GREEN AUDIT REPORT

2021

NORTH GAUHATI COLLEGE

Guwahati- 781031

CERTIFICATE

This is to certify that the Green Audit 2021 of the North Gauhati College has been conducted by the Green Audit Team comprising faculty members and office staff of the college using scientific methods for study and analysis. The work has been completed under the time constraints imposed by the covid pandemic. I have reviewed the work done alongwith the report prepared and express my satisfaction at the process.

I hope this audit report can provide the baseline data for implementation of development projects in the college keeping environmental sustainability in view.

04-03-2022

Mantu Mahanta

Associate Professor & Former HOD

Dept. of Botany, Pandu College

Mantu Mahanta
Associate Professor & Ex. H.O.D.
Department of Botany
Pandu College, Guwahati-12

Foreword from the Principal

Green Audit 2021 is the first ever exercise of such an audit in the North Gauhati College. This audit has been conducted in compliance with the NAAC recommendations as per Criterion VII of assessment of academic institutions. The purpose behind Green Audit is to scientifically document different parameters of the environment of the institution and analyse the environmental sustainability of its activities so as to be able to identify the weaknesses and develop strategies to reduce the negative impacts on the environment as a part of the larger goal of achieving a greener and healthier planet. The North Gauhati College is committed to environmental sustainability goals of the Governments at the state and centre as well as global bodies, aimed at negating the impacts of climate change and environmental degradation which followed the rapid industrialization and urbanization of the 19th century.

I am hereby pleased to present the Green Audit 2021 report of the North Gauhati College which is the result of thorough scientific investigation and comprehensive analysis of data by the audit team. I appreciate the sincere efforts of advisor Dr. Sumanjit Kakati, convenor Dr. Jyotirmay Kalita, and all members of the Green Audit Team whose rigorous exercise has resulted in successful completion of this audit and preparation of this report. I sincerely hope that this audit will have positive impact on the college environment and guide future development projects.

Dr. Dilip Das

Principal,

North Gauhati College

Principal
North Gauhati College

Acknowledgement

The Green Audit 2021 of the North Gauhati College has been conducted in compliance with the recommendations of the National Assessment and Accreditation Council as per the criterion VII of its assessment criteria for accreditation of educational institutions. This is the first Green Audit conducted in the college and due importance has been given to different elements of the audit to present a clear picture of the richness of the various environmental assets of the college, as well as environmental sustainability of its various activities.

This audit has been possible due to the tireless efforts of every member of the Green Audit Team in addition to other teaching and non-teaching members of the college. I would firstly like to thank our Principal, Dr. Dilip Das, for providing every possible support to the effort. I am grateful to Mr. Mantu Mahanta, Associate Professor (Botany) of Pandu College, for reviewing the audit process. I offer my gratitude to our Vice Principal, Dr. Sumanjit Kakati, who is also the advisor of this Green Audit for his constant guidance. I thank Dr. Achyutananda Baruah, Co-ordinator of IQAC, North Gauhati College, for his relentless help in conducting the audit. I thank the faculties of the department of Zoology for their help in recording the fauna of the college campus. I express my heartfelt thanks to Dr. Purabi Hazarika and Dr. Sujata Deori, alongwith the other faculty members of the department of Geography for their support in preparation of the college map and the land use survey. I am indebted to Mrs. Ruby Doley for offering her expertise in recording the flora of the college campus. I am thankful to Dr. Swati Nawami Aideo for her support in the energy audit. I thank Mr. Pradip Kumar Kalita and Dr. Himadri Borah for their assistance in conducting the air and water quality reviews. I am extremely grateful to Mr. Sukamani Deka for his assistance in conducting review of documents during the energy audit of the college. Finally, I would also offer my sincere thanks to all faculty members, non-teaching staff, and students for their active participation in the questionnaire survey and other helpful acts which made this audit possible.

I am hopeful that this audit can serve as a proper documentation of the status of greenness as well as environmental sustainability of the activities of the North Gauhati College and prove to be a helpful document in future projects for enriching the environment of the college.

Dr. Jyotirmay Kalita

Convenor, Green Audit 2021

North Gauhati College

GREEN AUDIT TEAM

Advisor:	Dr. Sumanjit Kakati, Department of Zoology
Convenor:	Dr. Jyotirmay Kalita, Department of Botany
Members:	Mr. Pradip Kumar Kalita, Department of Chemistry
	Dr. Sujata Deori, Department of Geography
	Mrs. Ruby Doley, Department of Botany
	Dr. Purabi Hazarika, Department of Geography
	Dr. Himadri Borah, Department of Chemistry
	Dr. Swati Nawami Aideo, Department of Physics
	Mr. Sukamani Deka, Head Assistant

CONTENTS

INTRODUCTION

North Gauhati College was established on 4th September, 1962, on the Northern bank of the river Brahmaputra and at that time, was the only institution of Higher Education in the greater North Kamrup region of the old Kamrup District. The campus of the college is spread over an area of 34999 square metres and on the present day, comprises of 14 Departments comprising the Arts and Science streams, which impart education to Higher Secondary and Undergraduate students. The college was accredited in 2016 with the grade B by the National Assessment and Accreditation Council (NAAC).

Green Audit of North Gauhati College

In the present times, the high rates of industrialization and urbanization and increased demand for energy generation has led to the increase of a wide range of pollutants in our environment and given rise to the question of sustainability of different human activities. As an outcome, it has become the norm to engage in monitoring activities that determine the impact of human activities on the environment. As an institution of higher education there are specific needs of a college that leads to the generation of wastes, consumption of energy and natural resources, and thereby exerts a demand on the environment. Moreover the environment of the institution and its surroundings also has an impact on the health and well being of its stakeholders. As such, an audit for assessment of the environmental assets and impacts of various activities of the institution on the environment is considered necessary, and given proper weightage by the National Assessment and Accreditation Council (NAAC).

Green audit can be stated as a scientific process of identification, recording, and analysis of different assets of the college and activities in and around the institution that has an environmental toll. It is an integral tool in determining where the institution stands in terms of environmental sustainability of its activities and the wealth of ambience that it is endowed with, as well as in creating awareness among the different stakeholders for preservation of the environment. The audit provides an opportunity to identify a benchmark for the college in terms of a healthy environment. Furthermore, it empowers the authorities and stakeholders to set targets for improving the college environment and implement measures for the same. The

National Assessment and Accreditation Council (NAAC) places 'Environmental Consciousness' under criterion VII of its assessment criteria for accreditation of educational institutions.

The goals set for achievement by the Green Audit of the North Gauhati College are:

- Collection of baseline data of various important environmental parameters.
- Identification of areas of strength and areas of concern in the operation of different units of the college, namely the administrative department, academic units, research laboratories, hostel and the campus management activities.
- Identification of opportunities and challenges in implementing sustainable management of the environment and enhancing aesthetic ambience of the campus.
- Increasing awareness for sustainable utilization and management of environmental resources by different stakeholders.

PRE AUDIT STAGE

The stages of activities during the Green Audit have been divided as Pre Audit, Audit, and Post Audit stages. Prior to the actual audit, a pre-audit meeting enabled the outlining of the plan of action for conducting the green audit. The meeting provided the opportunity for each member to get acquainted with the areas of audit and audit protocols alongwith getting assigned to their respective tasks. The discussions that took place in the meeting were fruitful in providing the directions to proceed in conducting the green audit.

Target areas of Green Audit

1. Land Use and Land Cover:

The land use and land cover (LULC) survey was aimed at providing a correct estimate of the total geographical area under the college premises and the range of activities for which the area is being used. The purpose of this study was to outline the geographical strength of the college and identify areas which bear promises for improvement of the college environment as well as provide scope for eco-friendly infrastructural development of the college in future.

2. Water Use Audit

This component of the green audit was aimed at documenting the sources of water available to the college, the daily extraction and requirement of water in the college, any preventable wastage of the water, and the different categories under which the water is being used. It was also determined to document any measures undertaken for reuse of waste water or harvesting of rainwater. This study further aims to undertake a qualitative analysis of the water obtained from the different sources in order to identify and prevent any potential hazard from poor water quality.

3. Waste Management Audit

The proper management of wastes is a serious issue that determines the hygiene of a place. The green audit aimed at documenting the wastes generated during the college activities and categorizing them as biodegradable, non-biodegradable, and hazardous wastes. It was aimed at studying whether waste segregation measures are followed by different departments and administrative units of the college. Management of hazardous wastes is of particular significance and this audit aims to document the level of awareness of different stakeholders concerning hazardous waste management, and any practices that are followed specially by the science laboratories for proper disposal of hazardous wastes. It was also aimed to document any measures undertaken for recycling of non-biodegradable wastes as practiced in the college. The audit also aimed at documenting the overall measures of waste disposal followed by the college.

4. Health and Hygiene Audit

This part of the audit was aimed at documentation of the pure drinking water facilities and access to proper sanitary facilities that are at the disposal of the different stakeholders.

5. Energy Audit

This part of the audit was aimed at documenting the usage of different forms of energy for running the college activities. The forms of energy usage to be documented were primarily electricity, in addition to LPG and other forms of fossil fuels which have a direct impact on the environment in terms of emission. The audit aimed at identifying measures undertaken to reduce energy usage in the college campus or switch over to renewable and ‘clean’ sources of energy.

An awareness survey was also to be undertaken among the different stakeholders regarding usage and energy conservation efforts.

6. Air Quality Audit

As an audit of the air quality in and around the campus, due to the unavailability of air quality monitoring facility in the college campus itself, data from external agencies was to be sought and it was resolved to request the Board to install an air quality monitoring system inside the college premises due to the close proximity of the college from industrial areas of Amingaon and North Guwahati region.

7. Biodiversity Audit

A survey was also to be undertaken to document the floral and faunal biodiversity within the college campus. A rich floral and faunal diversity boosts the ambience of the college as well as helps in maintaining a homeostatic ecosystem. A good number of large trees also acts as a thermoregulator during the hot summer days in addition to reducing the carbon footprint. The purpose of this part of the audit was to provide a baseline data required to identify areas in which the college biodiversity can be enhanced alongwith enriching of the ecosystem.

8. Ambience and Aesthetics Audit

As a part of the green audit, a survey was also aimed to be conducted among different stakeholders to gather idea on their view on the ambience of the college and also gather ideas for its improvement.

AUDIT STAGE

The green audit was conducted by faculty members from the departments of Zoology, Botany, Geography, Chemistry and Physics alongwith non teaching staff of the college. The methodologies followed during the audit are as below:

1. Site visits were conducted during the land use and land cover survey, for parts of the water audit, the energy audit and the health and hygiene audit, and for the biodiversity audits.

2. The interview method was used for obtaining data regarding water source and daily water requirement, management of wastes, and use of energy sources other than electricity.

3. Questionnaires were distributed among different stakeholders to obtain data regarding water usage, waste segregation, awareness about waste management, part of the health and hygiene audit, part of the energy audit, and for obtaining views and opinions regarding the ambience of the college premises.

4. Documents were studied for obtaining data on the consumption of electrical energy in various parts of the college.

5. Use of technology, softwares, and Standard Operating Procedures was done for obtaining geographical data as well as data on air and water quality.

POST AUDIT STAGE

1. Land Use and Land Cover:

The total area of land inside the college premises is 34999 square metres of which different buildings comprise a total of 6616 square metres. There is a playground of 6154 square metres on the North Western side within the college campus, while a pond of 2809 square metres lies on the Southern side of the campus to the East of the Library building. Of the different buildings is an indoor stadium on the Northern side of the campus, to the East of the playground. A garden of 140 square metres is present in the open area on the Southern side of the social sciences building, while the remaining of the free space is used for vehicle parking. A cycle stand of 270 square metres is present on the Western side of the parking area by the roadside boundary wall.

There is an open area on the South Eastern side of the Physics and Life Sciences building on which a weather station of the meterological department comprising about 40 square metres is present. On the remainder of the free space, a botanical garden of about 1100 square metres is being proposed where earth filling has already begun.

The college campus has walkways of about 363 metres total length, of which, about 215 metres are paved with concrete. Of the remaining of the walkways, about 44 metres is laid with loose bricks and the rest is bare soil.

The following table (Table 1) highlights different categories of land use in the college campus.

Table 1. Categories of Land Use.

Sl. No.	Categories	Area (Sq. Metres)	Length (Metres)
1	College Campus Total Area	34999	
2	Administrative Building with adjacent general classrooms	861	
3	Social Sciences Building	655	
4	Auditorium	693	
5	Eco-Ass Dept. Building	694	
6	Education Dept. Building	456	
7	New Chemistry Dept. Building with attached general classrooms	506	
8	Cycle stand	270	
9	Mathematics Dept. Building	342	
10	Boys' Common Room	123	
11	BOI Garden	140	
12	Playground	6154	
13	Pond	2809	
14	Water supply scheme	308	
15	Indoor Stadium	767	
16	Library and English Dept. Building	271	
17	Girls' Common Room	106	
18	Girls' Hostel	471	
19	Physics and Life Sciences Dept. Building	615	
20	Urinal 2 (between Edu. Dept. and Chem Dept.)	31	
21	B-Voc Dept. Building	25	
22	Path 1 (Admin Building to boys common room)		58
23	Path 2 (main gate to Eco_Ass Building)		108
24	Path 3 (Mid admin to Edu dept)		54
25	Path 4 (Science gate to Girls hostel)		99
26	Path 5 (last point of admin to RCC 1 Building)		44

Fig 1: North Gauhati College campus map (Source: Google Earth; Prepared using: ArcGIS, v. 10.6.1).

