GREEN AUDIT REPORT, 2022-2023

Dr. Bhupendra Nath Dutta Smriti Mahavidyalaya, Hatgobindapur, Dist. Purba Burdwan

Auditing agency:

Progyan Foundation for Research and Innovation

An ISO 14001:2015 Certified Organization

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Report Overview

Sl No	Audit parameters	Score Card	Page No	Remarks
1	Water Resource Management	9	10-17	Good
2	Energy Resource Management	7	18-25	Scope for betterment
3	Waste Management	7	26-30	Scope for betterment
4	Ambient Air & Noise Quality	8	31-34	Good
5	Biodiversity	9	35-42	Good
6	General Awareness	8.5	43-46	Good
7	Environmental Compliances	6.8	47-50	Moderate

SECTION 1
INTRODUCTION

1.1. Introduction to green audit

I) Basis of green audit

The term 'Green' signifies conservation of the environment, primarily, in terms of carbon footprint reduction and promotion of renewable energy. It is used as an acronym for 'Global Readiness in Ensuring Ecological Neutrality' (GREEN). Green Audit is the systematic process of identifying, quantifying, recording, reporting, and analysing elements of environmental diversity. Green accounting involves the same systematic process but expresses these elements in financial or social terms. Often referred to as 'Environmental Auditing,' Green Auditing aims to evaluate environmental practices within and around an institution that affect its eco-friendly atmosphere. It started as a way to inspect activities within organizations that might pose risks to both public health and the environment.

Green audits of educational institutions are essential for a variety of reasons. Firstly, they evaluate the considerable environmental impacts of these institutions, taking into account their size, activities, and resource consumption. Secondly, by identifying areas of inefficiency in energy, water, and other resources, green audits help institutions to adopt sustainable practices that result in resource conservation and cost savings. Furthermore, they aid in identifying the types and quantities of waste produced, enabling effective waste reduction and recycling initiatives. These audits also enhance health and safety by recognising environmental hazards. Ensuring compliance with environmental regulations through green audits prevents potential legal issues. Moreover, the educational advantages are substantial, as they raise awareness about sustainability among students and staff as well as offer practical learning opportunities. Additionally, institutions can set an example, motivating other organizations and the wider community to embrace sustainable practices. Also, green audits facilitate long-term sustainability planning by integrating environmental considerations into operational and strategic decisions. This dedication to sustainability can improve an institution's reputation, attract students, faculty, and funding, and appeal to environmentally conscious stakeholders.

II) Objectives of green audit

A Green Audit oversees all environmental practices within an institution, evaluating whether processes consume more resources than necessary and offering efficient ways to utilize natural resources. In the current era of climate change and resource depletion, it is essential to verify and transform these processes into green and sustainable practices. The Green Audit facilitates this transformation, raising overall environmental awareness among institutional staff. The various components of the Green Audit include:

i. Charting the geographical layout of the college and its surrounding area.

ii. Recording the climate data specific to the college's location.

iii. Assessing and documenting the quality of drinking water.

iv. Evaluating and detailing the waste management systems in place.

v. Analysing and documenting wastewater quality.

vi. Cataloguing the biodiversity, including both flora and fauna, within the college grounds.

vii. Monitoring and documenting air, water, and noise conditions in the environment.

viii. Calculating the energy consumption needs of the college.

ix. Implementing environmental management strategies across departments.

x. Developing objectives, vision, and mission statements for campus sustainability.

xi. Reviewing and reporting expenditures on green initiatives over the past five years.

III) Benefits of green audit

i. It helps to protect the campus and surrounding environment.

ii. It helps in identifying cost-saving opportunities through improved waste management.

iii. It helps to detect current and potential future environmental impacts.

iv. It enhances environmental and social awareness among students and staff.

v. It improves the institution's environmental performance.

vi. It projects a positive image of the college through sustainable practices.

vii. It promotes environmental responsibility and ethical values.

viii. It strengthens the institution's reputation through green initiatives during NAAC evaluations.

1.2. Details of the audited institution

Dr. Bhupendra Nath Dutta Smriti Mahavidyalaya, a rural college established in 1996, honors Dr. Bhupendra Nath Dutta, the younger brother of the esteemed Swami Vivekananda and a notable figure in the Bengal Renaissance. Dr. Dutta's connection to Hatgobindapur and its surrounding areas dates back to the pre-independence period, where he was instrumental in the socio-economic development of the region. To commemorate his efforts, a decision to establish a college in his name was made during a public meeting in 1983, culminating in the founding of Dr. Bhupendra Nath Dutta Smriti Mahavidyalaya in 1996. This college is a state government-aided institution affiliated with The University of Burdwan.

Amidst the freedom movement in the 1930s, a new socio-educational movement emerged alongside the progressive peasant movement in Burdwan district. Hatgobindapur, a traditional rural area, was affected by this movement. Dr. Jnananjan Guha Neogi, in collaboration with Dr. Bhupendra Nath Dutta, initiated the renowned 'Lantern Lectures' to promote socio-educational activities by establishing libraries and literacy centers. The local community took the initiative to establish a higher education center named after Dr. Bhupendra Nath Dutta, recognizing his contributions to the area's development. In 1982, through a mass meeting, prominent figures such as Dr. Ram Narayan Dutta, a leading medical practitioner, and Sri Ganesh Choudhury, a dedicated social worker, decided to establish the college. Sri Ganesh Choudhury played a pivotal role as the main architect of the college, providing unwavering support for its establishment.

A final decision was made during a meeting on August 21, 1995, chaired by Dr. Ram Narayan Dutta, and an organizing managing committee was formed. A formal proposal was then submitted to the Government of West Bengal and the University of Burdwan for approval.

The college is situated in Hatgobindapur, 14 kilometers from Burdwan township, connected by the Burdwan-Kalna road. The nearest railway station is Saktigarh, located 6 kilometers from the college. Hatgobindapur is known for its bi-weekly market held on Mondays and Thursdays. The area is well-connected by frequent local and long-distance bus services, linking the southern and northern districts of Bengal, with an important stop at Hatgobindapur.

Table 1: College details

Name of the College	Dr. Bhupendra Nath Dutta Smriti Mahavidyalaya
Name of the Principal	Dr. Amal Kumar Ghosh
Latitude	23°15´28´´N
Longitude	87°59´10´´E
Total Campus Area	29502 sq. metre
Total Built-up Area	2775.77 sq. metre
Address	P.O.: HathGobindopur, P.S.: Saktigarh, District: Purba Bardhaman; Pin: 713407
Contact Details	0342-2584616/401/960
No. of Departments (UG)	18
No. of Students	1998
No. of Distant Education Students (Netaji Subhash open University Study Centre, PG)	16
No. of Permanent Teachers	29 + Principal+ Librarian
No. of SACT (State Aided College Teacher)	50
No. of Permanent Non-teaching Staff	15
No. of Casual Non-teaching Staff	15
No. of Security Staff	2

1.3. Vision and mission statement of the college

The college aims to create new opportunities for rural students to pursue higher education. It seeks to disseminate knowledge by publishing literary articles and organizing seminars and workshops. The institution is dedicated to providing higher education to socially disadvantaged communities and has introduced job-oriented courses to foster self-employment opportunities. Additionally, it offers support to economically disadvantaged students, including those from SC, ST, and OBC backgrounds, to help them continue their studies.

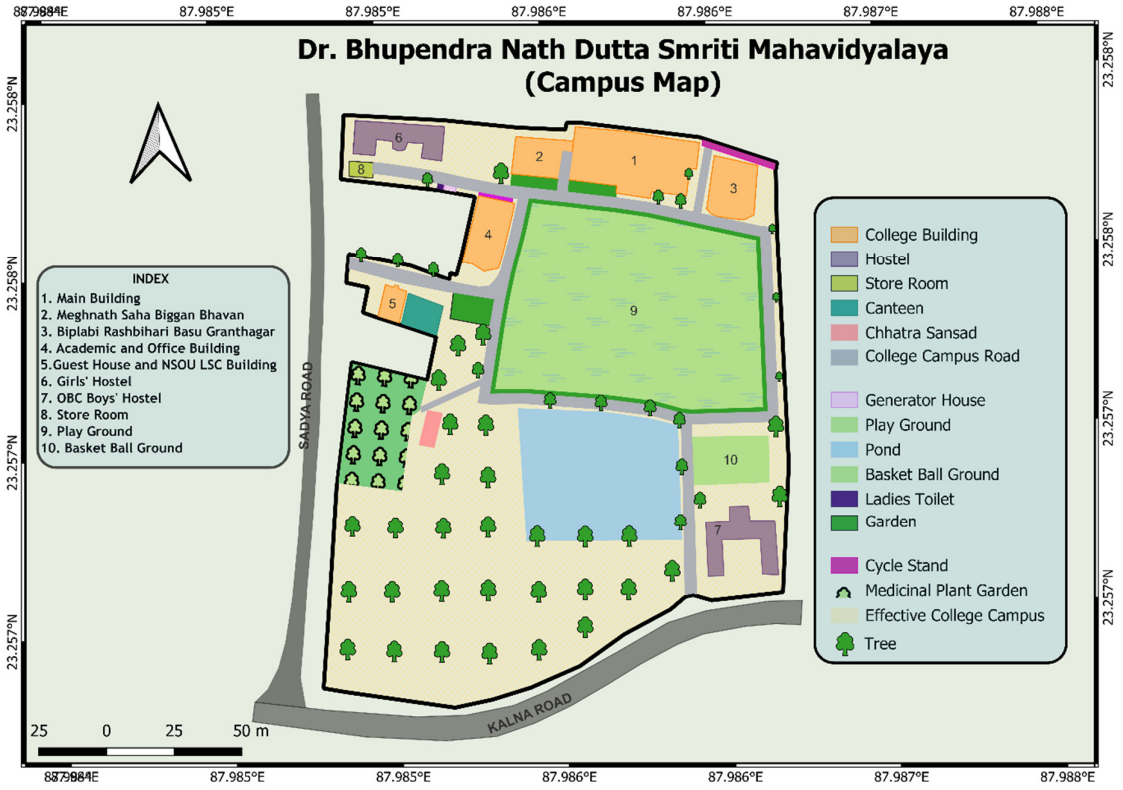

Fig. 1. Map of the college campus

1.4. Methods of auditing

The audit procedure was executed in three stages between June 2022 and May 2023. Initially, all necessary secondary data for the study was sourced from various key information providers and relevant departments. A comprehensive literature review was undertaken to grasp the concept of green auditing. Various case studies and methodologies were reviewed, leading to the adoption of the following approach for the current audit. The methodology for this study involved onsite visits, personal observations, and questionnaire survey tools. Baseline data for the Green Audit report was collected through questionnaire surveys. The questionnaires used for conducting the Green Audit on college campuses were based on guidelines, rules, acts, and formats prepared by the Ministry of Environment, Forest and Climate Change, New Delhi, the Central Pollution Control Board, and other statutory organizations. After onsite visits and stakeholder interviews, the questionnaires were completed. The gathered data was then compiled and used for further analysis. Based on the results of the comprehensive study, a final report was prepared.

