GREEN , ENERGY & ENVIRONMENT AUDIT REPORT

2022-2023

BANGABASI EVENING COLLEGE

REPORT PREPARED BY

INSTITUTE OF NATURE RESEARCH AND CONSERVATION (INRC)

INSTITUTE OF NATURE RESEARCH AND CONSERVATION

SATYEN BOSE ROAD, BASUDEBPUR,
P.O.- BANIPUR, P.S.- SANKRAIL,
DIST.- HOWRAH, PIN- 711304,
WEST BENGAL, INDIA
website: www.inrc-india.org

Mob. No.: 7003988808/
7076154284
Email: inrc.org@gmail.com
Registration Number: 190100239/2023

Reference No: *Date-12/12/23*

GREEN, ENVIRONMENT AND ENERGY AUDIT CERTIFICATE

ACADEMIC YEAR 2022-2023

This is to certify that Bangabasi Evening College, located at 19 Rajkumar Chakraborty Sarani ,Kolkata-700009, West Bengal, has steadfastly strived to establish a robust and ecologically sustainable environment, dedicated to the preservation of nature and biodiversity. Institute of Nature Research and Conservation (INRC) expresses satisfaction following the successful completion of the Green, Environment, and Energy Audit for the academic year 2022-2023.

This accomplishment has been made possible through the active and moral support extended by the Honorable Principal, the IQAC Team, the dedicated teaching and support staff, and the enthusiastic student body of Bangabasi Evening College. Their collective efforts have significantly contributed to the creation of a positive and eco-friendly atmosphere on the campus.

The commitment demonstrated by both faculty and students towards environmental improvement and the conservation of biodiversity is truly commendable. This proactive approach aligns with the highest standards of ecological stewardship, reflecting a genuine dedication to sustainable practices.

This certificate serves as recognition for the outstanding efforts undertaken by Bangabasi Evening College to foster a healthier and more environmentally conscious campus. We applaud their commitment to creating a positive impact on the environment and encourage the continuation of such admirable initiatives in the future.

DR. SUMIT MANNA
Lead Auditor EMS
UIN: 840180406937
INRC

Secretary
INRC
Satyen Bose Road, Sankrail
Howrah, W.B., 711304

DR. AMIT MANNA
Lead Auditor EnMS
UIN: 292286787454
VICE PRESIDENT
INRC

Vice-President
INRC
Satyen Bose Road, Sankrail
Howrah, W.B., 711304

INRC Satyen Bose Road, Sankrail, Howrah, W.B., 711304
Reg. No.- 0239/2023

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ACKNOWLEDGEMENT

The Green, Environment, and Energy Audit Team of Institute of Nature Research and Conservation (INRC) extend their deepest gratitude to the management of Bangabasi Evening College for entrusting us with the significant task of conducting a Green & Environmental audit. We would like to express our sincere appreciation to the Principal Dr. Sanjib Chattopadhyay of Bangabasi Evening College for their support.

We are grateful for the collaboration extended to our team during the course of this study, and for the valuable inputs provided to facilitate our audit activities. Special thanks are also due to the IQAC members, teaching staff, and supporting non-teaching staff, whose dedicated involvement has been instrumental in the successful execution of this project.

AREAS OF CONCERN

GREEN AUDIT

- Floral Diversity
- Faunal Diversity

ENVIRONMENT AUDIT

- Water Management
- Waste Management
- Air quality
- carbon footprint
- e-waste management
-

ENERGY AUDIT

- Energy consumption
- Energy management

RECOMMANDATIONS

- To reduce energy consumption and management
- Find out potential areas for environment management and green development
- Reduce biodiversity loss

- Find out potential areas for increase species richness in the campus

A comprehensive audit was conducted by a committee comprising experts and scientists from various reputable institutes. The committee formulated a questionnaire for the audit, aligning it with both central and state regulatory requirements. Gathering and compiling essential data, the committee meticulously analysed it.

Overall, the audit findings indicate a favourable environmental status within the Bangabasi Evening College campus. The committee has put forward both short-term and long-term recommendations aimed at enhancing environmental conditions to higher standards. The college authorities and all stakeholders have expressed their commitment to giving due attention to these recommendations and leveraging opportunities for the identified improvements.

AUDIT COMMITTEE MEMBERS

An expert committee of 3 members was formed to conduct the Green, Environment and Energy Audit from different field of expertization such as Biodiversity, Taxonomy, Physics (Energy Science and management) and Conservation Biology.

The Committee members are listed below:

SL No.	NAME	Area in interest	Designation
1.	Dr. Sumit Manna	Ecology, Environment, Biodiversity Economics and Conservation	Assistant Professor HOD. Dept. of Botany and IQAC coordinator Moyna College And Secretary Auditor INRC
2.	Dr. Amit Manna	Energy management, green synthesis of Nano particle and characterization, Spectroscopic analysis	Vice President Institute of Nature Research and Conservation & Former Project Scientist Spectroscopic Analysis Team NASA
3.	Prof. Nilanjan Sadhukhan	Molecular Taxonomy and Biodiversity	Faculty, Dept of Botany Moyna College

The Audit team started the audit at the Bangabasi Evening College Campus from 18st April, 2023

Important dates and of Initiative

SL NO	PURPOSE	DATE	REMARKS
1	Communication with College authority	April 18, 2023	Discuss about term and condition
3	Collection information about the College	April19, 2023	Introduced to Administrative Officer
4	Campus visit and observation	April 30, 2023	Outdoor observation with Photo camera and GPS coordinates
5	Campus enquiry	April 30, 2023	Physically enquiry with expert
6	Departments visit and enquiry	May 4, 2023	Laboratory enquiry
7	Interview with other stake holder	May 4, 2023	Meet with others stake holder
8	Interview with staff	May 4, 2023	Collected different information
9	Review data and Assessment	May 22, 2023	Data generate and drown figures
10	Pre-Closing meeting	May 22, 2023	Meeting with IQAC
11	Closing Meeting	September 15, 2023	Pre-submission of the Report
12	Submit audit report	December 12, 2023	Submit of the Report

ABOUT THE BANGABASI EVENING COLLEGE

Principal Prasanta Kumar Bose, the esteemed descendant of Acharya Girish Chandra Bose, the visionary founder of Bangabasi College and a renowned educator in Bengal, established the evening section of Bangabasi College in 1940 with a focus on Commerce education for employed students in need.

In 1944, Principal Bose expanded the college's offerings to include Arts and Science faculties during evening hours, and notably welcomed employed women as students. With the implementation of the Phase Reduction Scheme by the University Grants Commission, Bangabasi Evening College gained independent status on April 11, 1965, under Principal Prasanta Kumar Bose's guidance. This separation was part of a larger effort to comply with the reduction of student numbers mandated by the University Grants Commission, which led to Bangabasi College being divided into three separate entities. The evening section was designated as Bangabasi Evening College, operating under a distinct Governing Body.

During World War II, a branch of Bangabasi College was established in Kushtia (now in Bangladesh) in 1942, offering refuge to Kolkata residents amidst Japanese bombing raids. However, it ceased operations after the war.

Located near Sealdah Station in Kolkata, Bangabasi Evening College is steeped in a rich cultural heritage, tracing its origins to Bangabasi School founded by Acharya Girish Chandra Bose in 1855. The college relocated to its current site at 19, Scott Lane (now Raj Kumar Chakraborty Sarani) in 1903.

The college's name is derived from the patriotic newspaper Bangabasi, founded by Acharya Girish Chandra Bose in 1887 at 16, Bowbazar Street. With just five teachers and twelve students, this institution, nurtured by Bose's visionary zeal, has grown into a formidable educational establishment, providing education to thousands of deserving students, employing hundreds of dedicated teachers and staff.

During the colonial era, Bangabasi College served as a sanctuary for those persecuted for their political beliefs, with students and faculty actively participating in movements against the partition of Bengal in 1905 and the Civil Disobedience Movement. Notable educators such as Ladly Mohan Mitra and Satyananda Roy pioneered evening classes at Bangabasi Evening College, extending educational opportunities to working students who were unable to attend daytime classes due to employment obligations.

ACADEMIC DEPARTMENTS

SL NO	Department of Arts	Department of Science	Department of Commerce
1	Bengali	Anthropology	Commerce
2	English	Botany	
3	Geography	Chemistry	
4	Hindi	Economics	
5	History	Mathematics	
	Philosophy	Physiology	
	Political Science	Physics	
	Sanskrit	Zoology	

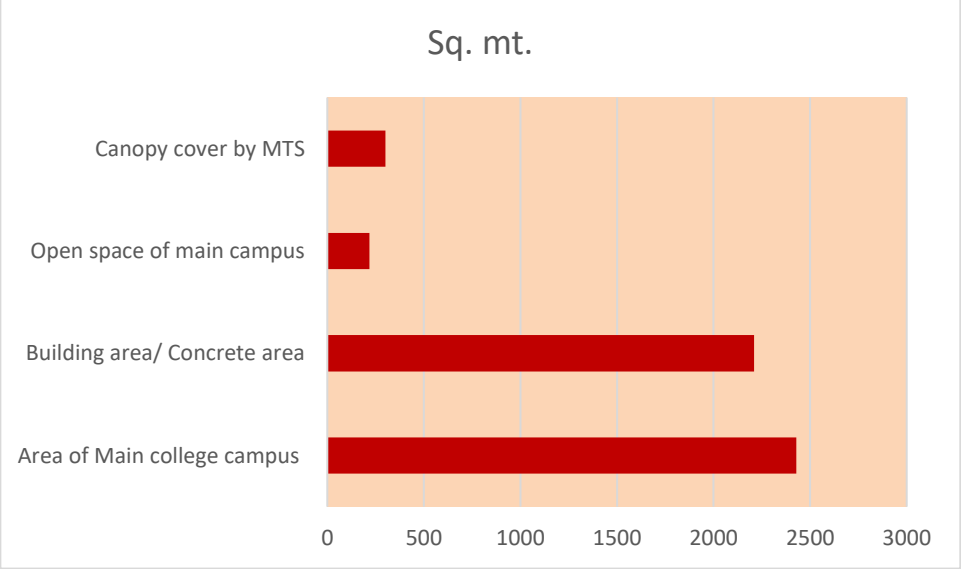
CLASSIFICATION AND AREA OF COVERAGE COLLEGE CAMPUS

Arial View of the main Campus of Bangabasi Evening College depicting the Canopy cover, concrete and building Areas. (Canopy cover 301.66 m^2). 22°34'09"N 88°22'05"E, E 29 M

Playground and Tent area of Bangabasi Evening College

Area distribution and area use pattern of Bangabasi Evening College

Area	Sq. mt.
Area of Main college campus	**2428.123**
Building area/ Concrete area	2209.58
Open space of main campus	218.543
Canopy cover by MTS	301.66



Apart from the area of main campus, Bangabasi Evening College have also the permission to use the playground and a tent for the players near Kolkata Maidan area.

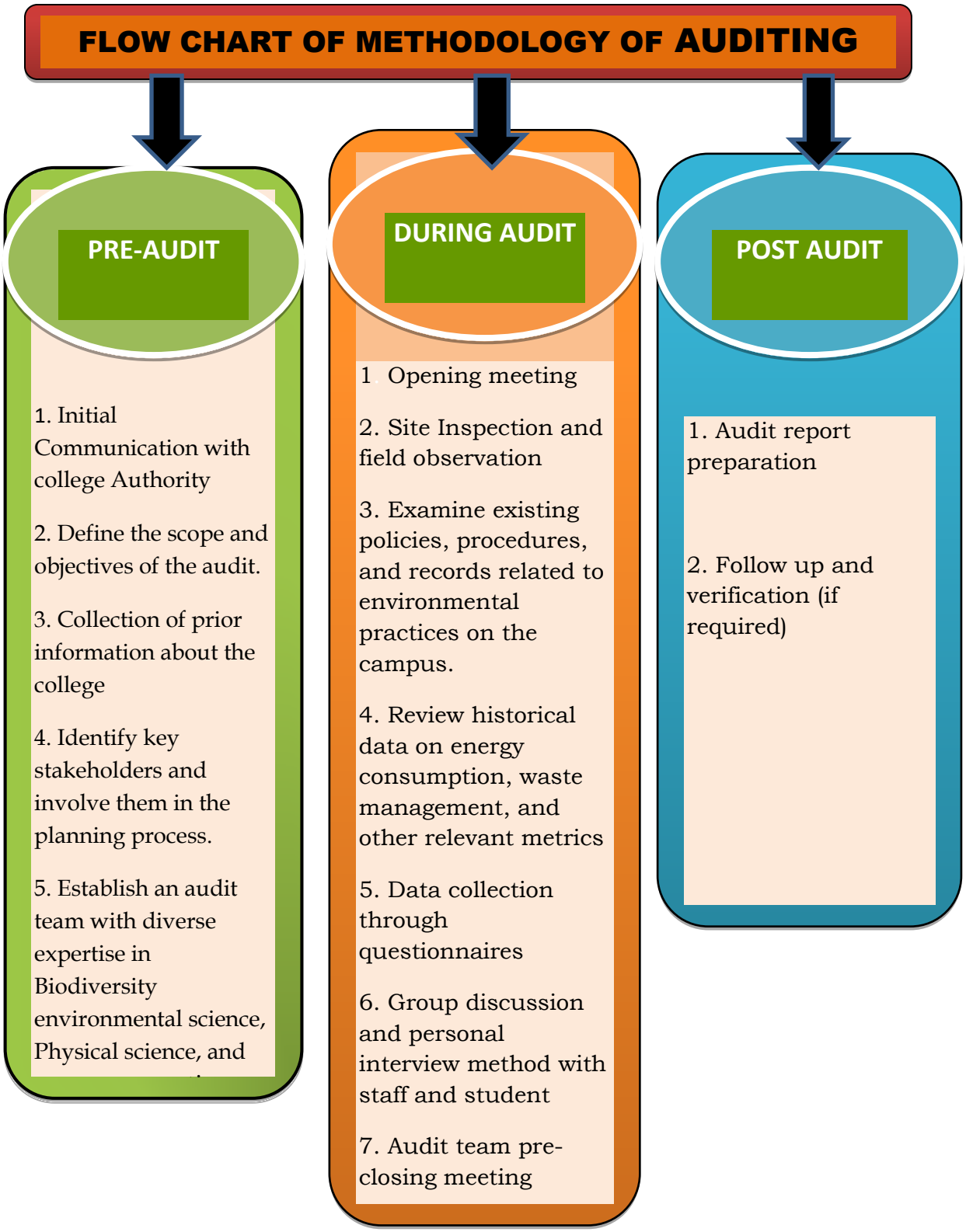
PURPOSE OF GREEN AND ENVIRONMENT AND ENERGY AUDIT

Purpose of Green and Environmental Auditing

- **Environmental Compliance**: Ensure adherence to local, regional, and national environmental laws, covering waste disposal, energy usage, and other pertinent regulations.
- Resource Management: Assess the efficient utilization of resources on campus, including water, energy, and materials. Identify avenues for conservation and sustainable resource allocation.
- **Waste Reduction and Recycling**: Evaluate waste management protocols and advocate for measures to minimize waste production. Identify opportunities for recycling and appropriate waste disposal.
- **Energy Efficiency**: Analyze campus energy consumption patterns and propose strategies to enhance efficiency, including the adoption of renewable energy sources.
- **Biodiversity and Green Spaces**: Evaluate the impact of campus expansion on local biodiversity. Promote the establishment and preservation of green areas, gardens, and natural habitats.
- **Transportation and Commuting**: Assess the environmental impact of campus transportation. Encourage sustainable commuting options to reduce carbon emissions.
- **Curriculum Integration**: Incorporate environmental and sustainability themes into academic programs. Cultivate awareness and understanding of environmental issues among students and faculty.
- **Community Engagement**: Engage the campus community in environmental initiatives and educational campaigns. Foster a culture of environmental stewardship among students, faculty, and staff.
- **Infrastructure Development**: Ensure new construction and development projects adhere to green building standards and sustainable design principles.
- **Climate Change Mitigation**: Identify strategies to mitigate the college's contribution to climate change, including reducing greenhouse gas emissions and implementing carbon reduction measures.
- **Cost Savings**: Identify cost-effective strategies to improve environmental performance, leading to long-term financial savings through energy efficiency, waste reduction, and sustainable practices.
- **Institutional Reputation**: Enhance the college's reputation as an environmentally conscious institution, positively influencing enrollment, partnerships, and community relationships.
- **Regulatory and Funding Compliance**: Ensure alignment with environmental regulations and explore opportunities for funding through environmentally friendly initiatives

Purpose of Energy Auditing

- In any organization, the top three operational expenses typically revolve around energy (both electricity and heating), labor, and materials. When analyzing these costs or potential savings, energy consistently stands out as a key factor, making energy management a critical area for cost reduction.
- An Energy Audit plays a vital role in understanding how energy and fuel are utilized within an institution, identifying areas where waste occurs and opportunities for improvement. It offers valuable insights that support efforts to reduce energy costs, enhance preventive maintenance, and improve quality control programs, all crucial for production and utility operations.
- This audit program allows for a focused examination of energy cost fluctuations, the reliability of energy supply, decisions regarding energy sources, identification of energy-saving technologies, and upgrading to energy-efficient equipment. Essentially, the Energy Audit translates conservation concepts into practical solutions, providing technically feasible recommendations while considering economic and organizational factors within a specified timeframe.
- The primary goal is to develop strategies for reducing energy consumption per unit of output or decreasing operational expenses. Acting as a benchmark, the Energy Audit establishes a reference point for managing energy within the organization and serves as the foundation for more efficient energy utilization planning across the entire institution.
- The eco-campus concept emphasizes efficient energy utilization and conservation, striving for sustainable savings. It also aims to reduce carbon emissions, calculate carbon footprints, endorse the procurement of energy-efficient equipment for cost-effective and reliable energy supply, promote energy conservation in all buildings, decrease overall energy consumption, minimize landfill waste, and integrate environmental considerations into contracts and services with significant environmental impacts.
- Examining Energy Management through audits focuses on energy savings and potential opportunities. While energy itself is intangible, its effects are observable through heat, light, and power in wires, pipes, and other materials.
- Energy management indicators cover aspects such as energy consumption, sources, monitoring, lighting, vehicle usage, electrical appliances, and transportation. Energy usage is a fundamental aspect of campus sustainability and is assessed accordingly without further elaboration.
- Despite the widespread use of energy, attention to energy-saving options remains essential. For example, a standard incandescent bulb consumes 60W to 100W, while an energy-efficient LED bulb uses less than 10W, highlighting the significant impact on energy savings. Energy auditing is crucial for conservation efforts and implementing measures to reduce consumption, thereby mitigating environmental harm.