2. Water Use Audit

The various purposes for which water is used in the college are drinking, lavatories and washrooms, science laboratories, cleaning and washing activities, construction activities from time to time, gardening, and the kitchens run in various departments and the girls' hostel, in addition to the daily water requirement of the hostel boarders.

The main source of water for various uses in the college is the underground aquifers. The water is obtained from the aquifers by four submersible pumps that are installed in borewells in the following locations: i) one pump behind the college library, ii) one pump behind the B.Voc. building, iii) one pump behind the department of Botany, and iv) one pump in the girls' hostel. A total of about 18500 Litres of water is obtained from the borewells daily. The total water requirement in different departments, laboratories and offices of the college is approximately 10000 Litres on average on a normal working day. The total water requirement of the girls' hostel is about 8500 Litres per day. The water obtained from the borewells is stored in 11 overhead tanks of different sizes placed at different locations throughout the college campus, whose total water holding capacity is 14650 Litres. The water is supplied from these tanks to the different sites of usage through pipelines. Although there is a large pond within the college campus, it is entirely covered by invasive plant species like *Eichhornia crassipes*, and hence the water is rendered unusable in activities such as gardening, construction, etc., that would otherwise have been possible with the pond water, reducing the demand for ground water. There are no installations for rainwater harvesting or reuse of waste water in the college. Most of the rainwater drains into the college pond and low lying areas within the college campus. The waste water is also let to run onto low grounds to percolate.

A quality assessment of the ground water that is stored in overhead tanks and supplied to various units of the college was performed in the District Level Laboratory (PHED), Kamrup District, under the Govt. of Assam, located in Bamunimaidam, Guwahati-21. The water quality report is tabulated in Table 2 below.

Table 2: Water quality report obtained from District Level Laboratory (PHED), Kamrup district.

Sl. No.	Parameter	Protocol Used	Results	Desirable Limit	Maximum permissible Limit	Unit
1	Taste	IS: 3025 (part 8)	Aggregable	Aggregable	Aggregable	-
2	Odour	IS: 3025 (part 5)	Aggregable	Aggregable	Aggregable	-
3	Turbidity	IS: 3025 (part 10)	0	1	5	NTU
4	pH	IS: 3025 (part 11)	7.08	6.5-8.5	No relaxation	-
5	TDS	IS: 3025 (part 16)	265.5	500	2000	mg/L
6	Chloride	IS: 3025 (part 32)	14	250	1000	mg/L
7	Total Alkalinity	IS: 3025 (part 23)	186	200	600	mg/L
8	Total Hardness	IS: 3025 (part 21)	151.2	200	600	mg/L
9	Calcium (as Ca)	IS: 3025 (part 40)	48	75	200	mg/L
10	Magnesium	APHA (23rd ED) 3500 Mg B	7.6	30	100	mg/L
11	Total Iron	APHA 3500 (23rd ED) Fe B	0.17	0.3	No relaxation	mg/L
12	Arsenic	APHA 3500 (23rd ED) As B	-	0.01	0.05	mg/L
13	Fluoride	APHA (23rd ED) 4500 F F	0.25	1	1.5	mg/L
14	Nitrate	APHA (23rd ED) 4500 NO3 D	0	45	No relaxation	mg/L
15	Sulphate	IS: 3025 (part 24)	10	200	400	mg/L

A questionnaire survey among teachers and students to identify possible measures for increasing efficiency of water usage, or rather to prevent wastage, suggested the following facets:

i) Leakages in pipelines, especially in toilets and sinks, and presence of faulty taps lead to the wastage of certain amount of water which can be checked by a thorough servicing.

ii) Improper closure of taps specially in toilets also lead to the wastage of a considerable amount of water, which can be prevented by the use of self closing taps.

iii) Overflow from the overhead water storage tanks during filling up also leads to water wastage. For checking this, sensors that detect water level can be installed with the tanks to help in timely switching off the water jet pumps.

iv) As one pipeline carries water to a number of departments, the installation of additional valves in the water pipelines can be of help in checking water wastage during the case of severe leakage due to faulty installations in any department that require professional repairing.

v) Cleaning the college pond can provide water for certain activities such as gardening, construction, etc., which can help in reducing demand on groundwater.

3. Waste management audit

The activities of different units of the college lead to the generation of wastes. An account of the amount of wastes generated on a periodical basis is not available, as most of the wastes are immediately disposed off by respective departments and offices. Waste segregation methods are not followed in the college and all types of wastes are dumped together. None of the departments were found to follow special procedures for management of hazardous wastes, and all wastes find their way to the dumping areas. Some of the solid wastes are burnt off within the college campus. Other wastes are dumped in low lying areas. Waste water from laboratories are allowed to make their way to low lying areas. In a questionnaire survey of teachers and students to ascertain the types of waste generated during their activities in the college, the respondents were aware of generating 18.5% hazardous wastes, 30.6% non-biodegradable wastes, and about 51% biodegradable wastes.

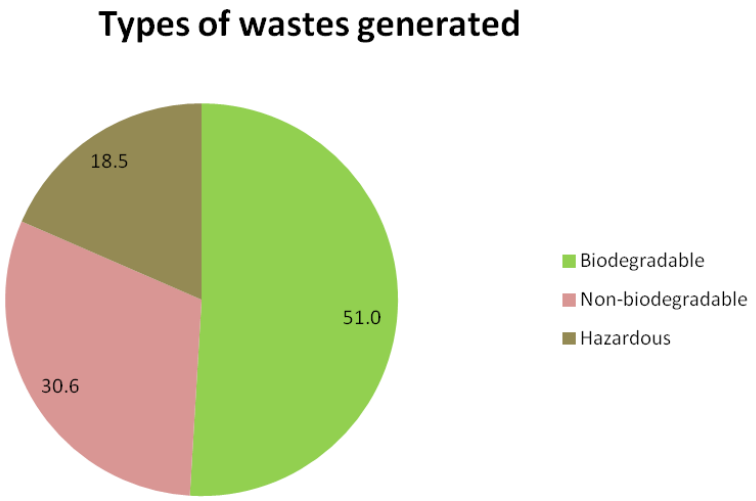


Fig 2: The respondents were aware of generating the following types of wastes during their activities.

On being enquired about their awareness regarding proper disposal of hazardous wastes, the responses recorded were as follows:

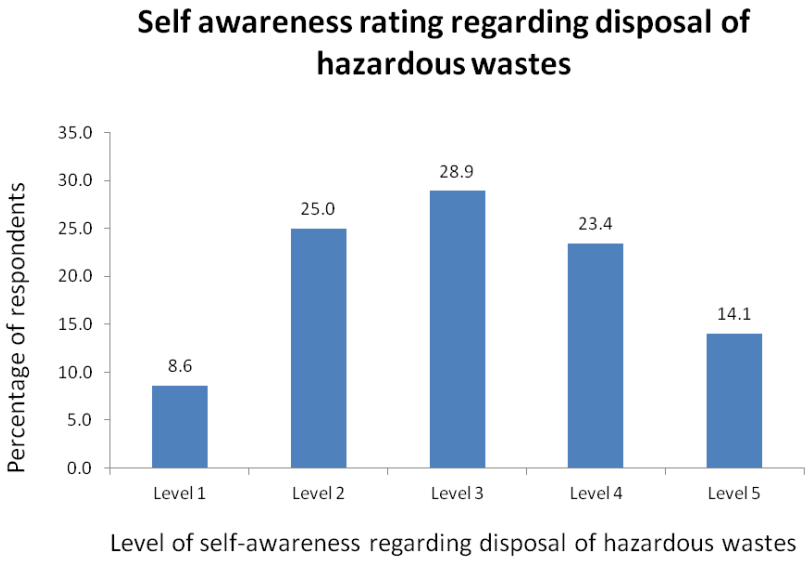


Fig 3: The level of awareness as self assessed by the respondents regarding methods of disposal of hazardous wastes on a scale of 1 to 5.

In an attempt to identify measures to reduce waste generation in the college, the following responses were obtained from various stakeholders:

i) Limitation on the use of single use plastic in the college campus,

ii) Use of paper bags or reusable bags for carrying loose items instead of polythene bags,

iii) Recycling and repurposing as many items as possible and create awareness regarding the same,

iv) Use of duplex printing wherever possible to reduce paper consumption and waste,

v) Procurement of products with better durability ratings.

The following are certain areas identified as avenues for recycling and reusing in order to reduce wastes:

i) Recycling of paper – use of paper shredder wherever required,

ii) Reduction on the dependency on disposable cutlery for lunch,

iii) Reuse of waste water (wherever possible) in gardening,

iv) Reuse of temporary slides in the laboratory after proper washing,

v) Use of reusable water bottles instead of disposable ones,

vi) Reuse of construction materials and materials obtained from the demolition of old buildings,

vii) Recycling of broken glasswares from the laboratories,

viii) Composting of biodegradable wastes.

4. Health and Hygiene audit

Pure drinking water, hygienic food and sanitary facilities are important indicators of the health and hygiene friendly status of an institution. The college has a total of 5 numbers of water elctronic filter/cooler units installed for pure drinking water purposes. The college however lacks a functioning canteen facility for hygienic food.

In total the college has 16 numbers of toilets for teachers and non-teaching staff members. The total number of student toilet facilities includes 4 numbers for boys and 3 numbers for girl students and 1 common toilet.

The satisfaction regarding pure drinking water facilities in the college as recorded by the students and teachers are depicted in Fig 4 below:

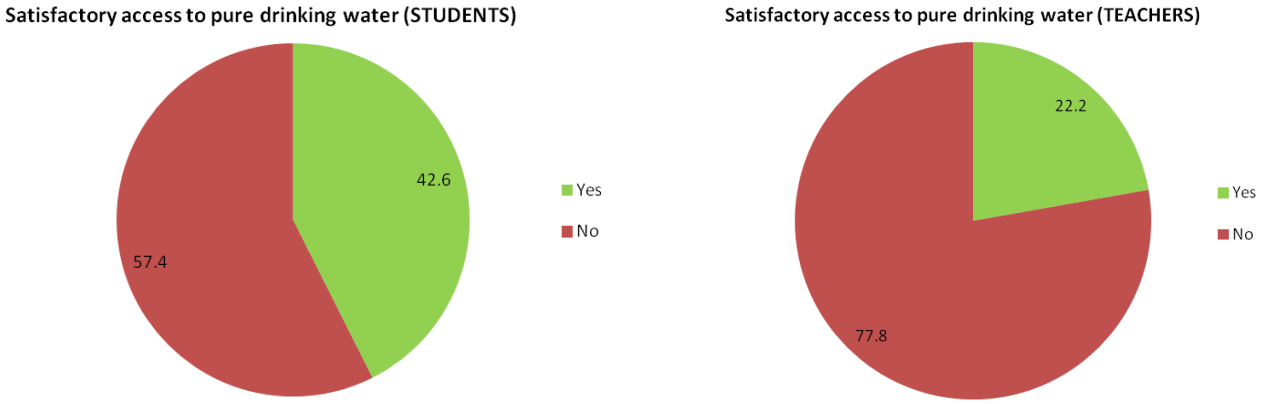


Fig 4: Student and Teacher satisfaction regarding provisions of pure drinking water in the college.

With regards to provisions for toilet and washrooms, the student and teacher satisfactions are depicted in Fig 5 as follows:

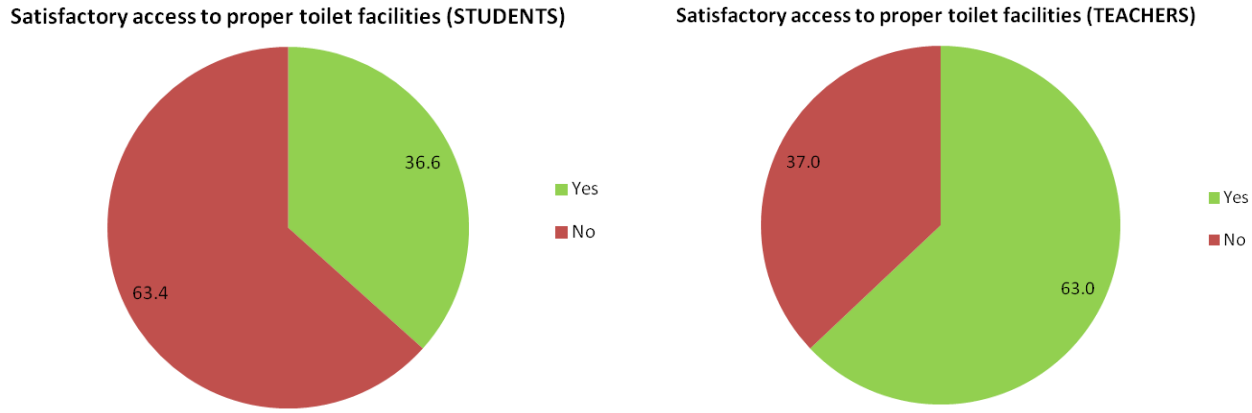


Fig 5: Student and Teacher satisfaction regarding toilet and washroom facilities in the college.

