equipment per month? (kwh).
- How many computer has your college installed? Mention use (Hours used/day for how many days in a month)
- Energy used by each computer per month? (kwh)
- How many photocopier has your college installed? Mention use (Hours used/day for how many days in a month).
- How many cooling apparatus has your college installed? Mention use(Hours used/day for how many days in a month)
- Energy used by each cooling apparatus per month? (kwh) Mention use (Hours used/day for how many days in a month)
- Energy used by each photocopier per month? (kwh) Mention use (Hours used/day for how many days in a month)ow many inverters your college installed? Mentions use (Hours used/day for how many days in a month)
- Energy used by each inverter per month? (kwh)
- How many electrical equipment used in different labs of your college ? Mentions use (Hours used/day for how many days in a month)
- Energy used by each equipment per month? (kwh)

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- How many heaters used in the canteen of your college ? Mention use (Hours used/day for how many days in a month)
- Energy used by each heater per month? (kwh)
- No of street lights in your college?
- Energy used by each street light per month? (kwh)
- No of TV in your college and hostels?
- Energy used by each TV per month? (kwh)
- Any other item that uses energy (Please write the energy used per month) Mentions use (Hours used/day for how many days in a month)
- Are any alternative energy sources/nonconventional energy sources employed / installed in your college? (photovoltaic cells for solar energy, windmill, energy efficient stoves, etc.,) Specify.
- Do you run “switch off” drills at college?
- Are your computers and other equipment put on power-saving mode?
- Does your machinery (TV, AC, Computer, weighing balance, printers, etc.) run on stand by modes most of the time? If yes, how many hours?
- What are the energy conservation methods adapted by your college?
- How many boards displayed for saving energy awareness?
- How much ash collected after burning fire wood per day in the canteen?
- Write a note on the methods/practices/adaptations by which you can reduce the energy use in your college campus in future.

Appliance	Power used in (watt)	Usage per day(hours)	Number of appliances	Average kWh per day (Watt X hours XNumber X 1000)	Average kWh per month (Watt Xhours XNumber X 1000 x 30)
Incandescent bulb					
CFL					
Microwave					
Kettle					

3. (a) Auditing for Waste Management

- Does your college generate any waste?
- If so, what are they? How much quantity? Number or weight
- Is there any waste treatment system in the college?
- Is there any treatment for toilet/urinal/sanitary napkin waste?
- What is the approximate amount of waste generated per day? (in Kilograms) (approx.)
- Whether waste is polluting ground/surface water? How?
- Whether waste is polluting the air of the college? How?
- How is the waste generated in the college managed? Methods
- How many separate boxes do you think you would need to put into a classroom to start a waste segregation and recycling campaign?
- Do you use recycled paper in College?
- Is there any waste wealth programme practiced in the college?
- How would you spread the message of recycling to others in the community? Have you taken any initiatives? If yes, please specify.
- Can you achieve zero garbage in your college? (Reduce, Recycle, Reuse, Refuse) If yes, how?

Department	Chemical/ Biological/ Microbial Waste	Total	Method of disposal

Location of dustbins	No. of dustbins	Quantity of collection (kg/ day)	Disposal time	Cleaning by eco-friendly product

3. (b) Auditing for E-Waste Management

Quantity of e-waste generated?

Number of cartridge used month-wise?

Number of cartridge disposed in a year (average)?

Number of times refilling & reusing method of disposal of e-waste (if any)?

Is there any means of disposal of unused computers, printers and electronic wastes through authorized agents?

Item	Quantity	Net weight	Name of agency of disposal

4. Auditing for Green Campus Management

- Is there a garden in your college? Area?
- Do students spend time in the garden?
- List the plants in the garden, with approx. numbers of each species.
- Suggest plants for your campus. (Trees, vegetables, herbs, etc.)
- List the species planted by the students, with numbers.
- Whether you have displayed scientific names of the trees in the campus?
- Is there any plantations in your campus? If yes specify area and type of plantation.
- Is there any vegetable garden in your college? If yes how much area?
- Is there any medicinal garden in your college? If yes how much area?

- What are the vegetables cultivated in your vegetable garden? (Mention the quantity of harvest in each season)
- How much water is used in the vegetable garden and other gardens? Mention the source and quantity of water used.
- Who is in charge of gardens in your college?
- Whether you are using any type of recycled water in your garden?
- List the name and quantity of pesticides and fertilizers used in your gardens?
- Whether you are doing any organic farming in your college? How?
- Do you have any composting pit in your college? If yes What are you doing with the compost generated?
- What are you doing with the vegetables harvested? Do you have any student market?
- Is there any botanical garden in your campus? If yes give the details of campus flora.
- Name number and names of the medicinal plants in your college campus.
- Any threatened plant species planted/conserved.
- Is there a nature club in your college? If yes what are their activities?
- Is there any arboretum in your college? If yes details of the trees planted.
- Is there any fruit yielding plants in your college? If yes details of the trees planted.
- Is there any groves in your college? If yes details of the trees planted.
- Is there any irrigation system in your college?
- What is the type of vegetation in the surrounding area of the college?
- What are the nature awareness programmes conducted in the campus? (2014-15)
- What is the involvement of students in the green cover maintenance?
- What is the total area of the campus under tree cover? Or under tree canopy?
- Share your ideas for further improvement of green cover.

5. Auditing for Carbon footprint

Methodology for assessing carbon sequestration:

Implementing carbon sequestration methods on a college campus can significantly reduce carbon emissions by capturing and storing CO₂ from the atmosphere, which directly lowers the institution's overall carbon footprint. Techniques like afforestation and soil carbon sequestration not only absorb CO₂ but also enhance the campus's greenery, creating a healthier, more sustainable environment. By integrating these methods into campus operations, the college can demonstrate leadership in sustainability, contribute to global climate goals, and foster an eco-friendly culture among students and staff.

The biomass in the areas surrounding the college campus was assessed by measuring the diameter of trees at 1.37 meters above the ground (BH) and their total height. Trees distribute biomass into two main compartments: Above-Ground Biomass (AGB) and Below-Ground Biomass (BGB). The calculation of these biomass values was performed using a specific formula that incorporates these measurements (*Shadman et al., 2022*). Estimating AGB is crucial for evaluating carbon stocks. In this study, we first calculated the AGB of trees based on the measured tree girth at 1.37 meters above the ground (BH) and the total tree height. Additionally, species-specific constants were applied to estimate the total biomass. This data was then utilized to quantify the amount of carbon stored in the tree species.

For trees with $D < 11$:

$$AGB = 0.25 \times D^2 \times H \text{ ----- (1)}$$

For trees with $D \geq 11$:

$$AGB = 0.15 \times D^2 \times H \text{ ----- (2)}$$

Where:

AGB: Above-Ground Biomass (pounds).

D: Tree diameter measured at 1.37 meters from the ground (inches). This measurement is globally used as a standard to get a better result. However, if your tree is below 1.37 meters, you can still use the formula.

H: tree height (feet).

The tree's root system, accounts for approximately 20% of the AGB (*Shadman et al., 2022*)

$$BGB = 0.2 \times AGB \text{ ----- (3)}$$

$$\text{Total Biomass (TB)} = AGB + BGB = AGB + 0.2 \times AGB = 1.2 \times AGB \text{ ----- (4)}$$

A tree is made up of both mass and water, so only the dry weight needs to be considered. A tree consists of 72.5% dry matter (*Fransen, 2024*)

$$\text{Total Dry Weight (TDW)} = TB \times 0.725 \text{ ----- (5)}$$

Carbon makes up 50% of the total dry weight.

$$\text{Total Carbon (TC)} = TDW \times 0.5 \text{ ----- (6)}$$

The weight of CO₂ in trees is determined by the ratio of CO₂ to C is 44/12 = 3.67.

$$\text{CO}_2 \text{ weight} = TC \times 3.67 \text{ ----- (7)}$$

It is important to note that the CO₂ weight mentioned represents the total amount sequestered over the tree's entire lifespan. To calculate the annual rate of CO₂ sequestration, divide the total CO₂ absorbed by the tree by its age.

If a tree forks above breast height (BH), it should be considered a single tree. However, if the tree forks below BH, each fork should be treated as a separate tree.

"The greatest threat to our planet is the belief that someone else will save it."



CHAPTER 3

Audit Stage

Green auditing was conducted by members of the Green Audit Committee, which included many student groups as well as teaching and non-teaching personnel. The green audit began with the teams walking through all of the college's facilities, identifying the various types of appliances and utilities (lights, taps, toilets, fridges, etc.), measuring the usage per item (watts indicated on the appliance or measuring water from a tap), and identifying relevant consumption patterns (such as how frequently an appliance is used) and their impact. Staff and students were questioned to obtain information about the usage, frequency, and general features of specific appliances. Data were collected in several sectors, including energy, waste, greening, carbon footprint, and water use.

3.1 Student groups involved

Supriya Maji

Ranadip Maji

Sumitra Badyakar

Subham Dey

Aditi Chakraborty

Riya Bhandari

Nitu Mondal

Mamoni Mejhan

Hrittik Mondal

Nabadeep Bauri

Rahul Hembram

Hritesh Das

Ananya Chatterjee

Shruti Mukherjee

Poulami kar

3.1 Student groups involved (...contd)

Susmita Ghosal
Neha Dhangar
Nandini Mondal
Arpita Bauri
Swati Marandi
Durba Maji
Chhanda Gorai
Riya Kumbhakar
Lajasree Sarkar
Neelanjana Paul
Anirudhya Dey
Sangeeta Hazra
Sneha Bhattacharyya
Sohini Chakraborty
Shruti Mishra
Sanchita Mukherjee
Sayoni Halder
Debjit Roy
Rahul Maji
Rima Pal
Sayandeep Das
Rahnuma Naaz
Fatiya Parween
Kajal Shaw
Himanshu Ram

3.2 Student Clubs and Forums

Banwarilal Bhalotia College, Asansol, offers a vibrant array of student clubs and forums designed to enhance the overall development and engagement of students beyond the classroom. These clubs and forums cater to various interests, promoting cultural, social, intellectual, and professional growth among students.