FLOW CHART OF METHODOLOGY OF AUDITING
PRE-AUDIT
1. Initial Communication with college Authority
2. Define the scope and objectives of the audit.
3. Collection of prior information about the college
4. Identify key stakeholders and involve them in the planning process.
5. Establish an audit team with diverse expertise in Biodiversity environmental science, Physical science, and
DURING AUDIT
1. Opening meeting
2. Site Inspection and field observation
3. Examine existing policies, procedures, and records related to environmental practices on the campus.
4. Review historical data on energy consumption, waste management, and other relevant metrics
5. Data collection through questionnaires
6. Group discussion and personal interview method with staff and student
7. Audit team pre-closing meeting
POST AUDIT
1. Audit report preparation
2. Follow up and verification (if required)

Site Visit:

- We conducted a comprehensive tour of the campus to observe and document various environmental aspects, including waste disposal sites, energy infrastructure, green areas, and water management systems.
- We documented the plant biodiversity on campus, identifying and photographing different floral and faunal species. Additionally, we inspected areas such as the medicinal garden, canteen, library, all departments, office spaces, buildings, and parking lots to gather data.
- We recorded the air quality at different points of the college e.g. different class rooms, office, Principal chamber, corridor, open space, canteen, students common room, seminar room and from different laboratories too.
- We recorded the number and types of vehicles used by stakeholders and verified the fuel consumption of each vehicle in consultation with users. We also counted the usage of LPG cylinders in laboratories, the canteen, and hostel kitchens.
- We conducted a thorough inspection of water taps, identifying a few leaky taps and overflowing tanks during the site visit.

Different types of Survey are conducted in College Campus:

- **Building Energy Assessment:**

  Study energy usage patterns across various campus buildings.

  Suggest ways to conserve energy and improve efficiency.

- **Water Resource Management Analysis:**

  Review water sources, usage trends, and wastewater treatment facilities.

  Offer strategies for water conservation and promoting sustainable water practices.

- **Waste Handling Evaluation:**

  Examine waste generation and disposal methods.

Recommend approaches to minimize waste, promote recycling, and ensure proper disposal.

- **Commuting and Transportation Review:**

  Analyze travel behaviors of students and faculty.

  Propose eco-friendly transportation alternatives and enhancements to transportation infrastructure.

- **Greenery and Biodiversity Inspection:**

  Assess the state of green spaces, gardens, and natural habitats.

  Provide suggestions to enrich biodiversity and safeguard green areas.

- **Environmental Education and Awareness Assessment:**

  Evaluate the integration of environmental topics into academic programs.

  Assess the level of environmental consciousness among students and faculty.

- **Sustainability Features Examination in Development Projects:**

  Review the eco-friendly aspects of upcoming construction endeavors.

- **Community Involvement Survey:**

  Assess community engagement in environmental projects.

  Gather input from campus residents on environmental awareness efforts.

- **Compliance Verification with Environmental Regulations:**

  Ensure adherence to environmental laws and guidelines.

  Identify areas requiring adjustments to meet regulatory standards.

Steps of data collection:

- Initially, the audit team split into two factions. The adept members of the first faction commenced data collection for energy audit, while those of the second and third factions began gathering data for green and environmental audits.

- Each faction's members traversed the entirety of the college campus, including the gardens, canteen, kitchen, library, and each department along with their respective laboratories.
- A comprehensive questionnaire was devised and circulated to cover all aspects of green, environmental, and energy audits, which was distributed to stakeholders to procure data prior to the visit.
- All information and data were gathered through observations, personal interviews, and group discussions with various stakeholders.
- The assessment of various environmental parameters across different points of the college premises was conducted using various electronic devices such as atmospheric TVOC and HCOC meter, different SPM level (PM 1, PM 2.5 and MP 10) measuring meter, water TDS meters, water Salinity meter, etc., and measurements were recorded.

Data Analysis:

- Calculation of green area, concrete area, and aquatic land in the college campus.
- Calculation of DBH and F% of different MTS.
- Analysis of Biodiversity and taxonomic diversity.
- Calculation of energy consumption and energy generation from renewable energy sources.
- Analysis of ground water and rain water storage procedure and reused
- Waste generation & disposal arrangements.
- Measurement of air quality level along with TVOC, HCOC level at different location (Principal room, teachers' room, office, class rooms, Laboratory, canteen and open space) of the college campus.
- Calculation of Biodiversity index in the campus using standard indices.
- Measurement of TDS, Salinity of water of the and tank and filter were taken into account from different point of the college campus.

Bngabasi Evening College stands as a venerable institution dedicated to academic excellence and holistic development. The college recognizes the pressing need to align its operations with sustainable practices. In this pursuit, the initiation of a Green Audit has emerged as a pivotal step towards fostering environmental responsibility and resilience.

GREEN AUDIT

IMPORTANCE OF GREEN AUDIT AT BANGABASI EVENING COLLEGE:

The significance of a Green Audit at Bangabasi Evening College is immense in today's global scenario. As communities around the world face the challenges of climate change, dwindling resources, and environmental harm, educational institutions have a pivotal role in fostering sustainable attitudes and actions. Bangabasi Evening College, as a hub of knowledge and societal impact, recognizes the importance of this duty.

The Green Audit acts as a thorough evaluation tool that examines the college's environmental footprint, resource consumption, waste management, and overall ecological impact. Through this detailed analysis, the college seeks to pinpoint areas needing improvement and adopt sustainable practices in line with its dedication to environmental care.

Moreover, the Green Audit at Bangabasi Evening College transcends mere regulatory compliance; it acts as a driving force in promoting environmental consciousness among students, faculty, and staff. By embedding sustainable practices into the institution's core values, the college not only supports the global sustainability movement but also nurtures a sense of environmental responsibility within its community

METHODOLOGY ADAPDTED FOR GREEN AUDIT

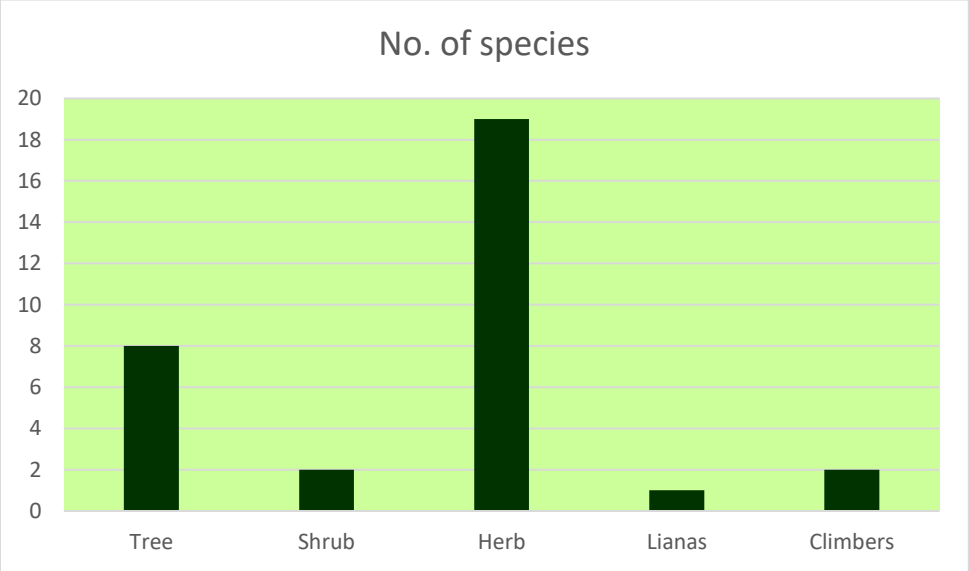
The Green Audit team has surveyed the college campus and recorded all the biodiversity components *i.e.* flora and fauna in the campus of Bangabasi Evening College. Species were

identified on the spot and specimen was collected where farther identification is needed. Most of the existed species were photographed on the field. Flora has been categorized into Major Tree species (MTS), Shrubs, herbs. Insects, soil fauna, Butterfly, Dragon fly, Birds, amphibians, reptilians and mammals were sited and identified during the field visit.

Floral diversity at the campus of Bangabasi Evening College

A total of 31 species of flowering plants and 1 pteridophyte has been recorded during the study out of which 8 species were considered as Major Tree Species (MTS), 2 species belong from shrubs, 19 species from herbs, 2 species from climbers and 1species was considered as liana. Out of 32 species 44% plants species have medicinal potentiality, as evidenced by published literature (Fig. 1).

Fig.1 Classification of flora of Bangabasi Evening College based on habit



It is interesting to note that all the 8 species of MTS belong from 7 different taxonomic families which represents that the taxonomic diversity of the college campus was moderately high (Table 1). As the open area in the college campus is very low, most of the MTS (*Mangifera indica*, *Azadirachta indica* and *Citrus maxima*) were found to be distributed

in this small open space in a highly competitive environment. Other were found to be occur either in pot or on the Cornish of the buildings.

Table 1. Diversity of Major Tree Species (MTS) in the Campus of Bangabasi Evening College

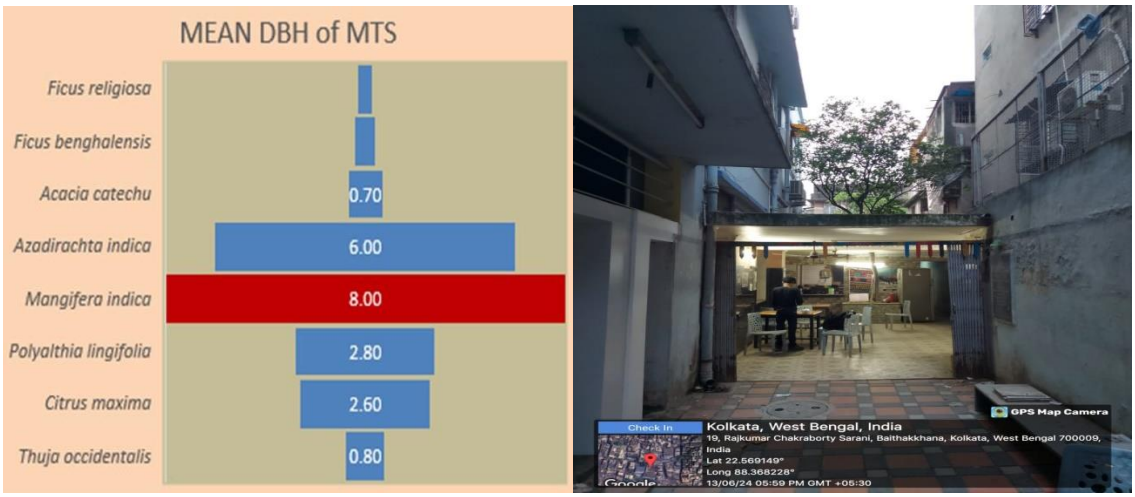
MTS	Family	No. of individuals	Mean DBH (ft.)	Phenological condition	Canopy cover	F %
Ficus religiosa	Moraceae	3	0.30	3 IM	VL	17.647
Ficus benghalensis	Moraceae	3	0.40	3 IM	VL	17.647
Acacia catechu	Fabaceae	1	0.70	1 M	VL	5.882
Azadirachta indica	Meliaceae	1	6.00	1 M	H	5.882
Mangifera indica	Anacardiaceae	1	8.00	1 M	VH	5.882
Polyalthia longifolia	Arecaceae	6	2.80	6 M	M	35.294
Citrus maxima	Rutaceae	1	2.60	1 M	M	5.882
Thuja occidentalis	Cupressaceae	1	0.80	1 M	L	5.882

VL: Very low, L: Low, M: Medium, H: High, VH: Very high

Most of these MTS are arborescent except 2 under tree species. *Mangifera Indica* is the most dominant species followed by *Azadirachta indica* contribute maximum green canopy of the college campus. Though the species such as *Ficus religiosa* and *Ficus benghalensis* are arborescent in nature, they were found to be grown in Cornish of the buildings. An extension of the building of the canteen area was noted without sacrificing a large MTS. *i.e. Citrus maxima* which reflects the positive attitude towards campus biodiversity of different stockholders including college authority. Six individuals of *Polyalthia longifolia*were found to be grown at the front of the campus (though planted). A great initiative by the college authority was noted.

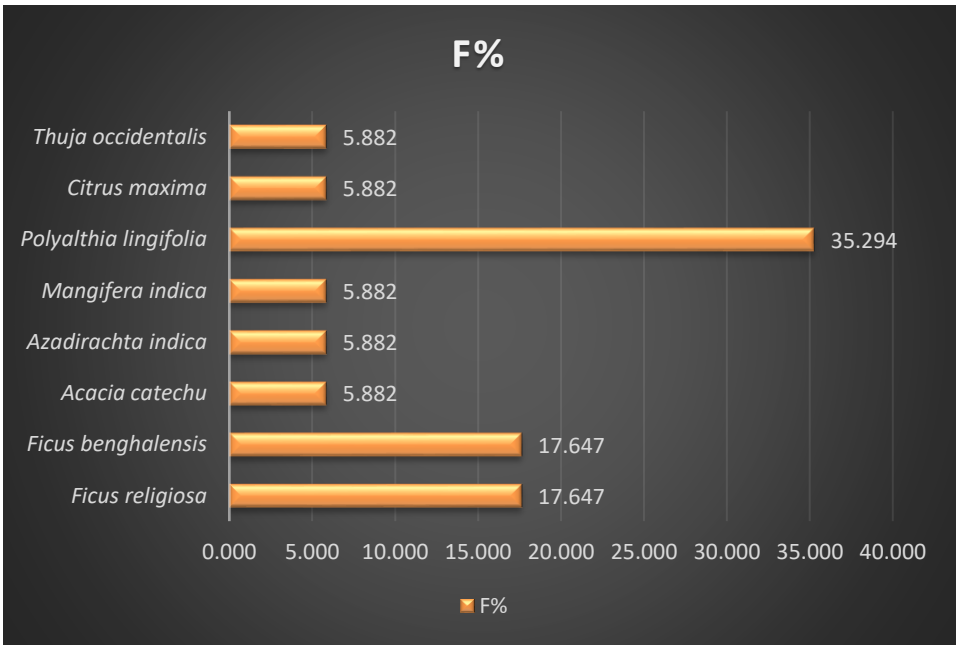
Out of these 8 MTS *Mangifera Indica* has shown its highest diameter at breast Height (DBH) (8 ft.) followed by *Azadirachta indica* (6 ft) (Fig. 2).

Figure 2. Mean DBH of the MTS



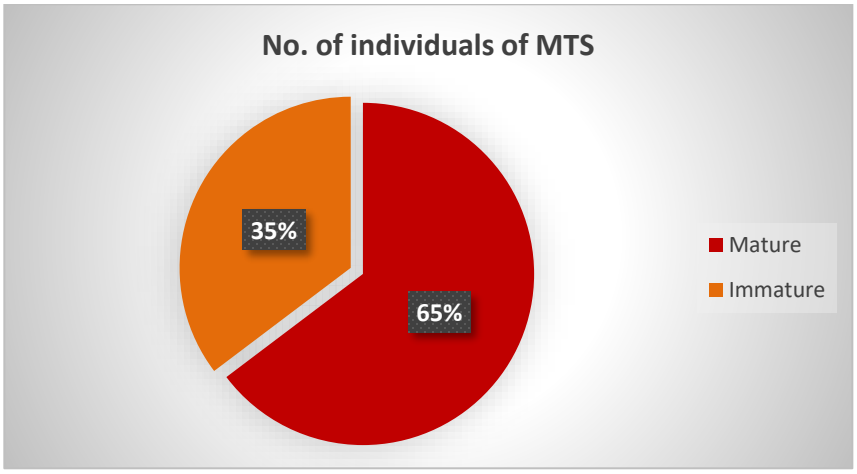
When the frequency percentage of these MTS was calculated it was observed that the F% of *Polyalthia longifolia* (35.294 %) was highest (Though planted) followed by *Ficus religiosa* and *Ficus benghalensis* (Fig. 3).