5. Energy Audit

The bulk of the energy consumed in various activities in the college is in the form of electrical energy which is provided by the government run Assam Power Distribution Company Limited from its Amingaon (021) sub division. The college has a total of three connections having consumer numbers 021000006032, 021000006034, 021010041547 (Connections 1, 2, and 3 respectively in Table 3). A total of 25289 units of electricity was consumed during the year 2021 that generated a total electricity bill amount of Rs. 1,96,384 (Table 3). However most of the electricity bills were prepared based on an estimated number of units consumed determined by

the provider, as highlighted in Table 3, which does not reflect the actual energy consumption status.

To reduce the electricity consumption, solar panels of a total capacity of 10 KWP were installed in the college girls' hostel premises recently.

Table 3. Monthly electricity consumption in North Gauhati College during the year 2021.

Month	**Connection 1**		**Connection 2**		**Connection 3**	
	Units	**Bill Amount (Rs)**	**Units**	**Bill Amount (Rs)**	**Units**	**Bill Amount (Rs)**
January	816*	5970	1078*	9305	407*	2840
February	816*	5971	1120	9775	408*	2891
March	737*	5164	797	7106	368*	2570
April	816*	5718	1032	8963	407*	2842
May	816*	5589	1078*	9305	368*	2571
June	816*	5589	1078*	9305	407*	2779
July	790*	5576	980*	8608	397*	2771
August	816*	5589	980*	8353	407*	2778
September	816*	5589	0	1209	394*	2771
October	746*	5289	980*	8420	360*	2459
November	816*	5589	980*	8420	407*	2778
December	790*	5573	871	7592	394*	2767
Total	9591	67206	10974	96361	4724	32817

* *Estimated Units consumed as recorded by service provider.*

Total Units consumed	25289
Total Bill Amount Paid (Rs)	196384

The college is switching over to more energy efficient appliances like LED bulbs and tubes in place of the old halogen or CFL bulbs and fluorescent tubes in a phased manner. At present there are a total of 239 fans, 107 LED bulbs, 62 LED tubes, 61 Fluorescent tube lights, and 10 CFL bulbs in the college. In addition, a total of 28 LED Lamp posts lighting the whole of the college campus during the dark hours are also being operated.

Other energy consuming appliances in the college include a total of 33 desktop computer sets, 17 printers, 4 refrigerators, 2 ACs, 3 Xerox machines, 5 water pumps, and various laboratory

equipments. The total energy demand of each department is not available due to the absence of separate electricity meters.

In addition to electric energy the college also consumes certain amount of LPG and diesel fuels. A total of about 230 kgs of LPG are consumed annually in the college girls' hostel, alongwith about 30 kgs of LPG annually in the chemistry laboratory. Moreover, a monthly average of 25 Litres of diesel are consumed during the operation of the DC generator at times of electric outage.

During a questionnaire survey of students and teachers, their responses on self estimation of the level of awareness on a scale of 1 to 5 regarding conservation and economical use of energy were recorded as in the graph in Fig 6. More than 70% respondents (students and teachers) admitted to switching off electrical appliances (light bulbs, tubes, or fans) when vacating a room. About 18% respondents switch off appliances quite often. Almost 11% respondents admitted that they rarely switch off appliances when vacating a room, while 0.8% said they had never switched off appliances when vacating a room (Fig 7).

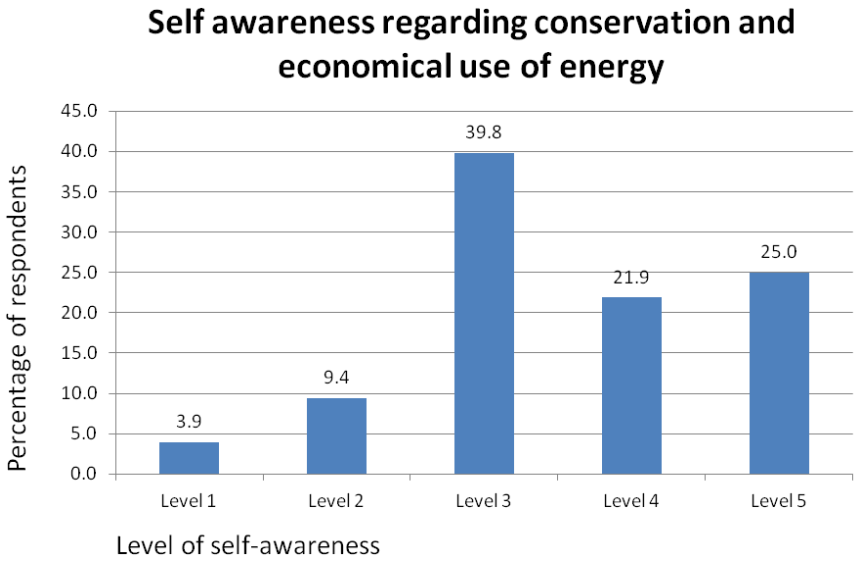


Fig 6: The level of awareness as self assessed by the respondents regarding conservation and economical use of energy on a scale of 1 to 5.

As measures to reduce energy consumption in the college campus, the following responses were obtained from students and teachers:

i) Switching off of electrical appliances when not in use,

ii) Develop measures to use renewable sources of energy such as to generate solar energy by campus-wide installation of solar panels,

iii) Measures to replace more energy consuming appliances with energy efficient alternatives, which could include the use of LED bulbs in place of CFL or filament bulbs, replacing old fans (wherever possible) with less energy consuming fans having BLDC motors which can save upto 65% electricity,

iv) Using laptop computers instead of desktop computers whenever possible,

v) Re-do old electrical wirings wherever necessary,

vi) Create awareness among different stakeholders regarding the necessity and ways of energy conservation.

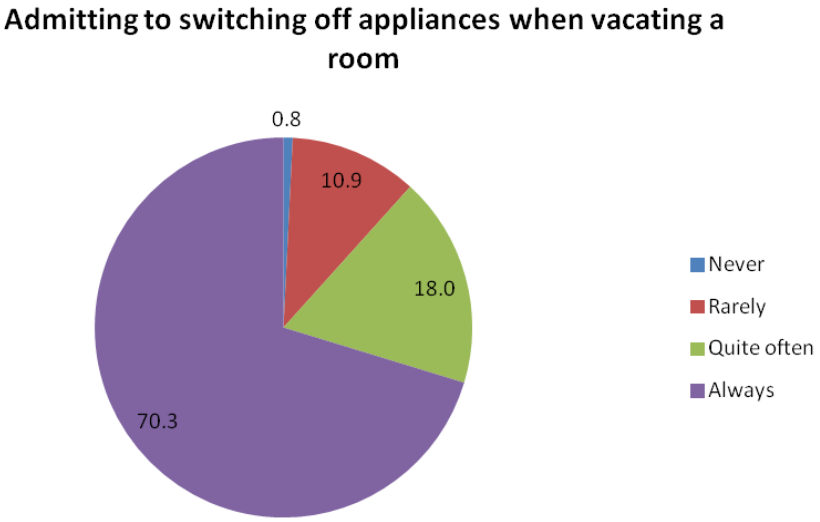


Fig 7: The level of awareness as self assessed by the respondents regarding conservation and economical use of energy on a scale of 1 to 5.

6. Air Quality Audit

The ambient air quality data of the locality of the North Gauhati College was obtained from the records of the IOCL LPG bottling plant which is located at an aerial distance of less than 1 km

from the college campus. The data was obtained for two months of February and August, 2021 which is presented in Table 4 below:

Table 4: Ambient air quality (24 hrs) data for the year 2021

Month of Sampling	**Location**	**Weather**	**PM_{10} ($\mu g/m^3$)**	**SO_2 ($\mu g/m^3$)**	**NO_2 ($\mu g/m^3$)**
Feb-21	IOCL LPG Bottling Plant Premises	Clear	162	16	21
Feb-21	IOCL LPG Bottling Plant Premises	Clear	127	18	28
February Average			**144.5**	**17**	**24.5**
Aug-21	IOCL LPG Bottling Plant Gate	Clear	76	8	12
Aug-21	IOCL LPG Bottling Plant Premises	Clear	72	6	10
August Average			**74**	**7**	**11**

Particulate matter (PM_{10}) consists of all solid and liquid particles of size 2.5 - 10μm, which are suspended in air and many of which are hazardous and cause respiratory and cardiovascular disorders. This complex mixture includes both organic and inorganic particles, such as dust, pollen, soot, smoke, and liquid droplets. The average PM_{10} concentration during the dry season (February) was 144.5 $\mu g/m^3$ while that during the monsoon season (August) was 74 $\mu g/m^3$. The PM_{10} levels in the dry season were found to be higher than the CPBC Ambient Air Quality Standard of 100 $\mu g/m^3$ (for 24 hrs). The main source of PM_{10} in the college locality is identified to be the plying of public and heavy industrial carriage vehicles as well as ongoing constructions in the highly industrialized and rapidly urbanizing neighbourhood.

The SO_2 and NO_2 levels in the area are however well below ambient air quality standards (average of 80$\mu g/m^3$ in 24 hrs for both SO_2 and NO_2) of the CPBC.

It is however felt necessary at this point to keep record of ambient air quality throughout the year within the college campus. As such, it would be recommendable to set up air quality monitoring systems in the college premises under the Pollution Control Board of the State Government.

7. Biodiversity Audit

The college has a rich biodiversity in terms of flora and faunal species found. The flora and fauna found in the college campus are tabulated as below:

Flora of North Gauhati College

Table 5.1: Herbaceous Plants/ Grasses

Sl. No.	Scientific name	Family	Common/Vernacular name
1	*Achyranthes aspera*	Amaranthaceae	Apang
2	*Ageratum conyzoides*	Asteraceae	Gondhoa bon
3	*Agrostis capillaris*	Poaceae	-
4	*Alopecurus myosuroides*	Poaceae	-
5	*Alternanthera triandra*	Amaranthaceae	Gurundi
6	*Amaranthus viridis*	Amaranthaceae	khutura
7	*Amaranthus spinosus*	Amaranthaceae	Kata khutura
8	*Bambusa ventricosa*	Poaceae	Buddha's belly bamboo
9	*Bambusa vulgaris*	Poaceae	
10	*Blumea sp.*	Asteraceae	-
11	*Boerhavia diffusa*	Nyctaginaceae	Punounouwa
12	*Carex rostrata*	Cyperaceae	-
13	*Catharanthus roseus*	Apocynaceae	Nayantara
14	*Centella asiatica*	Apiaceae	Bor-manimuni
15	*Cheilocostus speciosus*	Costaceae	Jom lakhuti
16	*Chenopodium ficifolium*	Amaranthaceae	-
17	*Chrysopogon gryllus*	Poaceae	-
18	*Cleome rutidosperma*	Cleomaceae	-
19	*Cleome viscosa*	Cleomaceae	Hurhuriya
20	*Colocasia esculenta*	Araceae	Kachu

21	*Commelina benghalensis*	Commelinaceae	Kona himolu
22	*Cyanthillium cinereum*	Asteraceae	Sahadevi
23	*Cyperus rotundus*	Cyperaceae	Keya bon
24	*Cyperus strigosus*	Cyperaceae	-
25	*Dactyloctenium aegyptium*	Poaceae	Kakkakalan pullu
26	*Dicliptera roxburghiana*		-
27	*Diplazium esculentum*	Athyriaceae	Dhekia sak
28	*Diplazium polypodiodes*	Athyriaceae	-
29	*Echinochloa colona*	Poaceae	Binoi-bon
30	*Eclipta prostrata*	Asteraceae	Kehraj bon
31	*Eleusine indica*	Poaceae	Bobosa bon
32	*Euphorbia hirta*	Euphorbiaceae	Gakhiroti bon
33	*Gnaphalium uliginosum*	Asteraceae	-
34	*Heliotropium indicum*	Boraginaceae	Hati-huria
35	*Hydrocotyle sibthorpiodes*	Apiaceae	Saru manimuni
36	*Kyllinga brevifolia*		-
37	*Lantana camara*	Verbenaceae	Gu phul
38	*Lepidogathis incurva*		-
39	*Leucas plukentii*	Lamiaceae	Durun bon
40	*Leonurus sibiricus*	Lamiaceae	-
41	*Ludwigia sp.*	Onagraceae	-
42	*Mazus pumilus*	Mazaceae	-
43	*Malvastrum coromandelianum*	Malvaceae	Lafa
44	*Mimosa pudica*	Fabaceae	Lajuki lata
45	*Mirabilis jalapa*	Nyctaginaceae	Gadhuli gopal
46	*Ocimum sanctum*	Lamiaceae	Tulsi
47	*Oldenlandia sp.*	Rubiaceae	-
48	*Oplismenus sp.*	Poaceae	-
49	*Oxalis corniculata*	Oxalidaceae	Tengeshi
50	*Oxalis debelis*	Oxalidaceae	Tengeshi
51	*Parthenium hysterophorus*	Asteraceae	Gajor ghas
52	*Peperomia pellucida*	Piperaceae	-