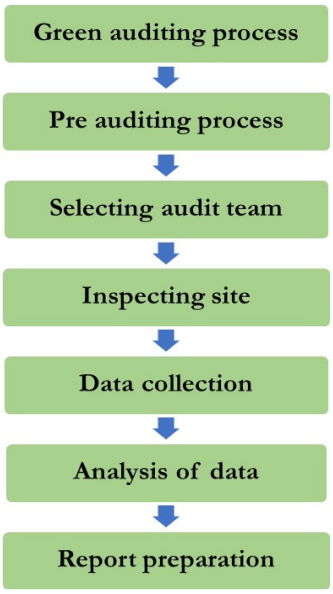

Fig. 2. Process of green audit

1.5. Scope of green audit

The scope of a green audit covers multiple facets of environmental management and sustainability practices. Key components include:

i. **Water usage:** Reviewing water consumption to find areas for reduction, implementing water-saving technologies, and ensuring proper wastewater treatment processes are in place.

ii. **Energy conservation:** Evaluating energy usage patterns, identifying inefficiencies, and recommending measures to reduce energy consumption and improve efficiency.

iii. **Waste management:** Assessing waste generation, segregation, and disposal practices. The audit identifies ways to minimize waste, promote recycling, and manage hazardous waste safely.

iv. **Pollution control:** Monitoring and controlling air, water, and soil pollution. The audit examines emissions, effluents, and practices that impact the environment, recommending strategies for pollution prevention and mitigation.

v. **Resource efficiency:** Analyzing the use of natural resources, such as raw materials and fuels, to ensure they are used efficiently and sustainably.

vi. **Compliance with environmental policies:** Ensuring that the organization adheres to local, national, and international environmental regulations and standards. This includes compliance with laws related to emissions, waste disposal, and resource use.

vii. **Sustainable practices:** Promoting the adoption of sustainable practices, such as using renewable energy sources, eco-friendly materials, and green technologies. The audit assesses the organization's overall sustainability strategy and its implementation.

viii. **Biodiversity conservation:** Evaluating the organization's impact on local ecosystems and biodiversity. This includes assessing land use practices, habitat protection efforts, and initiatives to preserve and enhance biodiversity. The audit identifies potential risks to wildlife and natural habitats and recommends actions to mitigate these impacts.

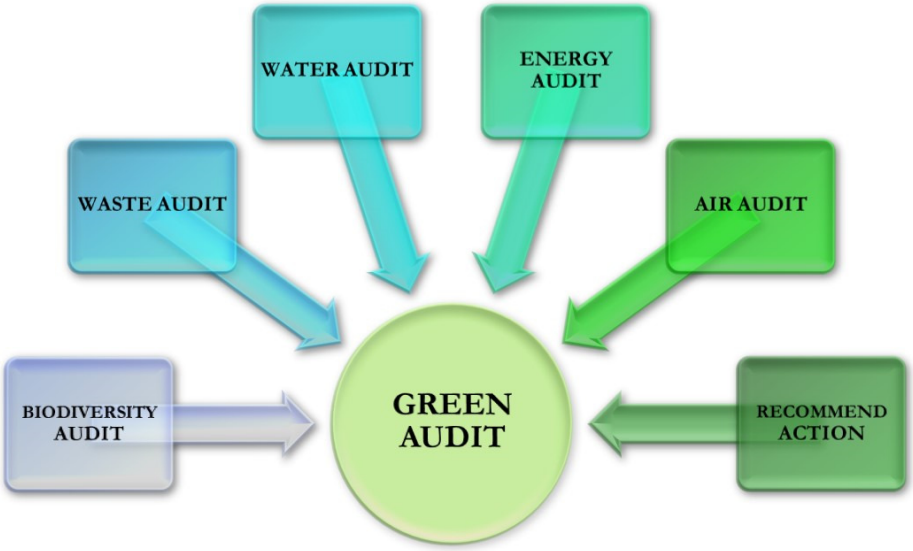

Fig. 3. Scope of the green audit

SECTION 2
WATER AUDIT

2. Water Resource Management

I) Importance of water resource management

Water is a fundamental nutrient required for human survival, in addition to carbohydrates, proteins, fats, and vitamins. It constitutes about 60% of the human body, and survival without water is limited only to three to five days. Water is crucial for bodily functions such as waste elimination, temperature regulation, and nutrient transportation, which are essential for digestion.

A. Increasing demand for freshwater

Rising living standards, industrialization, and urbanization have accentuated freshwater requirements in India. To address this increasing demand, the Central Government has initiated a national mission on water conservation called the 'Jal Shakti Abhiyan.' This campaign encourages all citizens to join efforts in combating water scarcity by saving every drop of water and suggests that water audits be conducted in all sectors of water usage.

B. Water auditing

A water audit is a methodical process aimed at creating a detailed water balance. It measures the flow of water from its source or treatment point through the distribution system to where it is used, and ultimately discharged. Water audits are cost-effective ways to identify and reduce losses of water, optimize water use in various applications, and achieve significant water savings in sectors like irrigation, domestic use, power generation, and industry.

C. Recommendations for water conservation

In order to tackle the ever-rising demand for freshwater, it is vital to cut down on water usage and boost the reuse and recycling of treated wastewater. Water audits are instrumental in locating inefficiencies and identifying areas for improvement, thus fostering sustainable water management practices. The growing stress on freshwater resources makes the adoption of comprehensive water conservation strategies essential. Water auditing and popularising water reuse and recycling may ensure substantial progress in sustainable water management, thereby safeguarding it for future generations.

D. Importance of water audit

Identifying problems through the system of water audit simplifies the process of finding solutions, making it more efficient and allowing for the implementation of an effective tracking system.

A multitude of factors such as climate, culture, dietary habits, employment and working conditions, level of socio-economic development, and physiology influence the amount of water required by individuals, groups, and institutions. For the purpose of this water audit, the water requirements of the Southeast Asia Regional Office of the World Health Organization (WHO) have been accepted as the yardstick (Table 2).

Table 2: Yardstick of water requirements by institutions

Purpose	Requirements
Administration (excluding staff accommodation)	50 lit/day/person
Staff Housing	30 lit/day/person
School	2 lit / student
Water-flushed toilets	10-15 lit/student

II) Water quality

Table 3 offers a comprehensive summary of critical water quality parameters, carefully measured using established standard protocols to ensure precision and dependability. The World Health Organization (WHO) publishes a range of water quality guidelines, covering areas such as drinking water, safe wastewater use, and safe recreational water environments. These guidelines, which focus on risk management, have emphasized the Framework for Safe Drinking Water since 2004.

Table 3: Water quality assessment

Parameters	Raw water	Filtered water	Standard value (BIS)
Odor	Agreeable	Agreeable	-
Taste	Agreeable	Agreeable	-
Dissolved Oxygen (mg/l)	7.1	7.9	≥ 6
pH	7.65	7.1	6.5-8.5
Fe(mg/l)	1.157	0.068	0.3
Total hardness as $CaCO_3$(ppm)	280	210	200
Arsenic (mg/l)	0.01	BDL	0.01
Chloride (mg/l)	24.2	10.2	250
Turbidity(NTU)	0.8	0.3	1
Mn (mg/l)	0	0	0.1
TDS(mg/l)	170	80	500
Total coliform (cfu/100ml)	0	0	0
Faecal coliform (cfu/100ml)	0	0	0

The water quality of the college is assessed based on several parameters, comparing raw water to filtered water and standard values set by the Bureau of Indian Standards (BIS). Both raw and treated water have agreeable odor and taste, meeting acceptable sensory standards. The dissolved oxygen levels increase from 7.1 mg/l in raw water to 7.9 mg/l in treated water, exceeding the minimum requirement of 6 mg/l. The pH levels decrease slightly from 7.65 in raw water to 7.1 in treated water, remaining within the permissible

range of 6.5-8.5. Iron concentration significantly drops from 1.157 mg/l to 0.068 mg/l after treatment, well below the standard limit of 0.3 mg/l. Total hardness as $CaCO_3$ reduces from 280 ppm to 210 ppm, nearing the acceptable limit of 200 ppm. Arsenic levels are brought down to below detectable limits (BDL) from 0.01 mg/l, meeting the standard value of 0.01 mg/l. Chloride levels decrease from 24.2 mg/l to 10.2 mg/l, far below the limit of 250 mg/l. Turbidity is reduced from 0.8 NTU to 0.3 NTU, within the permissible limit of 1 NTU. Manganese remains undetected in both raw and treated water, below the standard limit of 0.1 mg/l. Total dissolved solids (TDS) drop from 170 mg/l to 80 mg/l, well within the acceptable limit of 500 mg/l. Both total coliform and fecal coliform counts are zero in both raw and treated water, meeting the stringent requirement of zero cfu/100ml. This comprehensive assessment indicates that the treated water quality is significantly improved and meets all the BIS standards for potable water.

III) Water storage system

The college campus contains an efficient water storage setup that includes various reservoirs categorized by their placement and function. It comprises three overhead tanks holding 2000 liters of water each, totaling 6000 liters of stored water. Additionally, three smaller overhead tanks, each with a capacity of 1000 liters of water, store a total of 3000 liters. Two rainwater harvesting tanks, each accommodating 2000 liters of water, contribute another 4000 liters to the total storage capacity. Together, these reservoirs demonstrate the college's strong commitment to water conservation and effective management with a total storage capacity of 13,000 liters.