1. Cultural Clubs

Meghe Dhaka Cinema Club: Meghe Dhaka Cinema Club encourages students to showcase their talents in making short reels and highlight their understanding of cinema by organising a review writing competition. Regular events, competitions, and workshops are organised to nurture the filmic skills of students.

Meraki Art and Photography Club: A platform for budding photographers, this club organises exhibitions and workshops, allowing students to explore their creative potential.

2. Academic and Professional Clubs

Beagle, Nature Club: Aimed at fostering scientific curiosity, the Nature Club conducts various activities such as nature-oriented works, guest lectures, and hands-on experiments. This club serves as a bridge between theoretical knowledge and practical application.

3. Social Service and Outreach Programmes

NSS (National Service Scheme): The NSS unit at Banwarilal Bhalotia College actively engages in community service activities. Students participate in health camps, literacy drives, environmental awareness campaigns, and more, contributing to the betterment of society.

Equal Opportunity Cell: This cell plans outreach programmes, such as visits to laboratories and libraries by neighbouring school students, to inculcate scientific temper, curiosity, and enthusiasm among young students.

4. Forums and Councils

Institution's Research Cell: This cell aims to provide better exposure to students regarding research works, projects, jobs, and other employability options.

5. Entrepreneurship and skill development

Entrepreneurship Development Cell: This cell organises programmes like seminars, workshops, and hands-on training to promote entrepreneurship skills among students. It opens various opportunities for employment and helps students develop the necessary skills to start their own ventures (IQAC Plans for Next Aca).

Skill Development Workshops: The college plans to introduce various skill development courses, workshops, and seminars, ranging from basic to advanced levels, to improve students' soft skills, ICT skills, language skills, and life skills, enhancing their employability.

6. Gender and Inclusivity Initiatives

Gender Audit Initiatives: The college plans to organise surveys for initiating and conducting a gender audit of the campus to make it more gender-neutral. This initiative aims to create an inclusive and equitable environment for all students.

These student clubs and forums play a crucial role in the holistic development of students at Banwarilal Bhalotia College, Asansol, providing them with numerous opportunities to explore their interests, develop new skills, and contribute to society.

3.3 Comments on Site Tour

A site inspection was conducted with students and staff. It was quite intriguing and fascinating. It was an environmental awareness project for students who took part in the green audits. For the majority of the students, this was their first exposure with green auditing. They shared their expectations for a green campus and made comments for the audit recommendations.

3.4 Review of Documents and Records

Documents such as admission registers, remittance registers for power and water charges, furniture registers, laboratory equipment registers, purchase registers, audited statements, and office registers were scrutinized and data obtained. College calendars, college publications, the college's annual report, NAAC self-assessment reports, the UGC report, and other documents were also verified as part of the data collection process.

3.5 Review of Policies

There were discussions with the college administration about their environmental management policies. Future plans for the college were also discussed.

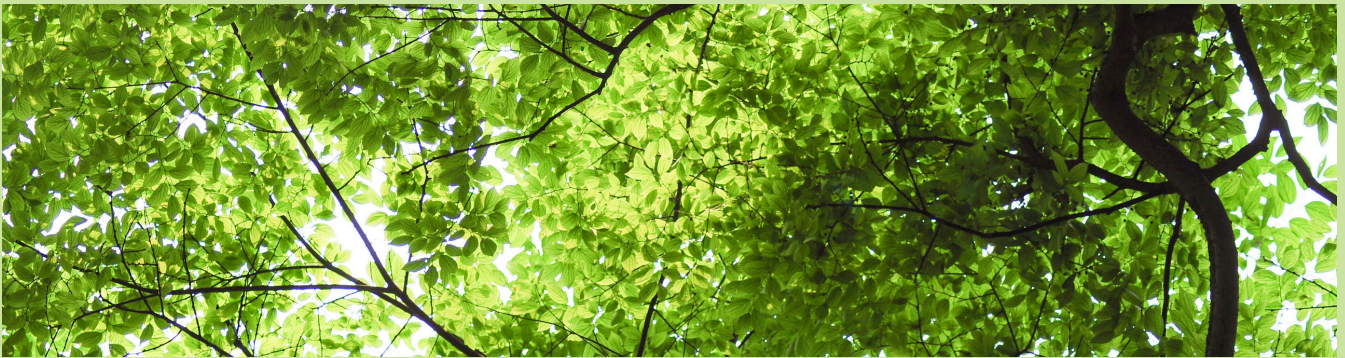
3.6 Interviews

To collect information for green auditing, various audit groups questioned office employees, the principal, teaching and non-teaching staff, students, parents, and other college stakeholders.

3.7 Site inspection

Audit teams visited and analyzed the college and its premises multiple times in order to acquire information. Data was gathered by counting and identifying campus trees, as well as inspecting the vegetable garden, play areas, canteen, library, office spaces, and parking lots.

"We should prevent moving from being a part of nature to being apart from nature."



CHAPTER 4

Post Audit Stage

4.1 Key findings and observations

1. Water management

Water is chiefly used for the following purposes in the college premises:

- Drinking
- Laboratory experiments
- Gardening
- Toilets
- Boys & Girls Hostel (cooking, bathing, washing clothes)
- Canteen (cooking, washing, and utensils)

The main source of water in our college is from Asansol Municipal Corporation (AMC). The water supply from AMC helps us to cater to the major needs of the college. There are two big wells and a deep boring system which is highly effective in meeting the huge demand of water in the college. Additionally, there is one comparatively small well which is of 62' depth and the big one is of 80' depth which is efficacious in water management during dry spells. The depth of water in small well is 37 feet approximately (from bottom) and the depth of water in large well is 43 feet approximately (from bottom).

There are 11 water pumps in our college, each of 2HP. There are 6 underground reservoirs in our college and 15 overhead tanks which are the main reservoirs of water. We also have one rain-water harvesting tank. Everyday, 20550 l of water is pumped. We have a negligible amount of water wastage. A minimum quantity of water, only that much required to continue daily experiments in labs and to maintain the livelihood of hostel dwellers, is used judiciously. In spite of this our college has planned several measures to prevent wastage of water in future, like installation of sensor taps, pasting stickers mentioning how to save water, and strict vigilance of water leakage, running taps, etc. by maintenance staff.

Quantity of water stored in your overhead water tank

Location	No. of tanks	Water retaining capacity of each tank (l)	Total capacity (l)
Administrative building	2	1000	2000
BBA-BCA building	2	1000	2000
Science & Commerce building	1	13000	13000
Arts building	4	1000	4000
Hindi Shift building	2	2000	4000
Girls hostel	2	1000	2000
Boys hostel	2	1000	2000

There are quite a few entry of water and point of exit of waste water in the college. One for Hindi Shift building, two for girls hostel, one for boys hostel, one for Science and Arts building each. Waste water comes from laboratories of different departments, toilets of college and hostels, kitchen of hostels and canteens. We have well organized pipeline system through which we collect all kinds of waste water into specific waste water recycling tank. After treatment, the waste water is used for gardening purposes. Waste water or liquid effluents including hazardous liquids from laboratory activities are channelled through dedicated conduits to shaded and concrete-lined pits. It is to be kept in mind that the wastewater is not getting mixed with ground water because of above mentioned practice which minimizes the risk of surface and sub surface water contamination.

We have two types of treatment methods for lab water, chemical detoxification and biological oxidation processes. As a part of green practice, we recycle the cooling water released from distillation plant and use it in gardening purpose.

There are several ways by which one can reduce the amount of water used in the college, listed as under:

- Usage of sensor-sensitive water taps in few places
- Stopping leakages, strict vigil by maintenance staff to take immediate care of leakage
- Minimize water wastage by collecting kitchen water like water after washing rice, pulses and vegetables and using the same for gardening
- Usage of non-disposable water bottles by students

The main observations are pointed as under:

- Whether college has an efficient and hygiene water storage mechanism to minimize the loss of water during storage? **Yes**
- Whether college is using water filter with RO, Aqua Guard and/or large water filter with cooler at the strategic locations in the college. If so, are they under AMC? **Yes**
- Whether college has its own mechanism in repairing of water leakage? **Yes**
- Is there any rainwater harvesting unit in college? Uses? **Yes**

a) *Tree plantation, b) Gardening, c) Cleaning purpose*

- Whether college has developed any reuse and recyclable of water system? **No**
- Is there any scope of measurement of water quality parameters used in hostel, lab, office, canteen, tap water (if so, parameters: pH, EC, TDS etc.)

Yes, in the laboratory of the *Department of Environmental Science*.