Figure 2. Frequency percentage of different Major Tree Species (MTS)



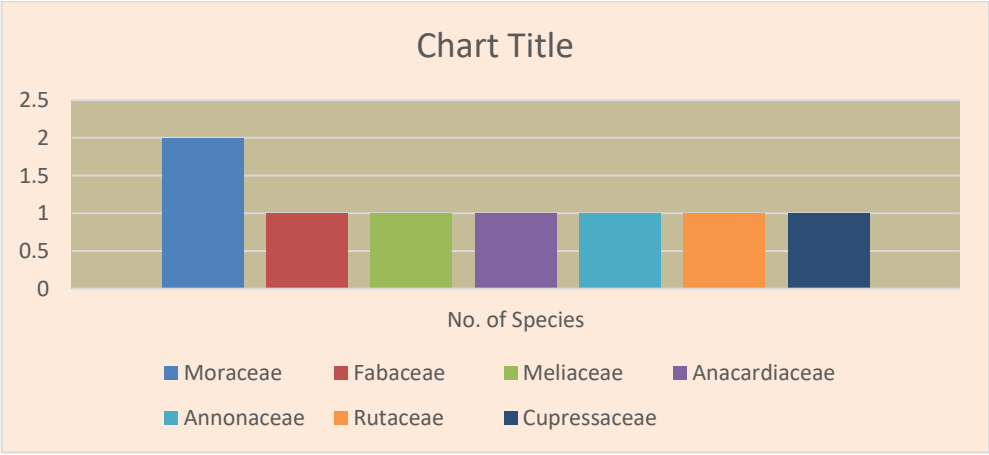
It was noted that 65 % of the MTS achieved their phenological stage which represents that the MTS community is considerable mature and causes high carbon sequestration and their control over different niche of the ecosystem. Specifically, the two species *i.e. Azadirachta indica* and *Mangifera indica* provide a diverse habitat for different kinds of insects, birds and other organisms (Fig 4).

Figure 4. Phenological status of different MTS



Out of 7 taxonomic families on which these 8 MTS belongs from, Moraceae is the family dominant family (2 species of MTS belongs from this family). One species from each was found to be belonged from the rest of the 6 families of MTS (Fig 5).

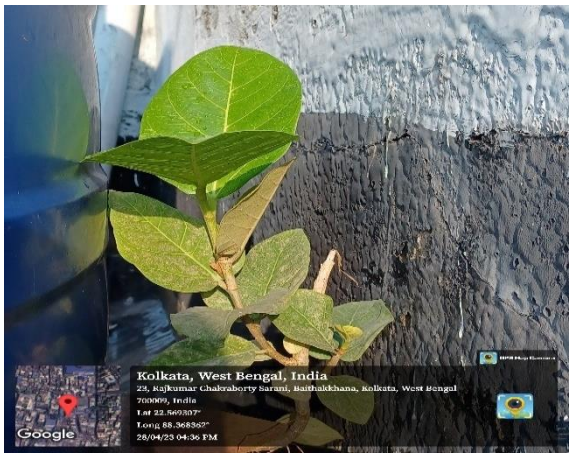
Figure 5. Number of Genus under different Taxonomic Family



Considering the species richness and evenness when the Simpson's Diversity Index of the MTS was calculated using the formula (EQ-1)

$$\mathbf{D = 1 - (\sum n(n-1)/N(N-1))} \ldots\ldots\ldots\ldots\ldots\ldots\ldots \text{(EQ-1)}$$

It was observed that the diversity of MTS in the campus of Bangabasi Evening College was not very high (**D =0.036**). As the college is situated at a very congested urban settlement of the mega city (Kolkata), there is very constrains of open spaces for arborescent trees.



Ficus benghalensis

Azadirachta indica and *Mangifera indica*

Canopy cover by MTS at Bangabasi Evening College, Kolkata

Diversity of Shrubs, Herbs, Climbers and Lianas in the Bangabasi Evening College Campus

A total of 24 species of Shrubs, Herbs, Climbers and Lianas were recorded from College Campus which were found to be distributed from 20 different taxonomic families (Table 2). Among these plants *Lindenbergia muraria,* and *Pouzolzia zeylanica* were the most dominant species. Though most of these herbs and shrubs were found to be grown in pot, and Cornish of the buildings.

Table 2 Diversity and use of herbs, shrubs, climbers and trees in the college campus

Herbs Shrubs, Climbers and lianas	Family	Habit	Use as/Use in
Scoparia dulcis	Plantaginaceae	Herb	Medicinal
Aloe vera	Asparagaceae	Herb	Medicinal
Mentha spicata	Lamiaceae	Herb	Medicinal
Pteris sp.	Pteridoideae	Pteridophyt (Herb)	Wild
Sansevieria trifasciata	Asparagaceae.	Herb	Medicinal
Dracena sp	Asparagaceae	Herb	Ornamental
Ocimum sanctum	Lamiaceae	Herb	Medicinal
Rhoeo discolor	Commelinaceae	Herb	Ornamental
Lindenbergia muraria	Orobanchaceae	Herb	Medicinal
Kyllinga brevifolia	Cyperaceae	Herb (Grass)	Wild
Achyranthes aspera	Amaranthaceae	Herb	Wild
Digitaria sanguinalis	Poaceae	Herb (Grass)	Wild
Turneria ulmifolia	Passifloraceae	Shrub	Medicinal
Pouzolzia zeylanica	Urticaceae	Herb	Wild
Brassica nigra	Brassicaceae	Herb	Economic important
Catharanthus roseus	Apocynaceae	Herb	Medicinal, Ornamental
Phyllanthus niruri	Euphorbiaceae	Herb	Medicinal

Kalanchoe pinnata	Crassulaceae	Herb	Medicinal, Ornamental
Epipremnum aureum	Araceae	Climber	Ornamental
Crinum viviparum	Amaryllidaceae	Herb	Ornamental, Medicinal
Colocasia esculenta	Araceae	Herb	Ornamental
Quisqualis indica	Combretaceae	Lianas	Ornamental
Hibiscus rosa sinensis	Malvaceae	Shrub	Ornamental
Mikania scandens	Asteraceae	Climber	Medicinal, Alien invasive

Turneria ulmifolia

Aloe vera, Ficus religiosa and *Mentha spicata*

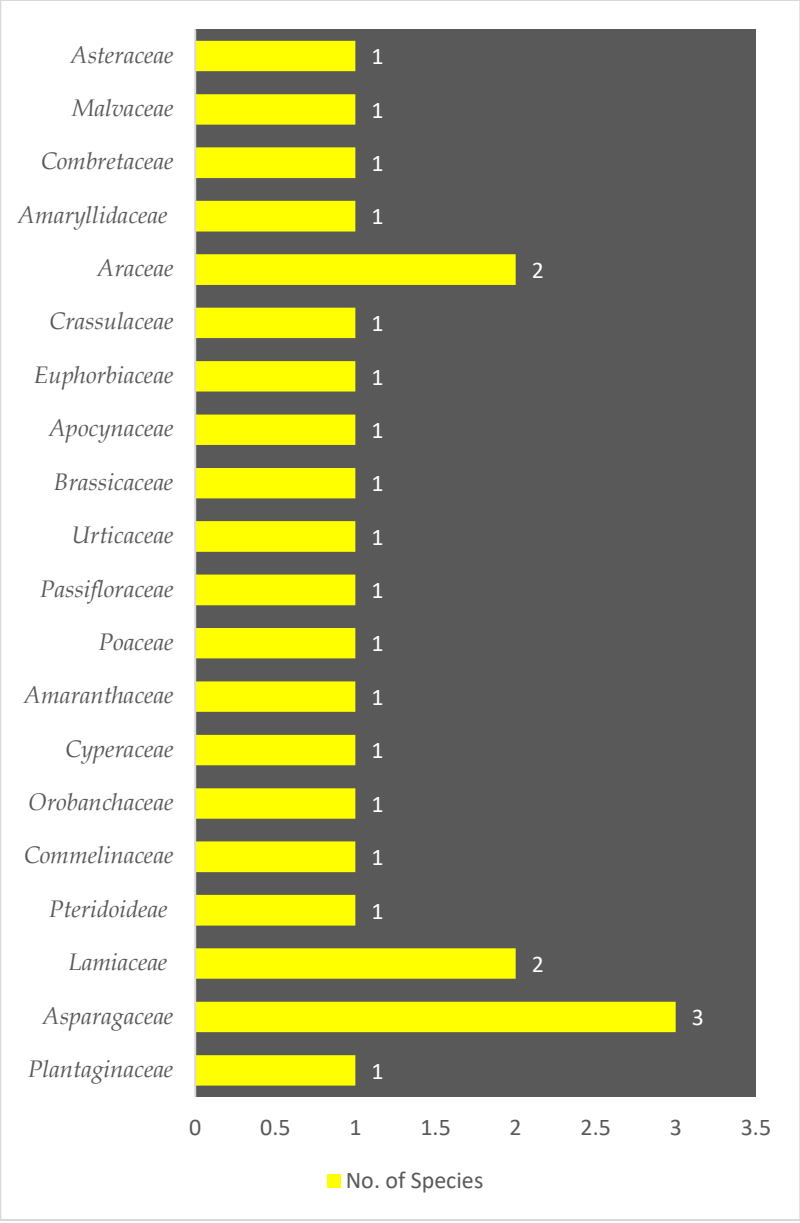
Kyllinga brevifolia

Scoparia dulcis

Catharanthus roseus

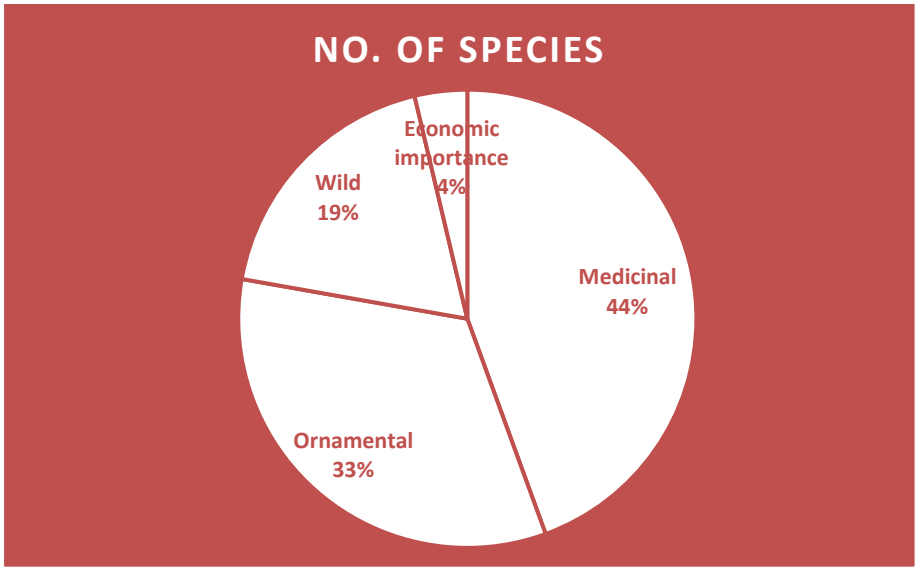
Out of these 20 taxonomic families Asperagaceae is the most dominant family (3 species belonged from this family) followed by Araceae and Lamiaceae (2 species belonged from each of these two families). Rest of the families contain 1 species each (Fig. 6).

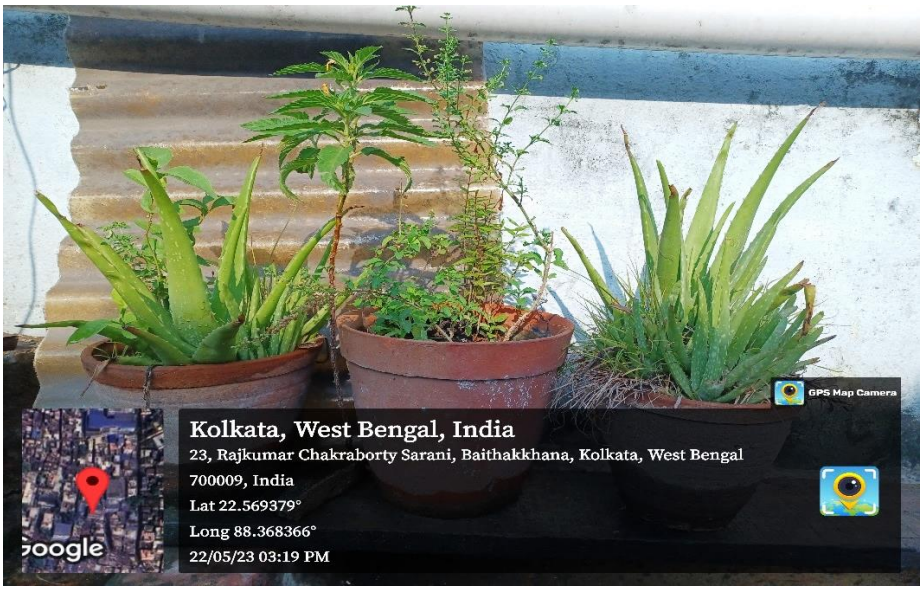
Fig. 6 Dominance of different taxonomic families



Out of these 24 species of herbs, shrubs climbers and trees present in the Bangabasi Evening College Campus, 44% were have medicinal properties, 33% were ornamental, 19% of them were found to be grown in wild fallow lands and 4% have economic importance (Fig. 7).

Fig. 7 Use pattern of different plant species present in the college campus





Aloe vera, Scoparia dulsis and *Turneria ulmifolia* grown on pot

Faunal diversity at the campus of Bangabasi Evening College

As the college is situated at the most congested area of Calcutta, there is no such wild habitat present in the college campus. Here in this green audit the total fauna of the college campus has been categorized into **1. Soil fauna, 2. Fauna on and within wooden furniture, wooden stairs Cupboards, and wooden walls & in books 3. Butterflies, Moth, Dragon flies and other flies 4. Birds and 5. Mammals.**

In case of soil fauna, a total of three species each of Nematodes, Anilids, Milipede, Snails and Protura; four species each from Collembola and Dipleura were recorded. Apart from that Soil Arthropods, Centepede, Dung-beetle, Crickets, red and black ants, Termites, Wall-lizard, Burrowing Skinks, Garden-lizard, Skink a Shrews were also noted from the soil of the college campus (Table 1).

The diverse array of soil fauna detailed in the table highlights the intricate web of life that sustains soil health and ecosystem functionality. From nematodes and annelids to soil arthropods, insects, and reptiles, each group plays a vital role in processes such as decomposition, nutrient cycling, and soil aeration. This biodiversity is crucial for maintaining fertile and productive soils, which are foundational to both natural ecosystems and agricultural systems.

Understanding and preserving the diversity of soil fauna is essential for sustainable land management and environmental conservation. As these organisms collectively contribute to soil structure, fertility, and overall ecosystem health, their protection and study should be prioritized. This knowledge can inform practices that enhance soil quality, support biodiversity, and ensure the resilience of ecosystems in the face of environmental challenges.

Table 1. Soil Fauna of Bangabasi Evening College

Soil Fauna: Types and common name	Name of the Family/Genus/Species
Nematodes	*Meloidogyne ssp.*
	Heterodera ssp.
	Globodera ssp.
Anilids	*Metaphire postuma*
	Lampito mauritii
	Eutyphoeus incommodus
Soil Arthropods	*Oniscus asellus*
Insects: Spring-tails or Collembola:	*Orchisella sp.*
	Hypogastrura nivalis
	Sira buskii
	Cephalotoma grandiceps
Dipleura	Family: Campodeidae
	Family: Octostigmatidae
	Family:Dinjapygidae
	Family: Campodeidae
Millipede	*Stemmiulus vagans*
	Nopoiulus kochii
	Anaulaciulus acaudatus
Centepede	*Scolopendra hardwickii*
Dung-beetle	*Apogonia ferruginea*
Crickets	*Gryllus sp.*
Indian Red ant:	Solenopsis 24nvicta
	Camponotus compressus
Termites	Odontotermes feae
Indian Black Ant	Camponotus compressus
Snails	*Cornu aspersum*
	Limax sp Slugs
	Deroceras reticulatum

Protura:	Sinetomata
	Eosentomidae
	Acerentomata
Wall-lizard:	*Hemidactylus*
Burrowing Skinks	*Janetaescincus sp.*
Garden-lizard	*Calotes versicolor*
Skink	*Mabuyia sp.*
Shrews	*Suncus murinus*

Apart from the diverse faunal composition in the soil of the college campus, a number of species were also recorded from the wooden furniture, wooden stairs Cupboards, and wooden walls & in books too. Such as *Periplaneta americana, Nephila sp*. Etc. These findings represent that a diverse niche for these species present in the college premises (Table 2).

Table 2. Faunal diversity on and within wooden furniture, wooden stairs Cupboards, and wooden walls & in books

Fauna on and within wooden furniture, wooden stairs Cupboards, and wooden walls & in books	Common name/English name/ Vernacular name
Lepisma sp.	Silver-fish or book-lice
Diplatys sp.	Ear-wigs
Odontotermes feae	Termites
Periplaneta americana	Cockroach
Nephila sp	Spider

A total of two species of butterflies, one species of moth, grasshopper, honey bees, flesh fly, common green bottle fly, lesser fruit fly, Syrphid-flies and Robber flies were noted at the college campus along with two species of house flies, different types of mosquitoes (Table 3).

The table 3 provides a snapshot of the diverse insect fauna that inhabit various ecosystems. Each species listed plays a significant role, whether it be in pollination, decomposition, predation, or as part of the food chain. Understanding the roles and behaviors of these insects can help in managing ecosystems more effectively, particularly in agriculture and conservation efforts.

Insects like the Indian honey bees are crucial for pollination services, supporting both wild plant populations and agricultural crops. On the other hand, species like Aedes aegypti and Anopheles mosquitoes are targets for control measures due to their roles in spreading diseases.