53	*Pouzalzia zeylanica*	Urticaceae	-
54	*Portulaca oleracia*	Portulacaceae	-
55	*Phyla nodiflora*	Verbenaceae	Jal popali
56	*Phyllanthus urinaria*	Phyllanthaceae	Hajar moni
57	*Rorippa indica*	Brassicaceae	-
58	*Scoparia dulcis*	Plantaginaceae	-
59	*Sida rhombifolia*	Malvaceae	Son barial
60	*Solanum nigrum*	Solanaceae	Los kochi
61	*Solanum torvum*	Solanaceae	Tit bhekuri
62	*Spilanthus paniculata*	Asteraceae	NA
63	*Stachytapheta australis*	Verbenaceae	-
64	*Stellaria media*	Caryophyllaceae	-
65	*Synedrella nodiflora*	Asteraceae	Mudundrapacha
66	*Tridex procumbens*	Asteraceae	Akal kohadi
67	*Thysanolaena sp.*	Poaceae	-
68	*Vernonia cinera*	Asteraceae	Lohpohi

Table 5.2: Shrubs

Sl. No.	**Scientific name**	**Family**	**Common/Vernacular name**
1	*Allamanda cathartica*	Apocynaceae	Ghanta phul
2	*Bauhinia acuminata*	Fabaceae	Kanchan
3	*Bixa orellana*	Bixaceae	Sendur
4	*Bougainvillea glabra*	Nyctaginaceae	Kagaj phul
5	*Caesalpinia pulcherrima*	Fabaceae	Radhasura
6	*Calotropis gigantea*	Apocynaceae	Safed aak
7	*Citrus limon*	Rutaceae	Kaji nemu
8	*Hibiscus rosa-sinensis*	Malvaceae	Jaba phul
9	*Ixora coccinea*	Rubiaceae	Rangol
10	*Manihot esculenta*	Euphorbiaceae	Simolu alu
11	*Murraya koenigii*	Rutaceae	Narasingha
12	*Murraya paniculata*	Rutaceae	Kamini kanchan
13	*Musa acuminata*	Musaceae	Cheni kol

14	*Ricinus communis*	Euphorbiaceae	Era gosh
15	*Tabernaemontana divaricata*	Apocynaceae	Kathanda

Table 5.3: Trees

Sl. No.	Scientific name	Family	Common/Vernacular name
1	*Albizia saman*	Fabaceae	Sirish gos
2	*Areca catechu*	Arecaceae	Tamol
3	*Azadirachta indica*	Mweliaceae	Neem
4	*Butea monosperma*	Fabaceae	Palash
5	*Carica papaya*	Caricaceae	Amita
6	*Cassia tora*	Caesalpiniaceae	Medeluwa
7	*Cocos nucifera*	Arecaceae	Narikol
8	*Crescentia cujete*	Bignoniaceae	Calabash
9	*Cycas pectinata*	Cycadaceae	Nag champa
10	*Dalbergia sisso*	Fabaceae	Sishu
11	*Delonix regia*	Fabaceae	Krishna shura
12	*Dillenia indica*	Dilleniaceae	Ou tenga
13	*Dypsis lutescens*	Arecaceae	Momai tamol
14	*Ficus racemosa*	Moraceae	Dimoru
15	*Mesua ferrea*	Calophyllaceae	Nahor
16	*Mimusops elengi*	Sapotaceae	Bokul
17	*Nyctanthes arbor-tristis*	Oleaceae	Sewali phul
18	*Polyalthia longifolia*	Annonaceae	Debdaru
19	*Phyllanthus emblica*	Phyllanthaceae	Amla
20	*Psidium guajava*	Myrtaceae	Mathuriam
21	*Ravenala madagascariensis*	Strelitziaceae	Traveller’s Tree
22	*Terminalia arjuna*	Combretaceae	Arjun

Table 5.4: Climbers

Sl. No.	Scientific name	Family	Common/Vernacular name
1	*Cardiospermum halicacabum*	Sapindaceae	Kopal phuta bon

2	*Clitoria ternatea*	Leguminosae	Aparajita
3	*Cuscuta campestris*	Convolvulaceae	Golden dodder
4	*Mikenia mikrantha*	Asteraceae	Japani lota
5	*Paederia foetida*	Rubiaceae	Bhedai lota
6	*Syngonium podophyllum*	Araceae	-
7	*Tinospora cordifolia*	Menispermaceae	Amor lota

Table 5.5: Hydrophytes

Sl No.	Scientific name	Family	Common/Vernacular name
1	*Agapanthus sp.*	Amaryllidaceae	Apang
2	*Eichhornia crassipes*	Convolvulaceae	Pani meteka
3	*Ipomea aquatica*	Convolvulaceae	Kolmi-sak
4	*Nymphaea pubescens*	Nymphaeaceae	Nal Mokuwa

Fauna of North Gauhati College

Table 6.1: Birds

Sl. No.	Scientific name	Family	Common/Vernacular name
1	*Phalacrocorax niger*	Phalacrocoracidae	Little cormorant
2	*Bubulens coromandus*	Ardeidae	Eastern cattle egret
3	*Egretta aeba*	Ardeidae	Large egret
4	*Andrea purpurea*	Ardeidae	Purple heron
5	*Egretta grazetta*	Ardeidae	Little egret
6	*Ardeola grayii*	Ardeidae	Indian pond heron
7	*Anastomus oscitans*	Ciconiidae	Openbill stork
8	*Leptoptilos javanicus*	Ciconiidae	Lesser adjutant
9	*Milvus migrans*	Accipitridae	Pariah kite
10	*Amaurornis phoenicurus*	Rallidae	White-breasted waterhen
11	*Streptopelia chinensis*	Columbidae	Spotted dove
12	*Haleyon smyrnensis*	Alcedinidae	White-breasted

			kingfisher
13	*Upupa epops*	Upupidae	Indian hoopoe
14	*Oriolus xanthornus*	Oriolidae	Black-headed oriole
15	*Copsychus saularis*	Muscicapidae	Magpie robin
16	*Orthotomus sutorius*	Cisticolidae	Common tailorbird
17	*Passer domesticus*	Passeridae	House sparrow
18	*Corvus splendens*	Corvidae	House crow
19	*Dendrocitta vagabunda*	Corvidae	Indian treepie
20	*Acridotheres tristis*	Sturnidae	Common myna
21	*Acridotheres fuscus*	Sturnidae	Jungle myna
22	*Motacilla alba*	Motacillidae	Common wagtail
23	*Dicrurus adsimilis*	Dicruridae	Common black drongs
24	*Turdoides striata*	Leiothrichidae	Jungle babbler
25	*Megalaima asiatica*	Megalaimidae	Blue-throated barbet
26	*Dendrocopos atratus*	Picidae	Stripe-breasted pied woodpecker

Table 6.2: Mammals

Sl No.	**Scientific name**	**Family**	**Common/Vernacular name**
1	*Macaca assamensis*	Cercopithecidae	Assamese macaque
2	*Tamiops macclellandi*	Sciuridae	Himalayan striped squirrel

Table 6.3: Amphibians

Sl No.	**Scientific name**	**Family**	**Common/Vernacular name**
1	*Bufo melanostictus*	Bufonidae	Common toad
2	*Hyla arborea*	Hylidae	Tree frog
3	*Rana tigrina*	Ranidae	Frog

Table 6.4: Reptiles

Sl No.	**Scientific name**	**Family**	**Common/Vernacular name**

1	*Calotes versicolor*	Agamidae	Indian garden lizard
2	*Mabuya carinata*	Scincidae	Indian mabuya
3	*Varanus bengalensis*	Varanidae	Monitor lizard
4	*Naja kaouthia*	Elapidae	Monocled cobra
5	*Natrix piscator*	Colubridae	Checkered keelback
6	*Bungarus fasciatus*	Elapidae	Banded krait

Table 6.5: Insects

Sl No.	**Scientific name**	**Family**	**Common/Vernacular name**
1	*Dacus cucurbitae*	Tephritidae	Melon fruit fly
2	*Pieris brassicae*	Pieridae	Cabbage fly
3	*Sitophilus oryzae*	Curculionidae	Rice weevil
4	*Tribolium castaneum*	Tenebrionidae	Red rust flour beetle
5	*Papilio demoleus*	Papilionidae	Lemon butterfly
6	*Mantis religiosa*	Mantidae	Praying mantis
7	*Odontotermes sp.*	Termitidae	White ants
8	*Anisoptera sp.*	Libellulidae	Dragon fly
9	*Gryllus sp.*	Gryllidae	Field cricket
10	*Gryllotalpa sp.*	Gryllotalpidae	Mole cricket
11	*Oryctes rhinoceros*	Scarabaeidae	Rhino beetle
12	*Epilachna sp.*	Coccinellidae	-
13	*Leptocorisa varicornis*	Alydidae	Gundhi beetle
14	*Belostoma sp.*	Belostomatidae	Giant water bug
15	*Nepa sp.*	Nepidae	Water scorpion
16	*Cicada sp.*	Cicadidae	Cicada
17	*Camponotus sp.*	Formicidae	Common house ant
18	*Monomorium sp.*	Formicidae	Large black ant
19	*Solenopsis sp.*	Formicidae	Small red ant
20	*Apis indica*	Apidae	Honey bee
21	*Carausius morosus*	Lonchodidae	Stick insect
22	*Melanoplus sp.*	Acrididae	Grasshopper

Table 6.6: Other arthropods

Sl No.	Scientific name	Family	Common/Vernacular name
1	*Carcinus sp.*	Portunidae	Common crab
2	*Scolopendra sp.*	Scolopendridae	Centepede
3	*Julus sp.*	Julidae	Millipede
4	*Palamnaeus sp.*	Scorpionidae	Scorpion
5	*Aranea sp.*	Araneidae	Common house spider

Table 6.7: Fish

Sl No.	Scientific name	Family	Common/Vernacular name
1	*Ophiocephalus pnetatus*	Channidae	Goroi
2	*Channa bleheri*	Channidae	Cheng
3	*Anabas testudineus*	Anabantidae	Kawai
4	*Heteropneustes fossilis*	Heteropneustidae	Singi
5	*Clarias magur*	Clariidae	Magur
6	*Channa striata*	Channidae	Shole
7	*Amblypharyngodon mola*	Cyprinidae	Mowa fish
8	*Mystus tengara*	Bagridae	Tinra fish
9	*Macrognathus aral*	Mastacembelidae	Tora
10	*Puntius sophore*	Cyprinidae	Puthi
11	*Rasbora daniconius*	Cyprinidae	Dorikona

Table 6.8: Reptiles

Sl No.	Scientific name	Family	Common/Vernacular name
1	*Lymnaea sp.*	Lymnaeidae	Fresh water snail
2	*Planorbis sp.*	Planorbidae	Common water snail
3	*Limax sp.*	Limacidae	Grey slug
4	*Pila globosa*	Ampullariidae	Apple snail
5	*Achatina sp.*	Achatinidae	Garden snail

8. Ambience and Aesthetics Audit

A questionnaire survey was conducted to determine the satisfaction of students and teachers on the ambience of the college campus on a scale of 1 to 10 which yielded the following responses as noted in Fig 8 below.

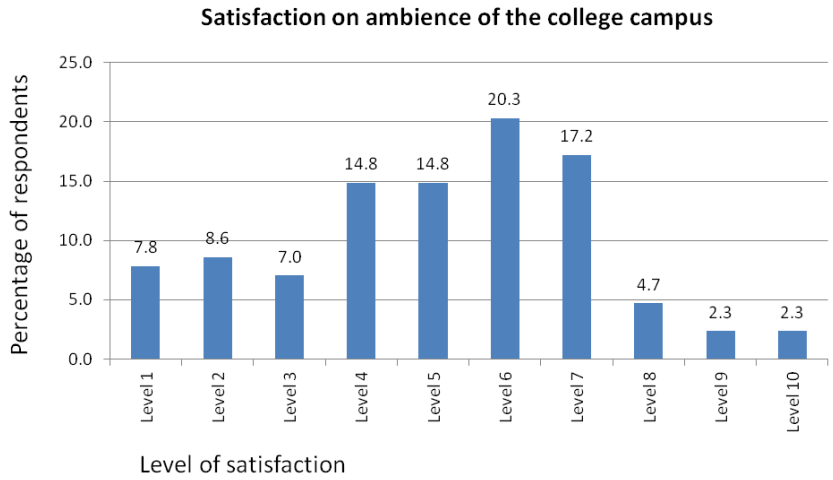


Fig 8: The level of satisfaction of respondents on the ambience of the college campus on a scale of 1 to 10.