- Lab-wise water consumption (lt/d)

Chemistry: 35, Zoology: 1.15, Botany: 1.02, Microbiology: 1.8, Environmental Studies: 2.1, Physics: 0.05, Geography: (Day: 0.10; Hindi: 0.08)

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- Whether college has sufficient/adequate drainage system? **Yes**
- **No of water treatment system in place -**
- No of urinals and toilets - 59; 8000 litres/day
- No of waterless urinals - No
- No of bathrooms - 59; 8000 litres/day
- No of water taps - 137; 20550 litres/day
- Taps in canteen and cafeteria - 6; 400 litres/day
- No of wells - 2
- No of motors - 11
- No of fountains - 1
- Quantity of water pumped - 20550 litres/day
- Water charges paid - Water charge is paid for one bulk connection, i.e. Rs. 1909.00 bimonthly for female hostel. AMC provide water for other water connections which are free of cost
- Water used for garden use - 2000 litres/day
- No. of water coolers with drinking water filtration installed - 5; 3 of 120 litres/day & 2 of 80 litres/day
- Water use in hostels - 8000 litres/day (girls hostel); 2000 liters/day (boys hostel)
- Water use from from the college water meter for six months - 2712600 litres

Departmental laboratories	No.of water taps	Amount of water used per day (l)
Chemistry	30	40
Geography	01	0.05
Botany	05	1.5
Zoology	26	1.5
Microbiology	02	2.5
Central Laboratory	02	1.5

Purpose	Amount of water used per day
Drinking (water purifiers)	5000 litres
Washing	4000 litres
Laboratory (chemical and biological media preparation, cleaning glasswares and other equipments)	2000 litres
Gardening	2000 litres
Cooking	1500 litres
Bathroom	8000 litres

Water Management Plans

- ☑ We have proper pipeline system to collect water. We have 1 bulk connection and 5 normal municipal water connection points. With each point we do have associated storage reservoirs
- ☑ We have 15 overhead tanks which are enough to store water without overflow
- ☑ We harvest roof top rain water in a separate harvesting tank
- ☑ We periodically recharge our open wells
- ☑ We accumulated laboratory and toilet waste water in a specific excavated place (three layers) where it is treated as oxidation ditch, and treated water is used for gardening purpose
- ☑ We have also constructed ground water recharge pit
- ☑ We also follow the green chemistry practice which aids in the conservation of water and prevents contamination at the same time
- ☑ We also have separate set up to collect waste water released from chemistry lab and is treated and recycled
- ☑ We also collect the used water from water distillation plants (cooling) and AC outlets and use them for gardening and cleaning purposes

Water saving techniques

- ☑ Use of greywater for gardening purpose
- ☑ No water leakage policy
- ☑ Minimize the consumption of drinking water by asking students to bring their own water bottles
- ☑ Student awareness programme
- ☑ Sensor sensitive taps

Grey water from hostels and canteen are accumulated in small vessels and used in gardens. Waters released from air conditioners are also collected and channelled through pipes into tank and use for cleaning and gardening purposes. We already follow the water saving strategies as envisioned by green committee . We attempt to enhance our activities in future further.

2. Energy management

Energy is used through electrical equipments, like, light, fan, computer, air conditioner, water cooler, water pump, inverter, projector, photocopier, refrigerator, electric kettle, microwave, and diesel run generator.

Equipment	Number	Hours used/ day	Monthly energy consumption (Kwh)
Air Conditioner	30	5.3 hours/ day (6 months in a year)	1574.1
Fan	562	4 hours/ day	2472
Light	150 (CFL Bulbs) 173 (Ceiling Lights) 404 (LED tube lights) 137 (LED Bulbs)	4 hours/ day	198 (CFL Bulbs) 323 (Ceiling Lights) 640 (LED tube lights) 108 (LED Bulbs)
Computer	210	2.5 hours/ day	577
Pump	11	3 hours/ day	45
Inverter	2	0.5 hours/ day	18
Refrigerator	8	24 hours/ day	110
Water cooler	5	5.5 hours/ day (6 months in a year)	177.46
Photocopier	4	0.75 (45 mins) hour/ day	3.6
Inverter	2	0.5 hours/ day	18
Weighing Machine	4	0.75 (45 mins) hour/ day	0.36
Spectrophotometer	2	3 hours/ month	0.48
Colorimeter	2	5-6 times/ month	0.01
Autoclave	3	2 hours	1.4
Incubator with shaker	3	5 hours; 3-4 times/ month	15

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Equipment	Number	Hours used/ day	Monthly energy consumption (Kwh)
Hot air oven	3	0.5 hours	8.8
Heater		0.5 hours	16.5
Water bath	2	Once weekly; 6 hours/ year	0.005
Centrifuge	2	1 hour/ week	
Microwave	3		
Laminar	1		1220 Watt
Shaker	1		
Conductivity meter	3	12 hours/ year	0.03
Distillation Plant	1	10 hours/ week	176
Vacuum Pump	1	11 hours/ year	0.01
Projector	3 (Mini-2)	4 hours/ week	17.6; Mini- 4.4
Magnetic stirrer		15-20 mins/ day	4
Light tracing table	3	1 hour/ day	3.5
Sodium vapour lamp	4	4.5 hours/ week	2.52
Triode valve	2	4.5 hours/ week	1.62
Current source for electromagnet	1	2 hours/ week	1.2
He-Ne Laser	2	2 hours/ week	0.8
GM Counter	1	2 hours/ week	0.064
Neon glow discharge lamp	2	2 hours/ week	0.048
Function generator	2	2 hours/ week	0.032
Electronics lab (analogue & digital)		4.5 hours/ week	0.54
Street lights	28		
TV (monitor)	2		5.5

2. Energy management

- Electricity charges Rs. 49248/month
- **Number of gas cylinders used –**
- **Cost of Gas cylinders – Rs. /cylinder**
- Monthly amount paid for electricity and gas – Rs. 49248/-
- Cost of generator fuel – Rs. 3376/month
- No. of tubelights – 158 (soon to be replaced by LED bulbs)
- No. of CFL bulbs – 150; 4 hours a day (approximately), 22 days in a month
- No. of LED bulbs – 137; 4 hours a day (approximately), 22 days in a month
- No. of LED tubelights – 404
- No. of ceiling lights – 173
- No. of incandescent bulbs – Nil
- No. of fans – 562; 4 hours a day (approximately), 22 days in a month
- No. of ACs – 30; 3 hours in 6 months
- No. of computers – 210; 2 hours a day (approximately), 22 days in a month
- No. of WiFi routers – 10
- No. of LAN – 150
- No. of smart classrooms – 2
- No. of water pumps – 11
- No. of photocopiers – 2
- No. of printers – 26
- No. of water purifiers cum cooler – 5
- No. of water purifiers – 13
- No. of LCD projectors – 15
- No. of televisions – 2
- No. of inverters – 2; Monthly charges Rs. 5800 (average)
- No. of CCTV systems and monitors - 64
- No. of fridges - 8

ARTS BUILDING

Room No	LED Tube	Normal Tube	LED Bulb/ CFL	Fan
101	3	-	2	4
102	3	-	1	4
103	3	2	-	6
104	2	1	-	2
105	-	3	-	2
106	3	-	-	4
107	4	-	-	2
108	3	-	-	4
201	2	2	-	2
202	1	2	-	3
203	3	-	-	2
204	2	-	-	1
Old library	6	7	-	16
205	2	1	-	5
206	1	2	-	2
207	1	1	-	2
208	2	1	-	4
301	2	-	-	4
302	2	-	-	3
303	4	-	-	6
304	1	-	-	2
305	-	-	-	-
306	1	1	1	1
307	1	-	-	2
308	4	-	-	5
309	1	-	-	1
310	2	-	-	2
311	2	2	2	4
312	2	2	2	4
313	-	2	2	2
Corridor (Ground floor)	5	1	-	1
Corridor (First floor)	3	-	-	-
Corridor (Second floor)	4	-	-	-

SCIENCE BUILDING

Room No	LED Tube	Normal Tube	LED Bulb/ CFL	Fan
101	2	-	-	3
102	1	2	-	4
103	2	2	-	2
104	-	-	11	3
105	-	2	-	1
106	-	12	-	6
107	7	-	-	7
108	-	3	-	2
109	-	-	8	2
110	3	3	-	4
111	4	2	-	5
112	-	-	9	2
113	1	1	2	1
114	5	5	2	4
115	3	-	3	5
116	2	-	-	2
117	3	-	-	3
118	3	1	-	4
119	2	3	4	3
120	-	2	2	3
121	-	4	-	4
122	1	2	2	2
201	7	-	-	7
202	3	-	1	2
203	11	2	-	8
204	1	1	1	1
205	2	5	-	8
206	3	-	1	4
207	2	8	-	7
208	4	4	-	4
209	4	-	-	2
210	3	3	-	4
211	4	-	-	5
212	2	1	2	5
213	-	12	-	3
214	1	1	1	2
215	2	1	4	1

SCIENCE BUILDING

Room No	LED Tube	Normal Tube	LED Bulb/ CFL	Fan
216	4	1	-	6
217	5	-	-	6
218	5	-	-	6
219	3	-	-	3
220	-	4	-	3
221	1	2	-	4
222	4	-	-	4
223	4	-	-	4
301	6	-	-	7
302	2	8	-	3
303	8	-	-	8
304	3	3	1	6
305	1	3	-	4
306	1	3	-	4
307	1	4	-	4
308	2	-	-	1
309	1	4	-	4
310	-	3	-	1
311	-	2	-	2
312	1	1	-	2
313	1	2	-	2
314	2	-	2	2
315	5	-	-	3
316	5	-	-	6
317	4	-	-	3
318	3	-	-	4
319	2	4	-	5
320	3	1	-	4
321	1	3	-	4
322	3	1	-	4
323	5	2	-	7
324	3	5	-	6
325	-	4	-	4
326	3	-	-	4
327	4	-	-	4
Corridor (Ground floor)	17	-	-	1
Corridor (First floor)	16	-	-	-
Corridor (Second floor)	13	-	-	-

BBA/ BCA BUILDING

Room No	LED Tube	Normal Tube	LED Bulb/ CFL	Fan
101	4	1	-	3
102	2	2	5	4
103	2	-	12	3
201	5	-	-	2
202	2	2	-	4
203	4	1	-	7
204	-	3	-	5
205	3	-	-	4
206	1	2	-	4
301	1	2	-	5
302	-	3	-	4
303	3	-	-	3
Corridor (Ground floor)	1	-	-	-
Corridor (First floor)	1	-	-	-
Corridor (Second floor)	1	-	-	-

HINDI SHIFT BUILDING

Room No	LED Tube		Normal Tube	LED Bulb/ CFL	Fan
1	2		1	3	5
2	1		1	2	3
3	1		4	12	12
4	-		2	4	4
5	-		2	4	4
6	-		2	4	4
7	-		2	4	4
8	-		2	4	4
9	3		-	4	5
10	4		-	4	4
11	7		-	8	8
12	7		-	8	10
Corridor (Ground floor)	1		6	-	2
Corridor (First floor)	-		10	-	2
Corridor (Second floor)	4		-	-	2

ADMINISTRATIVE BUILDING

Room No	LED Tube	Normal Tube	LED Bulb/ CFL	Fan
Principal Office	4	-	16	5
Computer Laboratory	4	15	-	12
All offices	31	7	2	25