The presence of both beneficial insects (like bees and predatory flies) and pests (like mosquitoes and house flies) underscores the complexity of ecological interactions. Effective management strategies need to consider this complexity to maintain ecological balance and protect both human interests and biodiversity.

Overall, this table highlights the importance of insects in maintaining ecological functions and the need for continued study and conservation of these vital organisms.

Table 3 Diversity of Butterflies, Moth, Dragon flies and other flies

Butterflies, Moth, Dragon flies and other flies	Common name/English name/ Vernacular name
Papilo demoleus	Lemon butterfly
Papilio polytes	Common Mormon
Plodia interpunctella	Indian meal moth
Omocestus viridulus	common green grasshopper
***Corduligaster* sp.**	Spiketails

Apis indica	Indian honey bee
Vespa sp.	Hornets
Tabanus sp.	House fly
Musca domestica	House fly
Sarcophaga sp.	Flesh fly
Lucilia sp.	common green bottle fly
Aedes aegypti	yellow fever mosquito
Anophelese sp.	marsh mosquitoes
Culex porcellus	mosquitoes
Drosophila sp.	lesser fruit fly
Gryllus sp.	Syrphid-flies
Dysmachus trigonus	Robber flies

A total of 6 species of birds were recorded from the college campus (Table 4). Each bird species listed has a unique role in its ecosystem. Owls and crows help control pest populations, Mynas and parrots assist in seed dispersal, and pigeons contribute to nutrient cycling in urban environments. Birds like the owl and parrot have significant cultural and symbolic meanings. Owls are often associated with wisdom and mystery, while parrots are admired for their beauty and mimicry.

While these birds are common and adaptable, they still face threats from habitat destruction, pollution, and human activities. Conservation efforts should focus on preserving their habitats and mitigating the negative impacts of urbanization.

- **Urban Wildlife Management**: Cities need to implement strategies that allow coexistence with these bird species, such as creating green spaces and ensuring safe nesting sites.

- **Public Awareness**: Educating the public about the ecological roles and importance of these birds can foster a sense of stewardship and encourage conservation actions. Bangabasi Evening College may take an important role in this awareness programme.

Table 4. Diversity of birds at the campus of Bangabasi Evening College

Birds	Common name/English name/ Vernacular name
Bubo bengalensis	Owl/Pancha
Acridotheres tristis	Common Moyna/Salik
Corvus domesticus	Crow/ Kak
Corvus splendens	Crow/ Kak
Psittacula sp.	Parrot/Tia
Columba domestica	Pigeon/ Payra

6 species of mammals were recorded from the college campus of which 1 is domestic. *Craseonycteris thonglongyal* was noted to be dwell in the *Mangifera indica* tree. Chip-munk was also found to be occur in the two arborescent tree species present at the college campus.

Table 5 Diversity of mammals at the college campus

Mammals	Common name/English name/ Vernacular name
Bandicoota bengalensis	Rat
Mus booduga	Mice
Craseonycteris thonglongyal	Bat
Funambulus palmarum	Chip-munk
Felis domesticus	Cat

Urban colleges like Bangabasi Evening College have the potential to be powerful advocates and practitioners of fauna conservation. Through education, research, habitat creation, community engagement, sustainable practices, and strategic collaborations, these institutions can significantly contribute to preserving and enhancing urban biodiversity. By fostering a culture of environmental stewardship among students and the community, This Urban college can help ensure a sustainable future for both people and city wildlife.

Bubo bengalensis

Corvus domesticus

Acridotheres tristis

Columba domestica

Papilo demoleus

Papilio polytes

Plodia interpunctella

Omocestus viridulus

Corduligaster sp.

Periplaneta americana

CONCLUSION

The Green Audit at Bangabasi Evening Collegeis not merely a procedural requirement but a strategic commitment towards building a greener and more sustainable future. It reflects the college's dedication to being a responsible global citizen and preparing its stakeholders to navigate the challenges of a rapidly changing environmental landscape. As Bangabasi Evening College embarks on this transformative journey, it sets an example for other educational institutions to follow, fostering a collective effort towards a more sustainable and resilient world.

ENVIRONMENT AUDIT

CAMPUS SURVEY AND ENQUIRY

Conducting an environmental audit on a college campus is crucial for promoting sustainability, ensuring regulatory compliance, and achieving financial savings. By identifying inefficiencies in resource use and waste management, the college can implement measures to reduce consumption and enhance recycling, contributing to a more sustainable campus. Compliance with environmental laws and regulations is also ensured through regular audits, preventing legal penalties and maintaining necessary permits. Financially, reducing energy and resource inefficiencies lowers operational costs and opens opportunities for grants aimed at sustainability. Additionally, a proactive environmental strategy bolsters the institution's reputation, attracting students and funding while fostering positive community relationships. Environmental audits also provide educational opportunities, integrating real-world data into the curriculum and involving students in sustainability initiatives. Furthermore, they contribute to the health and well-being of the campus community by identifying and mitigating environmental hazards. Regular audits enable the college to benchmark performance, set improvement goals, and adopt innovative practices, enhancing overall efficiency and sustainability. Lastly, audits help identify environmental risks and improve crisis preparedness, ensuring the campus is equipped to handle potential environmental challenges responsibly.

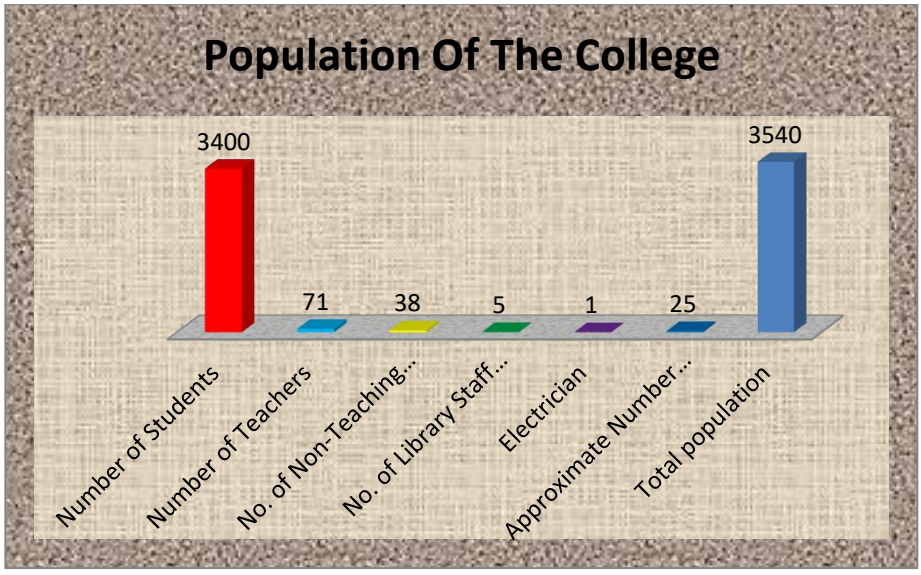
The Audit covered the following major areas:

- Average Foot fall
- Water Efficiency and Water Management
- Air Quality and Carbon foot print and Management
- Waste and Waste Management
- E-waste management
- Environmental disaster management
- Biodiversity and Green Zone and management

TOTAL POPULATION OF THE COLLEGE CAMPUS – FOOT FALL

Number of Students	**3400**
Number of Teachers	71
No. of Non-Teaching Staff including Casual Staff	38
No. of Library Staff including Casual Staff	5
Electrician	1
Approximate Number of visitors	25
Total population	3540

FOOT FALL BASED ON TOTAL POPULATION



75% of the footfall of the total population may be considered as the average footfall in the college per day. This represent the footfall is moderate considering the total space of the college campus.

WATER EFFICIENCY AND WATER MANAGEMENT

Water, the essence of life, is a precious and limited resource that is vital for supporting ecosystems, livelihoods, and human well-being. Water is essential for human life, playing a critical role in maintaining health and well-being. As a fundamental component of our bodies, water is necessary for numerous physiological processes, including digestion, absorption, circulation, and temperature regulation. Water also plays a significant role in maintaining ecosystems, supporting diverse plant and animal life, and contributing to biodiversity. It is essential for maintaining the natural habitats that sustain wildlife and balance ecological processes.

However, in today's world characterized by population growth, urbanization, and climate change, there is increasing pressure on water sources. This necessitates a collective effort towards adopting water-efficient practices and effective water management techniques to address modern water challenges.

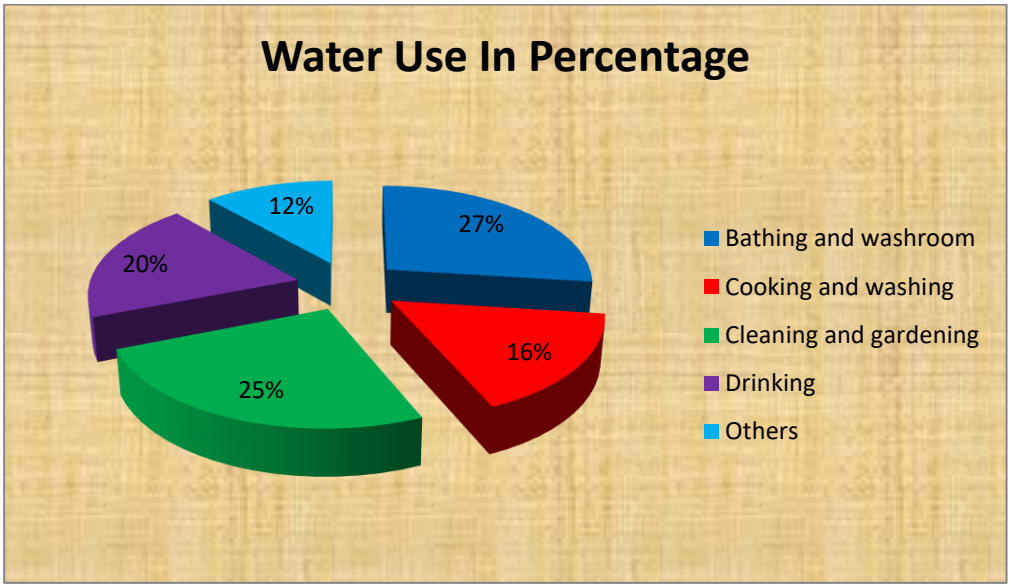
Water management and water audits are essential for college campuses to ensure the efficient and sustainable use of this vital resource. By effectively managing water, colleges can significantly reduce waste and lower operational costs, contributing to both environmental and financial sustainability. Regular water audits help identify inefficiencies, leaks, and areas of excessive use, allowing for timely interventions that save water and money. These practices also ensure compliance with regulatory standards, preventing legal issues and demonstrating the institution’s commitment to environmental stewardship. Additionally, proper water management supports the health and hygiene of the campus community by ensuring a safe and reliable water supply. It also offers educational opportunities, integrating practical learning experiences into the curriculum and raising awareness about water conservation among students and staff. Overall, water

management and audits promote a sustainable, cost-effective, and health-conscious campus environment, setting a positive example for the broader community.

USE OF WATER IN DIFFERENT PURPOSE OF COLLEGE PREMISES

Use of water in Different Purpose Per Day	Use in Percentage
Bathing and washroom	27
Cooking and washing	16.5
Cleaning and gardening	25.5
Drinking	19.5
Others	11.5

PERCENTAGE OF USE OF WATER AT THE COLLEGE CAMPUS



In this college maximum percentage of water was found to be used in bathing and washroom (27%) followed by cleaning and gardening (25.50%). 19.5% of the total used

water is used for drinking purpose after proper purification. Though a few amount was drained out in this process.

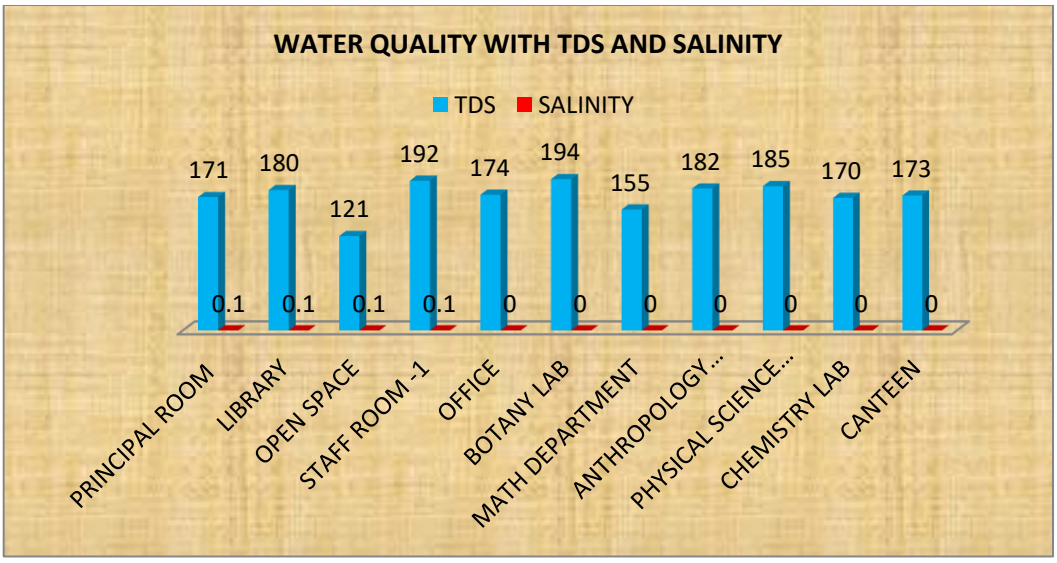
WATER QUALITY IN COLLEGE CAMPUS

Drinking water is essential for maintaining health and supporting bodily functions. It hydrates, aids in digestion, regulates body temperature, and helps in nutrient absorption. The quality of drinking water, however, is paramount to ensure it is safe for consumption and free from harmful contaminants.

The drinking water we consume today is often treated with hazardous chemicals at various water treatment plants, which results in the removal of natural minerals from the water. Therefore, it is crucial to employ proper filtration processes to eliminate contaminants and ensure the water is safe for consumption. One major contaminant in water is total dissolved solids (TDS), which remain after the standard filtration process. TDS are contaminants larger than 2 microns. A fine filter typically removes particles that are 0.45 microns in size and can come from various sources.

WATER TDS AND SALINITY LEVEL AT DIFFERENT REGION OF COLLEGE CAMPUS

ROOMS/DEPARTMENT	TDS	SALINITY
PRINCIPAL ROOM	171	0.1
LIBRARY	180	0.1
OPEN SPACE	121	0.1
STAFF ROOM -1	192	0.1
OFFICE	174	0
BOTANY LAB	194	0
MATH DEPARTMENT	155	0
ANTHROPOLOGY LAB	182	0
PHYSICAL SCIENCE LAB	185	0
CHEMISTRY LAB-1	170	0
CANTEEN	173	0



REFERENCE RANGE OF TOTAL DISSOLVED SOLIDS (TDS)

TDS LEVEL	COLOUR BAR	HAZARD LEVEL	REMARKS
<50	Orange	Serious	Unacceptable as it lacks essential minerals
50-150	Green	Very safe	Excellent for drinking. The TDS level is ideal for areas where the water polluted by sewage or industrial waste
150-250	Light green	Safe	Good. The water is ideal for people with cardiovascular disease
250-350	Yellow	Normal	Good. The water is ideal for people with cardiovascular disease
350-500	Light orange	Medium	Fairly acceptable
500-900	Orange	Serious	Less acceptable
900-1200	Light red	Danger	Least acceptable. Avoid drinking water that has a tds level of 900
1200-2000	Red	Danger	Water is not acceptable for drinking.
Above 2000	Dark red	Danger	Unacceptable

Water salinity, which refers to the concentration of dissolved salts in water, plays a significant role in both human life and ecosystems. In human life, salinity levels are critical for drinking water quality. High salinity in drinking water can lead to health issues such

as hypertension, cardiovascular diseases, and kidney problems. It's also a concern for agriculture, as crops are sensitive to salinity; excessive salt levels in irrigation water can reduce crop yields and soil fertility, posing a threat to food security. Furthermore, industries that rely on water, such as food processing and manufacturing, require water with controlled salinity levels to maintain product quality and operational efficiency.

In ecosystems, salinity profoundly influences the distribution and health of aquatic life. Many freshwater organisms are sensitive to salinity changes and can suffer from physiological stress or mortality if exposed to high salt levels. This can lead to a decline in biodiversity and disrupt aquatic food webs. In estuarine environments, where freshwater and seawater mix, salinity gradients are essential for the survival of various species that have adapted to specific salinity ranges. Mangroves, salt marshes, and seagrass beds, which provide crucial habitat for many species, also depend on stable salinity conditions.

Moreover, salinity impacts soil health and plant communities. High soil salinity can inhibit plant growth by affecting water uptake and nutrient availability, leading to reduced agricultural productivity and loss of vegetation cover, which in turn affects wildlife habitats and soil erosion patterns.

Overall, maintaining appropriate salinity levels in water bodies is essential for human health, agricultural productivity, industrial processes, and the health of aquatic and terrestrial ecosystems. Addressing salinity issues requires integrated water management strategies that consider the needs of diverse stakeholders and the complex interactions within ecosystems.