Table 4: Categories of the water reservoir and its water holding capacity

Type	Number	Volume (l)	Total Volume (l)
Overhead	3	2000	6000
Overhead	3	1000	3000
Rainwater	2	2000	4000
	Total		**13000**

IV) Per capita water allocation and per capita usage

The water usage data for the college reveals critical insights into consumption patterns and areas for improvement. Groundwater is the primary water source, with the annual total water usage reaching 26,783,665 liters (Table 5). The data shows that gardening accounts for 3.14% of the total water usage, amounting to 840,000 liters annually, indicating that the college authorities are meticulous about preserving the flora of the college. The annual drinking water consumption is relatively low, with students using 3.79% (1,014,984 liters) and other categories (permanent teachers, SACT teachers, permanent and casual NTS, and security personnel) collectively using about 0.19%. However, these percentages are at par with the water intake requirements of individuals. The most significant water consumption comes from toilet usage, particularly by students, who account for 85.27% (22,837,140 liters) of the total water usage. Other

categories for toilet use contribute an additional 4.25% annually. These figures highlight that sufficient water is being allocated for the maintenance of sanitation and hygiene within the campus. 2.37% (635,000 liters) of the total water consumed is used for mopping the built-up parts of the campus annually, reiterating the concern for the maintenance of sanitation among the college authorities.

Table 5: Different categories of water usage

Water Source	Activity	Category	Days	No. of Users	Water usage/day/ person	Total water usage/day	Annual water usage	% of water used
Groundwater	Gardening		210	College Campus	4000	4000	840000	3.136239943
	Drinking	Students	254	1998	2	3996	1014984	3.789563527
		Permanent Teacher	254	31	2	62	15748	0.058797032
		SACT Teacher	202	50	2	100	20200	0.075419103
		Permanent NTS	254	15	2	30	7620	0.028450177
		Casual NTS	202	15	2	30	6060	0.022625731
		Security Personnel	254	2	2	4	1016	0.003793357
Groundwater	Toilet	Students	254	1998	45	89910	22837140	85.26517935
		Permanent Teacher	254	31	45	1395	354330	1.322933213
		SACT Teacher	202	50	45	2250	454500	1.696929826
		Permanent NTS	254	15	45	675	171450	0.640128974
		Casual NTS	202	15	45	675	136350	0.509078948
		Security Personnel	254	2	45	90	22860	0.08535053
Groundwater	Washing hands & face	Students & staff excluding SACT	254	2046	0.5	1023	259842	0.970151023
		SACT	202	50	0.5	25	5050	0.018854776
		Casual NTS	202	15	0.5	7.5	1515	0.005656433
Groundwater	Mopping Floor		254	College built-up area	2500	2500	635000	2.370848052
Total Water Usage						**106772.5**	**26783665**	**100**

V) Utilization and wastewater generation

The annual data on the college's water usage highlights substantial consumption in several key areas, demonstrating its operational priorities and dedication to upholding a functional and sustainable environment (Fig. 4). As indicated by the calculations in Table 5, gardening, mopping the built-up parts of the campus, toilet usage, and washing face and hands consume appropriate amounts of water, reflecting suitable consciousness regarding environmental conservation, cleanliness, and sanitation among the college authorities, staff, and students. This comprehensive analysis emphasizes both the college's varied water requirements and the importance of effective water management strategies to maintain operations and encourage conservation.

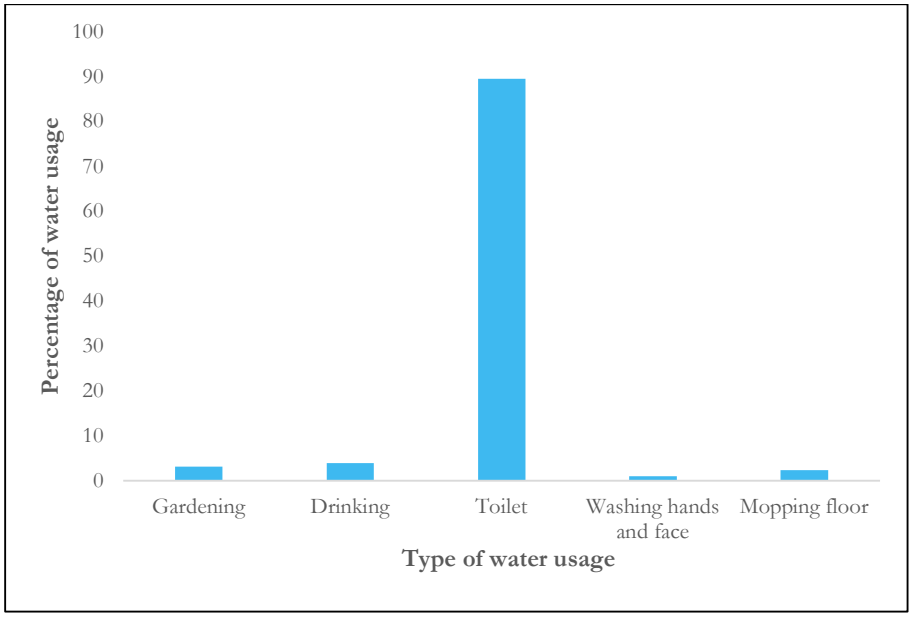

Fig. 4. Proportion of water utilisation per annum according to the type of usage

The largest share of wastewater is generated from toilet usage as it consumes the maximum proportion of water annually. Table 6 and Fig. 5 depict the wastewater generated from various activities.

Table 6. Amount of wastewater generated based on various activities

Amount of wastewater generated based on various activities Activity Wastewater generated		
Activity	**Wastewater generated (l/annum)**	**Percentage of wasterwater generated/annum**
Gardening	840,000	3.266190184
Toilet	23,976,630	93.22884946
Washing hands and face	266,407	1.035876105
Mopping floor	635,000	2.469084246

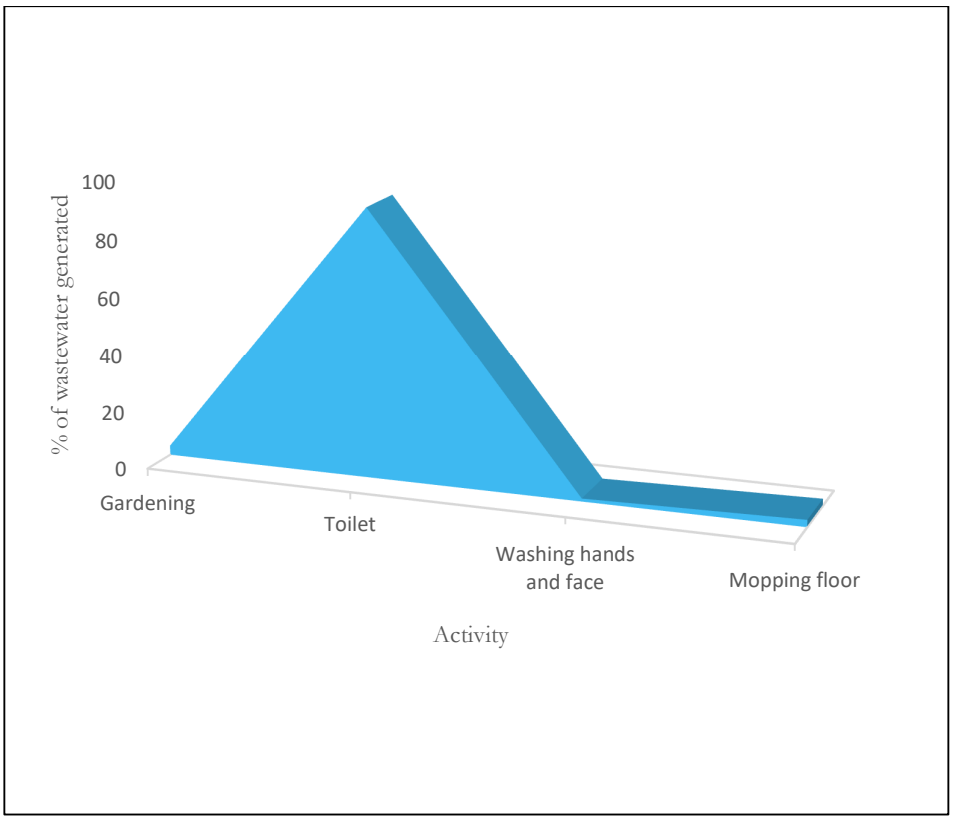

Fig. 5. Proportion of wastewater generated according to the type of usage

VI) Rainwater harvesting, usage, and groundwater recharge

The college has introduced a rainwater harvesting system, showcasing its dedication to environmental conservation and efficient water management. This system includes two units, each capable of holding 2000 liters, amounting to a total of 4000 liters. Although there is room to expand this capacity in the future, it currently represents a substantial volume. The collected rainwater is used to replenish groundwater reserves, playing a vital role in sustaining the groundwater table and providing a consistent water source during times of dryness or scant rainfall, thereby supporting the water sustainability of the entire campus.

Also, the college has significantly boosted its greenery by planting more vegetation and regularly modifying the landscape. These actions not only enhance the appearance of the campus but also significantly improve groundwater reserves. The extensive vegetation cover helps water infiltrate the ground and reduces runoff, thus increasing the rainwater harvesting system's effectiveness. Collectively, these efforts reflect the commitment of the college authorities to promote sustainable practices for maintaining a stable and eco-friendly environment for the entire campus community.

Photograph 1. Rainwater reservoirs on the college campus to store excess rainwater

VII) Accessibility to water resources

The water audit shows that the drinking water and sanitation facilities of the college are highly satisfactory. The entire college campus is well connected with easily accessible potable water, allowing students to remain well- hydrated for good health. A steady flow of water is maintained in all the toilets and washrooms throughout the campus, ensuring the maintenance of good hygiene. These facilities demonstrate a robust infrastructure that supports the health and well-being of students.