From the responses obtained it was clear that 53% of the respondents expressed their satisfaction on the ambience of the college campus at level 5 or below. 37.5% of the respondents expressed their satisfaction at levels 6 or 7. Only 9.3% of the respondents expressed satisfaction at more than level 7. The response is suggestive of the mixed satisfaction of the stakeholders on the college ambience. Different cells of the college such as the Eco Club, the NSS and the NCC units have held cleanliness and plantation drives alongwith environmental awareness campaigns to boost the college environment and ambience. However, many suggestions were obtained from the respondents in the survey as measures to enhance the visual ambience of the college campus, which are as below:

i) To maintain a clean campus by placing additional dustbins at different locations within the college campus and encouraging their proper use alongwith clean maintenance of the open grounds within the college campus,

ii) To take measures for organized plantations, proper maintenance of gardens, organizing plantation drives, hanging plant-pots wherever possible, lining passageways with ornamental hedge shrubs and grooming of the campus grass,

iii) Proper implementation of waste management and waste segregation procedures,

iv) Allotment of organized vehicle parking space for teachers and students alongwith increasing the parking area,

v) Developing modern infrastructure,

vi) Construction of proper drainage channels for prevention of waterlogging during monsoon,

vii) Setting up of sitting facilities for students outside the classrooms at different locations within the campus for their leisure periods,

viii) Construction of a proper badminton/basketball court alongwith a modern playground, completion of indoor stadium,

ix) Concrete paving of the arts-science connecting lane alongwith the addition of pavements within the campus,

x) Modification/re-construction of the main entrance gate and painting of the science gate,

xi) Proper planning during layout and construction of buildings, proper construction/renovation of college office, auditorium interior, redesign of the office interior, addition of modern furnitures, demolishion of old dilapidated building (assam type),

xii) Completion of the college boundary wall,

xiii) Paint jobs wherever necessary,

xiv) Addition of a botanical garden.

As additional measures to improve the liveliness of the college environment the respondents suggested the following measures:

i) Increasing the availability of drinking water in the college campus,

ii) Providing proper sanitation facilities,

iii) Creating environmental awareness by celebrating occasions like world environment with mass plantation drives,

iv) Declaration of no tobacco zone inside the college campus,

v) Installation of solar panels,

vi) Cleaning of the college pond and earth filling in low lying areas.

SUMMARY AND RECOMMENDATIONS

The Green Audit 2021 of the North Gauhati College has been completed through rigorous investigations and scientific analysis of data of various environmental parameters concerning the functioning and maintenance of the college. At the end of the audit, various positive aspects of the college has come to light alongwith areas that need sincere efforts for development. The college is endowed with an extensive land area of which a large proportion remains under-utilized and bears great potential. The water resources of the college also need proper care and bear potentials. Overall, the air and water quality of the college is found satisfactory, except for the amount of particulate matter (PM_{10}) in the air during dry seasons. Some of the ongoing construction projects around the college render this unavoidable, except for the fact that the in-campus quality of air can be improved by extensive and ordered plantations throughout the campus. As the college is located close to industrial establishments, it is also felt as a critical need of the college to have a proper air quality monitoring system installed within campus for year-round monitoring of the quality of air. It is recommended to seek assistance of the state pollution control board for installation of such units in the campus.

The waste management procedures followed in the college are found to be below satisfactory. The college needs to step up measures of reusing and recycling of materials to reduce waste generation and also make use of scientific procedures of waste management. There needs to be an addition of the number of dustbins throughout the campus for that purpose. It is also advisable to seek the service of the North Guwahati Town Committee for provision of special waste pick-up services for the college as there is no such facility available to the college at present.

From the point of view of health and hygiene of the students, teachers and other members of the college, the audit report highlights the requirement of additional facilities for drinking water and sanitation throughout the college. Moreover an urgent need is felt for hygienic canteen facility in the college campus that is accessible to all.

In terms of the energy consumption and conservation, the college has already stepped up efforts to reduce energy expenditure by switching over to the use of energy efficient lighting equipments such as LED bulbs, LED tublights and LED campus lighting in a phased manner. Moreover the college is also augmented with a solar panel facility of 10 KWP capacity. Addition of more solar panels can reduce dependence on grid electricity to a further extent.

In regards of biodiversity, the college campus is blessed with a rich biodiversity. There can however be efforts to boost the biodiversity even further. The addition of a botanical garden can go a long way in achieving that.

The ambience of the college campus has received mixed reviews from various stakeholders. A large percentage of the stakeholders believe there are a number of aspects which need attention in order to enhance the ambience of the college. A number of recommendations have already been enlisted in the previous section. The most important considerations to be made are well-planned constructions and modern infrastructural development, ordered plantations, proper waste management and regular up keeping of the college campus.

GREEN AUDIT REPORT

2021-22

NORTH GAUHATI COLLEGE

Guwahati- 781031

CERTIFICATE

This is to certify that the Green Audit 2021-22 of North Gauhati College has been prepared by faculty members of the departments of Geography, Zoology, Botany and Chemistry alongwith members of the college office in compliance with the norms of sustainable development. The audit team has rigorously surveyed the various aspects included in the study and presented the report to highlight the environmental compatibility of the activities of the institution. There have also been several instances of questions being raised by the audit report regarding the college's environmental compliance which needs to be addressed in the future.

I hereby certify that the audit process and its presentation have been found satisfactory and scientific. I hope that this audit report sets the proper targets for the college in achieving environmental sustainability in all its future undertakings.

04/03/2023

Dr. Dhrubajyoti Sahariah

Professor & Head of the Department,

Department of Geography

Gauhati University

Professor & Head
Department of Geography
Gauhati University
Guwahati- 781014

Foreword from the Principal

The Green Audit 2021-22 of North Gauhati College has been conducted by the college in compliance with the NAAC recommendations as per Criterion VII of assessment of academic institutions. The purpose behind Green Audit is to scientifically document different environmental parameters within the institution and analyse the environmental sustainability of the institution's activities to enable the identification of the weaknesses and develop strategies to reduce the negative impacts on the environment as a part of the larger goal of achieving a greener and healthier planet. North Gauhati College is committed to environmental sustainability goals of the Governments at the state and centre as well as global bodies, aimed at negating the impacts of climate change and environmental degradation which followed the rapid industrialization and urbanization of the 19th century.

I am hereby pleased to present the Green Audit 2021-23 report of the North Gauhati College which is the result of thorough scientific investigation and comprehensive analysis of data by the audit team. I sincerely hope that this audit will have positive impact on the college environment and guide future development projects.

Dr. Dilip Das

Principal,

North Gauhati College

Principal

North Gauhati College

Acknowledgement

The Green Audit 2021-22 of the North Gauhati College has been conducted in compliance with the recommendations of the National Assessment and Accreditation Council as per the criterion VII of its assessment criteria for accreditation of educational institutions. The audit has taken into consideration, various aspects of the environment within the college that influence and are influence by the activities herein.

This audit has been possible due to the tireless efforts of the teaching and non-teaching members of the college. I am obliged to thank our Principal, Dr. Dilip Das, for providing every possible support to the audit. I express my heartfelt thanks to the faculty members of the department of Geography for their support in preparation of the college map and the land use survey. I thank the faculties of the departments of Botany and Zoology for their help in conducting the biodiversity audit. I thank the faculties from the department of Chemistry for their assistance in conducting the air and water quality reviews. I am extremely grateful to members of the college office for their assistance in conducting review of documents during the energy audit of the college. Finally, I would also offer my sincere thanks to all faculty members, non-teaching staff, and students for their active participation in the questionnaire surveys and other helpful acts which made this audit feasible.

I hope that this audit is a proper reflection of the status of the college in terms of environmental compliance and express my confidence that it will serve to improve sustainability of the various activities in the institution.

Dr. Achyutananda Baruah

Coordinator of the IQAC,

North Gauhati College

CONTENTS

INTRODUCTION

North Gauhati College is a premier institution of Higher Education in the Northern bank of the river Brahmaputra, which was established on 4th September, 1962, and was the only institution of Higher Education in the greater North Kamrup region of the old Kamrup District at that time. The college has a total campus area of 34999 square metres and comprises of 14 Departments belonging to the Arts and Science faculties, which impart education to Higher Secondary and Undergraduate students. In addition to the curricular activities, the college has organized various environmental awareness and development programmes over the years with the aid of its wings such as the Eco Club, the Science Forum, the NSS, and also various academic departments.

The issue of environmental degradation is a burning problem in modern times and the North Gauhati College has strived to live up to sustainable development goals with an aim to minimize negative impact on the environment. The high rates of industrialization and urbanization and increased demand for energy generation in the modern times has led to the increased pollution in our environment, which gives rise to the question of sustainability of different human activities. As an outcome, it has become the norm to engage in monitoring activities that determine the impact of human activities on the environment. As an institution of higher education, activities within the college leads to the generation of wastes, consumption of energy and natural resources, and thereby exerts a demand on the environment. Moreover the environment of the institution and its surroundings also has an impact on the health and well being of its stakeholders. As such, an audit for assessment of the environmental assets and impacts of various activities of the institution on the environment is considered necessary, and given proper weightage by the National Assessment and Accreditation Council (NAAC).

The Green Audit can be stated as a scientific process of identification, recording, and analysis of different assets of the college and activities in and around the institution that has an environmental toll. It is an integral tool in determining where the institution stands in terms of environmental sustainability of its activities and the wealth of ambience that it is endowed with, as well as in creating awareness among the different stakeholders for preservation of the environment. The audit provides an opportunity to identify a benchmark for the college in terms of a healthy environment. Furthermore, it empowers the authorities and stakeholders to set targets for improving the college environment and implement measures for the same. The

National Assessment and Accreditation Council (NAAC) places 'Environmental Consciousness' under criterion VII of its assessment criteria for accreditation of educational institutions.

The goals set for achievement by the Green Audit of the North Gauhati College are:

- Collection of baseline data of various important environmental parameters.
- Identification of areas of strength and areas of concern in the operation of different units of the college, namely the administrative department, academic units, laboratories, hostel and the campus management activities.
- Identification of opportunities and challenges in implementing sustainable management of the environment and enhancing aesthetic ambience of the campus.
- Increasing awareness for sustainable utilization and management of environmental resources by different stakeholders.

Target areas of Green Audit

1. Land Use and Land Cover:

The land use and land cover (LULC) survey was aimed at providing a correct estimate of the total geographical area under the college premises and the range of activities for which the area is being used. The purpose of this study was to outline the geographical strength of the college and identify areas which bear promises for improvement of the college environment as well as provide scope for eco-friendly infrastructural development of the college in future.

2. Water Use Audit

This component of the green audit was aimed at documenting the sources of water available to the college, the daily extraction and requirement of water in the college, any preventable wastage of the water, and the different categories under which the water is being used. It was also determined to document any measures undertaken for reuse of waste water or harvesting of rainwater. This study further aims to undertake a qualitative analysis of the water obtained from the different sources in order to identify and prevent any potential hazard from poor water quality.

3. Waste Management Audit

The proper management of wastes is a serious issue that determines the hygiene of a place. The green audit aimed at documenting the wastes generated during the college activities and categorizing them as biodegradable, non-biodegradable, and hazardous wastes. It was aimed at studying whether waste segregation measures are followed by different departments and administrative units of the college. Management of hazardous wastes is of particular significance and this audit aims to document the level of awareness of different stakeholders concerning hazardous waste management, and any practices that are followed specially by the science laboratories for proper disposal of hazardous wastes. It was also aimed to document any measures undertaken for recycling of non-biodegradable wastes as practiced in the college. The audit also aimed at documenting the overall measures of waste disposal followed by the college.

4. Health and Hygiene Audit

This part of the audit was aimed at documentation of the pure drinking water facilities and access to proper sanitary facilities that are at the disposal of the different stakeholders.

5. Energy Audit

This part of the audit was aimed at documenting the usage of different forms of energy for running the college activities. The forms of energy usage to be documented were primarily electricity, in addition to LPG and other forms of fossil fuels which have a direct impact on the environment in terms of emission. The audit aimed at identifying measures undertaken to reduce energy usage in the college campus or switch over to renewable and ‘clean’ sources of energy. An awareness survey was also to be undertaken among the different stakeholders regarding usage and energy conservation efforts.

6. Air Quality Audit

As an audit of the air quality in and around the campus, due to the unavailability of air quality monitoring facility in the college campus itself, data from external agencies was to be sought. It was however resolved to initiate an air quality monitoring system inside the college premises in the coming days because of the close proximity of the college from industrial areas of Amingaon and North Guwahati region.