REFERENCE RANGE OF WATER SALINITY

SALINITY STATUS	SALINITY (%)	SALINITY (PPT)	COLOR BAR	HAZARD LEVEL	USE
FRESH	< 0.05	< 0.5	BLUE	SAFE	Drinking and all irrigation
MARGINAL	0.05 – 0.1	0.5 – 1	DEEP BLUE	NORMAL	Most irrigation, adverse effects on ecosystems become apparent
BRACKIS	0.1 – 0.2	1 – 2	DARK	LIGHT	Irrigation certain crops

H			BLUE		only; useful for most stock
SALINE	0.2 – 1.0	2 – 10	LIGHT ORANGE	MEDIUM	Useful for most livestock
HIGHLY SALINE	1.0 – 3.5	10 – 35	ORANGE	SERIOUS	Very saline groundwater, limited use for certain livestock
BRINE	> 3.5	> 35	RED	DANGER	Seawater; some mining and industrial uses exist

***Overall the water quality level within the college campus is well maintained and water quality of the open space area of the college is best within the college campus.**

PERFORMANCE AUDIT OF WATER MANAGENENT & RAIN WATER HARVESTING PLANT

Factors	Weightage
Quality of Water	H
Re-use of water	L
Water Harvesting & Recharge	L
Use of Surface Water	M

* H denote- Taken management policy level above 60%

** M denote- Taken management policy level 40%-60%

*** L Denote-Taken management policy level below 40%

Following examinations utilizing Water salinity meters and TDS meters, we've established that the drinking water quality on campus is excellent for human health, earning a high rating (H) for Water Quality. A single water harvesting unit was also noticed in the college campus which was found to be performed efficiently. The stored water was found to be used in the toilets and washing purpose in the ground floor of the college campus. Moreover, there was some initiatives noticed in management of water and its reuse and

utilization of surface water within the campus premises was noticed. As a result, the effectiveness of the current water management policy is evaluated as moderate (M).

AIR QUALITY LEVEL IN THE COLLEGE CAMPUS

Air quality on college campuses is a critical aspect of environmental health and overall well-being for students, faculty, and staff. Poor air quality can result from various sources, including vehicle emissions, industrial activities nearby, construction projects, and indoor pollutants like mold, dust, and chemicals used in cleaning or laboratory settings. Managing air quality effectively involves monitoring pollution levels, identifying sources of contamination, and implementing strategies to maintain and improve air purity.

To monitor air quality, campuses often install air quality sensors and conduct regular assessments to track pollutants such as particulate matter (PM1.0, PM2.5 and PM10), formaldehyde or HCHO, carbon monoxide (CO), and total volatile organic compounds (TVOCs). These sensors provide real-time data, helping campus authorities respond quickly to air quality issues.

Vehicle emissions are a significant contributor to outdoor air pollution on campuses. To mitigate this, colleges can promote alternative transportation options like biking, walking, and public transit. Implementing carpooling programs, providing electric vehicle charging stations, and encouraging the use of campus shuttles can also reduce vehicle emissions. Additionally, establishing no-idle zones and restricting vehicle access to certain areas can further enhance air quality.

Indoor air quality is equally important and can be managed through several measures. Ensuring proper ventilation in buildings helps reduce the concentration of indoor pollutants. Regular maintenance of HVAC systems, use of air purifiers, and the selection of low-emission materials and furnishings contribute to healthier indoor environments. Managing indoor humidity levels prevents mold growth, while strict protocols for handling chemicals in laboratories and cleaning supplies minimize exposure to harmful substances.

Construction activities on campus can also impact air quality by releasing dust and other pollutants. Effective management includes scheduling construction during off-peak times, using dust suppression techniques, and installing barriers to contain construction-related emissions. Engaging in green building practices, such as using environmentally friendly materials and ensuring proper site management, further supports air quality goals.

Educational initiatives play a vital role in air quality management. Raising awareness about the importance of air quality and encouraging the campus community to adopt sustainable practices can lead to long-term improvements. Programs that educate about the health impacts of poor air quality and promote actions like reducing energy consumption, planting trees, and maintaining clean surroundings can significantly contribute to better air quality.

In summary, managing air quality on college campuses involves a combination of monitoring, mitigating sources of pollution, and promoting sustainable behaviors. By addressing both outdoor and indoor air quality, implementing effective transportation and construction policies, and engaging the campus community, colleges can create a healthier and more sustainable environment for everyone.

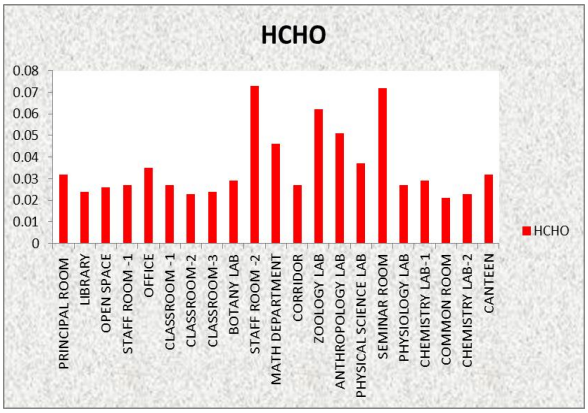
DIFFERENT PARA METERS OF AIR QUALITY LEVEL AT DIFFERENT REGION OF COLLEGE CAMPUS

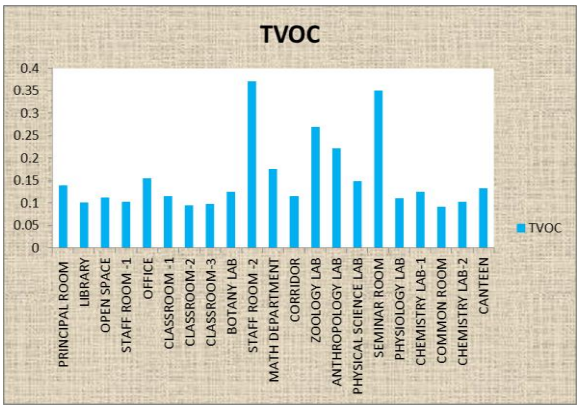
Rooms	HCHO	TVOC	PM2.5	PM1.0	PM10	APL
PRINCIPAL ROOM	0.032	0.139	39	29	45	15
LIBRARY	0.024	0.101	41	30	46	16
OPEN SPACE	0.026	0.112	46	34	53	18
STAFF ROOM -1	0.027	0.102	41	30	46	16
OFFICE	0.035	0.155	44	33	51	17
CLASSROOM -1	0.027	0.116	42	31	48	13
CLASSROOM-2	0.023	0.094	46	34	53	18
CLASSROOM-3	0.024	0.098	44	32	51	17
BOTANY LAB	0.029	0.125	44	33	51	18
STAFF ROOM -2	0.073	0.371	29	21	32	19
MATH DEPARTMENT	0.046	0.175	28	21	32	11

CORRIDOR	0.027	0.115	41	31	48	16
ZOOLOGY LAB	0.062	0.269	40	29	45	16
ANTHROPOLOGY LAB	0.051	0.222	42	31	48	16
PHYSICAL SCIENCE LAB	0.037	0.148	44	33	51	17
SEMINAR ROOM	0.072	0.35	40	29	45	23
PHYSIOLOGY LAB	0.027	0.111	43	31	48	16
CHEMISTRY LAB-1	0.029	0.125	89	64	96	34
COMMON ROOM	0.021	0.091	46	34	53	18
CHEMISTRY LAB-2	0.023	0.102	45	34	52	18
CANTEEN	0.032	0.133	98	73	112	38

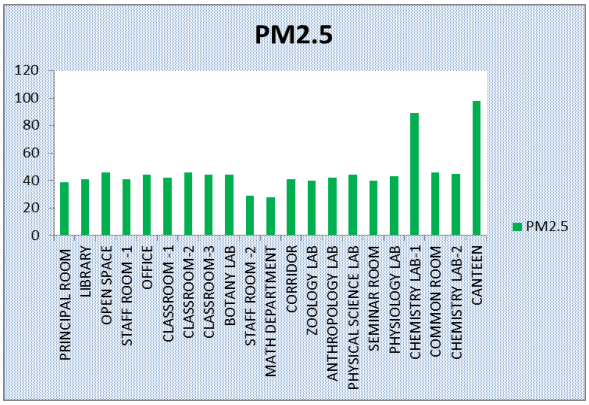
APL: Air Pollution Level

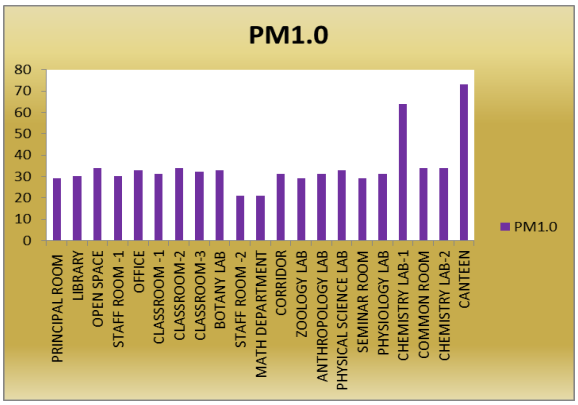
GRAPHICAL REPRESENTATION OF DIFFERENT PARAMETER OF AIR QUALITY LEVEL



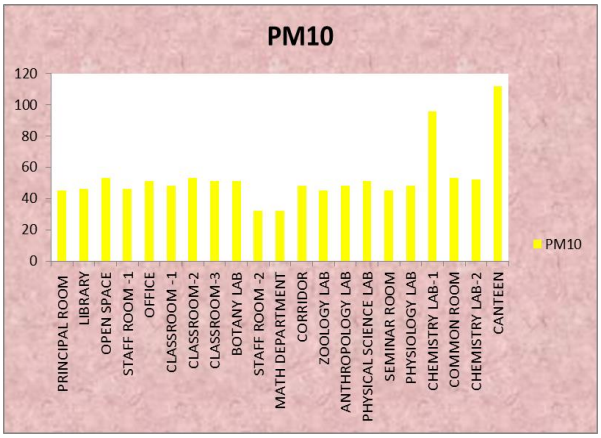


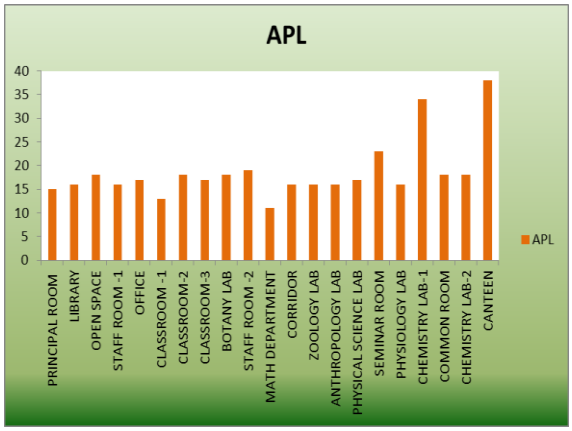
Level of HCOC and TVOC at different points of Bangabasi Evening College





Level of PM 2.5 and PM 1.0 at different points of Bangabasi Evening College





Level of PM 10 and Air Pollution Level at different points of Bangabasi Evening College

The canteen shows the highest levels of PM2.5 (98), PM1.0 (73), PM10 (112), and APL (38), indicating poor air quality, likely due to cooking activities generating smoke and grease particles. This area requires immediate attention, potentially through improved ventilation systems and air purifiers to reduce particulate levels.

Chemistry Lab-1 has an exceptionally high PM2.5 level (89) and other particulates, likely due to experimental activities. Implementing stringent air filtration and proper ventilation systems is crucial to ensure a safer environment for lab users.

The math department has the lowest levels of PM2.5 (28), PM1.0 (21), PM10 (32), and APL (11), indicating relatively good air quality. Maintaining current practices and ensuring regular monitoring can help sustain this environment.

The common room shows the lowest levels of HCHO (0.021) and TVOC (0.091), suggesting minimal pollution from indoor sources. This could be due to less frequent use of volatile compounds and good ventilation.

Most other rooms, such as classrooms and labs, exhibit moderate levels of pollutants. Consistent monitoring, maintaining good ventilation, and controlling sources of pollutants can help manage these levels effectively.

REFERENCE RANGE OF DIFFERENT PARAMETERS TO MEASURE AIR QUALITY

HCHO RANGE	TVOC RANGE	PM2.5 RANGE	PM1.0 RANGE	PM10 RANGE	APL RANGE	COLOR BAR	AIR POLLUTION LEVEL	Hazard Level
<0.061	<0.3	<35	<10	0-50	0-50	GREEN	SAFE	LIVABLE (FRESH)
<0.100	0.3-1.0	<75	<20	51-100	51-100	LIGHT GREEN	NORMAL	TEMPORARY STAY(NORMAL)
<0.370	1.0-3.0	<115	<30	101-150	101-150	YELLOW	LIGHT	DON'T STAY LONG(POOR)
<0.775	3.0-6.0	<150	<40	151-200	151-200	LIGHT ORANGE	MEDIUM	SHOULD NOT STAY(HARMFUL)
<1.181	6.0-10	<250	<50	201-300	201-300	ORANGE	SERIOUS	LEAVE ASAP(SERIOUS)
>1.181	>10	>250	>50	301-400	>300	RED	DANGER	LEAVE NOW(DANGER)

Generation of Waste and Waste Management

Effective waste management on college campuses is essential for promoting sustainability and environmental health. Colleges generate various types of waste, including municipal solid waste (MSW), which encompasses everyday items like food waste, packaging, and paper. Recyclable waste, such as paper, cardboard, glass, metals, and certain plastics, requires robust recycling programs and educational efforts to ensure proper segregation and recycling. Organic waste, mainly food scraps and yard waste, can be managed through composting initiatives, turning waste into valuable fertilizer for campus landscaping. Hazardous waste, including chemicals, batteries, and electronic waste (e-waste), demands strict disposal protocols and partnerships with specialized disposal services to mitigate risks to health and the environment. Construction and demolition waste, generated from campus building projects, can be reduced by on-site segregation and reuse of materials. Laboratory waste, including chemical reagents and biological materials, must be handled with stringent safety measures and secure disposal methods. To manage these waste types effectively, campuses implement various strategies such as source reduction, recycling programs, composting, and waste audits to monitor and

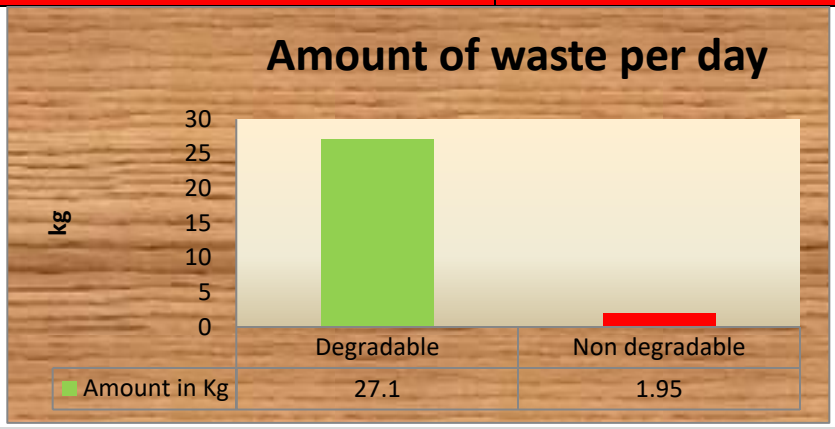
improve waste management practices. Educational campaigns are crucial in raising awareness and promoting sustainable behaviors among students, faculty, and staff. Additionally, sustainable procurement and green building practices help minimize waste generation and enhance campus sustainability. Through these comprehensive efforts, colleges can significantly reduce their environmental footprint and foster a culture of environmental responsibility within the campus community.

Different source of waste Generation in College Campuses:

- **Academic Waste:** Includes paper waste, discarded textbooks, notebooks, and other educational materials.
- **Food Waste:** Generated from dining facilities, cafes, and student activities.
- **E-waste:** Arises from the use and disposal of electronic devices in computer labs and personal electronics.
- **Plastic and Packaging Waste:** From products, promotional materials, and campus events.
- **General Waste:** Includes everyday waste from offices, maintenance activities, and residential areas.