- Whether college has any provision/choice of renewable and carbon-neutral electricity options? **No**
- Whether college has planned to install solar panels? **Yes, installed in November, 2023**
- Whether college has efficient water heating system? **NA**
- Whether the staff members of all sectors are concerned in turning off electrical appliances when not in use in both commercial and residential area? **Yes**
- Is there any monitoring system – like put off the main switch where there is no need of electricity? **Yes**
- Whether the users follow the appropriate and measurable targets for a reduction of energy, such as, computer, printers, electrical equipment when not in use? **Yes**
- Is there any options for equipment's running on standby mode? **Yes**
- Whether college has taken initiative to purchase efficient and environmentally sound appliances in order to fulfill the green budget? **Yes**
- Whether college has its own mechanism in repairing of electrical fault? **Yes**
- Whether the class rooms are with sufficient illumination in day time and ventilation? **Yes**
- Number of lights & fans in class room (average) – **3 LED lamps** and **4 fans**
- Use of light & fans in the day time (average hours) – **6 hours**
- Number of windows per class – **4**
- Natural light source in day time (in hours) (average per class) – **6 hours**
- How many (%) e-notice generated by the college for academic/administrative purposes in a month? **100%**
- How many (%) paper-notice generated by the college for academic/administrative purposes in a month? **Negligible**
- Whether college has organized lectures on energy conservation in order to give awareness to the students? **Yes**

Energy conservation strategies

- Whether the architectural design for college is based upon use of natural lighting & ventilation, to save extra power for bulbs and fans? **Yes, the new constructions are compliant to the aforementioned.**
- What are the available/maximum transport facilities used by the staff members/students etc., - mention the number (in average per day)?

Students mostly use **public vehicles** for commuting to college. However, the staff use their own private vehicles (30). The rest of the staff members commute through public vehicles.

- Whether college has any common car sharing/car pool among the students and faculty? **No**

We have enabled sleep mode in every two minutes in all the computers of our laboratory and departments. We have installed a main switch of each classroom which connect all the lights and fan of that classroom, so that one could save the power just by switch off the main switch. Except these, the street lights of our college campus and the water pumps are also connected to sensor so that the amount of waste water could be reduced as well as the energy consumption also would be checked. There are three boards displayed in each building and in near future we have planned to increase the numbers of such boards for awareness. There is no burning of wood in canteen for any purpose.

- We are planning to introduce Solar Energy in our college campus as the main source of energy.
- To decrease the numbers of CFL bulbs and to replace them with LED bulbs.
- To increase awareness among students by seminars and different kind of programs to aware them about energy consumption techniques.
- To introduce sustainable methods for cooling water in summer days to save the energy.

3. (a) Waste management

Stakeholders	Students	Teachers	Non-Teaching Staff
Male	3184	84	40
Female	4058	53	9
Total	7242	137	49

Level of disturbance on a scale of 1-9 found near college

Areas	Level of disturbance
Industry	NA
Bus stop	1.0
Railway station	NA
Market	2.5
Shopping complex	NA
Public halls	NA

Waste, specifically solid waste, bio-degradable waste and very small amount of waste gets generated in the laboratories of Chemistry, Microbiology and Zoology. Solid biodegradable waste treatment, vermicompost, septic tank compost are done for solid bio-degradable waste and in liquid waste, water management, rain water harvesting has been done.

There are baskets in each toilet for the waste and sweepers are allotted to collect waste from each toilet and to clean the toilets twice in a day of all the buildings in our campus. After collection of those wastes, it is given up to the garbage collection vehicle of Asansol Municipal Corporation.

We dispense used paper of our institution to companies and they provide us certificate. A workshop was conducted on 16th September, 2022 regarding making of decoratives using waste glass bottles, medicine strips and newspaper.

- Is there any method of segregation of waste materials? **Yes**
- Total amount of solid waste generated in the campus (including tree droppings & Lawn wastes) – **15 – 17 kg/month**
- Total number of staff – **207**
- Per capita production per day – **0.082 kg/month**
- Whether college arrange any workshop/seminar/conference for awaring the students/staff for specific arrangements for recyclable wastes – **Yes**
- Whether college follow specific disposal method for solid or liquid waste in specific manner – **Yes**
- Whether the recycling/collection facilities are provided by the city Municipality and/or private suppliers (including glass, white plastic bottle, printer cartridges, cardboard, furniture, plastics, thermocol, waste papers, electrical goods & alliances, electronic gadgets, instruments, equipment, packing materials)? **Yes**
- Whether college has any composting ground/vat or any collection unit etc.? **Yes**
- Is there any mechanism of treatment/uses of domestic influent in the college campus (if so, what is the capacity of treatment plant/composting etc.)? **No**

Department	Chemical Waste	Biological Waste	Microbial Waste	Total	Method of disposal
Chemistry	Different organic (0.016) and inorganic salts (0.015), broken glasses (0.025)	Paper waste (0.005)	-	0.061	Wastes are collected in blue and black closed bins and disposed to AMC's waste collecting vehicle time to time
Zoology	Different organic (0.003) and inorganic (0.001) chemicals, broken glasses (0.007)	Dissected animal species (0.009)	-	0.020	Chemical wastes are disposed in similar manner, and biological wastes are collected in red bins and disposed to AMC's waste
Botany	Different organic (0.002) and inorganic (0.001) chemicals, broken glasses (0.0005), plastic container (0.0010), microcentrifuge tubes and tips (0.0013)	Dissected plant samples (0.0003), papers(0.001), cotton plugs (0.0001)	Bacterial culture medium (0.003)	0.007	Chemical wastes are disposed in similar manner, and biological wastes are collected in red and blue bins and disposed to AMC's waste collecting vehicle time to time

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Department	Chemical Waste	Biological Waste	Microbial Waste	Total	Method of disposal
Geography	Different chemicals (0.0001), soil samples (0.0003), broken glasses (0.001)	-	-	0.001	Wastes are collected in blue and black closed bins and disposed to AMC's waste collecting vehicle time to time
Microbiology	Different organic and inorganic compound (0.005), broken glasses (0.005), plastic container (0.010), microcentrifuge tubes and tips (0.0025), rubber bands (0.0025)	Food samples (0.005), papers (0.010), cotton plugs (0.0014)	Bacterial cultures (0.03), Hospital wastes (negligible), contaminated waste (0.0025)	0.020	Chemical wastes are disposed in similar manner, and biological wastes are collected in red, black and blue bins and disposed to AMC's waste collecting vehicle from time to time

Location of dustbins	No. of dustbins				Quantity of collection (kg/day)	Disposal time	Cleaning by eco-friendly product
	Biodegradable*	Non-bio degradable**	Non-bio Degradable hazardous chemical waste***	Plastic waste**			
Administrative building (Principal office)	1	1	-	-	0.02	9 am - 11 am	Yes
Library	1	2	-	-	0.04		Yes
Science building (Ground floor)	1	1	1	-	0.02		Yes
Science building (1st floor)	1	1	-	-	0.03		Yes
Science building (2nd floor)	1	1	1	-	0.08		Yes
BBA/BCA office	1	1	-	-	0.05		Yes
Corridor of Humanities and arts building (ground floor)	1	1	-	-	0.04		Yes
Corridor of Humanities and arts building (1st floor)	1	1	-	-	0.04		Yes

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Location of dustbins	No. of dustbins				Quantity of collection (kg/day)	Disposal time	Cleaning by eco-friendly product
	Biodegradable*	Non-bio degradable**	Non-bio Degradable hazardous chemical waste***	Plastic waste**			
Corridor of Humanities and arts building (2nd floor)	1	1	-	-	0.04	9 am - 11 am	Yes
Hindi shift Building corridor	1	1	-	-	0.03		Yes
Exam section (Day, morning, evening) office	1	-	-	-	0.05		Yes
Girls' common room	-	1	-	-	0.02		Yes
Girls' Hostel	1	1	-	-	0.05		Yes
Boy's Hostel	1	-	-	1	0.04		Yes
Canteen	1	-	-	1	0.07		Yes
Vivekanda seminar hall	1	-	-	-	0.03		Yes

*- Blue bin (Biodegradable dry waste nonhazardous)

** - Red bin (Biohazardous + plastic waste)

*** - Black bin (Non-bio Degradable hazardous chemical waste)

3. (b) E-waste management

- **Quantity of e-waste generated – 331 kgs**
- Number of cartridges used month-wise – 23 (yearly)
- Number of cartridges disposed in a year (average) – Cartridges are not disposed, they are refilled.
- Is there any means of disposal of unused computers, printers and electronic wastes through authorized agents? **The unused monitors and keyboards were given to an external agency, Hulladek Recycling Private Limited, for recycling.**

Item	Quantity	Net weight	Name of agency of disposal

4. Green campus management

To maintain the college garden, we have gardeners who take proper care. Recycled water is used in our garden. Chemical fertilizer as well as pesticides are not used in our gardens. Instead of these, we use Neem Oil, Vermi Compost, Leaf Compost and salt water. We have started organic farming in our college campus and there are composting pits in the college. We have arboretum in our college, the details of which are enlisted as under:

Name of the plants	Details of the trees planted
Andrographis paniculata (Acanthaceae)	Andrographis paniculata is one of the highly used potential medicinal plants in the world. This plant is traditionally used for the treatment of common cold, diarrhoea, fever due to several infective cause, jaundice, as a health tonic for the liver and cardiovascular health, and as an antioxidant.
Thuja sp. (Cupressaceae)	Thuja is used for respiratory tract infections such as bronchitis, bacterial skin infections, and cold sores. Some people use thuja to loosen phlegm (as an expectorant), to boost the immune system (as an immune-stimulant), and to increase urine flow (as a diuretic).
Strychnos nux-vomica (Loganiaceae)	It is used for nerve conditions, depression, migraine headache, symptoms of menopause and a blood vessel disorder called Raynaud's disease. Other uses include treatment of "tired blood" (anemia), as a tonic, and as an appetite stimulant. Men use nux vomica for erectile dysfunction.
Madhuca indica (Sapotaceae)	Traditionally, Madhuca Indica bark has been used against diabetes, rheumatism, ulcers, bleeding and tonsillitis. The flowers, seeds and seed oil of Madhuca have great medicinal value. Externally, the seed oil massage is very effective to alleviate pain.
Gmelina arborea (Lamiaceae)	Both the fruit and bark have medicinal properties against bilious fever. Leaf sap is taken as a demulcent to treat gonorrhoea and cough, and it is applied to wounds and ulcers. The roots are considered to have tonic, stomachic and laxative properties, and the flowers have been used to treat leprosy and blood diseases.