7. Biodiversity Audit

A survey was also to be undertaken to document the floral and faunal biodiversity within the college campus. A rich floral and faunal diversity boosts the ambience of the college as well as helps in maintaining a homeostatic ecosystem. A good number of large trees also acts as a thermoregulator during the hot summer days in addition to reducing the carbon footprint. The purpose of this part of the audit was to provide a baseline data required to identify areas in which the college biodiversity can be enhanced alongwith enriching of the ecosystem.

8. Ambience and Aesthetics Audit

As a part of the green audit, a survey was also aimed to be conducted among different stakeholders to gather idea on their view on the natural ambience of the college and also gather ideas for its improvement.

The Audit

The green audit was conducted by faculty members from the departments of Zoology, Botany, Geography, and Chemistry alongwith non teaching staff of the college. The methodologies followed during the audit are as below:

1. Site visits were conducted during the land use and land cover survey, for parts of the water audit, the energy audit and the health and hygiene audit, and for the biodiversity audits.

2. The interview method was used for obtaining data regarding water source and daily water requirement, management of wastes, and use of energy sources other than electricity.

3. Questionnaires were distributed among different stakeholders to obtain data regarding water usage, waste segregation, awareness about waste management, part of the health and hygiene audit, part of the energy audit, and for obtaining views and opinions regarding the ambience of the college premises.

4. Documents were studied for obtaining data on the consumption of electrical energy in various parts of the college.

5. Use of technology, softwares, and Standard Operating Procedures was done for obtaining geographical data as well as data on air and water quality.

AUDIT FINDINGS

1. Land Use and Land Cover:

The total area of land inside the college premises is 34999 square metres of which different buildings comprise a total of 6616 square metres. There is a playground of 6154 square metres on the North Western side within the college campus, while a pond of 2809 square metres lies on the Southern side of the campus to the East of the Library building. Of the different buildings is an indoor stadium on the Northern side of the campus, to the East of the playground. A garden of 140 square metres is present in the open area on the Southern side of the social sciences building, while the remaining of the free space is used for vehicle parking. A cycle stand of 270 square metres is present on the Western side of the parking area by the roadside boundary wall.

There is an open area on the South Eastern side of the Physics and Life Sciences building on which a weather station of the meterological department comprising about 40 square metres is present. On the remainder of the free space, a botanical garden of about 1100 square metres is being proposed where earth filling has already begun.

The college campus has walkways of about 363 metres total length, of which, about 215 metres are paved with concrete. Of the remaining of the walkways, about 44 metres is laid with loose bricks and the rest is bare soil.

The following table (Table 1) highlights different categories of land use in the college campus.

Table 1. Categories of Land Use.

Sl. No.	Categories	Area (Sq. Metres)	Length (Metres)
1	College Campus Total Area	34999	
2	Administrative Building with adjacent general classrooms	861	
3	Social Sciences Building	655	
4	Auditorium	693	
5	Eco-Ass Dept. Building	694	
6	Education Dept. Building	456	
7	New Chemistry Dept. Building with attached general classrooms	506	
8	Cycle stand	270	
9	Mathematics Dept. Building	342	
10	Boys' Common Room	123	
11	BOI Garden	140	
12	Playground	6154	
13	Pond	2809	
14	Water supply scheme	308	
15	Indoor Stadium	767	
16	Library and English Dept. Building	271	
17	Girls' Common Room	106	
18	Girls' Hostel	471	
19	Physics and Life Sciences Dept. Building	615	
20	Urinal 2 (between Edu. Dept. and Chem Dept.)	31	
21	B-Voc Dept. Building	25	
22	Path 1 (Admin Building to boys common room)		58
23	Path 2 (main gate to Eco_Ass Building)		108
24	Path 3 (Mid admin to Edu dept)		54
25	Path 4 (Science gate to Girls hostel)		99
26	Path 5 (last point of admin to RCC 1 Building)		44

Fig 1: North Gauhati College campus map (Source: Google Earth; Prepared using: ArcGIS, v. 10.6.1).

2. Water Use Audit

The various purposes for which water is used in the college are drinking, lavatories and washrooms, science laboratories, cleaning and washing activities, construction activities from time to time, gardening, and the kitchens run in various departments and the girls' hostel, in addition to the daily water requirement of the hostel boarders.

The main source of water for various uses in the college is the underground aquifers. The water is obtained from the aquifers by four submersible pumps that are installed in borewells in the following locations: i) one pump behind the college library, ii) one pump behind the B.Voc. building, iii) one pump behind the department of Botany, and iv) one pump in the girls' hostel. A total of about 18500 Litres of water is obtained from the borewells daily. The total water requirement in different departments, laboratories and offices of the college is approximately 10000 Litres on average on a normal working day. The total water requirement of the girls' hostel is about 8500 Litres per day. The water obtained from the borewells is stored in 11 overhead tanks of different sizes placed at different locations throughout the college campus, whose total water holding capacity is 14650 Litres. The water is supplied from these tanks to the different sites of usage through pipelines. Although there is a large pond within the college campus, it is entirely covered by invasive plant species like *Eichhornia crassipes*, and hence the water is rendered unusable in activities such as gardening, construction, etc., that would otherwise have been possible with the pond water, reducing the demand for ground water. There are no installations for rainwater harvesting or reuse of waste water in the college. Most of the rainwater drains into the college pond and low lying areas within the college campus. The waste water is also let to run onto low grounds to percolate.

A quality assessment of the ground water that is stored in overhead tanks and supplied to various units of the college was performed in the District Level Laboratory (PHED), Kamrup District, under the Govt. of Assam, located in Bamunimaidam, Guwahati-21. The water quality report is tabulated in Table 2 below.

Table 2: Water quality report obtained from District Level Laboratory (PHED), Kamrup district.

Sl. No.	Parameter	Protocol Used	Results	Desirable Limit	Maximum permissible Limit	Unit
1	Taste	IS: 3025 (part 8)	Aggregable	Aggregable	Aggregable	-
2	Odour	IS: 3025 (part 5)	Aggregable	Aggregable	Aggregable	-
3	Turbidity	IS: 3025 (part 10)	0	1	5	NTU
4	pH	IS: 3025 (part 11)	7.08	6.5-8.5	No relaxation	-
5	TDS	IS: 3025 (part 16)	265.5	500	2000	mg/L
6	Chloride	IS: 3025 (part 32)	14	250	1000	mg/L
7	Total Alkalinity	IS: 3025 (part 23)	186	200	600	mg/L
8	Total Hardness	IS: 3025 (part 21)	151.2	200	600	mg/L
9	Calcium (as Ca)	IS: 3025 (part 40)	48	75	200	mg/L
10	Magnesium	APHA (23rd ED) 3500 Mg B	7.6	30	100	mg/L
11	Total Iron	APHA 3500 (23rd ED) Fe B	0.17	0.3	No relaxation	mg/L
12	Arsenic	APHA 3500 (23rd ED) As B	-	0.01	0.05	mg/L
13	Fluoride	APHA (23rd ED) 4500 F F	0.25	1	1.5	mg/L
14	Nitrate	APHA (23rd ED) 4500 NO3 D	0	45	No relaxation	mg/L
15	Sulphate	IS: 3025 (part 24)	10	200	400	mg/L

A questionnaire survey among teachers and students to identify possible measures for increasing efficiency of water usage, or rather to prevent wastage, suggested the following facets:

i) Leakages in pipelines, especially in toilets and sinks, and presence of faulty taps lead to the wastage of certain amount of water which can be checked by a thorough servicing.

ii) Improper closure of taps specially in toilets also lead to the wastage of a considerable amount of water, which can be prevented by the use of self closing taps.

iii) Overflow from the overhead water storage tanks during filling up also leads to water wastage. For checking this, sensors that detect water level can be installed with the tanks to help in timely switching off the water jet pumps.

iv) As one pipeline carries water to a number of departments, the installation of additional valves in the water pipelines can be of help in checking water wastage during the case of severe leakage due to faulty installations in any department that require professional repairing.

v) Cleaning the college pond can provide water for certain activities such as gardening, construction, etc., which can help in reducing demand on groundwater.

3. Waste management audit

The activities of different units of the college lead to the generation of wastes. An account of the amount of wastes generated on a periodical basis is not available, as most of the wastes are immediately disposed off by respective departments and offices. Waste segregation methods are not followed in the college and all types of wastes are dumped together. None of the departments were found to follow special procedures for management of hazardous wastes, and all wastes find their way to the dumping areas. Some of the solid wastes are burnt off within the college campus. Other wastes are dumped in low lying areas. Waste water from laboratories are allowed to make their way to low lying areas. In a questionnaire survey of teachers and students to ascertain the types of waste generated during their activities in the college, the respondents were aware of generating 18.5% hazardous wastes, 30.6% non-biodegradable wastes, and about 51% biodegradable wastes.

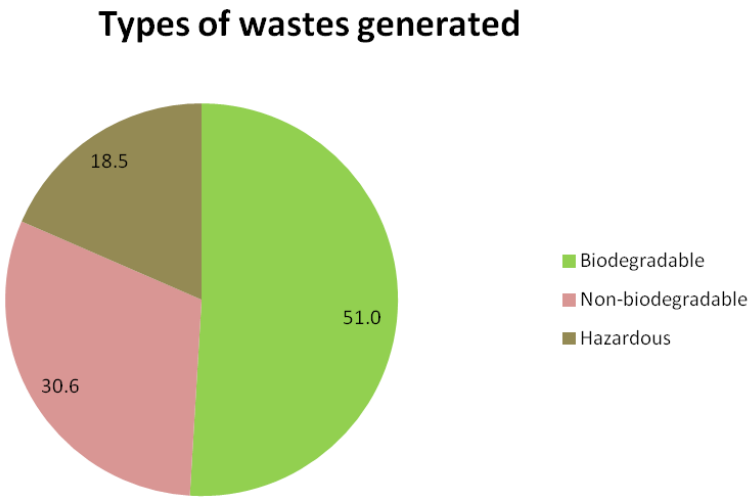


Fig 2: The respondents were aware of generating the following types of wastes during their activities.

On being enquired about their awareness regarding proper disposal of hazardous wastes, the responses recorded were as follows:

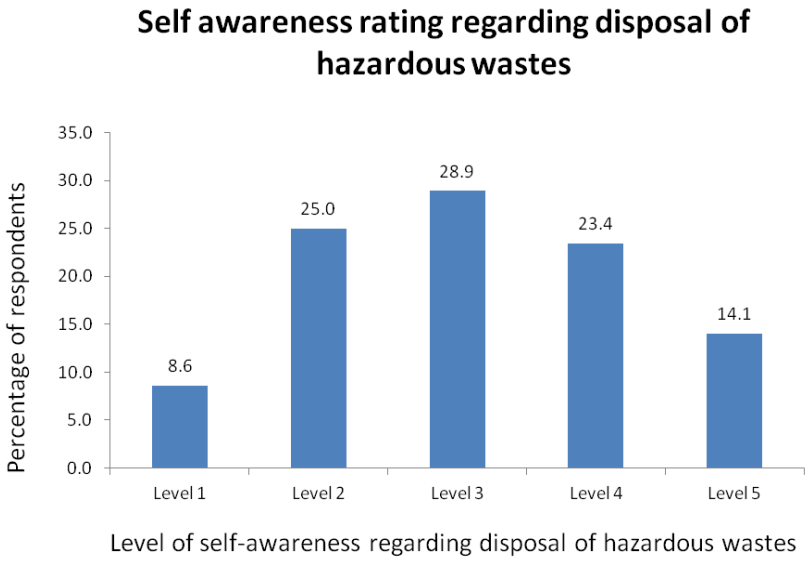


Fig 3: The level of awareness as self assessed by the respondents regarding methods of disposal of hazardous wastes on a scale of 1 to 5.

In an attempt to identify measures to reduce waste generation in the college, the following responses were obtained from various stakeholders:

i) Limitation on the use of single use plastic in the college campus,

ii) Use of paper bags or reusable bags for carrying loose items instead of polythene bags,

iii) Recycling and repurposing as many items as possible and create awareness regarding the same,

iv) Use of duplex printing wherever possible to reduce paper consumption and waste,

v) Procurement of products with better durability ratings.

The following are certain areas identified as avenues for recycling and reusing in order to reduce wastes:

i) Recycling of paper – use of paper shredder wherever required,

ii) Reduction on the dependency on disposable cutlery for lunch,

iii) Reuse of waste water (wherever possible) in gardening,

iv) Reuse of temporary slides in the laboratory after proper washing,

v) Use of reusable water bottles instead of disposable ones,

vi) Reuse of construction materials and materials obtained from the demolition of old buildings,

vii) Recycling of broken glasswares from the laboratories,

viii) Composting of biodegradable wastes.

4. Health and Hygiene audit

Pure drinking water, hygienic food and sanitary facilities are important indicators of the health and hygiene friendly status of an institution. The college has a total of 5 numbers of water elctronic filter/cooler units installed for pure drinking water purposes. The college however lacks a functioning canteen facility for hygienic food.

In total the college has 16 numbers of toilets for teachers and non-teaching staff members. The total number of student toilet facilities includes 4 numbers for boys and 3 numbers for girl students and 1 common toilet.