TYPES OF WASTES:

Type of Wastage	Amount in Kg per day
Degradable	27.1
Non degradable	1.95



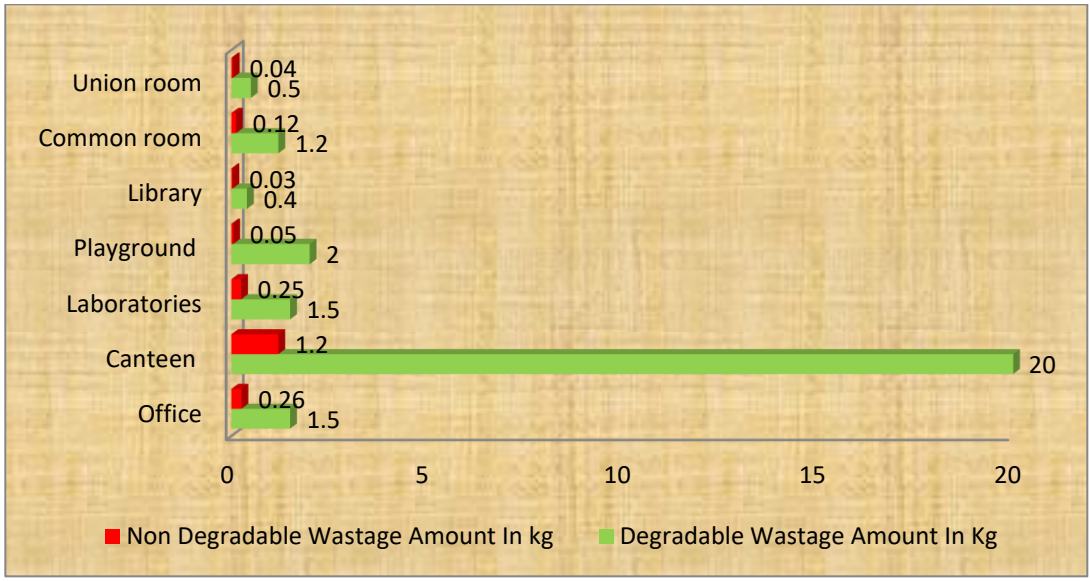
SOURCE OF WASTAGE IN DIFFERENT SECTOR (PER DAY IN KG):

Source of Wastage in Different Sector (per day in Kg)	Degradable Wastage Amount in Kg	Non-Degradable Wastage Amount In kg
Office	1.5	0.26
Canteen	7	1.2
Laboratories	1.5	0.25
Playground	2	0.05
Library	0.4	0.03
Common room	1.2	0.12
Union room	0.5	0.04




Collection of data of air and water quality at different points of the Bangabasi Evening College

SOURCE OF WASTAGE IN DIFFERENT SECTOR (PER DAY IN KG):



PERFORMANCE AUDIT OF WASTE ISSUES:

Implemented wastes management		
Sl.no	Factors/Indicators	Weightage
1	Plastic and Polythene free	H
2	Re-use of papers	H
3	Hazardous effect waste management	M
4	Removal of E-Wastes	M
5	Organic & food waste	M
6	Others solid wastes	M

*** H denote- Taken management policy level above 60%**

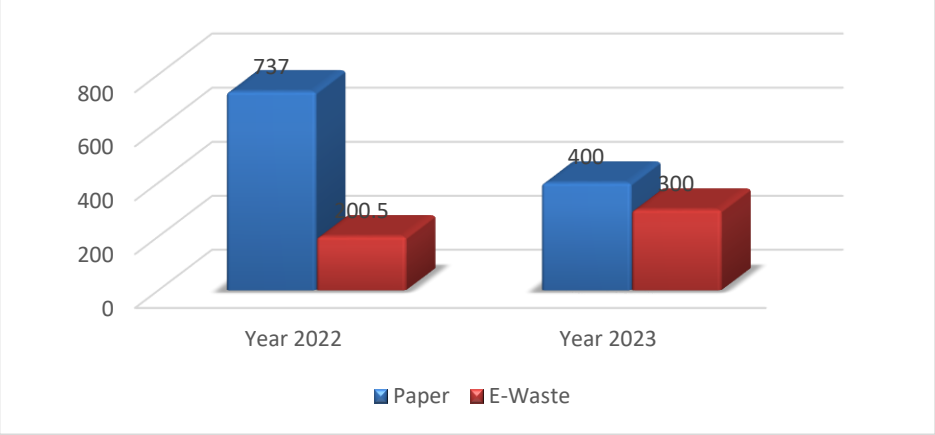
**** M denote- Taken management policy level 40%-60%**

***** L denote-Taken management policy level below 40%**

E-waste management in the college campus

Bangabasi Evening College has demonstrated efficient waste management practices, including the handling of electronic waste (e-waste). The college collaborates with a company called Vital Waste to manage various types of waste, such as paper and metal. During 2022 and 2023, Vital Waste assisted the college in managing its paper and e-waste. According to the waste audit report by Vital Waste, the college generated 727 kilograms of paper waste and 200.5 kilograms of e-waste in 2022. Impressively, Bangabasi Evening College successfully reduced its paper waste to 400 kilograms in 2023, although e-waste increased to 300 kilograms that year.

The result depicts the efforts of Bangabasi Evening College in managing various types of waste, including electronic and paper waste. The collaboration with Vital Waste highlights a structured approach to waste management, and the data provided demonstrates the college's commitment to reducing waste. The clear and concise language enhances readability, making it easy to understand the college's achievements and ongoing challenges in waste reduction. Overall, this version is well-structured, informative, and professional, providing a comprehensive overview of the college's waste management initiatives.



No such disaster management cell and infrastructure was noted at the Bangabasi Evening College.

Energy Audit

Introduction: An exhaustive examination entails a meticulous inspection of power consumption within an establishment, aiming to diminish energy use. It demands scrutinizing techniques and frameworks to decrease energy consumption while upholding functionality. Suggestions for diverse approaches to amplify energy efficiency are supplied. With traditional energy sources such as fossil fuels decreasing, there's a necessity to explore substitutes and prioritize energy preservation. The fundamental objective is to provide goods or services at the most minimal feasible expense while lessening environmental impact. Executing an energy evaluation aids in recognizing potential savings, comprehending fuel consumption trends, pinpointing inefficiencies, and discovering opportunities for enhancement. It's vital for educational institutions to execute sustainable energy-conserving practices. The evaluation procedure encompasses formulating surveys, inspecting facilities, reviewing records, conducting interviews, scrutinizing data, taking measurements, and offering recommendations. Energy appraisal assesses the potential for energy savings, managerial practices, and alternative energy choices. Specific goals include assessing sustainability management systems and ensuring adherence to regulations. The outcomes of the evaluation profoundly influence operational expenses and environmental impact. Initiatives such as the Energy Conservation Building Code and the Bureau of Energy Efficiency endorse energy-efficient methodologies. Energy designations and rankings empower consumers to make educated choices. The Energy Examination functions as a standard for energy management, aiding in formulating more efficient tactics. It's a methodical appraisal of energy sources aimed at preserving the environment and safeguarding natural resources. At Bangabasi Evening College, under University of Calcutta, the audit is conducted with identifying, measuring, recording, reporting, and analyzing energy elements.

Need for an Energy Audit: In each organization, the trio primary operational expenditures commonly comprise energy (both electric and heat), workforce, and resources. Amidst these, energy consistently emerges as a pivotal component in cost

supervision and potential economies, rendering energy supervision imperative for cost minimization. An Energy Examination is pivotal in understanding energy and fuel utilization within an industry, identifying wasteful sectors and those with enhancement potential. It furnishes perspectives that aid in reducing energy expenditures, improving preventative upkeep, and refining quality assurance programs, all indispensable for manufacturing and utility functions. This scrutiny initiative permits an intricate analysis of energy expense fluctuations, energy supply dependability, determinations concerning energy origins, identification of energy preservation methodologies, and retrofitting for energy-efficient machinery. Fundamentally, the Energy Examination translates preservation notions into actionable resolutions, proffering technically viable suggestions that contemplate financial and organizational elements within a specified duration. The fundamental aim is to devise tactics for diminishing energy utilization per unit of product yield or diminishing operational expenditures. Functioning as a yardstick, the Energy Examination establishes a ground work for supervising energy within the organization and sets the stage for strategizing more efficient energy utilization throughout the establishment. The environmentally conscious campus notion accentuates efficient energy utilization and preservation, striving for sustainable economies. Additionally, it focuses on reductions in carbon discharges, involves computing carbon footprint, advocates procuring energy-efficient equipment for cost-effective and secure energy provision, advocates energy preservation in all edifices, aims to reduce overall energy consumption, curtail waste channelled to landfills, and amalgamates environmental considerations into agreements and facilities with substantial environmental ramifications. Assessing Energy Supervision through audits concentrates on energy savings and prospective openings. While energy itself is abstract, its presence is conspicuous in wires, channels, and other materials through perceptible ramifications like warmth, illumination, and effectiveness. Energy supervision evaluations encompass energy consumption, origins, monitoring, illumination, conveyance, electric gadgets, and distribution. Energy usage is a crucial facet of campus sustainability, necessitating inclusion in evaluations without further elaboration. Despite the prevalent utilization of energy, attention to energy-saving

potential remains pivotal. For instance, a conventional incandescent bulb consumes 60W to 100W, whereas an energy-efficient LED employs less than 10W, underscoring notable energy savings. Energy auditing is indispensable for preservation endeavours and the acceptance of techniques to curtail consumption, thus alleviating environmental degradation. Furthermore, audits furnish invaluable recommendations and suggestions for efficient energy-saving practices. Environmentally cognizant institutions are encouraged to scrutinize their energy practices at least once every two years, utilizing both internal and external auditors. Conducting energy assessments, facilitated by both internal and external auditors, plays a momentous role in organizational energy supervision. These assessments efficiently assess the energy potential within an establishment, pinpointing more efficient methods to diminish environmental impact.

Aims and Objectives of an Energy Audit: A power scrutiny is an essential instrument for devising and executing comprehensive energy supervision blueprints within an establishment. Its fundamental aim is to systematically unearth opportunities for ameliorating energy effectiveness, preservation, and financial economies at the scrutiny locale. The evaluation procedure encompasses the subsequent stages:

- ⇒ Assessing the energy-conserving initiatives and measures currently enacted at the scrutiny locales.
- ⇒ Distinguishing diverse opportunities for energy preservation measures and additional paths for financial savings.
- ⇒ Investigating alternative energy origins to gauge potential energy economies and steer decision-making in energy supervision.
- ⇒ Dispensing technical counsel on instituting an energy equilibrium and presenting precise, application-oriented recommendations.
- ⇒ Conducting an exhaustive scrutiny of energy consumption, scrutinizing recent electric invoices for the locale, and comprehending the tariff arrangements proffered by the central and state electric boards.

⇒ Enumerating the manifold manners energy is consumed, encompassing electricity for contrivances such as ranges, pots, microwaves, and other origins like LPG, diesel, and beyond.

⇒ Appraising the utilization of disparate contrivances and apparatus, encompassing incandescent (tungsten) bulbs, CFL bulbs, fans, air conditioners, cooling contrivances, heaters, computers, photocopiers, inverters, generators, and laboratory equipment. This evaluation entails computations grounded on aspects such as wattage and duration of utilization (e.g., 60-watt bulb x 5.5 hours x quantity of bulbs = kWh).

Assessing the adoption of non-traditional energy sources/alternative energy origins within the establishment, such as photovoltaic cells for solar power, energy-efficient contrivances, biogas, etc. Moreover, instigating initiatives to heighten awareness among stakeholders concerning energy preservation and efficient utilization. Essentially, power auditing in the institutional milieu is a multi-faceted tactic that not only pursues efficiency in resource employment but also underscores the significance of sustainable methodologies, financial savings, and collective liability for the welfare of the establishment and its milieu.

Methodology and Survey Schedules: To execute an energy examination, a variety of methodologies are utilized at the scrutiny locales, concentrating principally on a thorough site investigation scrutiny. This procedure encompasses aligning comprehensive energy inputs with total energy outputs and charting all energy movements within a establishment. Physical authentication of diverse constituents, such as illumination, roofing, desks, airflow fans, cooling systems, solar cells, warmers, generators, continuous power provision units, and air circulation mechanisms, is performed during the examination. This involves authenticating the efficacy of deployed energy-efficient frameworks. The scrutiny accentuates scrutinizing the expenses or potential financial savings linked with each of these constituents, with energy consistently surfacing as a critical zone for cost minimization. Energy supervision becomes indispensable in attaining

cost-saving targets. Additionally, the energy invoice from the utility corporation is gathered for scrutiny. This evaluation entails assessing load prerequisites and efficient energy utilization. Stakeholders are involved during the examination to probe prospects for enhancement in energy supervision. Prospective zones for energy preservation and cost-saving opportunities are pinpointed and advocated for implementation within the establishment. Energy examinations can be classified into the ensuing categories: I. Preliminary Energy Examination II. Thorough Energy Examination III. Extent and Magnitude of Energy Examination IV. Elaborate Energy Examination.

Survey Form for data collection:

- List the methods through which energy is utilized by the college (Electricity, electronic ranges, cooking utensils, microwaves, LPG, timber, petrol, diesel, and others).
- Synopsize the total electric invoices for the prior two/three years.
- Log the overall expenditure on LPG canisters during the antecedent year.
- Compute the expense of petrol/diesel/alternative fuels for power generators.
- Specify the quantity of CFL bulbs installed and detail their operational lifespan.
- Ascertain the energy consumed by each bulb on a monthly basis.
- Identify the count of LED bulbs utilized within college premises (with specified operational duration).
- Tally the number of incandescent (tungsten) bulbs affixed.
- Aggregate the quantity of fans in operation (with specified operational lifespan).
- Document the count of air conditioners in operation (Hours used per day, for how many days monthly).
- Compute the energy consumed by each electronic device monthly (kWh).
- Outline the number of operational computers and their usage (Hours used per day, for how many days monthly).
- Specify the quantity of photocopiers installed.
- Tally the number of cooling devices affixed.

- Determine the energy consumed by each inverter on a monthly basis (kWh).
- Enumerate the number of electronic appliances utilized in various laboratories along with their power ratings.
- Detail the usage of heaters in the cafeteria (with usage details, hours used per day, and number of days monthly).
- Validate if any alternative energy source modules are installed and provide detailed specifications.
- Confirm whether computers and additional devices are configured to energy-saving mode.
- Identify whether machines (TVs, ACs, computers, weighing scales, printers, etc.) frequently operate on standby mode and specify the duration in hours if applicable.
- Summarize the energy conservation methods adopted by the college.
- Calculate the number of displays advocating energy conservation awareness.

To evaluate the environmental impact, carbon dioxide levels were gauged at various points across the campus utilizing a portable CO2 analyzer. This measurement aimed to assess the carbon footprint and identify areas with significant carbon emissions, offering valuable insights for reduction strategies. The college's energy invoice was scrutinized and dissected to comprehend kilowatt-hour (kWh) requisites and the efficacy of energy utilization. Engaging with diverse stakeholders was vital in acquainting them with energy evaluation procedures, ensuring a prosperous and outcome-oriented energy examination. Opportunities for energy conservation and savings were pinpointed during the examination, setting the stage for potential implementation measures. The evaluation methodology encompassed collating information through various avenues, including on-site visits, collective deliberations, campus surveys, inquiries, observations, perception analyses, and feedback. All these constituents contributed to the comprehensive examination report.

Detailed Energy Audit Methodology: A comprehensive evaluation provides a detailed energy management strategy for a facility by examining all major energy-consuming systems. This type of evaluation delivers the most precise assessment of both energy efficiency and costs. It considers the cumulative effects of all initiatives, takes into account the energy consumption of key appliances, and involves meticulous calculations for both energy cost savings and project expenses. In an in-depth evaluation, the energy balance is a vital element, relying on an inventory of energy-consuming systems, assumptions about current operational conditions, and calculations of energy usage. This estimated usage is then compared with charges on utility bills. Preliminary site visits and preparations are essential stages before detailed analysis. An initial site visit typically lasts a day, allowing the Energy Auditor/Engineer to interact with relevant personnel, familiarize themselves with the surroundings, and assess the procedures necessary for conducting the energy evaluation.

7. Source of Energy: Through the enquiry process it is noted that the mostly used energy source is conventional but institution has taken notable steps to develop non-conventional energy sources in terms of solar energy module and it is found to be nearly 25% of the total unit consumption.

Figure 1. Power house and energy distribution module of Bangabasi Evening College

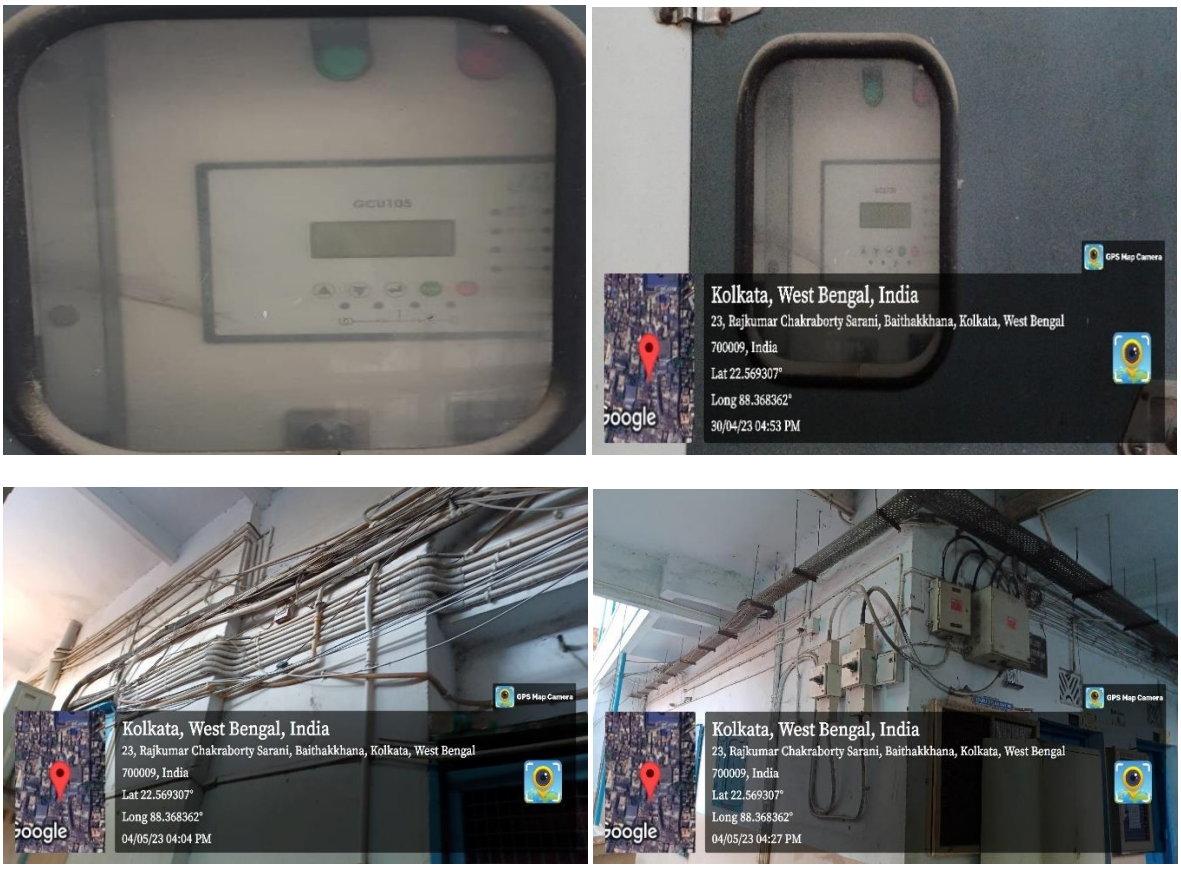


Figure 2. Electrical energy distribution system of Bangabasi Evening College

Energy Cost:

Total electricity consumption (conventional)- 40458 U (75%)

Total electricity consumption (non-conventional)-13486 U (25%)

Fossil fuel consumption per year-

a. Number of LPG gas cylinders used for cooking (Canteen)-120PCs (Approx.)

b. Number of LPG used in Laboratories-42PCs (Approx.)

c. Diesel used for green Generator- 500(Approx.) litter.