- Is there any garden in the college campus/outside the campus under college custody? **Yes; there are four gardens in our college comprising an area of 13000 sq ft.**
- Is there any irrigation system in your college? **Pot Irrigation**
- Whether the garden is watered by using drip/sprinkler irrigation system? **Yes (drip)**
- Is there any mechanism of review of periodical monitoring of tree species? **Yes**
- What is the type of vegetation in the surrounding area of the college? **Primarily Deciduous vegetation.**
- Whether the college has taken any programme for plantation of some fruit trees which can attract birds, bees etc.? **Yes**

Location and Area	Type of plantation				Species name	Family name	Total
	Indigenous	Medicinal	Ornamental	Exotic			
Campus 1; 7.227 acre	85	52	38	28	<i>Acalypha hispida</i>	Euphorbiaceae	15
					<i>Aegle marmelos</i>	Rutaceae	7
					<i>Agave sp</i>	Asperagaceae	2
					<i>Albizia lebbeck</i>	Fabaceae	2
					<i>Aloe vera</i>	Liliaceae	6
					<i>Alstonia scholaris</i>	Apocynaceae	5
					<i>Andrographis paniculata</i>	Acanthaceae	8
					<i>Annona squamosa</i>	Annonaceae	5
					<i>Areca catechu</i>	Arecaceae	5
					<i>Artocarpus heterophyllus</i>	Moraceae	12
					<i>Aurocaria excelsa</i>	Araucariaceae	5
					<i>Azadirchta indica</i>	Meliaceae	5
					<i>Barleria cristata</i>	Acanthaceae	2
					<i>Bauhinia purpurea</i>	Fabaceae	1
					<i>Bauhinia variegata</i>	Caesalpiniaceae	4
					<i>Bombax ceiba</i>	Malvaceae	5

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Location and Area	Type of plantation				Species name	Family name	Total
	Indigenous	Medicinal	Ornamental	Exotic			
					<i>Bougainvillea glabra</i>	Nyctaginaceae	5
					<i>Bridella retusa</i>	Phyllanthaceae	2
					<i>Caesalpinia pulcherrhema</i>	Caesalpinaceae	18
					<i>Canna indica</i>	Canaceae	15
					<i>Carica papaya</i>	Caricaceae	2
					<i>Caryota urens</i>	Palmae	15
					<i>Cathranthus roseus</i>	Apocynaceae	8
					<i>Cinnamomum camphora</i>	Lauraceae	1
					<i>Cinnamomum tamala</i>	Lauraceae	1
					<i>Cinnamomum zeylanicum</i>	Lauraceae	1
					<i>Citrus aurantiifolia</i>	Rutaceae	2
					<i>Citrus macroptera</i>	Rutaceae	2
					<i>Citrus medica</i>	Rutaceae	1
					<i>Clitoria ternatea</i>	Papilionaceae	11
					<i>Cocos neucefera</i>	Aricaceae	3
					<i>Codiaeum variegatum</i>	Euphorbiaceae	12
					<i>Combretum indicum</i>	Combretaceae	3
					<i>Cordyline fruticosa</i>	Asperagaceae	4
					<i>Cycas revoluta</i>	Cycadaceae	3
					<i>Dalbergia sissoo</i>	Papilionaceae	5
					<i>Datura metel</i>	Solanaceae	2
					<i>Delonix regia</i>	Fabaceae	3
					<i>Dracaena fragrans</i>	Asperagaceae	1
					<i>Duranta repens</i>	Verbenaceae	<100
					<i>Dypsis lutescens</i>	Palmae	28
					<i>Elaeocarpus grandiflorus</i>	Elaeocarpaceae	1
					<i>Embllica officinalis</i>	Phyllanthaceae	2
					<i>Eucalyptus sp</i>	Myrtaceae	6

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Location and Area	Type of plantation				Species name	Family name	Total
	Indigenous	Medicinal	Ornamental	Exotic			
					<i>Eugenia uniflora</i>	Myrtaceae	<100
					<i>Ficus elastica</i>	Moraceae	6
					<i>Ficus religiosa</i>	Moraceae	3
					<i>Ficus roxburghii</i>	Moraceae	2
					<i>Gardenia jasminoides</i>	Rubiaceae	2
					<i>Gmelina arborea</i>	Lamiaceae	1
					<i>Hemidesmus indicus</i>	Apocynaceae	6
					<i>Hibiscus rosa-sinensis</i>	Malvaceae	5
					<i>Hyphaene sp</i>	Palmae	2
					<i>Ixora arborea</i>	Rubiaceae	3
					<i>Juniperus sp</i>	Cupressaceae	2
					<i>Justicia adhatoda</i>	Acanthaceae	5
					<i>Lagerstroemia speciosa</i>	Lythraceae	2
					<i>Lantana camera var.</i>	Verbenaceae	2
					<i>Latania sp</i>	Palmae	1
					<i>Leucaena leucocephala</i>	Caesalpiniaceae	4
					<i>Litchi chinensis</i>	Sapindaceae	1
					<i>Livistona sp</i>	Palmae	1
					<i>Machelia chapmpaka</i>	Magnoliaceae	2
					<i>Madhuca longifolia</i>	Sapotaceae	1
					<i>Mangifera indica</i>	Anacardiaceae	17
					<i>Manilkara zapota</i>	Sapotaceae	
					<i>Melaleuca viminalis</i>	Myrtaceae	1
					<i>Melia azadiracta</i>	Melaceae	1
					<i>Mimusops elengi</i>	Sapotaceae	7
					<i>Moringa oleifera</i>	Moringaceae	5
					<i>Murraya koenigii</i>	Rutaceae	3
					<i>Murraya paniculata</i>	Rutaceae	3

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Location and Area	Type of plantation				Species name	Family name	Total
	Indigenous	Medicinal	Ornamental	Exotic			
					<i>Murraya paniculata</i>	Rutaceae	3
					<i>Musa paradisisea</i>	Musaceae	15
					<i>Mussanda frondosa</i>	Rubiaceae	2
					<i>Neolamarckia cadamba</i>	Rubiaceae	3
					<i>Nerium indicum</i>	Apocynaceae	125
					<i>Ocimum sactum</i>	Lamiaceae	8
					<i>Passiflora incarnata</i>	Passifloraceae	2
					<i>Phyllanthus reticulatus</i>	Phyllanthaceae	3
					<i>Phyllanthus emblica</i>	Phyllanthaceae	2
					<i>Pithocellobium dulcis</i>	Mimosaceae	2
					<i>Platycladus orientalis</i>	Cupressaceae	3
					<i>Plumeria acutifolia</i>	Apocynaceae	3
					<i>Plumeria pudica</i>	Apocynaceae	5
					<i>Polyalthia longifolia</i>	Annonaceae	5
					<i>Pritchardia sp</i>	Palmae	1
					<i>Psidium guajava</i>	Myrtaceae	5
					<i>Pterospermum acerifolium</i>	Malvaceae	1
					<i>Punica granatum</i>	Lythraceae	5
					<i>Rauvolfia tetraphylla</i>	Apocynaceae	6
					<i>Rosa sinensis</i>	Roisaceae	22
					<i>Roystonea regia</i>	Palmae	10
					<i>Saraca asoka</i>	Caesalpiniaceae	2
					<i>Selenicereus undatus (dragon)</i>	Cactaceae	2
					<i>Senna fistula</i>	Caesalpiniaceae	2
					<i>Senna seamea</i>	Caesalpiniaceae	2
					<i>Simarouba glauca</i>	Simaroubaceae	1
					<i>Spanduss mombin</i>	Sapindaceae	2
					<i>Spathodia campanulata</i>	Bigniniaceae	10

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Location and Area	Type of plantation				Species name	Family name	Total
	Indigenous	Medicinal	Ornamental	Exotic			
					<i>Spondias pinnata</i>	Anacardiaceae	1
					<i>Strychnos nuxvomica</i>	Loganiaceae	1
					<i>Swietenia macrophylla</i>	Meliaceae	4
					<i>Swietenia mahagoni</i>	Meliaceae	5
					<i>Syzygium cumini</i>	Myrtaceae	5
					<i>Syzygium samarangense</i>	Myrtaceae	1
					<i>Tabernaemontena divericate</i>	Apocynaceae	26
					<i>Tagetus patula</i>	Asteraceae	58
					<i>Tamarindus indica</i>	Papilionaceae	6
					<i>Tecoma stans</i>	Bignoniaceae	2
					<i>Tectona grandis</i>	Verbenaceae	15
					<i>Terminalia bellirica (Behera)</i>	Combretaceae	1
					<i>Terminalia tomentosa (Asan)</i>	Combretaceae	1
					<i>Terminilia bentzoe</i>	Combretaceae	6
					<i>Thuja occidentalis</i>	Cupressaceae	10
					<i>Tinospora cordifolia</i>	Menispermaceae	15
					<i>Tradescantia spathacea (Rhoeo)</i>	Commelinaceae	6
					<i>Trema orientalis</i>	Cannabaceae	2
					<i>Vitis vinifera</i>	Vitaceae	1
					<i>Wodyetia bifurcata</i>	Palmae	4
					<i>Ziziphus mauritiana</i>	Rhamnaceae	5
Campus 2; 0.582 acre	13	8	2	1	<i>Alstonia scholaris</i>	Apocynaceae	3
					<i>Areca catechu</i>	Arecaceae	2
					<i>Bombax ceiba</i>	Malvaceae	1
					<i>Caesalpinia pulchirrhema</i>	Fabaceae	14
					<i>Dalbergia sissoo</i>	Fabaceae	3
					<i>Moringa oleifera</i>	Moringaceae	2
					<i>Murraya paniculata</i>	Rutaceae	1