The satisfaction regarding pure drinking water facilities in the college as recorded by the students and teachers are depicted in Fig 4 below:

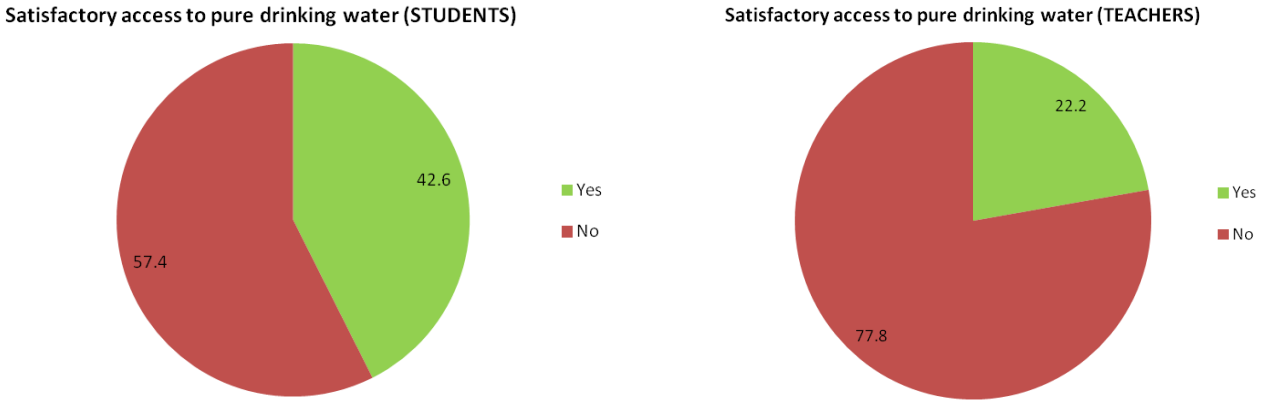


Fig 4: Student and Teacher satisfaction regarding provisions of pure drinking water in the college.

With regards to provisions for toilet and washrooms, the student and teacher satisfactions are depicted in Fig 5 as follows:

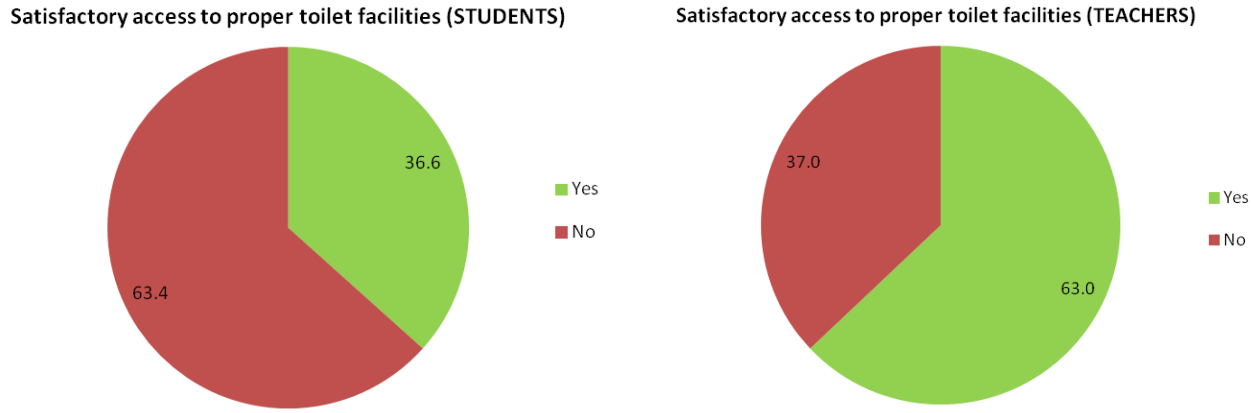


Fig 5: Student and Teacher satisfaction regarding toilet and washroom facilities in the college.

5. Energy Audit

The bulk of the energy consumed in various activities in the college is in the form of electrical energy which is provided by the government run Assam Power Distribution Company Limited from its Amingaon (021) sub division. The college has a total of three connections having consumer numbers 021000006032, 021000006034, 021010041547 (Connections 1, 2, and 3 respectively in Table 3). A total of 25289 units of electricity was consumed during the year 2021 that generated a total electricity bill amount of Rs. 1,96,384 (Table 3). However most of the electricity bills were prepared based on an estimated number of units consumed determined by

the provider, as highlighted in Table 3, which does not reflect the actual energy consumption status.

To reduce the electricity consumption, solar panels of a total capacity of 10 KWP were installed in the college girls' hostel premises recently.

Table 3. Monthly electricity consumption in North Gauhati College during the session 2021-22.

Month	**Connection 1**		**Connection 2**		**Connection 3**	
	Units	**Bill Amount (Rs)**	**Units**	**Bill Amount (Rs)**	**Units**	**Bill Amount (Rs)**
July 2021	790*	5576/-	980*	8608/-	397*	2771/-
August 2021	816*	5589/-	980*	8353/-	407*	2778/-
September 2021	816*	5589/-	0	1209/-	394*	2771/-
October 2021	746*	5289/-	980*	8420/-	360*	2459/-
November 2021	816*	5589/-	980*	8420/-	407*	2778/-
December 2021	790*	5573/-	871	7592/-	394*	2767/-
January 2022	816*	5589/-	769	6790/-	-	-
February 2022	1179	7910/-	1009	8706/-	0	290/-
March 2022	1215	16211/-	932	5826/-	153	1137/-
April 2022	1445	9621/-	892*	7927/-	21	271/-
May 2022	1488	10409/-	1164	8326/-	22	315/-
June 2022	2040	14212/-	1260	10479/-	20	310/-
Total	12957	97157/-	10817	90656/-	2575	18647/-

* *Estimated Units consumed as recorded by service provider.*

Total Units consumed	26349
Total Bill Amount Paid (Rs)	206460/-

The college is switching over to more energy efficient appliances like LED bulbs and tubes in place of the old halogen or CFL bulbs and fluorescent tubes in a phased manner. At present there are a total of 248 fans, 121 LED bulbs, 71 LED tubes, 61 Fluorescent tube lights, and 10 CFL bulbs in the college. In addition, a total of 28 LED Lamp posts lighting the whole of the college campus during the dark hours are also being operated.

Other energy consuming appliances in the college include a total of 33 desktop computer sets, 17 printers, 3 projectors, 4 refrigerators, 2 ACs, 3 Xerox machines, 5 water pumps, and various

laboratory equipments. The total energy demand of each department is not available due to the absence of separate electricity meters.

In addition to electric energy the college also consumes certain amount of LPG and diesel fuels. A total of about 230 kgs of LPG are consumed annually in the college girls' hostel, alongwith about 30 kgs of LPG annually in the chemistry laboratory. Moreover, a monthly average of 25 Litres of diesel are consumed during the operation of the DC generator at times of electric outage.

During a questionnaire survey of students and teachers, their responses on self estimation of the level of awareness on a scale of 1 to 5 regarding conservation and economical use of energy were recorded as in the graph in Fig 6. More than 70% respondents (students and teachers) admitted to switching off electrical appliances (light bulbs, tubes, or fans) when vacating a room. About 18% respondents switch off appliances quite often. Almost 11% respondents admitted that they rarely switch off appliances when vacating a room, while 0.8% said they had never switched off appliances when vacating a room (Fig 7).

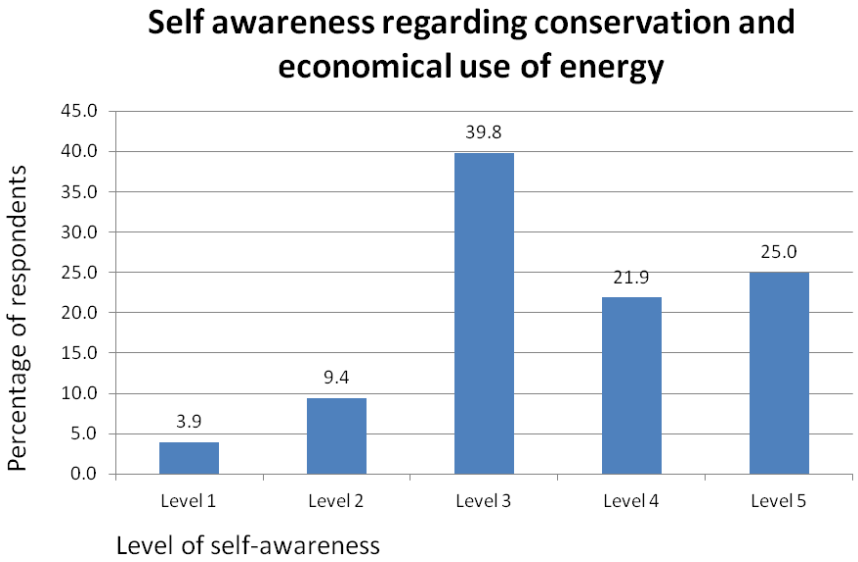


Fig 6: The level of awareness as self assessed by the respondents regarding conservation and economical use of energy on a scale of 1 to 5.

As measures to reduce energy consumption in the college campus, the following responses were obtained from students and teachers:

i) Switching off of electrical appliances when not in use,

ii) Develop measures to use renewable sources of energy such as to generate solar energy by campus-wide installation of solar panels,

iii) Measures to replace more energy consuming appliances with energy efficient alternatives, which could include the use of LED bulbs in place of CFL or filament bulbs, replacing old fans (wherever possible) with less energy consuming fans having BLDC motors which can save upto 65% electricity,

iv) Using laptop computers instead of desktop computers whenever possible,

v) Re-do old electrical wirings wherever necessary,

vi) Create awareness among different stakeholders regarding the necessity and ways of energy conservation.

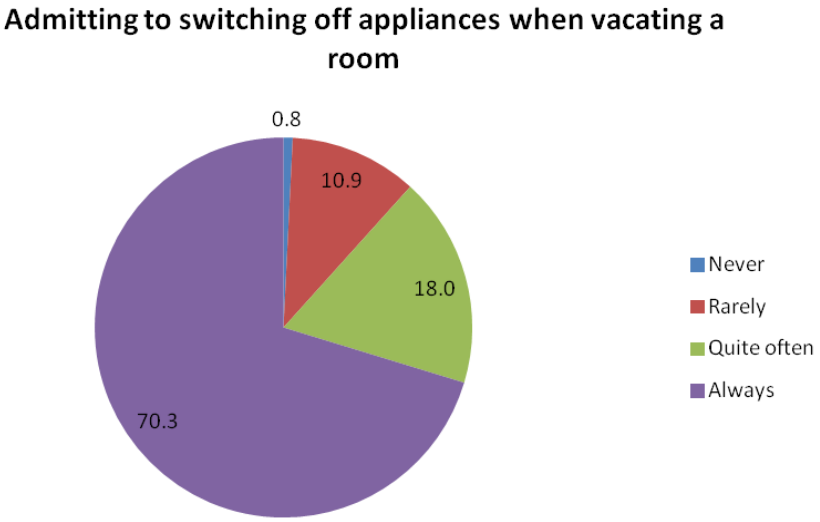


Fig 7: The level of awareness as self assessed by the respondents regarding conservation and economical use of energy on a scale of 1 to 5.

6. Air Quality Audit

The ambient air quality data of the locality of the North Gauhati College was obtained from the records of the IOCL LPG bottling plant which is located at an aerial distance of less than 1 km

from the college campus. The data was obtained during the month of August, 2021 which is presented in Table 4 below:

Table 4: Ambient air quality (24 hrs) data for the year 2021

Month of Sampling	**Location**	**Weather**	**PM_{10} ($\mu g/m^3$)**	**SO_2 ($\mu g/m^3$)**	**NO_2 ($\mu g/m^3$)**
Aug-21	IOCL LPG Bottling Plant Gate	Clear	76	8	12
Aug-21	IOCL LPG Bottling Plant Premises	Clear	72	6	10
Average			**74**	**7**	**11**

Particulate matter (PM_{10}) consists of all solid and liquid particles of size 2.5 - 10μm, which are suspended in air and many of which are hazardous and cause respiratory and cardiovascular disorders. This complex mixture includes both organic and inorganic particles, such as dust, pollen, soot, smoke, and liquid droplets. The average PM_{10} concentration during the period of collection was 74 $\mu g/m^3$, which is found to comply with the CPBC Ambient Air Quality Standard of 100 $\mu g/m^3$ (for 24 hrs). The main source of PM_{10} in the college locality is identified to be the plying of public and heavy industrial carriage vehicles as well as ongoing constructions in the highly industrialized and rapidly urbanizing neighbourhood.

The SO_2 and NO_2 levels in the area are well below ambient air quality standards (average of 80$\mu g/m^3$ in 24 hrs for both SO_2 and NO_2) of the CPBC.

It is however felt necessary at this point to record the ambient air quality throughout the year within the college campus as the college is in close proximity of the heavily industrialized areas of Amingaon and North Guwahati.