Table 1 represents the percentage use of conventional and non-conventional uses of energy and its corresponding plot is depicted in figure 3.

Table 1: Percentage use of conventional and non-conventional sources of energy.

Source of energy	In Percentage
Conventional	**75%**
Non -Conventional	**25%**

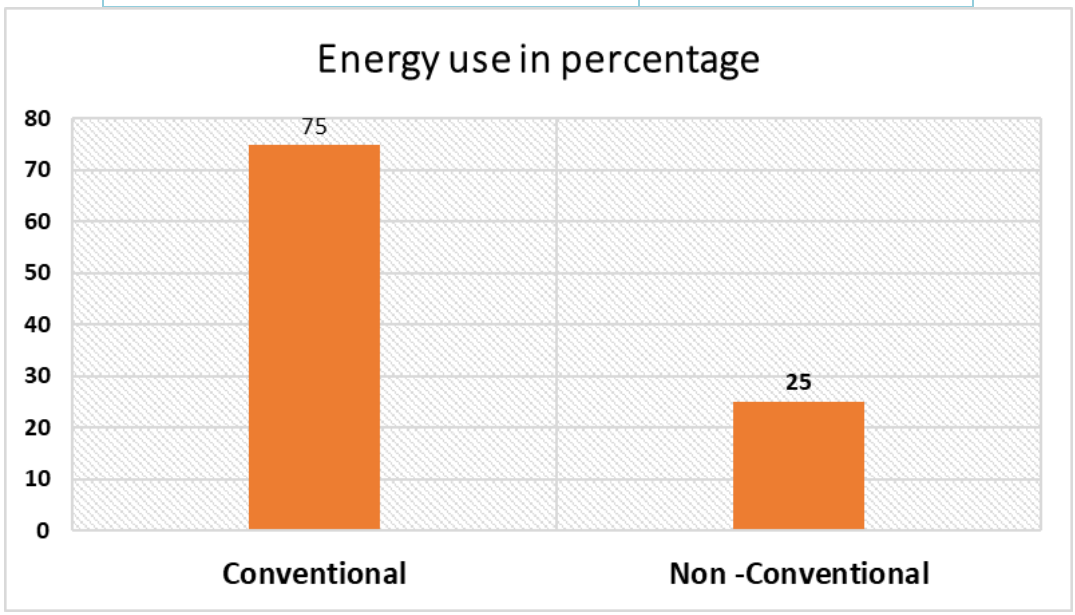
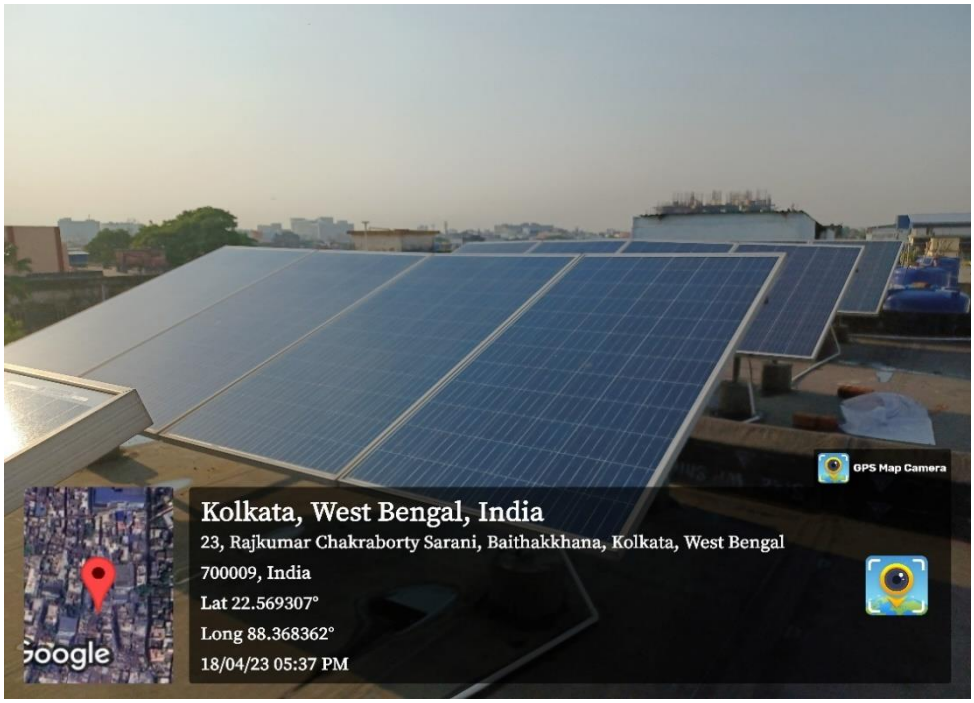


Figure 3. Mode of energy used in college campus (conventional and non-conventional)



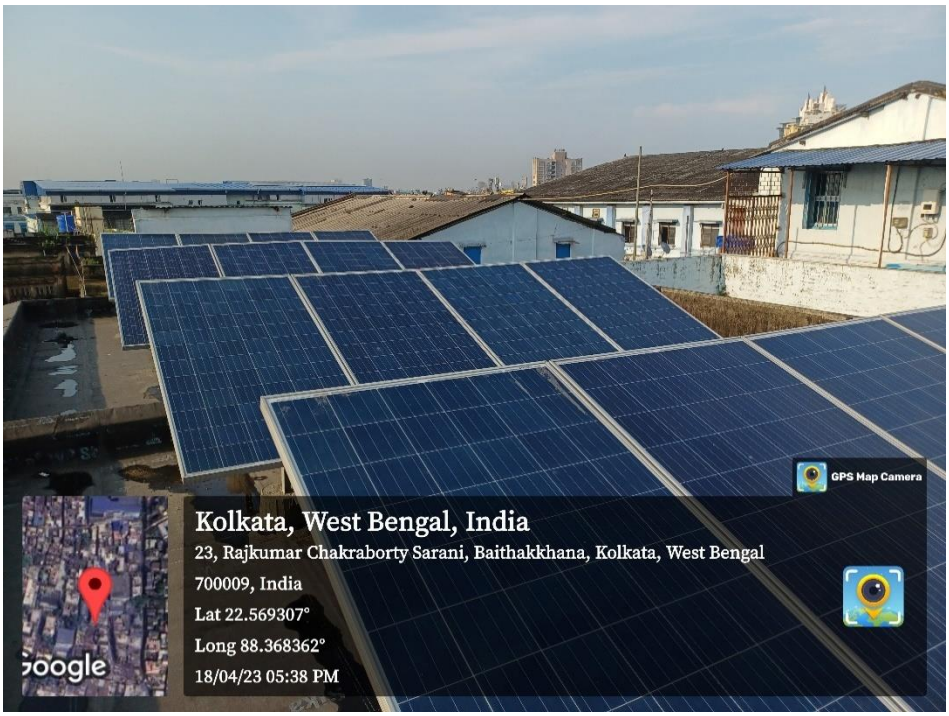


Figure 4. Solar energy module at Bangabasi Evening College

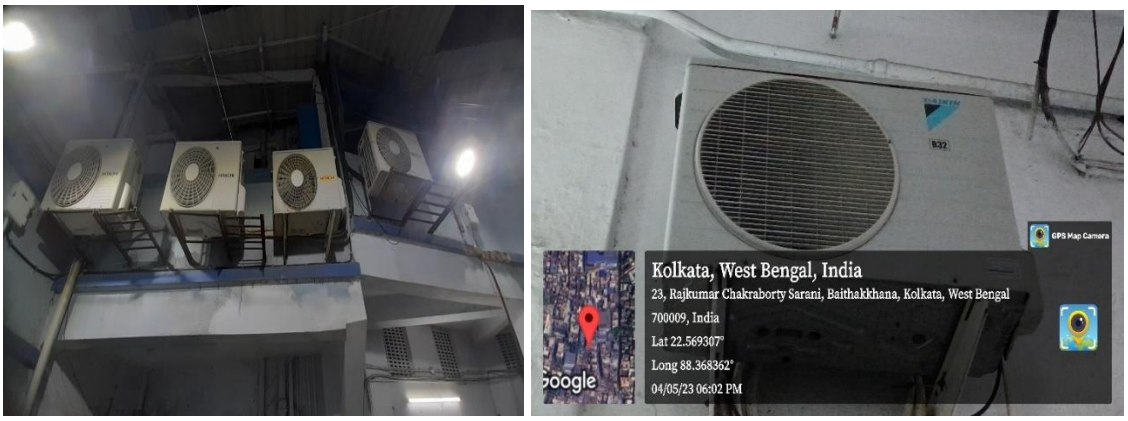


Figure 5. A.C. installed at Bangabasi Evening College

Figure 6. LED enabled well-equipped conference hall at Bangabasi Evening College

During the survey different electrical appliances are recorded with its corresponding power rating. For precaution, a maximum Demand Controller (DC) can be installed at the main LT panel to avoid the maximum demand penalty. In case the running maximum demand increases, the demand controller will switch off some non-essential load like Air-conditioning load etc. and simultaneously it will also give alarm for further action.

In table 2 the calculated daily approximate consumption of electrical energy is shown below.

Table 2: The detail calculation of energy consumption.

SlNo	**Particulars**	Power consumption per hour	Quantity	Consumption (KWh/day)
1.	Tube/Bulb light	40W/100W	366	45.56
2.	LED light	20/40W	158	22.5
3.	Fan	50W	269	39.5
4.	Air Conditioner	1.5/2KW	65	40.5
5.	Computer	300W	82	11.3
6.	Xerox Machine	500W	03	6.0
7.	Printer	65W	15	1.9
8.	Projector	500W	08	0.1
9.	Electric kettle	850W	02	0.1
10.	Refrigerator	500W	05	10
11.	Water pump	1KW	10	22
12.	Sound system	50W	05	0.2
13.	Other Laboratory instruments	500W	28	12
14.	Streetlight	500W	02	4.6
15.	Router	5W	04	0.4
16.	T.V	40W	01	0.9

Figure 7. Data collection at Bangabasi Evening College

The corresponding plot of energy consumption from calculation is depicted in figure 8.

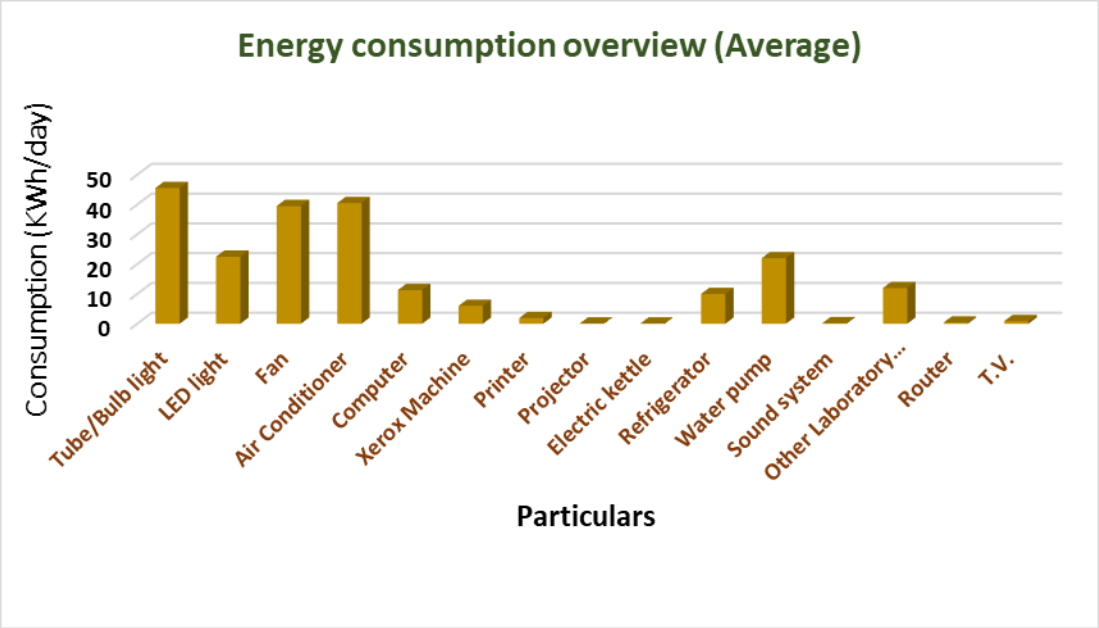


Figure 8: Bar diagram to represent the energy consumption rate.

Month	2021-22	2022-23
July	344	1339
August	339	1351
September	423	1336
October	352	583
November	387	701
December	350	557
January	331	463
February	313	586
March	778	651
April	1164	388
May	731	401
June	783	398

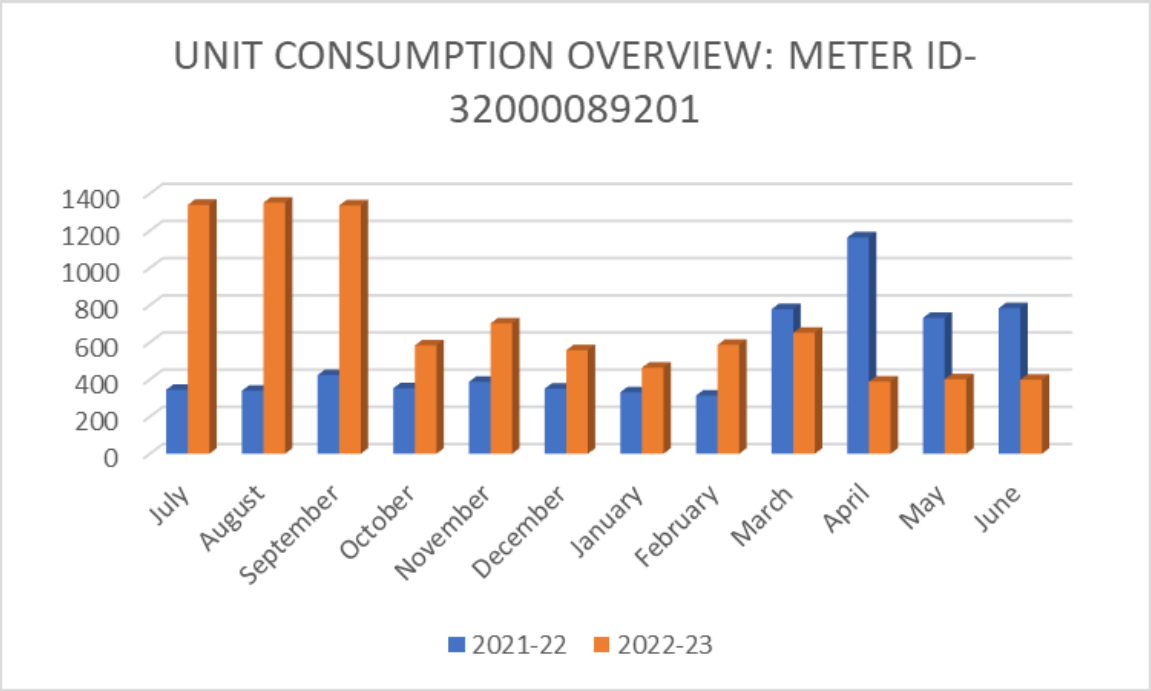


Figure 9: Unit consumption overview for the academic year 2021-22 & 2022-23

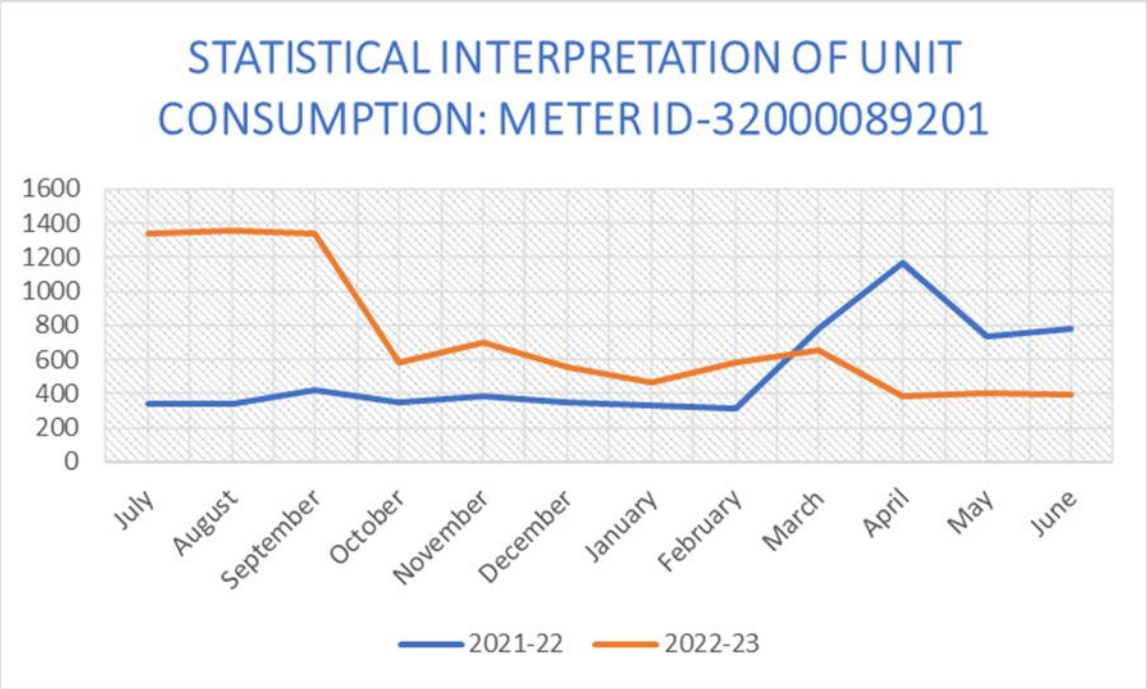


Figure 10. Statistical interpretation of unit consumption for the academic year 2021-22& 2022-23