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Location and Area	Type of plantation				Species name	Family name	Total
	Indigenous	Medicinal	Ornamental	Exotic			
					<i>Polyalthia longifolia</i>	Annonaceae	2
					<i>Psidium guajava</i>	Myrtaceae	4
					<i>Punica granatum</i>	Lythraceae	1
					<i>Swietenia mahagoni</i>	Meliaceae	3
					<i>Syzygium cumini</i>	Myrtaceae	4
					<i>Tectona grandis</i>	Verbenaceae	7
					<i>Ziziphus mauritiana</i>	Rhamnaceae	2

Awareness programmes in campus

Programme conducted	Date	No. of trees planted	Present status	Documentation (if any)	No. of beneficiaries
Earth day	22 April 2023	18	11 live	Yes	All of us
World environment day/ Vanmahotsav	5 June 2023	38	27 live	Yes	All of us
World Ozone Day	16 September 2023	-	-	Yes	All of us
No Vehicle Day	Second Saturday of every month	-	-	-	-

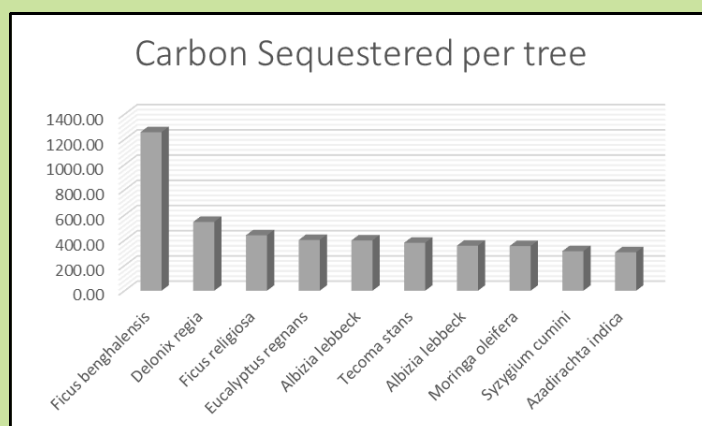
5. Campus Carbon Footprint Assessment:

Before delving into the results, it is crucial to understand the methodology used in assessing CO₂ sequestration across the campus. Our carbon sequestration analysis results provide a key understanding of how effectively the campus's natural environment contributes to mitigating its carbon footprint. By measuring the amount of CO₂ absorbed and stored by various tree species, we can assess the overall impact of these green assets on our sustainability goals. This section presents a detailed examination of the carbon sequestration capacity of the campus, offering valuable insights into the current effectiveness of our environmental initiatives and laying the groundwork for future strategies to enhance carbon capture.

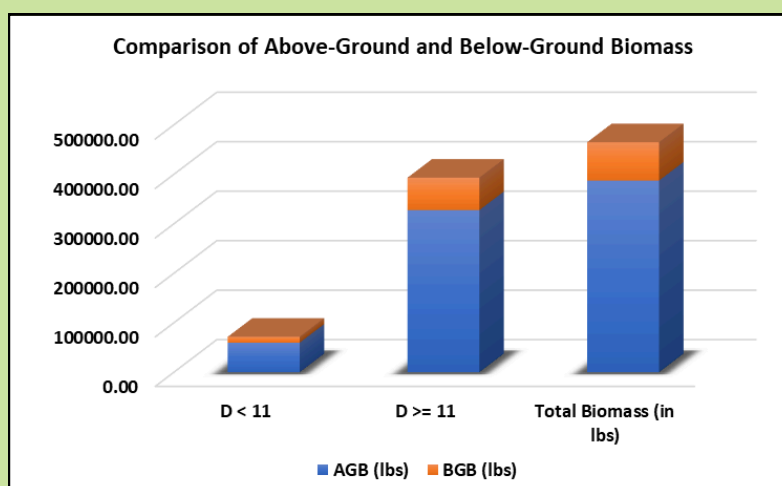
The analysis revealed that the trees within the campus sequestered a total of **280533.32** kg of CO₂ over their lifetimes, with the majority of carbon storage occurring in *Ficus benghalensis* and *Eucalyptus regnans* species. The total amount of carbon sequestered by all the trees in a year is **18,690.63** kg, with each tree on campus sequestering an average of **21.26** kg of carbon per year, indicating that the campus greenery plays a significant role in offsetting a portion of our carbon emissions.

Carbon Sequestration	
Particulars	2023 - 24
Carbon sequestration by trees in the campus (kg)	18,690.63

In our pursuit of sustainability, understanding the CO₂ sequestration rates of different tree species is essential. This graph provides a clear visualization of how each species contributes to reducing atmospheric carbon dioxide, reflecting their vital role in our environmental stewardship.



The analysis of carbon sequestration on the campus reveals a significant difference in the distribution of biomass between above-ground and below-ground components. Approximately **83.33%** of the total carbon sequestered is stored in the above-ground biomass (AGB), which includes the trunks, branches, and leaves of the trees. This indicates that the majority of the carbon captured by the campus greenery is concentrated in the visible parts of the trees. In contrast, the below-ground biomass (BGB), which comprises the root systems, accounts for about **16.67%** of the total carbon sequestered. Although BGB represents a smaller portion, it plays a crucial role in carbon storage and contributes to the overall stability and health of the ecosystem. This distribution highlights the importance of considering both above-ground and below-ground components when assessing the carbon sequestration potential of vegetation on campus.



The findings from this carbon footprint assessment provide a comprehensive view of the campus's current environmental impact, highlighting key areas where carbon sequestration efforts are making a meaningful difference. As we move forward, the data gathered from this assessment will serve as a foundation for continuous improvement, ensuring that our campus remains a leader in sustainability efforts.

List of trees with their annual CO₂ sequestration values:

Tree Name	Scientific Name	No. of Species	Diameter (D) (Inches)	Tree Height (feet)	CO ₂ Sequestered per year (lbs.)
Mango	<i>Mangifera indica</i>	1	7.90	32.4	100.52
		2	2.32	13.5	24.66
		3	1.78	20.7	43.51
		2	1.21	12.3	11.69
		2	5.51	27.6	119.47
		1	5.48	28.6	61.54
		1	6.15	25.4	61.33
		1	5.80	30.4	69.22
		1	7.39	35.6	103.33
		1	20.80	40.20	197.04
		1	12.26	26.50	76.58
		1	20.13	45.50	215.85
		2	13.18	42.70	265.39
		1	13.47	45.20	143.52
		1	13.41	40.50	127.99
		1	13.69	40.60	131.04
		1	11.50	40.50	109.75
Indian gooseberry	<i>Phyllanthus emblica</i>	1	2.01	19.5	21.52
Araucaria	<i>Araucaria araucana</i>	4	2.29	15.6	33.72
Indian Kino	<i>Pterocarpus marsupium</i>	1	7.87	32.4	100.12
Ashoka	<i>Saraca asoca</i>	1	6.40	15.8	42.91
Peepul tree	<i>Ficus religiosa</i>	1	39.17	47.60	439.48
Bahera	<i>Terminalia bellirica</i>	1	5.96	45.8	85.72
Spanish cherry	<i>Mimusops elengi</i>	4	3.09	12.5	60.68
		1	5.16	25.6	51.88
Golden shower	<i>Cassia fistula</i>	1	2.58	10.8	15.32

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Tree Name	Scientific Name	No. of Species	Diameter (D) (Inches)	Tree Height (feet)	CO ₂ Sequestered per year (lbs.)
Bael	<i>Aegle marmelos</i>	1	8.34	17.3	52.17
		1	8.34	32.6	98.31
		2	8.63	25.8	160.95
		1	8.73	30.5	96.19
		1	5.16	25.9	48.29
		1	15.38	61.80	206.13
Banyan	<i>Ficus benghalensis</i>	1	5.29	15.6	45.36
		1	71.97	52.80	1253.99
		1	71.34	53.40	1257.01
		1	72.29	50.60	1207.05
Bottle palm	<i>Hyophorbe lagenicaulis</i>	4	8.06	18.9	335.00
		5	3.09	10.6	90.04
		1	5.61	13.4	41.31
Casuarina	<i>Casuarina equisetifolia</i>	1	4.20	43.6	86.40
		1	4.17	20.4	40.12
Milkwood	<i>Alstonia scholaris</i>	1	16.94	25.70	123.15
		1	20.22	45.80	261.96
		1	18.98	38.60	207.22
		1	11.69	38.90	128.59
Cycas	<i>Cycas</i>	3	3.57	4.5	9.46
False ashoka	<i>Monoon longifolium</i>	7	5.51	28.5	345.42
		9	3.41	20.5	197.58
		1	15.41	62.60	181.94
		2	17.58	62.50	414.35
Eucalyptus	<i>Eucalyptus regnans</i>	9	24.94	85.50	3618.13
Hedge palm	<i>Chrysalidocarpus lutescens</i>	127	1.66	17.4	1437.57
Madras Thorn	<i>Pithecellobium dulce</i>	1	19.01	42.80	268.51
		1	19.14	41.70	263.37
		1	17.90	40.60	239.78