Photograph 2. Accessible drinking water on the college campus

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SECTION 3
ENERGY AUDIT

3. Energy Audit

I) Significance of energy resource management

Effective energy resource management in an educational institution is crucial for fostering a sustainable and efficient environment. Strategic management of energy resources can curtail operational costs, minimize their environmental impact by reducing the overall carbon footprint, and set a positive example for students. This practice not only ensures the optimal functioning of campus facilities but also promotes a culture of conservation and responsibility among students, faculty, and staff. Additionally, energy-efficient practices can enhance the general educational experience by providing a comfortable and well-maintained setting that supports academic and extracurricular activities. Energy auditing involves a comprehensive examination of energy usage within a facility to identify opportunities for energy conservation and cost savings. This process assesses the efficiency of energy-consuming systems and helps prioritize upgrades and improvements to enhance overall energy performance. The principal steps of the process are given below:

A. Assessment of energy use

i. **Preliminary assessment:** Gathering basic information about the facility, including its size, usage patterns, energy bills, and existing energy systems and scheduling an initial meeting with key stakeholders to outline the audit's scope and objectives.

ii. **Data collection:** Collecting detailed data on energy consumption through utility bills, meter readings, and energy management systems and documenting all energy-consuming equipment, including lighting, HVAC systems, machinery, and appliances.

iii. **Site inspection:** Conducting a thorough on-site inspection to assess the condition and performance of energy systems and identifying any obvious inefficiencies, such as outdated equipment, poor insulation, or leaks.

iv. **Benchmarking:** Analyzing the collected data to determine energy consumption patterns and identify areas of significant energy use and benchmarking to compare the facility's energy performance against similar facilities.

B. Analysis of Energy Efficiency

i. **Performance evaluation:** Utilizing key performance indicators (KPIs) to assess energy efficiency and detect inefficiencies.

ii. **Technology review:** Assessing the effectiveness of current technologies and systems, and exploring potential upgrades or replacements with more energy-efficient alternatives.

C. Development of conservation strategies

i. **Behavioral changes:** Encouraging energy-saving behaviors among students, faculty, and staff through awareness initiatives and training.

ii. **Operational improvements:** Implementing strategies like optimizing HVAC systems, improving insulation, and deploying energy management systems (EMS) to enhance efficiency.
iii. **Renewable energy integration:** Incorporating renewable sources like solar panels, wind turbines, and geothermal systems to reduce reliance on fossil fuels.
iv. **Energy storage solutions:** Implementing advanced systems for storing and optimizing the use of renewable energy.

II) Importance of the electricity and energy resource management

From a general point of view, an energy audit provides enormous benefits in different areas

i. **Identifying cost savings**: Energy audits help in identifying opportunities for reducing energy consumption and operational costs through efficiency improvements and better management practices.
ii. **Enhancing environmental sustainability**: By optimizing energy use, audits contribute to reducing carbon footprint and environmental impact, aligning with sustainability goals.
iii. **Improving operational efficiency**: Audits reveal inefficiencies in energy systems, enabling facilities to operate equipment more effectively and extend equipment lifespan.
iv. **Compliance and risk mitigation**: Audits ensure compliance with energy regulations and standards, audits mitigate risks associated with energy supply disruptions and regulatory non-compliance.
v. **Promoting organizational responsibility**: Conducting audits demonstrates commitment to responsible resource management, fostering a culture of sustainability within the organization.
vi. **Supporting strategic decision-making**: Insights from audits inform strategic decisions on capital investments in energy-efficient technologies and renewable energy integration.
vii. **Enhancing indoor environmental quality**: Efficient energy use often correlates with improved indoor air quality and comfort for occupants, benefiting overall health and productivity.
viii. **Securing funding and grants**: Audit findings can support applications for funding or grants aimed at implementing energy-saving initiatives and renewable energy projects.
ix. **Monitoring and continuous improvement**: Post-audit monitoring ensures sustained energy efficiency gains and identifies further optimization opportunities over time.

III) Total consumption in the whole campus as well as different sections

A. Electrical energy

The resilience of the campus community relies considerably on its energy utilization, sources, management practices, lighting systems, and diverse appliances. Conducting a thorough assessment of these elements is essential for devising effective strategies to conserve energy. Key areas of energy usage within the campus

include the office and laboratory, each fulfilling distinct functions with varying energy demands. Table 7 outlines the college's energy consumption trends over the course of a year.

The formula applied to compute energy usage is as follows:

Energy Consumption (kWh/year) = Power (W) × Hours × Number of Appliances × Days

Table 7. General electrical equipment and their electricity consumption in college per year

Sl No.	Appliances	No of appliances	Power used(kW)/ appliance	No of days	Usage per day(hour)	Energy consumption per year
1	Air conditioner (1 tonne)	3	1	198	8	4752
2	Air conditioner (1.5 tonne)	9	1.5	254	8	27432
3	CCTV	10	0.002	254	8	40.64
4	TV	3	0.08	254	5	304.8
5	Exhaust fan	24	0.2	254	5	6096
6	Refrigerator (180 L)	3	0.6	254	24	10972.8
7	Refrigerator (220 L)	1	0.8	254	24	4876.8
8	Aquaguard (80L)	2	0.05	254	8	203.2
9	Stand fan	1	0.8	20	7	112
10	Sound system	1	0.25	80	3	60
11	Tullu water pump	6	0.5	254	2	1524
12	Ceiling fan	295	0.25	198	8	116820
13	Tube light	284	0.02	254	8	11541.76
14	Computer	57	0.2	254	7	20269.2
15	Projector	4	0.12	200	5	480
16	Printer	11	0.15	254	5	2095.5
17	Photocopy machine	4	1	254	4	4064
18	Scanner	4	0.012	254	4	48.768
19	Wall mount fan	14	0.073	198	8	1618.848
20	LED light	15	0.011	254	5	209.55
21	Treadmill	4	0.65	254	3	1981.2
22	Halogen	1	0.006	254	8	12.192

B. Total energy consumption

The total energy consumption of the college has been calculated to be 336,674.1 kWh per year. Tables 7, 8, and 9 depict the distribution of electrical energy consumption across different appliances per annum by the college. Fig. 6 elucidates the proportion of the total energy consumed annually according to the types of appliances and their usage.

General electrical equipment consumes the maximum proportion of the total energy used by the college annually (64.01%) which is natural because of their more frequent usage and larger quantities in comparison to the other category of equipment. Among them, the chief power consuming appliances are ceiling fans (54.21%) followed by the air conditioner with a capacity of 1.5 tonnes (12.73%), computers (9.41%), refrigerators with a combined consumption of 7.35%, and tube lights (5.36%). The remaining appliances collectively consume 10.95% of the total energy consumed by this category.

Table 8. Energy consumption in laboratories

Sl No.	Appliances	No of appliances	Power used (kW)	No of days	Usage per day(h)	Energy usage per year
1	BOD incubator	1	1.5	254	24	**9144**
2	Incubator	1	1.7	254	24	**10363.2**
3	UV spectrophotometer (2000 W)	2	2	254	5	**5080**
4	Water distillation plant	2	0.4	254	6	**1219.2**
5	Hot air oven(2 chamber)	3	1.5	254	8	**9144**
6	Hot air oven(3 chamber)	1	2.5	254	8	**5080**
7	Hot air oven (small)	3	1	254	8	**6096**
8	Autoclave (750W)	1	0.75	254	8	**1524**
9	Autoclave (1000W)	1	1	254	8	**2032**
10	Heater (750W)	1	0.75	254	6	**1143**
11	Water bath	1	1.1	254	6	**1676.4**
12	High mass light(1000W)	6	1	254	8	**12192**
13	Suction pump(370W)	1	0.37	254	4	**375.92**

Table 9. Energy consumption from fuel in college per year

Sl No.	Appliances	No of appliances	Power used(kW)	No of days	Usage per day(h)	Energy usage per year
1	Auto Generator	2	25.21	190	1	9579.8
2	Manual Generator	2	25.21	190	1	9579.8
3	Domestic LPG Cylinders (14.5 Kg)	2	19	254	3	28956
4	LPG Cylinders (4 Kg)	2	5.24	254	3	7985.76

Among laboratory equipment, high mass lights (18.74%), incubator (15.93%), BOD incubator and hot air oven with two chambers (14.05% each), and small hot air oven (9.37%) are the principal energy consumers. The rest together use the remaining 27.86% of energy. Laboratory equipment utilize 19.33% of the total annual energy consumption of the college.

The remaining 16.66% of the total energy consumed annually by the college is used by fuel-based appliances like generators and LPG cylinders. Domestic LPG cylinders, used for classes in the Department of Nutrition and other miscellaneous uses for the staff account for the maximum proportion of energy consumption in this category (65.85%).

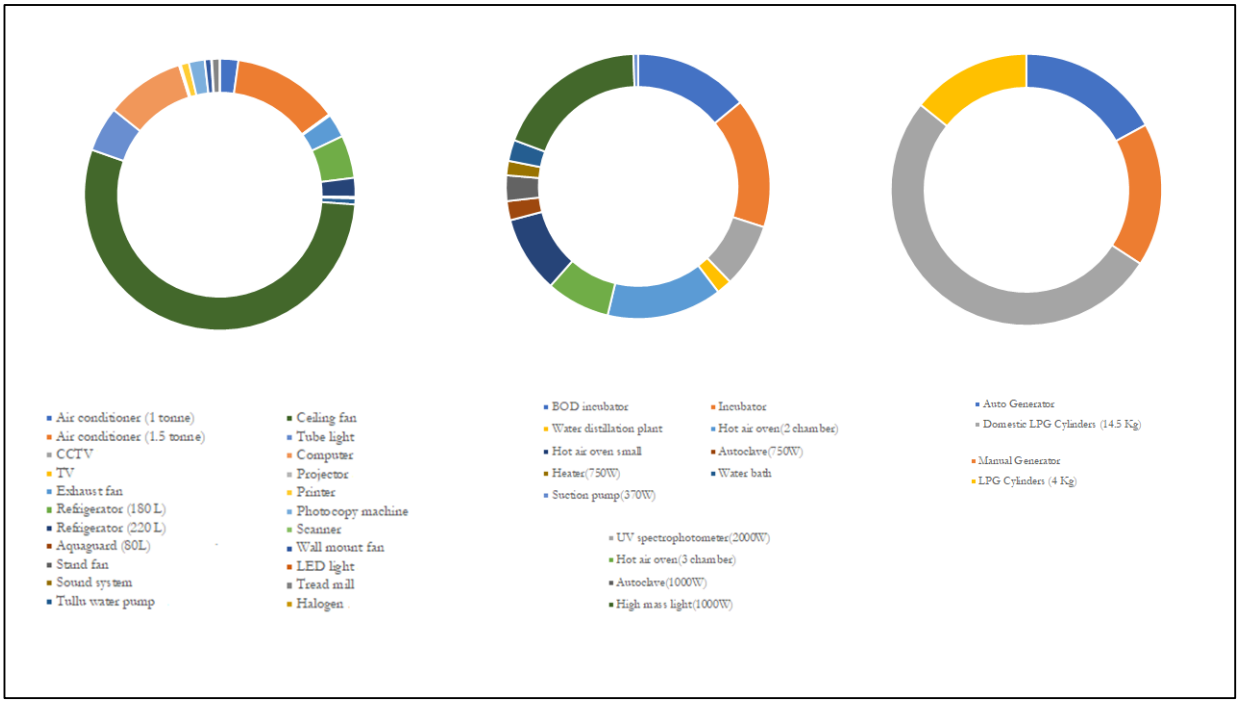

Fig. 6: Proportion of energy consumption per annum according to the type of usage

IV) Wiring and set-up conditions

The survey for energy audit confirms the excellent condition of the electrical infrastructure throughout the college campus. The maintenance of electricity circuits is efficiently handled, guaranteeing both safety and functionality. Exposed wires or circuits have not been discovered during the survey, demonstrating the thorough maintenance and regular inspections carried out by the campus maintenance team. This careful attention to electrical safety effectively reduces the risk of hazards such as short circuits or electrical fires, thereby protecting students, staff, and facilities. Additionally, the well-maintained electrical system supports the seamless operation of various campus facilities, ensuring uninterrupted functioning of classrooms, laboratories, and administrative offices. Presence of sufficient number of fire extinguishers throughout the college building, especially in proximity to the laboratories is indicative of the attention to safety by the college administration.