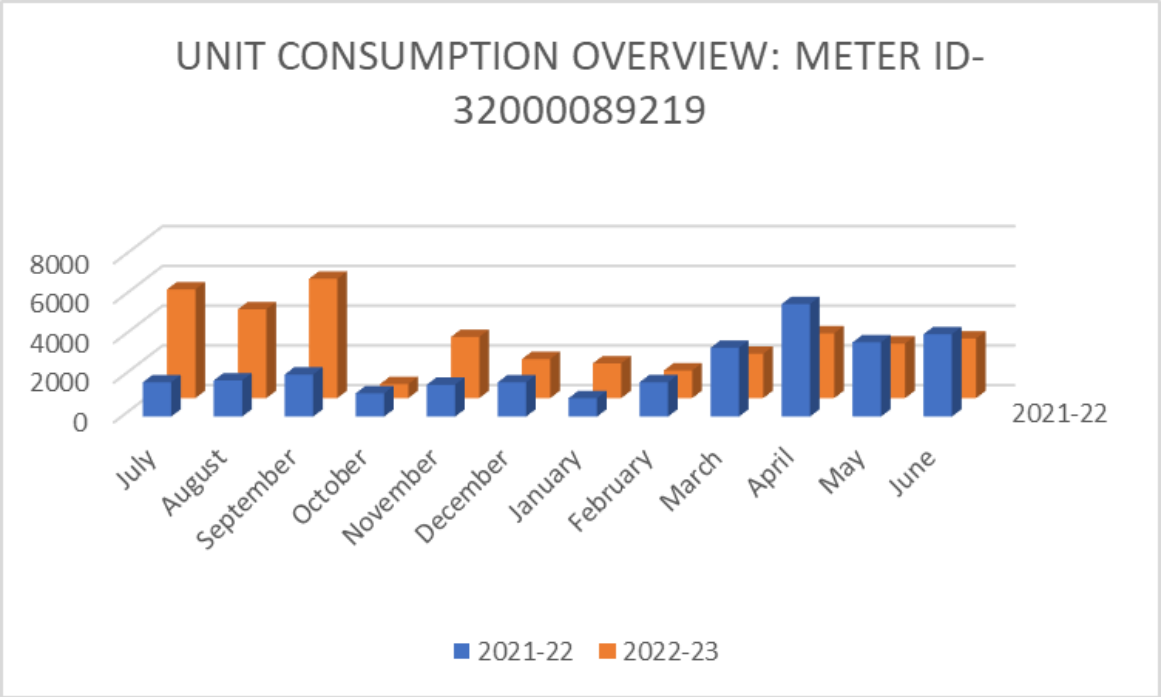


Figure 11. Unit consumption overview for the academic year 2021-22 & 2022-23

Month	2021-22	2022-23
July	1725.3	5469.3
August	1822	4470
September	2118.6	6000.6
October	1172	704
November	1602.6	3074.6
December	1722	1964
January	929.3	1747.3
February	1728	1390
March	3462	2228
April	5661.3	3256.6
May	3734	2742
June	4145.3	2999

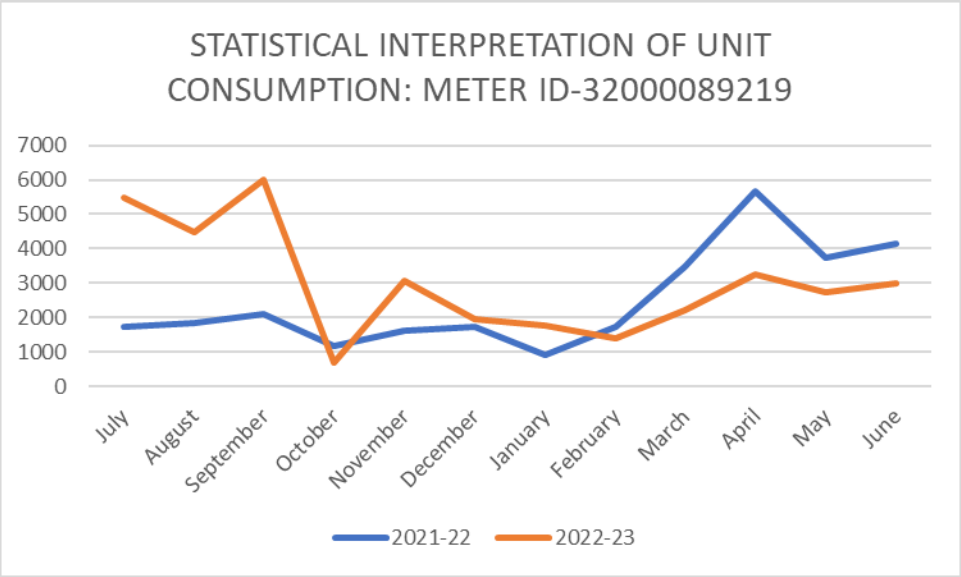


Figure 12. Statistical interpretation of unit consumption for the academic year 2021-22 & 2022-23

Figure 13. Distributed Generation of Bangabasi Evening College

The amount of CO_2 (ppm) in different places is depicted in table 3 and its corresponding pie diagram is shown in figure 14.

Table 3. Amount of CO2 (ppm) in different places

Locations inside college campus	CO2 (ppm) in air
Class room (Sample1)	410
Class room (Sample 2)	428
Class room (Sample 3)	400
Staff Room	365
Office (New)	375
Library	400
Office 2	410
Laboratories	450
Conference Hall	300
Canteen	680
Parking	400

CO2 Level Reference Ranges:

- 350-1000 ppm: Typical levels found in occupied spaces with efficient air exchange and clean air.
- 1000-2000 ppm: Moderate levels associated with reports of drowsiness and diminished air quality.
- 2000-5000 ppm: Critical levels linked to symptoms such as headaches, sleepiness, and a sensation of stagnant, stale air. Additionally, reduced concentration, attention span, elevated heart rate, and mild nausea may occur

Thermometer

CO2 (ppm) in different places

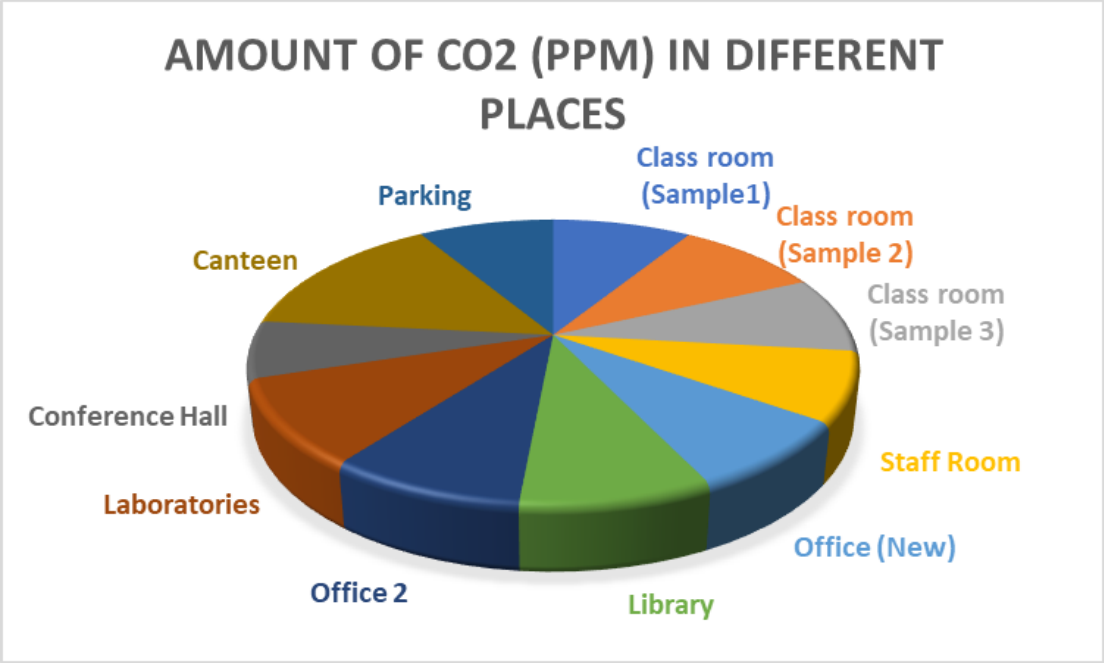


Figure 14. Amount of CO_2 (ppm) of the Air in Different location of the college Premises.

The calculation of carbon footprint can be carried out according to the method outlined on www.carbonfootprint.com, which involves summing the annual electricity usage. The CO_2 emissions from electricity are calculated using the formula:

CO_2 emission from electricity = (electricity usage per year in kWh / 1000) x 0.84

Substituting the given values: = (40458 kWh / 1000) x 0.84 = 33.98 metric tons

Note:

- Annual electricity usage: 40458 kWh
- 0.84 is the conversion coefficient from kWh to metric ton

Major audit observation:

SL. No.	Sectors	Weightage
1	Applied to NCE	L
2	Tendency to use LED and CFL bulb	M
3	Reduce of AC Uses	H
4	Awareness	L
5	Management of CHG_s	H

 # H denotes management policy level > 25%

 # M denotes management policy level > 15%--25%

 # L denotes management policy level< 15%

Best Practices followed in the Organization

- ✓ Converters, alternators, and battery backup systems are securely enclosed and labeled with awareness placards exhibiting 'Caution' and 'Alert' indicators.
- ✓ 'Activate' and 'Deactivate' indicators are strategically positioned in most regions to promote energy-conservation habits among stakeholders.
- ✓ Electric cables, control panels, and voltage stabilizers are adequately shielded to avert potential dangers to faculty and learners.
- ✓ LED lamps and solar roadway lamps are deployed.
- ✓ The energy efficiency ratio is upheld proximate to unity employing Automated Power Efficiency Amendment (APEA).
- ✓ Modifiable Frequency Drivers (MFDs) are utilized for elevators and air conditioning units.
- ✓ Antiquated display units and televisions have been substituted with LED displays.
- ✓ Electrically powered automobiles are accessible on the premises.
- ✓ Equipment with star ratings is employed wherever appropriate.

Energy Conservation Proposals: The power inspection presented suggestions for diminishing energy expenditures, enacting precautionary maintenance measures, and refining quality assurance undertakings, all vital for the effective functioning of utilities at the inspection locales.

- Contemplate investing in energy-sparing apparatus (4-5 star rated) when substituting antiquated equipment.
- Install subsidiary gauges in all edifices to oversee energy usage and utilization per edifice.
- Execute efficient water utilization and temperature settings through mechanized procedures to attain energy savings.
- Institute perpetual surveillance and analysis of energy usage with a committed campus squad.
- Routinely conduct energy preservation awareness initiatives (EPA) among stakeholders through unions, societies, assemblies, and segments.
- Promote the habit of powering down electrical contrivances when inactive.
- Ensure upkeep and substitution of obsolete appliances in all laboratories.
- Trigger power-conservation mode on computers and electronic gadgets.
- Set up a biogas facility for the dormitory kitchen and cafeteria.
- Deploy automatic switches with occupancy detectors in communal areas.
- Substantially curtail elevated monthly electricity consumption in the college through frequent energy evaluations.
- Modernize outdated and ineffective fans with fresh energy-efficient models.
- Consistently supervise equipment in all laboratories and promptly tackle any dilemmas.
- Provide value-added, informal, accreditation, or diploma courses on 'Energy and Environment Management Audits' to advantage scholars and research intellectuals seeking accreditation as Lead Auditors.

Introducing Energy-Saving Circuits for Air Conditioners: These mechanisms cleverly diminish compressor operation duration by employing timing or temperature fluctuation rationale while preserving human comfort. This advancement may yield electricity economizations ranging from 15% to 30%, contingent upon climatic circumstances and temperature configurations. Possessing a sum of 7 divided air conditioners, it is recommended to gradually substitute elder units with fresh, energy-efficient variants rated 5 Stars by the Bureau of Energy Efficiency (BEE).

Contemplating an average compressor activation duration of 5.5 hours daily, this shift guarantees notable energy conservations.

Recommendations on Carbon Footprint in the Organization:

- Enhance the Culinary Setup in the Dormitory Kitchen and Dining Hall to Save Gas.
- Promote Prudence in the Regular Operation of Generators, Inverters, and Uninterruptible Power Supplies (UPS).
- Instill the Practice of Switching Off Lights, Fans, Air Conditioners, Gadgets, and Equipment When Not in Use.
- Install Proper Ventilation and Exhaust Systems in Auditoriums, Classrooms, and Conference Rooms to Lower Carbon Dioxide Levels for Students, Faculty, and Staff.

Conclusions: Considering the establishment's widely acclaimed prestige and resilience, there presents a noteworthy chance to fortify energy-saving endeavours and propel the grounds towards self-sufficiency. The organization has already demonstrated admirable advancement in this realm by incorporating energy-efficient illumination, heightening stakeholder consciousness, and guaranteeing dependable backup power arrangements. Moreover, the establishment abides by stringent criteria for energy evaluation, encompassing appropriately fortifying transformers, alternators, and UPS mechanisms with enclosures and cautionary indicators. Eminent signage advocates for energy-conserving actions, complemented by meticulous electrical infrastructure upkeep, which bolsters energy conservation endeavours and prioritizes the welfare of staff and pupils. The application of sprinkler irrigation on campus to curtail energy usage is praiseworthy. Nonetheless, supplementary recommendations could further augment the establishment's energy preservation capacities, leading to a brighter prospect marked by an environmentally conscious campus and sustainable communal advancement in the times to come.

RECCOMMANDATION

To reduce energy consumption and management

- Given the esteemed reputation and long-standing presence of the institution, there exists abundant opportunity to bolster energy conservation endeavors and transition the campus towards self-sufficiency. The organization has already taken notable steps in this direction by instituting energy-efficient lighting, fostering stakeholder awareness, and ensuring reliable power backups. Furthermore, adherence to energy auditing best practices, including the proper safeguarding of transformers, generators, and UPS systems through fencing and informative signage, underscores a commitment to safety and sustainability.
- The adoption of sprinkler irrigation for campus upkeep represents a praiseworthy initiative in minimizing energy consumption. Nonetheless, there are additional recommendations to further augment the organization's energy-saving capabilities. Implementing these measures can pave the way for a prosperous future characterized by an energy-responsible campus and sustainable ecological and communal progress for stakeholders in the years to come.

Potential areas for environment management and green development.

- Another Rain water harvesting unit should be installed and use of the same for irrigation in garden along with the wash room use and clinging purpose may be done through developing some green project mode which reduce the consumption of ground water to some extent.
- Auto regulating device should be attached with the submersible pump so that overflow of the roof top tank may be checked.
- Auto regulating sprinkler may be installed for adequate irrigation in the rooftop plant garden even in the summer period.

- The Bangabasi Evening College have a considerable area of building blocks so, during rainy season huge amount of water from the roof top may be transfer to Ground water recharge system which may be taken into account by the college authority in a specific environment project mode.
- A bio-remediation plant should be installed in the college campus where the water admixed with different harmful chemicals of the chemistry laboratory may be treated by some specific aquatic hydrophytes and algae which have the capability to absorb the chemicals and heavy metals from the water. Then the water should be released to the common drainage systems.
- Some waste water was directly found to be admixed in the natural water bodies through some drainage system which should be carried on after passing through the water treatment plant.
- In each and every floor of all building more separate degradable and non-degradable waste been should be installed for proper management of the waste and the degradable waste may be transfer in the plant through which organic fertilizer can be produced and applied as green manure in the garden.

For better conservation of Biodiversity

- As the open area /fallow land in the college campus is almost nil so some vertical portion may be allotted by the college authority for Hanging medicinal plant library which can be used both for study and conservation of some locally threatened tree species.
- A space and provision for hanging garden has also been noticed which may be used for this purpose to create a green and healthy environment for the students and staff of the college
- Name plate of All existing MTS should be done and install for education purpose.