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Tree Name	Scientific Name	No. of Species	Diameter (D) (Inches)	Tree Height (feet)	CO ₂ Sequestered per year (lbs.)
Black plum	<i>Syzygium cumini</i>	1	3.89	12.6	26.92
		1	5.86	37.6	121.17
		1	10.10	38.6	214.31
		1	5.48	28.5	85.86
		1	5.16	30.8	87.39
		1	7.42	37.6	153.44
		1	4.84	32.5	86.52
		1	5.61	30.5	94.02
		1	6.78	37.6	140.27
		3	1.18	7	13.61
		1	7.10	37.8	147.64
		1	20.80	45.70	313.60
		1	14.75	42.50	206.79
Java apple	<i>Syzygium samarangense</i>	1	2.61	23.8	29.30
Queen Crepe Myrtle	<i>Lagerstroemia speciosa</i>	1	8.79	35.8	178.00
		2	13.12	42.60	379.42
Burflower-tree	<i>Neolamarckia cadamba</i>	1	7.39	34.5	150.20
Kaneir	<i>Cascabela thevetia</i>	7	2.77	14.6	133.48
Kachnar	<i>Bauhinia variegata</i>	2	3.95	18.5	68.88
oleander	<i>Nerium oleander</i>	38	1.82	10.4	394.54
		45	1.15	10.5	297.92
		72	1.50	11.6	687.52
		95	1.43	10.5	786.18
Camphor tree	<i>Camphora officinarum</i>	1	1.75	13.4	9.22
Jackfruit	<i>Artocarpus heterophyllus</i>	1	4.27	27.5	46.10
		1	10.70	40.7	171.08
		1	10.29	42.3	170.93
		1	10.00	35.5	139.45

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Tree Name	Scientific Name	No. of Species	Diameter (D) (Inches)	Tree Height (feet)	CO ₂ Sequestered per year (lbs.)
Jackfruit	<i>Artocarpus heterophyllus</i>	1	15.35	62.60	226.49
		1	13.15	42.80	132.68
		1	13.50	40.60	129.22
		1	12.96	42.50	129.84
		1	12.93	43.80	133.48
		1	11.91	40.20	112.86
Royal poinciana	<i>Delonix regia</i>	1	29.49	43.60	545.50
Indian jujube	<i>Ziziphus mauritiana</i>	1	3.60	15.6	22.05
Lemon	<i>Citrus limon</i>	1	7.13	17.5	49.04
		1	2.99	15.4	18.11
		1	1.78	12.5	8.76
		1	4.04	29.8	47.35
Lychee	<i>Litchi chinensis</i>	1	5.92	32	74.46
Mahogany	<i>Swietenia macrophylla</i>	6	1.82	14.5	55.84
White Plumeria	<i>Plumeria pudica</i>	6	1.75	9	56.63
		12	1.27	8	73.21
		8	1.11	8	42.71
Common wormwood	<i>Artemisia absinthium</i>	1	1.85	12.4	18.56
Neem	<i>Azadirachta indica</i>	2	1.34	7	8.83
		1	1.78	14	11.77
		1	9.17	25.2	108.95
		1	4.90	22	50.86
		2	5.19	24	117.46
		1	5.25	23.5	58.21
		1	15.35	23.00	99.86
		1	20.48	52.60	304.65

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Tree Name	Scientific Name	No. of Species	Diameter (D) (Inches)	Tree Height (feet)	CO ₂ Sequestered per year (lbs.)
Other kind of hedge		54	1.08	8	257.25
		46	1.24	6	188.53
		72	1.50	6.8	403.03
Other plants		15	8.54	37.6	2647.36
Other plants		8	4.84	32.2	685.79
Other plants		12	4.33	42.5	1214.81
Palm	<i>Attalea speciosa</i>	20	2.01	20.6	259.78
		6	14.43	37.50	612.06
Guava	<i>Psidium guajava</i>	1	4.27	15.5	36.38
		3	1.69	10	27.85
		1	3.95	30.2	65.59
		1	4.20	28.4	65.66
Yellow-flamboyant	<i>Peltophorum pterocarpum</i>	1	1.72	10	9.46
		1	13.12	40.60	175.78
African tulip tree	<i>Spathodea campanulata</i>	1	10.32	40.8	248.07
		1	10.70	41.3	260.41
		1	10.32	41.7	253.54
Rudraksha	<i>Elaeocarpus sphaericus</i>	1	2.99	22.6	26.58
		1	1.78	17.8	12.47
Naseberry	<i>Manilkara zapota</i>	1	2.36	9	10.00
Teak	<i>Tectona grandis</i>	1	2.64	14	13.37
		2	1.11	15.5	12.49
		5	9.36	37.5	634.47
		4	7.74	36.4	407.22
		1	8.06	34.6	100.75
		2	20.13	62.50	545.55

Green Audit Report, 2023-2024



Tree Name	Scientific Name	No. of Species	Diameter (D) (Inches)	Tree Height (feet)	CO ₂ Sequestered per year (lbs.)
		1	12.23	62.80	166.53
		1	14.08	65.40	199.62
		1	19.84	47.50	204.36
		1	15.06	63.80	208.40
Candle Bush	<i>Senna alata</i>	1	14.81	42.20	117.84
Indian rosewood	<i>Dalbergia sissoo</i>	1	3.25	13	13.27
		1	3.92	17.5	21.54
		1	6.59	23.5	48.69
		1	4.04	30.2	38.39
		1	19.49	48.10	176.77
Simarouba	<i>Simarouba glauca</i>	1	6.50	27.3	83.61
Red silk cotton	<i>Bombax ceiba</i>	1	6.53	10	20.52
		1	4.84	27.5	41.83
		3	2.29	12	25.94
Lebbeck	<i>Albizia lebbeck</i>	1	7.71	23.6	100.03
		1	5.83	22.8	73.08
		1	10.70	38.5	226.57
		1	10.57	39.6	230.27
		1	10.32	38.6	219.04
		1	3.98	20.6	45.10
		1	21.72	42.30	303.16
		1	17.74	42.70	249.94
		1	19.81	47.60	311.13
		1	22.96	52.60	398.54
		1	18.54	48.20	294.80
		1	11.37	38.60	144.81
		1	18.66	47.80	294.36

Green Audit Report, 2023-2024



Tree Name	Scientific Name	No. of Species	Diameter (D) (Inches)	Tree Height (feet)	CO ₂ Sequestered per year (lbs.)
		2	17.01	63.60	713.80
		1	15.92	40.50	212.80
Drumstick	<i>Moringa oleifera</i>	1	20.38	24.50	211.86
		1	18.31	45.60	354.26
		1	11.94	44.70	226.48
		1	14.71	45.30	282.77
Strychnos	<i>Strychnos nux-vomica</i>	1	3.57	17.5	19.62
Areca palm	<i>Areca catechu</i>	3	7.36	40.3	489.14
		3	7.42	42.5	520.31
		2	6.50	38.6	275.83
		2	7.04	35.4	274.05
Pinwheel flower	<i>Tabernaemontana divaricata</i>	1	5.80	11	45.08
Tecoma	<i>Tecoma stans</i>	1	16.75	45.30	336.25
		1	19.84	43.20	379.80
Indian bay leaf	<i>Cinnamomum tamala</i>	1	3.57	18.5	31.11

4.2 Suggestions for green campus

- Allocate more space for planting trees
- Create automatic drip irrigation system during vacations
- Improve Botanical gardens and greenhouses
- Collect rain water for watering purpose of gardens
- Beautifying the entire campus with indoor plants
- Providing funds to nature club for making campus more green
- Conducting more competitions among departments for making students more interested in making the campus green
- Develop clear and well-communicated policies outlining the consequences of non-compliance with environmental regulations within the college premises.
- Ensure fair and transparent implementation of sanctioning policies, emphasizing positive reinforcement and education alongside potential penalties

4.3 Consolidation of Internal Audit Findings

We are certain that now we have a better understanding and appreciation for the environmental impact of our own actions. We have effectively determined our very own environmental impacts through numerous auditing procedures. The green auditing exercise resulted in actionable solutions to lessen our negative environmental impact.

Participating in this green auditing procedure has taught all of us about the importance of sustainability on college campuses. It has thus, augmented and helped in raising awareness about the usage of Earth's resources in the home, college, local community, and elsewhere.

4.4 Preparation of Action Plan

Preparation of Action Plans on Green Endeavours at Banwarilal Bhalotia College, Asansol has laid out a comprehensive plan to integrate sustainability and green initiatives into its campus operations. The preparation of these action plans focuses on several key areas to ensure the college not only reduces its environmental impact but also fosters an eco-friendly culture among its students and staff.

1. Installation of solar panels

The college has committed to the installation of solar panels on the rooftops of all its buildings. This initiative is expected to be fully operational in the next academic year, with a total energy output of 85 kilowatts. This significant shift to solar energy will power the entire campus, substantially reducing the college's carbon footprint. Additionally, there are long-term plans to connect with the power grid, allowing the college to distribute excess electricity to regions with poor power supplies.

2. Green Campus Initiatives

The college is dedicated to transforming its campus into a green oasis. This includes:

Tree Plantation Drives: Regular tree plantation campaigns are organised to increase the green cover on the campus.

Waste Management Systems: Implementation of comprehensive waste segregation and recycling systems to minimise waste and promote recycling.

Water Conservation Measures: Installation of rainwater harvesting systems and promotion of water conservation practices among students and staff.

3. Environmental Awareness Programmes

Banwarilal Bhalotia College emphasises the importance of environmental education through:

Workshops and Seminars: Hosting workshops and conferences on topics such as environmental repair, and revisiting strategies for sustainable development.

Student Engagement: encouraging students to participate in Beagle, nature club and environmental campaigns to raise awareness and promote sustainable practices.

4. Energy Efficiency Measures

Beyond solar power, the college plans to implement various energy efficiency measures, including:

Energy-Efficient Lighting: Replacing traditional lighting with energy-efficient LED lights across the campus.

Energy Audits: Conducting regular energy audits to identify areas for improvement and ensure optimal energy usage.

5. Sustainable Infrastructure Development

New infrastructure projects at the college are designed with sustainability in mind. This includes:

Green Buildings: Ensuring new constructions adhere to green building standards, incorporating energy-efficient designs and materials.

Retrofitting Existing Buildings: Upgrading existing buildings to improve energy efficiency and reduce their environmental impact.

6. Community Outreach and Collaboration

The college actively collaborates with local communities and organisations to extend its green initiatives beyond the campus. This involves:

River Project Team Ahalya: An initiative to assess and improve the drainage system in the neighbouring locality, addressing overflow and flood situations during heavy rains. A primary report is planned to be submitted to the local municipality for fund sanction and larger-scale surveys.