Photograph 3. Well maintained laboratory set up and electrical wiring system

V) Renewable energy use

Understanding the critical need to reduce its carbon footprint and foster environmental resilience amidst increasing concerns about carbon emissions and climate change, the college has installed one 10 kWp Grid connected Roof top Solar PV Power Plant, jointly funded by the Government of West Bengal and the Ministry of New and Renewable Energy, Government of India and implemented by the West Bengal Renewable Energy Development Agency (WBREDA). The vendor used for executing the installation was M/s- Chloride Power System & Solutions Ltd. However, solar power is yet to be used for meeting the electricity requirements of the college. Presently, the harnessed power is wheeled to the grid, in exchange of which the college receives subsidies on its electricity consumption.

The college maintains the efficiency and durability of its solar energy system with regular upkeep. The maintenance team is tasked with routine cleaning of the solar panels, a vital process that removes dust,

debris, and other particles that can collect on the panels and greatly diminish their efficiency and energy output.

Photograph 4. Rooftop solar panels

By keeping the panels free of these obstructions, the maintenance team ensures optimal performance and steady energy production. These exemplary actions highlight the college's dedication to sustainability and environmental responsibility while also inspiring students and the wider community to engage in environmental conservation.

VI) Energy wise-use – daylight usage

Utilizing daylight effectively is a key component of energy-wise practices. By maximizing natural light through strategic architectural design, such as installing large windows and skylights, buildings can reduce the need for artificial lighting during daytime hours. This approach not only lowers energy consumption and utility costs but also creates a healthier, more productive environment for occupants by providing ample natural light. From the survey, it may be concluded that daylight usage is comparatively better on the upper floors of the college than on the ground floor due to the presence of balconies.

SECTION 4
WASTE AUDIT

4. Waste Management

I) Solid waste collection and disposal system

The college has established an effective solid waste collection and disposal system to enhance waste management and support environmental sustainability. This system employs a thorough strategy, beginning with waste segregation at the source. Strategically located bins for wet and dry waste are distributed throughout the campus, making it convenient for students, faculty, and staff to dispose of waste correctly. The campus maintenance team regularly collects the waste, ensuring proper handling of each type. Recyclable materials are sent to specified recycling centers, organic waste is either composted on-site or taken to local composting facilities, and non-recyclable waste is disposed of according to panchayat guidelines. This carefully designed system not only decreases the amount of waste sent to landfills but also cultivates a sense of environmental responsibility within the college community.

Photograph 5. Segregation of waste

Notably, no organic or plastic waste has been found lying in the campus during the survey although some solid waste has been observed. Also, an open pit with water was observed in the campus which could act as a potential breeding ground for mosquitoes and other insects.

Photograph 6a. Instance of waste materials lying open on the campus

Photograph 6b. Instance of open water storage on the campus

II) Waste water collection and disposal system

On the college campus, wastewater is channeled through the current drainage system. It has been observed, however, that the campus lacks a specialized wastewater disposal or treatment facility. As a result, the wastewater is released without prior treatment, which may affect environmental compliance and sustainability efforts. The absence of a treatment plant underscores a potential improvement area in the college's waste management strategy to ensure environmentally responsible wastewater handling. In this context, it must be mentioned that the college authorities plan to install a system of greywater treatment with governmental assistance in the near future.

III) Toxic and e-waste disposal system

The college has implemented a systematic method for disposing of chemical waste, encompassing both solid and liquid forms. This waste is meticulously managed and directed to a designated acid soak pit on campus, engineered to safely neutralize and contain chemicals, thus preventing environmental or human health hazards. To bolster safety, college laboratories follow strict protocols for storing and handling hazardous chemicals. These substances are securely stored in specialized, clearly labeled containers designed to resist leaks and spills. Such precautions ensure that hazardous materials are managed with the highest care, reducing the risk of accidents and adhering to safety regulations. These extensive measures demonstrate the college's dedication to maintaining a safe and environmentally responsible campus.

Photograph 7a. Toxic waste disposal practice by college

Photograph 7b. Safe-keeping of laboratory chemicals in controlled environment

Also, the college handles its electronic waste in strict compliance with the E-Waste Management Rules of 2016, ensuring that e-waste is recycled and disposed of responsibly. This process includes collecting discarded or damaged electronic devices and sending them to certified recycling facilities where valuable materials are recovered and hazardous components are safely disposed of. By following these regulations, the college not only meets legal requirements but also helps reduce the environmental impact of electronic waste, promotes sustainability, and encourages a culture of responsible e-waste management within the campus community.

IV) Amount of waste generated annually

The total solid waste generated by the college including daily wet (organic waste including garden waste) and dry waste (paper, plastic, etc) amounts to 181.42 kg per annum. Bulky recyclable wastes such as fibres, tin, glassware, scrap iron, paper stationery, and e-waste such as broken parts of machines and so on are excluded from the aforementioned category and are sold to vendors for recycling as already explained.

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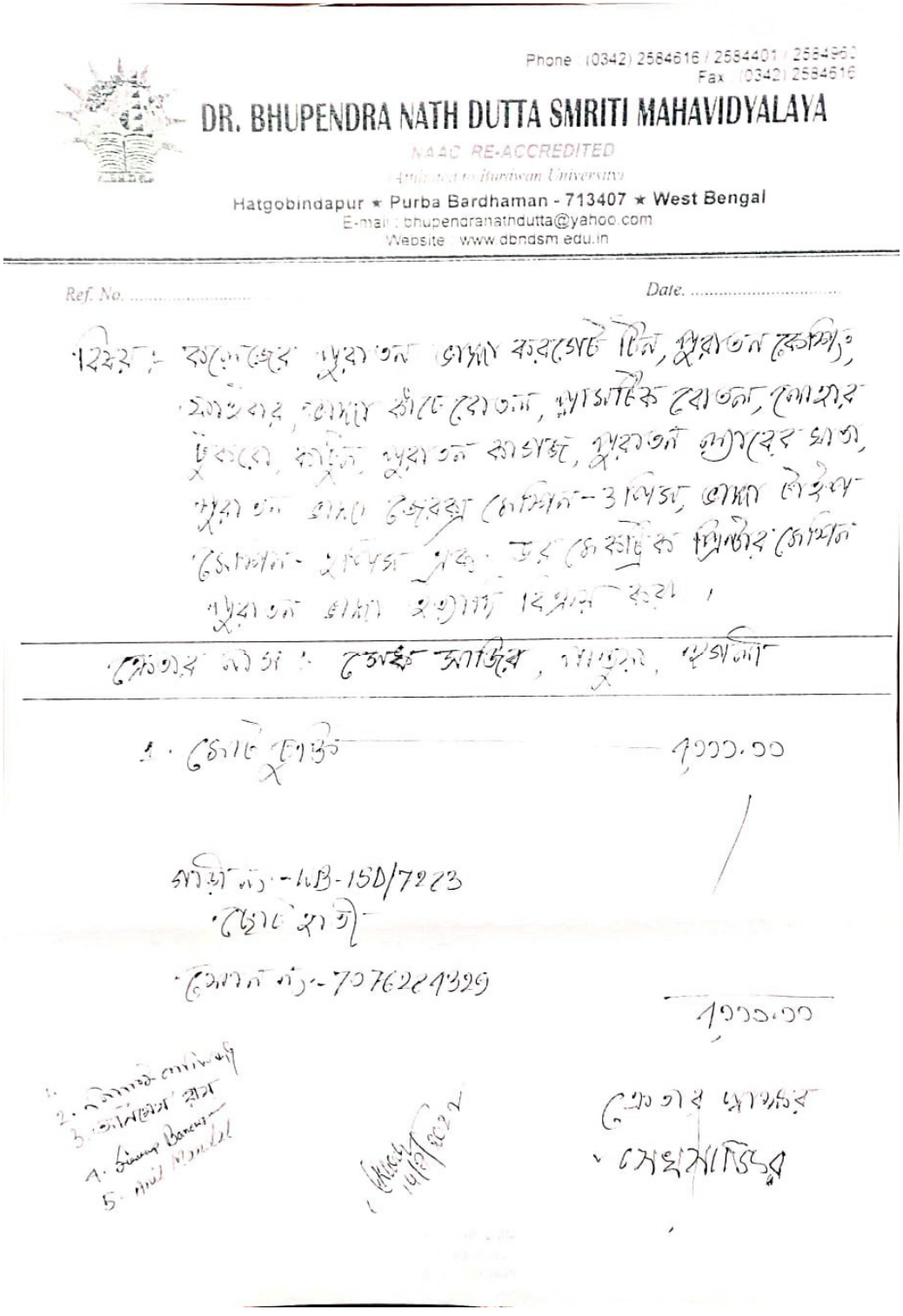

Photograph 8. Vendor details for solid and e-waste recycling

SECTION 5
AMBIENT AIR & NOISE QUALITY AUDIT

5.1. Ambient Air Quality

I) Ambient air quality inside the campus

The relatively remote location of the college helps maintain good air quality in the campus by limiting pollution. The main sources of air contaminants at the college are vehicle exhausts from traffic accessing the campus. Although the college is situated in an area which is mostly served by non-polluting vehicles such as electric rickshaws, few polluting vehicles such as busses cater to the hinterland of the college. However, they are few in number owing to the distant location as observed during the survey. Nevertheless, the lack of major industrial facilities within a 500-meter radius highlights that vehicle emissions are the primary contributors to local air quality degradation. The daily vehicular traffic on the college campus includes around 20 motorbikes and 6 private cars, indicating minimal movement within the premises. Most students and staff use public transportation like trains and buses, or eco-friendly modes of transport such as bicycles and electric rickshaws, to commute to and from the college. Although there is no current system to monitor Pollution Under Control (PUC) certificates, vehicle exhaust emissions, or noise and vibration pollution from vehicles, the college has conducted air and noise quality monitoring through the University of Burdwan. This shows the college's awareness of the potential environmental and health impacts of vehicular emissions and noise pollution.

Table 10. Status of ambient air inside the campus of the college

Parameters	Methods	Results	NAAQS(*24h)	Remarks
Sox	Improved West and Geake Method	10 µg/m3	80 µg/m3	Within permissible limit
Nox	Modified Jacob and Hochheiser Method	30 µg/m3	80 µg/m3	
PM10	Gravimetric Method	45 µg/m3	100 µg/m3	

The results of the air quality monitoring shows that all parameters are within the permissible limit, thereby demonstrating that the air quality inside the college campus is not degraded. The Air Quality Index (AQI) map (Fig. 7) shows that the campus air is mostly good, as indicated by shades of green, with the lowest value being the darkest (0-50 being the range for good quality). It becomes moderate during the winter months, as depicted by shades of orange, with the highest value being the darkest though the situation never becomes too concerning as the values remain within the low moderate range (51-100 being the range of moderate quality).

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
67	65	60	53	49	41	33	27	35	39	43	55

Fig. 7: Map showing the annual AQI of the college campus

II) Ventilation system

The college premises, especially the upper floors are well-ventilated, with classrooms designed to ensure a considerable flow of fresh air, creating a comfortable and healthy learning environment for both students and faculty. Moreover, the plentiful flora on the college grounds improves the air quality substantially. The plants and trees not only enhance the aesthetic appeal of the campus but also serve as natural air purifiers by absorbing carbon dioxide and other gases, contributing to a cleaner and more sustainable atmosphere. This blend of effective ventilation and strategic landscaping highlights the college's dedication to providing a healthy and conducive educational environment. Also, laboratories and toilets are suitably ventilated with exhaust fans, ensuring the prevalence of both safety and hygiene inside the college campus.

Photograph 9. Good ventilation system in toilets

5.2. Noise Quality

Table 11. Status of noise in the campus of the college

Place	Lowest (dB)	Highest (dB)
1. Inside Campus	36.63	65.66
2. Outside Campus	38.05	79.2
3. Lawn	36.1	76.5
4. Classroom	50.7	76
5. Office	50.2	62.4
6. Laboratory	42.1	77.2

Average of Lowest noise : 42.30 dB

Average of Highest noise : 72.83 dB

The average of the lowest noise levels across these locations is approximately 42.30 dB, indicating quieter environments, especially indoors and on the lawn. However, the average of the highest noise levels is around 72.83 dB, with some locations, such as outside the campus and in classrooms, experiencing higher noise levels, potentially affecting concentration and comfort.

SECTION 6
BIODIVERSITY

6. Biodiversity

I) Faunal diversity in the college campus

The college supports a significant diversity of fauna, attributed to the healthy and green vegetation surrounding the campus. A total of 31 bird species, 3 types of snake species, 3 types of amphibian species have been recorded, there are also observed 7 types of Ondata species & 3 types of mammal species & 4 types of butterfly species, as detailed in Table 10 The following observations highlight the diversity and abundance of avian species on the campus. According to the IUCN list, there are mainly least concerned bird species observed, the common birds seen in college, such as Spotted dove, White-rumped Munia, Common Iora, Rock Pigeon, Indian cuckoo etc.

Bird Species

The college campus hosts a rich diversity of bird species, reflecting a healthy and supportive environment for avian life. Among the observed species are the Spotted Dove (*Spilopelia chinensis*), Rock Pigeon (*Columba livia*), and Eurasian Collared-Dove (*Streptopelia decaocto*) from the Columbidae family, all classified as Least Concern (LC) on the IUCN Red List. The Strigidae family is represented by the Brown Boobook (*Ninox scutulata*) and Spotted Owlet (*Athene brama*), both also categorized as LC. The Picidae family includes the Fulvous-breasted Woodpecker (*Dendrocopos macei*), while the Rhipiduridae family is represented by the White-throated Fantail (*Rhipidura albicollis*), both holding an LC status. The Indian Paradise-Flycatcher (*Terpsiphone paradisi*) from the Monarchidae family, Common Tailorbird (*Orthotomus sutorius*) from the Cisticolidae family, and Oriental Magpie-Robin (*Copsychus saularis*) from the Muscicapidae family are frequently observed and are all classified as LC. The Estrildidae family includes the White-rumped Munia (*Lonchura striata*), and the Cuculidae family is represented by the Asian Koel (Eudynamys scolopaceus), both listed as LC. The Common Iora (*Aegithina tiphia*) from the Aegithinidae family, Black Drongo (*Dicrurusmacrocercus*) from the Dicruridae family, and House Crow (*Corvus splendens*) from the Corvidae family are also common, each holding an LC status. The Red-whiskered Bulbul (*Pycnonotus jocosus*) from the Pycnonotidae family and Jungle Babbler (*Argya striata*) from the Leiothrichidae family are frequently seen, both classified as LC. The Indian Pied Starling (*Gracupica contra*) and Jungle Myna (*Acridotheres fuscus*) from the Sturnidae family, as well as the Common Kingfisher (*Alcedo atthis*) from the Alcedinidae family, are also present on campus, all holding an LC status. This comprehensive assessment highlights the college campus as a vibrant habitat for a variety of bird species, all currently assessed as Least Concern by the IUCN.

Table 12a. List of bird species diversity inside the college campus

Sl No.	Family	Common name	Scientific name	IUCN red list status
1	Columbidae	Spotted dove	*Spilopelia chinensis*	LC
2	Strigidae.	Brown Boobook	*Ninox scutulata*	LC
3	Picidae	Fulvous-breasted Woodpecker	*Dendrocopos macei*	LC
4	Rhipiduridae	White-throated Fantail	*Rhipidura albicollis*	LC
5	Monarchidae	Indian Paradise-Flycatcher	*Terpsiphone paradisi*	LC
6	Cisticolidae	Common Tailorbird	*Orthotomus sutorius*	LC
7	Muscicapidae	Oriental Magpie-Robin	*Copsychus saularis*	LC
8	Estrildidae	White-rumped Munia	*Lonchura striata*	LC
9	Cuculidae	Asian Koel	*Eudynamys scolopaceus*	LC
10	Strigidae	Spotted Owlet	*Athene brama*	LC
11	Aegithinidae	Common Iora	*Aegithina tiphia*	LC
12	Dicruridae	Black Drongo	*Dicrurus macrocercus*	LC
13	Corvidae	House Crow	*Corvus splendens*	LC
14	Pycnonotidae	Red-whiskered Bulbul	*Pycnonotus jocosus*	LC
15	Leiothrichidae	Jungle Babbler	*Argya striata*	LC
16	Sturnidae	Indian Pied Starling	*Gracupica contra*	LC
17	Sturnidae	Jungle Myna	*Acridotheres fuscus*	LC
18	Alcedinidae	Common Kingfisher	*Alcedo atthis*	LC
19	Columbidae	Rock Pigeon	*Columba livia*	LC
20	Columbidae	Eurasian Collared-Dove	*Streptopelia decaocto*	LC

The biodiversity of the college campus is remarkable, featuring a variety of species across different taxa. Among the reptiles, the Colubridae family is represented by the Rat snake (*Ptyas mucosa*, LC), Checkered keelback (*Xenochrophis piscator*), and Striped keelback (*Amphiesma stolatum*).Amphibians on campus include the Common Indian bullfrog (*Hoplobatrachus tigerinus*, LC) from the Dicroglossidae family, the Common toad (*Bufo bufo*, LC) from the Bufonidae family, and the Common green frog (*Rana clamitans*, LC) from the Ranidae family. The molluscan fauna is represented by the Apple snail (Pila globosa, LC) from the Ampullariidae family. The mammalian species include the Fox (*Vulpes vulpes*, LC) from the Canidae family, Neul (*Urva edwardsii*, LC) from the Herpestidae family, and the Civet (*Viverricula indica*, LC) from the Viverridae family. Odonata species such as *Platygomphus dolabratus* (LC) from the Gomphidae family, Lesser Green Emperor (*Anax guttatus*, LC) from the Aeshnidae family, Keyhole Glider (*Tramea basilaris*, LC) and *Rhodothemis rufa* (LC) from the Libellulidae family, Libellago indica (LC) from the Chlorocyphidae family, *Agriocnemis kalinga* (LC) and Amphiallagma parvum (LC) from the Coenagrionidae family are also found on campus. The butterfly species include the Common jay (*Graphium doson*) from the Papilionidae family, Blue tiger (*Tirumala limniace*) from the Nymphalidae family, Indian sunbeam (*Curetis thetis*) from the Lycaenidae family, and Common grass yellow (*Eurema hecabe*, LC) from the Pieridae family. This diverse array of species underscores the ecological richness and habitat suitability of the college campus for various forms of wildlife.