Equal Opportunity Cell Programmes: organising visits to laboratories and libraries by neighbouring school students to inculcate scientific temper, curiosity, and enthusiasm among young students, promoting a broader understanding of environmental science and sustainability.

These detailed action plans underscore Banwarilal Bhalotia College's commitment to sustainability and green practices, ensuring a healthier and more sustainable future for its campus and the surrounding community.

4.5 Follow Up Action and Plans

Banwarilal Bhalotia College, Asansol, has established a comprehensive strategy to follow up on and build upon its green endeavors. The college is dedicated to ensuring that its sustainability initiatives are not only implemented effectively but also continuously monitored and improved.

1. Monitoring and Evaluation of Solar Panel Installation

The college has installed solar panels on the rooftops of its buildings, producing a total energy output of 85 kilowatts. To ensure the effectiveness of this initiative, the following follow-up actions are planned:

Regular Maintenance: Scheduled maintenance checks to ensure the solar panels are functioning optimally and address any technical issues promptly.

Energy Output Monitoring: continuous monitoring of the energy output to ensure it meets the expected levels. Any discrepancies will be investigated and rectified to maintain efficiency.

Reporting and Documentation: Regular documentation of energy savings and reductions in carbon footprints to assess the impact of the solar panels.

2. Expansion of Green Campus Initiatives

Building on the initial green campus initiatives, the college plans to expand and enhance these efforts through:

Increased Tree Plantation: Organising additional tree plantation drives to further increase the green cover on campus. This will include engaging students and staff in the planting activities.

Enhanced Waste Management: Strengthening waste management systems by introducing more comprehensive recycling programmes and reducing single-use plastics on campus.

Water Conservation Projects: Expanding rainwater harvesting systems and promoting water-saving practices among the campus community.

3. Continuous Environmental Education

To foster a culture of sustainability, the college will continue to emphasise environmental education through:

Ongoing Workshops and Seminars: Hosting more workshops and seminars on current environmental issues, sustainable practices, and the importance of green initiatives.

Student-Led Projects: encouraging students to lead and participate in environmental projects and research, providing them with practical experience, and fostering a deeper understanding of sustainability.

4. Energy Efficiency Enhancements

The college will further its efforts to improve energy efficiency by:

Upgrading infrastructure: retrofitting existing buildings with energy-efficient materials and systems, such as LED lighting and energy-efficient appliances.

Energy Audits: Conducting periodic energy audits to identify new areas for improvement and ensuring that all buildings and facilities adhere to energy efficiency standards.

5. Collaboration and Community Outreach

Banwarilal Bhalotia College recognises the importance of community involvement in its green initiatives. Plans include:

Partnerships with Local Organisations: Collaborating with local environmental organisations and government bodies to support broader sustainability goals and share best practices.

Community Education Programmes: Extending educational programmes to the local community, including workshops and awareness campaigns on environmental conservation and sustainable living.

6. Sustainable Infrastructure Development

The college is committed to ensuring all new infrastructure projects are sustainable.

Green Building Certifications: Pursuing green building certifications for new constructions to ensure they meet high standards of sustainability.

Sustainable Design Integration: Integrating sustainable design principles into all new infrastructure projects, focusing on energy efficiency, resource conservation, and environmental impact reduction.

7. Review and Feedback Mechanisms

To ensure the success and continuous improvement of green initiatives, the college will implement robust review and feedback mechanisms:

Regular Reviews: Conducting regular reviews of all green initiatives to assess progress and identify areas for improvement.

Stakeholder Feedback: Gathering feedback from students, staff, and other stakeholders to understand the effectiveness of the initiatives and incorporate suggestions for enhancement.

By implementing these follow-up actions and plans, Banwarilal Bhalotia College aims to create a sustainable, eco-friendly campus and contribute to the broader goal of environmental conservation.

4.6 Environmental Education

Banwarilal Bhalotia College, Asansol, places a strong emphasis on environmental education as part of its commitment to fostering a sustainable future. The college integrates environmental awareness and sustainability practices into its curriculum and extracurricular activities to ensure that students develop a comprehensive understanding of environmental issues and the importance of sustainable living.

1. Curriculum integration

Environmental Science Courses: The college offers dedicated courses in environmental science as part of its curriculum. These courses cover a range of topics, including ecology, environmental policy, conservation, and sustainable development.

Interdisciplinary Approach: Environmental education is not limited to specific courses but is integrated across various disciplines. Subjects such as geography, biology, and chemistry include modules on environmental studies, promoting an interdisciplinary understanding of environmental issues.

2. Workshops and Seminars

Regular Workshops: The college organises workshops on various environmental topics, such as climate change, renewable energy, and waste management. These workshops provide students with hands-on experience and practical knowledge about environmental conservation.

Invited Lectures: Experts from environmental organisations and academia are invited to deliver guest lectures, offering students insights into the latest research and developments in the field of environmental science.

3. Student Engagement

Beagle, Nature Club: The college encourages students to participate in Beagle, club, which are student-led group focused on promoting environmental awareness and sustainability practices on campus. These clubs organise activities such as clean-up drives, tree plantations, and awareness campaigns.

Student Projects: Students are encouraged to undertake research projects related to environmental science. These projects often involve fieldwork and collaboration with local communities, providing students with practical experience in addressing environmental challenges.

4. Community Outreach

Outreach Programmes: The college's Equal Opportunity Cell organises outreach programmes to educate neighbouring school students about environmental conservation. These programmes include visits to the college's laboratories and libraries, where young students can learn about scientific methods and sustainable practices.

Collaborations with Local Organisations: The college collaborates with local environmental organisations to extend its sustainability initiatives beyond the campus. This includes participating in community-based environmental projects and awareness campaigns.

5. Green Campus Initiatives

Sustainable Infrastructure: The college is committed to developing a green campus. This includes the installation of solar panels, waste management systems, and rainwater harvesting facilities. These initiatives not only reduce the environmental impact of the college but also serve as practical examples for students of sustainable practices in action.

Energy Efficiency Measures: The college has implemented various energy efficiency measures, such as the use of LED lighting and energy-efficient appliances. Regular energy audits are conducted to ensure optimal energy usage and to identify further areas for improvement.

6. Environmental Research

Publication and Dissemination: The college encourages the publication of research findings in reputed journals and participation in national and international conferences. This helps in disseminating knowledge and promoting the college's contributions to environmental science.

By integrating environmental education into its curriculum and campus life, Banwarilal Bhalotia College, Asansol, aims to equip students with the knowledge and skills necessary to address environmental challenges and promote sustainability in their personal and professional lives.

4.7 Conclusion and Full List of Recommendations

Banwarilal Bhalotia College, Asansol, is committed to advancing sustainability and environmental stewardship on its campus. The institution has undertaken significant steps to integrate green practices into its operations, curriculum, and

community engagement. Through the installation of solar panels, enhancement of waste management systems, implementation of energy-efficient measures, and fostering environmental education, the college aims to reduce its carbon footprint and promote sustainable living among its students and staff. These efforts are crucial in developing a culture of sustainability that extends beyond the campus and influences the broader community.

Solar panel installation and maintenance

- Ensure regular maintenance of solar panels to maintain optimal performance.
- Monitor energy output continuously and address any discrepancies promptly.
- Document energy savings and carbon footprint reductions for assessment and reporting purposes.

Tree Plantation and Green Cover Expansion

- Organise regular tree plantation drives involving students and staff.
- Increase green cover on campus to enhance biodiversity and improve air quality.

Waste Management Enhancements

- Implement comprehensive recycling programmes to minimise waste.
- Promote the reduction of single-use plastics on campus.
- Ensure proper segregation of waste at the source to facilitate recycling and composting.

Water conservation measures

- Expand rainwater harvesting systems across the campus.
- Promote water-saving practices among the campus community through awareness campaigns.

Energy Efficiency Improvements

- Retrofit existing buildings with energy-efficient materials and systems, such as LED lighting and energy-efficient appliances.
- Conduct regular energy audits to identify and implement further energy-saving measures.

Environmental education and awareness

- Integrate environmental education into the curriculum across various disciplines.
- Organise workshops, seminars, and guest lectures on environmental topics.
- Encourage student participation in eco-clubs and environmental projects.

Community Outreach and Collaboration

- Collaborate with local environmental organisations and government bodies on sustainability initiatives.
- Organise outreach programmes to educate neighbouring communities about environmental conservation and sustainable practices.

Sustainable Infrastructure Development

- Pursue green building certifications for new construction to ensure they meet high sustainability standards.
- Incorporate sustainable design principles into all new infrastructure projects.

Research and Innovation in Environmental Science

- Establish research centres focused on environmental studies and sustainability.
- Encourage the publication of research findings in reputed journals and participation in conferences.

Regular review and feedback mechanisms

- Conduct regular reviews of all green initiatives to assess progress and identify areas for improvement.
- Gather feedback from students, staff, and other stakeholders to enhance the effectiveness of sustainability efforts.

By implementing these recommendations, Banwarilal Bhalotia College can strengthen its commitment to sustainability, reduce its environmental impact, and serve as a model for other educational institutions in promoting green practices.

"Our task must be to free ourselves, to embrace all living creatures and the whole of nature and its beauty."



CHAPTER 5

Exit Meeting

The exit meeting was conducted by the members of the Green Audit Committee in the presence of Dr. Amitava Basu, Principal, Banwarilal Bhalotia College. This meeting paved the way to develop broad, preliminary findings and present the draft report to the management and staff of the college. The exit meeting was held in the college on 10th April, 2024.

Draft Audit Report

The material acquired was aggregated and written up as a preliminary audit report. The goal was to verify the report's accuracy. The draft green audit report was also discussed during the exit meeting.

Final Audit Report

The final audit report is the corrected final document which contains the findings and recommendations of the audit. This was submitted on 17th July, 2024 to the Principal of the college.

Follow up and Action Plans

Green audits form a part of an on-going process. Innovative green initiatives have to be designed and implemented every year to make the college environmentally sustainable.

Next Audit

In order to promote continuous improvement it is recommended to conduct the next green auditing during the year 2024-25.

Photographs



Photographs





Thank you