Table 12b. List of faunal diversity inside the college campus

List of snake species				
Sl No.	**Family**	**Common name**	**Scientific name**	**IUCN red list status**
1	Colubridae	Checkered keelback	*Xenochrophis piscator*	
2	Colubridae	Striped keelback	*Amphiesma stolatum*	
List of amphibia species				
Sl No.	**Family**	**Common name**	**Scientific name**	**IUCN red list status**
1	Dicroglossidae	Common Indian bullfrog	*Hoplobatrachus tigerinus*	LC
2	Bufonidae	Common toad	*Bufo bufo*	*LC*
3	Ranidae	Common green frog	*Rana clamitans*	LC
List of mollusca species				
Sl No.	**Family**	**Common name**	**Scientific name**	**IUCN red list status**
1	Ampullariidae	Apple snail	*Pila globasa*	-
List of mammal species				
Sl No.	**Family**	**Common name**	**Scientific name**	**IUCN red list status**
1	Canidae	Fox	*Vulpes vulpes*	LC
2	Herpestidae	Neul	*Urva edwardsii*	LC
3	Viverridae	Civet	*Viverricula indica*	LC
List of Odonata species				
Sl No.	**Family**	**Common name**	**Scientific name**	**IUCN red list status**
1	Gomphidae		*Platygomphus dolabratus*	LC
2	Aeshnidae	Lesser Green Emperor	*Anax guttatus*	LC
3	Libellulidae	Keyhole Glider	*Tramea basilaris*	LC
4	Libellulidae		*Rhodothemis rufa*	LC
5	Chlorocyphidae		*Libellago indica.*	LC
6	Coenagrionidae		*Agriocnemis kalinga*	LC
7	Coenagrionidae		*Amphiallagma parvum*	LC

Table 12c. List of butterfly diversity inside the college campus

List of butterfly species				
Sl No.	**Family**	**Common name**	**Scientific name**	**IUCN red list status**
1	Papilionidae	Common jay	*Graphium doson*	
2	Nymphalidae	Blue tiger	*Tirumala limniace*	
3	Lycaenidae	Indian sunbeam	*Curetis thetis*	
4	Pieridae	Common grass yellow	*Eurema hecabe*	LC

II) Floral Diversity in the college campus

The biodiversity assessment highlights a luxurious green environment flourishing on the college campus. The research team of the college has been engaged in detailing the biodiversity in the campus and has initiated various conservation and awareness events for students. Planting of trees and distribution of saplings on major college events are regularly practiced. The campus hosts a wide array of plant life, encompassing medicinal plants, trees, grasses, herbs, and shrubs. Specifically, the assessment identifies 26 types of major tree species, 15 varieties of medicinal plants, and 15 types of herbs and shrubs thriving across the campus (Table 13, 14, 15, 16). The medicinal plants contribute not only to the ecological value but also to the pharmacological value of the campus. This positive approach offers a priceless resource for educational and therapeutic purposes. Interestingly, three endangered (EN) [Monkey puzzle Tree, Tal, and Cycas] and one near threatened (NT) [Mahoginy] varieties as per the IUCN red list are observed here. This is extremely important from the perspective of conservation. To sum up, although the college campus is home to a diverse array of plants, it is crucial to continue implementing and refining strategies to preserve and improve this green space, particularly given the environmental challenges we face.

III) In-house, gardening and tree management

The college employs a devoted gardener who meticulously tends to the plants and trees throughout the campus regularly. Entrusted with the duty of maintaining the greenery and landscaping, the gardener makes sure that the floral species receive proper care. This includes watering, trimming, manuring, and general maintenance to help healthy growth and vibrant verdure throughout the campus grounds. The college authorities also regularly purchase new species from nurseries to increase their floral diversity.

Table 13: List of major tree species observed inside the college campus

Sl No.	Family	Common name	Scientific name	IUCN red list status
1	Cupressaceae	Thuja	*Thuja plicata*	LC
2	Fabaceae	Akashmoni	*Acacia auriculiformis A. cunn. Ex benth*	LC
3	Rubiaceae	Kadam	*Anthocephalus chinensis Miq*	
4	Araucariaceae	Monkey puzzle tree	*Araucaria araucana(Molina) K. Koch*	EN
5	Sapindaceae	Lichu	*Litche chinensis Sonn*	
6	Araucariaceae	Aam	*Mangifera indica L.*	DD
7	Magnoliaceae	Swet Chapa	*Michelia alba DC*	
8	Rutaceae	Kamini	*Murraya paniculata (L.) Jacq*	
9	Verbenaceae	Sal	*Techtona grandis Linn. f.*	
10	Fabaceae	Siris	*Albizia lebbeck (L.) Benth*	LC
11	Fabaceae	Palash	*Butea monosperma(Lam.) Kuntze*	
12	Meliaceceae	Mahoginy	*Swietenia mahagoni(L.) Jacq*	NT
13	Myrtaceae	Kalo jaam	*Syzygium cumini(L.) Skeels*	LC
14	Combretaceae	Kath badam	*Terminalia catappa L*	LC
15	Moraceae	Kathal	*Artocarpus heterophyllus Lam*	
16	Annonaceae	Ata	*Annona squamosal L.*	
17	Moraceae	Bot/Banyan	*Ficus benghalensis L.*	
18	Moraceae	Ashwattha/Peepul	*Ficus religiosa L.*	LC
19	Sapotaceae	Bakul	*Mimusops elengi L.*	LC
20	Apocynaceae	Chhatim/Saptaparni	*Alstonia scholaris (L.) R. Br.*	LC
21	Myrticeae	Peyara	*Psidium guajava L.*	LC
22	Fabaceae	Sissoo	*Dalbergia sessoo Roxb.*	
23	Malvaceae	Shimul	*Bombax ceiba L.*	LC
24	Fabaceae	Krishnachura	*Deloxin regia (Bojer ex Hook. Raf.*	
25	Aeracaceae	Tal	*Borassus flabellifer L.*	EN
26	Aeracaceae	Narikel	*Coccus nucifera L.*	

Table 14: List of some medicinal plants observed inside the college campus

Sl No.	Family	Common name	Scientific name	IUCN red list status
1	Lythraceae	Jarul	*Lagerstroemia speciosa (L.) Pers.*	LC
2	Annonaceae	Debdaru	*Polyalthia longifolia (Sonn.)*	
3	Santalaceae	Sethchandan	*Santalum akbum L*	
4	Phyllanthaceae	Amloki	*Phyllanthus embilica*	
5	Moraceae	Dumur	*Ficus carica L.*	LC
6	Myrtaceae	Eucalyptus	*Eucalyptus globulbus Labill.*	
7	Moringaceae	Sajina	*Moringa oleifera Lam.*	LC
8	Caricaceae	Papaya	*Carica papaya L.*	DD
9	Meliacear	Neem	*Azadirachta indica A. Juss*	LC
10	Meliacear	Mahaneem/Ghoraneem	*Melia azedarach L.*	LC
11	Combretaceae	Arjun	*Terminalia arjuna (Roxb.) Weight & Arn.*	
12	Lamiaceae	Gamhar	*Gmelina arborea Roxb.*	LC
13	Rutaceae	Curry pata	*Murraya koenigii L.*	LC
14	Fabaceae	Karanja	*Millettia pinnata (l.) panigrahi*	LC
15	Malvaceae	Ulotkambal	*Abroma augusta (L) L.f.*	

Table 15: List of herbs and shrubs observed inside the college campus

Sl No.	Family	Common name	Scientific name	IUCN red list status
1	Rubiaceae	Gandhara	*Gardenia jasmonioides, J Ellis*	
2	Cycadaceae	Cycas	*Cycas circinata*	
3	Cycadaceae	Cycas	*Cycas beddomei*	EN
4	Verbenaceae	Duronto	*Duranta repens L*	
5	Rutaceae	Patilebu	*Citrus aurantifolia (Christm.) Swingle*	
6	Commelinaceae	Boat lily/Rhoeo	*Rhoeo discolour L Heritier*	
7	Aspergaceae	Dracena	*Dracena angustifolia (Medik.) Roxb.*	
8	Rubiaceae	Rangan	*Ixora coccinea L.*	
9	Musaceae	Kancha kala	*Musa paradisiaca*	
10	Musaceae	Paka kala	*Musa balbisiana*	
11	Bignoniaceae	Tecoma	*Tecoma stans (L.) Juss. ex Kunth*	LC
12	Rhamnaceae	Kul	*Ziziphus jujube Mill*	
13	Combretaceae	Madhobilota	*Quisquolis indica L*	
14	Zingiberaceae	Dolan chapa	*Hedychium coronarium J. Koening*	DD
15	Apocynaceae	Korabi	*Nerium indicum Mill*	

Table 16: List of aquatic plants observed in the college campus

List of aquatic plant in the college campus				
Sl No.	**Family**	**Common name**	**Scientific name**	**IUCN red list status**
1	Nymphaceae	Saluk	*Nymphaea nouchali Burm. f.*	LC

Medicinal plants in the campus

The college campus has a diverse quality of medicinal plants, each with its unique therapeutic properties and significance. Among these, the Jarul (*Lagerstroemia speciosa*), belonging to the Lythraceae family, is renowned for its diabetes management properties. The Debdaru (*Polyalthia longifolia*), from the Annonaceae family, is often used in traditional medicine for its anti-inflammatory properties. The aromatic Sethchandan (*Santalum album*), from the Santalaceae family, is celebrated for its use in treating skin ailments and its aromatic oils. Amloki (*Phyllanthus emblica*), from the Phyllanthaceae family, is a potent source of Vitamin C and is widely used to boost immunity. The Dumur (*Ficus carica*), belonging to the Moraceae family, has laxative properties and aids in digestion.

The Eucalyptus (*Eucalyptus globulus*), from the Myrtaceae family, is a staple for respiratory issues due to its expectorant qualities. Sajina (*Moringa oleifera*), from the Moringaceae family, is known for its rich nutritional profile and various health benefits. The Papaya (*Carica papaya*), belonging to the Caricaceae family, is beneficial for digestive health and is a common remedy for wounds and skin conditions. The versatile Neem (*Azadirachta indica*), from the Meliaceae family, is celebrated for its wide range of medicinal uses, from skin treatments to dental care. Similarly, Mahaneem/Ghoraneem (Melia azedarach), also from the Meliaceae family, is known for its pesticidal and medicinal properties.

The Arjun (*Terminalia arjuna*), from the Combretaceae family, is valued for its cardiovascular benefits. Gamhar (*Gmelina arborea*), belonging to the Lamiaceae family, is utilized for its anti-inflammatory and analgesic properties. The Curry pata (*Murraya koenigii*), from the Rutaceae family, is not only a culinary staple but also aids in digestion and diabetes management. Karanja (*Millettia pinnata*), from the Fabaceae family, is used in traditional medicine for its hepatoprotective and anti-inflammatory properties. Lastly, Ulotkambal (*Abroma augusta*), from the Malvaceae family, is known for its use in treating menstrual disorders and other gynecological issues. Together, these plants contribute to the rich biodiversity of the campus and provide a living repository of traditional medicinal knowledge.

IV) Presence of a pond inside the campus

The college campus boasts of a clean and well-maintained pond of considerable size although the water is not used by the college. It contains aquatic floral species like Saluk. Moreover, it accentuates the aesthetics of the campus, providing a serene atmosphere.

Photograph 10. Green cover and pond inside the college campus

SECTION 7
GENERAL AWARENESS

7. General Awareness

I) Environmental Awareness of staff, teachers and students

All the college staff, teachers, and students exhibit a keen environmental awareness and appreciation. They all believe that recycling of reusable materials, afforestation, and using eco-friendly transport for carbon footprint reduction are extremely necessary, especially amidst the current climate change. They agree that each individual must follow sustainable practices to save the environment from further damage, and are willing to do their part. Understanding the significance of sustainability, the college administration has implemented proactive measures such as installing rainwater harvesting systems, which are vital for replenishing the groundwater and aiding water conservation. Furthermore, the college fosters biodiversity by routinely planting various plants and trees, all thoroughly maintained by a devoted gardener. This commitment to sustainable practices also includes promoting eco-friendly transportation, as demonstrated by the establishment of a bicycle stand inside the campus. These efforts emphasize the institution's dedication to cultivating a sustainable and environmentally conscious community in the college.

Photograph 11. Prevailing environmental awareness among the college authorities

Photograph 12. Bicycle stand inside the college campus to promote eco-friendly vehicles

II) Environmental awareness campaign

The college regularly observes events like the Earth Day and the World Environment Day, celebrating these occasions with various activities to encourage environmental conservation and sustainability. In addition, the college runs a comprehensive array of environmental awareness programs throughout the year. These initiatives include seminars, sapling distribution, tree plantation, and educational sessions on several environmental topics such as the add on course on 'Green Energy for a sustainable future' organised for the students of the Department of Geography. Moreover, the college has an 'Eco club', the decision-making body of which is composed of ten staff members, three of whom are women. By actively involving the campus community in these events, and by including women, the authorities foster a sense of responsibility and inclusivity towards the environment, cultivating an overall culture of environmental awareness and involvement. This ongoing commitment to environmental education and promotion highlights the institution's commitment to advancing a greener and resilient future.

III) Awareness communication

Environmental awareness communication, such as banners, posters, and wall writings, is present on the college campus but may be significantly increased in both quantity and consistency. The dearth of visual messaging represents an opportunity for the college to strengthen its efforts in endorsing environmental awareness and resilience.

Photograph 13. Insufficient number of banners relating to environmental awareness

SECTION 8

ENVIRONMENTAL COMPLIANCES

8. Environmental Compliance

I) Cleanliness in sanitation units

From the survey, it may be concluded that the sanitation units within the college are quite clean though there remains some scope for improvement, especially in the students' toilets. Exhaust fans are installed in all toilets, thereby assuring good ventilation there. The classrooms and staff rooms, are neat and clean, revealing the college authorities' dedication to provide a safe and hygienic atmosphere for the entire college community.

Photograph 14. Clean and comparatively dirty toilets

II) Safety in Laboratory

Safety within the college laboratories is meticulously upheld, creating a secure atmosphere for students and faculty engaged in diverse scientific activities. Every lab is furnished with crucial safety features like exhaust systems and fire extinguishers, showcasing the institution's dedication to prioritizing the safety of its members. These precautions not only reduce potential risks but also comply with industry standards and regulations, offering a conducive environment for experimentation and research. By maintaining strict safety protocols and ensuring the presence of essential safety equipment, the college promotes a culture of responsible laboratory practices, enhancing both academic excellence and individual protection within the laboratory setting.

Photograph 15. Fire extinguisher fitted in all laboratories

III) Segregation of waste at source

Waste segregation is practiced diligently in the college, with dry and wet dustbins clearly demarcated, and frequently placed throughout the campus. Very little solid waste has been observed lying open during the survey. Notably, no organic or plastic waste has been observed.

IV) Air pollution management and preparedness (Smoke dousing, dust precipitating, window cover etc)

The college does not have specialized air pollution monitoring units or specific measures to mitigate air pollution. Nevertheless, all windows on campus are adequately covered. Notably, air pollution is not a cause of much concern here, as explained in the previous corresponding section.

V) Water wastage reduction vigilance

The college has installed two rainwater harvesting units which replenish the groundwater table as already mentioned. No visible leakage has been observed during the survey. However, the monitoring system for water wastage reduction needs improvement according to the perception of the auditors.

Table 17. Perception of auditors regarding environmental compliances

Environmental Compliances	Rating on a 10-point Likert Scale
Cleanliness in sanitation units	7
Safety in laboratory	9
Segregation of waste at source	7
Air pollution management & preparedness	7
Water wastage reduction vigilance	6

SECTION 9
RECOMMENDATIONS

9. Recommendations

Each segment of the current assessment outlines the particular methods used and presents the results in a structured manner. Following this, a few suggestions are outlined for areas that can be improved. Dr. Bhupendra Nath Dutta Smriti Mahavidyalaya has already initiated various measures to foster a vibrant and sustainable environment on its campus. If the following recommendations are implemented, they can further advance this effort.

i. The college authorities may aim to expand the capacity of the rainwater harvesting units to foster even more water conservation.

ii. The college must start utilizing solar energy for its daily activities with utmost speed.

iii. The college may implement effective daylight usage for efficient electrical energy management, especially in its ground floor, which is comparatively dim than other parts. These strategies may include integrating sophisticated daylight harvesting systems that use sensors to adjust artificial lighting based on the availability of natural light, large windows, skylights, and light shelves to improve the penetration of natural light, using energy-efficient lighting fixtures with dimmable controls for active adjustments during changing daylight conditions, using shading devices to protect from glare and excessive heat gain.

iv. The college authorities must install a system of greywater treatment with urgently.

v. Implementing a monitoring system for air pollution could further reduce the environmental footprint of campus traffic, ensure compliance with environmental standards, and promote a healthier environment in the campus. Also, PUC certification of all vehicles entering the college premises must be checked systematically.

vi. Better vigilance system for monitoring water wastage reduction is recommended.

Certificate

PROGYAN is an independent policy-science action research organization working as a subsidiary wing of the South Asian Forum for Environment (SAFE), which is a regional CSO and a major stakeholder in the UN Environment towards knowledge economy for all stakeholders to act in this climate milieu. PFRI, SAFE is accredited with ISO 14001:2015 certification and registered as a non-profit Section 8 company in India, committed to advancing scientific knowledge across socio-economies and socio-ecologies in developing adaptive guidelines and operational frameworks, sustainable solutions for resource optimization and climate change, in both rural and urban settings through innovation and research. The major scopes for PFRI include Strategic Environmental Impact Assessment and Institutional Green Audit along with field and analytical research.

This is to certify that the 'Progyan Foundation for Research and Innovation' (PFRI), Kolkata 700099 has conducted a brief and precise 'Green Audit' for the 'Dr. Bhupendra Nath Dutta Smriti Mahavidyalaya', during the assessment year June 2022 to May 2023. The Green Audit was performed in accordance with the applicable standards prescribed by the Central Pollution Control Board and Ministry of Environment, Forests and Climate Change, Government of India, and following NAAC guidelines. The audit involves energy, water, waste, and biological inventories and gives recommendations that the institute can follow to improve the energy, water, waste, and environmental scenarios of the said institute.

Malancha Dey

Dr. Malancha Dey
(Director & Senior Scientist, PFRI)
Date: 30.05.2023

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Annexure I

Van Mahotsav Day

13.05.2023
Principal
Dr. Bhupendra Nath Dutta
Smriti Mahavidyalaya
Hatgobindapur, Burdwan

Figure showing celebration of Van Mahotsav by the college

Annexure II

DEPARTMENT OF ENVIRONMENTAL SCIENCE
THE UNIVERSITY OF BURDWAN
GOLAPBAG, BURDWAN-713104
WEST BENGAL, INDIA
E-mail. apurbaghosh2010@gmail.com
Phone No. : +919434003445

Ref. No.....

Date:: 12/04/2023

Dr Apurba Ratan Ghosh
Professor & Head

Analysis of air quality of
Dr. Bhupendra Nath Dutta Smriti Mahavidyalaya
[College campus]

Parameters	Methods	Results	NAAQS (*24h)	Remarks
SOx	Improved West and Geake Method	10 µg/m^3	80 µg/m^3	Within permissible limit
NOx	Modified Jacob and Hochheiser Method	30 µg/m^3	80 µg/m^3	
PM_{10}	Gravimetric Method	45 µg/m^3	100 µg/m^3	

Comments: It appears that the quality of air inside the campus is within the permissible limit.

12/4/23

Professor & Head
Environmental Science
The University of Burdwan
Burdwan

12/4/23
Professor
Environmental Science
The University of Burdwan
Burdwan

Air quality measurement by the college

Annexure III

DEPARTMENT OF ENVIRONMENTAL SCIENCE
THE UNIVERSITY OF BURDWAN
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WEST BENGAL, INDIA
E-mail. apurbaghosh2010@gmail.com
Phone No. : +919434003445

Ref. No..... Date:: 12/04/2023

Dr Apurba Ratan Ghosh
Professor & Head

Measurement of noise level of Dr. Bhupendra Nath Dutta Smriti Mahavidyalaya [College campus]

Measurement of Noise
Date: 08/04/2023
Average of Lowest noise: **44.26** dB
Average of Highest noise: **74.25** dB
Total Noise : **59.25** dB

Place	Lowest (dB)	Highest (dB)
1) Inside Campus	36.63	65.66
2) Outside Campus	38.05	79.2
3) Canteen	56.1	82.8
4) Lawn	36.1	76.5
5) Classroom	50.7	76.0
6) Office	50.2	62.4
7) Laboratory	42.1	77.2

Comments: Overall noise level is good for the campus and the stakeholders.

12/04/23
Professor
Dept. of Environmental Sc.
The University of Burdwan
Burdwan

12/4/23
Professor & Head
Environmental Science
The University of Burdwan
Burdwan

Noise quality measurement by the college

Green Audit going on by PFRI team

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