7. Biodiversity Audit

The college has a rich biodiversity in terms of flora and fauna species found. The flora and fauna found in the college campus are tabulated as below:

Flora of North Gauhati College

Table 5.1: Herbaceous Plants/ Grasses

Sl. No.	Scientific name	Family	Common/Vernacular name
1	*Achyranthes aspera*	Amaranthaceae	Apang
2	*Ageratum conyzoides*	Asteraceae	Gondhoa bon
3	*Agrostis capillaris*	Poaceae	-
4	*Alopecurus myosuroides*	Poaceae	-
5	*Alternanthera triandra*	Amaranthaceae	Gurundi
6	*Amaranthus viridis*	Amaranthaceae	Khutura
7	*Amaranthus spinosus*	Amaranthaceae	Kata khutura
8	*Bambusa ventricosa*	Poaceae	Buddha's belly bamboo
9	*Bambusa vulgaris*	Poaceae	
10	*Blumea sp.*	Asteraceae	-
11	*Boerhavia diffusa*	Nyctaginaceae	Punounouwa
12	*Carex rostrata*	Cyperaceae	-
13	*Catharanthus roseus*	Apocynaceae	Nayantara
14	*Centella asiatica*	Apiaceae	Bor-manimuni
15	*Cheilocostus speciosus*	Costaceae	Jom lakhuti
16	*Chenopodium ficifolium*	Amaranthaceae	-
17	*Chrysopogon gryllus*	Poaceae	-
18	*Cleome rutidosperma*	Cleomaceae	-
19	*Cleome viscosa*	Cleomaceae	Hurhuriya
20	*Colocasia esculenta*	Araceae	Kachu
21	*Commelina benghalensis*	Commelinaceae	Kona himolu
22	*Cyanthillium cinereum*	Asteraceae	Sahadevi
23	*Cyperus rotundus*	Cyperaceae	Keya bon
24	*Cyperus strigosus*	Cyperaceae	-
25	*Dactyloctenium aegyptium*	Poaceae	Kakkakalan pullu
26	*Dicliptera roxburghiana*		-
27	*Diplazium esculentum*	Athyriaceae	Dhekia sak
28	*Diplazium polypodiodes*	Athyriaceae	-

29	*Echinochloa colona*	Poaceae	Binoi-bon
30	*Eclipta prostrata*	Asteraceae	Kehraj bon
31	*Eleusine indica*	Poaceae	Bobosa bon
32	*Euphorbia hirta*	Euphorbiaceae	Gakhiroti bon
33	*Gnaphalium uliginosum*	Asteraceae	-
34	*Heliotropium indicum*	Boraginaceae	Hati-huria
35	*Hydrocotyle sibthorpiodes*	Apiaceae	Saru manimuni
36	*Kyllinga brevifolia*		-
37	*Lantana camara*	Verbenaceae	Gu phul
38	*Lepidogathis incurva*		-
39	*Leucas plukentii*	Lamiaceae	Durun bon
40	*Leonurus sibiricus*	Lamiaceae	-
41	*Ludwigia sp.*	Onagraceae	-
42	*Mazus pumilus*	Mazaceae	-
43	*Malvastrum coromandelianum*	Malvaceae	Lafa
44	*Mimosa pudica*	Fabaceae	Lajuki lata
45	*Mirabilis jalapa*	Nyctaginaceae	Gadhuli gopal
46	*Ocimum sanctum*	Lamiaceae	Tulsi
47	*Oldenlandia sp.*	Rubiaceae	-
48	*Oplismenus sp.*	Poaceae	-
49	*Oxalis corniculata*	Oxalidaceae	Tengeshi
50	*Oxalis debelis*	Oxalidaceae	Tengeshi
51	*Parthenium hysterophorus*	Asteraceae	Gajor ghas
52	*Peperomia pellucida*	Piperaceae	-
53	*Pouzalzia zeylanica*	Urticaceae	-
54	*Portulaca oleracia*	Portulacaceae	-
55	*Phyla nodiflora*	Verbenaceae	Jal popali
56	*Phyllanthus urinaria*	Phyllanthaceae	Hajar moni
57	*Rorippa indica*	Brassicaceae	-
58	*Scoparia dulcis*	Plantaginaceae	-
59	*Sida rhombifolia*	Malvaceae	Son barial
60	*Solanum nigrum*	Solanaceae	Los kochi

61	*Solanum torvum*	Solanaceae	Tit bhekuri
62	*Spilanthus paniculata*	Asteraceae	-
63	*Stachytapheta australis*	Verbenaceae	-
64	*Stellaria media*	Caryophyllaceae	-
65	*Synedrella nodiflora*	Asteraceae	Mudundrapacha
66	*Tridex procumbens*	Asteraceae	Akal kohadi
67	*Thysanolaena sp.*	Poaceae	-
68	*Vernonia cinera*	Asteraceae	Lohpohi

Table 5.2: Shrubs

Sl. No.	Scientific name	Family	Common/Vernacular name
1	*Allamanda cathartica*	Apocynaceae	Ghanta phul
2	*Bauhinia acuminata*	Fabaceae	Kanchan
3	*Bixa orellana*	Bixaceae	Sendur
4	*Bougainvillea glabra*	Nyctaginaceae	Kagaj phul
5	*Caesalpinia pulcherrima*	Fabaceae	Radhasura
6	*Calotropis gigantea*	Apocynaceae	Safed aak
7	*Citrus limon*	Rutaceae	Kaji nemu
8	*Hibiscus rosa-sinensis*	Malvaceae	Jaba phul
9	*Ixora coccinea*	Rubiaceae	Rangol
10	*Manihot esculenta*	Euphorbiaceae	Simolu alu
11	*Murraya koenigii*	Rutaceae	Narasingha
12	*Murraya paniculata*	Rutaceae	Kamini kanchan
13	*Musa acuminata*	Musaceae	Cheni kol
14	*Ricinus communis*	Euphorbiaceae	Era gosh
15	*Tabernaemontana divaricata*	Apocynaceae	Kathanda

Table 5.3: Trees

Sl. No.	Scientific name	Family	Common/Vernacular name
1	*Albizia saman*	Fabaceae	Sirish gos
2	*Areca catechu*	Arecaceae	Tamol

3	*Azadirachta indica*	Mweliaceae	Neem
4	*Butea monosperma*	Fabaceae	Palash
5	*Carica papaya*	Caricaceae	Amita
6	*Cassia tora*	Caesalpiniaceae	Medeluwa
7	*Cocos nucifera*	Arecaceae	Narikol
8	*Crescentia cujete*	Bignoniaceae	Calabash
9	*Cycas pectinata*	Cycadaceae	Nag champa
10	*Dalbergia sisso*	Fabaceae	Sishu
11	*Delonix regia*	Fabaceae	Krishna shura
12	*Dillenia indica*	Dilleniaceae	Ou tenga
13	*Dypsis lutescens*	Arecaceae	Momai tamol
14	*Ficus racemosa*	Moraceae	Dimoru
15	*Mesua ferrea*	Calophyllaceae	Nahor
16	*Mimusops elengi*	Sapotaceae	Bokul
17	*Nyctanthes arbor-tristis*	Oleaceae	Sewali phul
18	*Polyalthia longifolia*	Annonaceae	Debdaru
19	*Phyllanthus emblica*	Phyllanthaceae	Amla
20	*Psidium guajava*	Myrtaceae	Mathuriam
21	*Ravenala madagascariensis*	Strelitziaceae	Traveller's Tree
22	*Terminalia arjuna*	Combretaceae	Arjun

Table 5.4: Climbers

Sl. No.	**Scientific name**	**Family**	**Common/Vernacular name**
1	*Cardiospermum halicacabum*	Sapindaceae	Kopal phuta bon
2	*Clitoria ternatea*	Leguminosae	Aparajita
3	*Cuscuta campestris*	Convolvulaceae	Golden dodder
4	*Mikenia mikrantha*	Asteraceae	Japani lota
5	*Paederia foetida*	Rubiaceae	Bhedai lota
6	*Syngonium podophyllum*	Araceae	-
7	*Tinospora cordifolia*	Menispermaceae	Amor lota

Table 5.5: Hydrophytes

Sl No.	Scientific name	Family	Common/Vernacular name
1	*Agapanthus sp.*	Amaryllidaceae	Apang
2	*Eichhornia crassipes*	Convolvulaceae	Pani meteka
3	*Ipomea aquatica*	Convolvulaceae	Kolmi-sak
4	*Nymphaea pubescens*	Nymphaeaceae	Nal Mokuwa

Fauna of North Gauhati College

Table 6.1: Birds

Sl. No.	Scientific name	Family	Common/Vernacular name
1	*Phalacrocorax niger*	Phalacrocoracidae	Little cormorant
2	*Bubulens coromandus*	Ardeidae	Eastern cattle egret
3	*Egretta aeba*	Ardeidae	Large egret
4	*Andrea purpurea*	Ardeidae	Purple heron
5	*Egretta grazetta*	Ardeidae	Little egret
6	*Ardeola grayii*	Ardeidae	Indian pond heron
7	*Anastomus oscitans*	Ciconiidae	Openbill stork
8	*Leptoptilos javanicus*	Ciconiidae	Lesser adjutant
9	*Milvus migrans*	Accipitridae	Pariah kite
10	*Amaurornis phoenicurus*	Rallidae	White-breasted waterhen
11	*Streptopelia chinensis*	Columbidae	Spotted dove
12	*Haleyon smyrnensis*	Alcedinidae	White-breasted kingfisher
13	*Upupa epops*	Upupidae	Indian hoopoe
14	*Oriolus xanthornus*	Oriolidae	Black-headed oriole
15	*Copsychus saularis*	Muscicapidae	Magpie robin
16	*Orthotomus sutorius*	Cisticolidae	Common tailorbird
17	*Passer domesticus*	Passeridae	House sparrow
18	*Corvus splendens*	Corvidae	House crow
19	*Dendrocitta vagabunda*	Corvidae	Indian treepie
20	*Acridotheres tristis*	Sturnidae	Common myna

21	*Acridotheres fuscus*	Sturnidae	Jungle myna
22	*Motacilla alba*	Motacillidae	Common wagtail
23	*Dicrurus adsimilis*	Dicruridae	Common black drongs
24	*Turdoides striata*	Leiothrichidae	Jungle babbler
25	*Megalaima asiatica*	Megalaimidae	Blue-throated barbet
26	*Dendrocopos atratus*	Picidae	Stripe-breasted pied woodpecker

Table 6.2: Mammals

Sl No.	Scientific name	Family	Common/Vernacular name
1	*Macaca assamensis*	Cercopithecidae	Assamese macaque
2	*Tamiops macclellandi*	Sciuridae	Himalayan striped squirrel

Table 6.3: Amphibians

Sl No.	Scientific name	Family	Common/Vernacular name
1	*Bufo melanostictus*	Bufonidae	Common toad
2	*Hyla arborea*	Hylidae	Tree frog
3	*Rana tigrina*	Ranidae	Frog

Table 6.4: Reptiles

Sl No.	Scientific name	Family	Common/Vernacular name
1	*Calotes versicolor*	Agamidae	Indian garden lizard
2	*Mabuya carinata*	Scincidae	Indian mabuya
3	*Varanus bengalensis*	Varanidae	Monitor lizard
4	*Naja kaouthia*	Elapidae	Monocled cobra
5	*Natrix piscator*	Colubridae	Checkered keelback
6	*Bungarus fasciatus*	Elapidae	Banded krait

Table 6.5: Insects

Sl No.	Scientific name	Family	Common/Vernacular name

1	*Dacus cucurbitae*	Tephritidae	Melon fruit fly
2	*Pieris brassicae*	Pieridae	Cabbage fly
3	*Sitophilus oryzae*	Curculionidae	Rice weevil
4	*Tribolium castaneum*	Tenebrionidae	Red rust flour beetle
5	*Papilio demoleus*	Papilionidae	Lemon butterfly
6	*Mantis religiosa*	Mantidae	Praying mantis
7	*Odontotermes sp.*	Termitidae	White ants
8	*Anisoptera sp.*	Libellulidae	Dragon fly
9	*Gryllus sp.*	Gryllidae	Field cricket
10	*Gryllotalpa sp.*	Gryllotalpidae	Mole cricket
11	*Oryctes rhinoceros*	Scarabaeidae	Rhino beetle
12	*Epilachna sp.*	Coccinellidae	-
13	*Leptocorisa varicornis*	Alydidae	Gundhi beetle
14	*Belostoma sp.*	Belostomatidae	Giant water bug
15	*Nepa sp.*	Nepidae	Water scorpion
16	*Cicada sp.*	Cicadidae	Cicada
17	*Camponotus sp.*	Formicidae	Common house ant
18	*Monomorium sp.*	Formicidae	Large black ant
19	*Solenopsis sp.*	Formicidae	Small red ant
20	*Apis indica*	Apidae	Honey bee
21	*Carausius morosus*	Lonchodidae	Stick insect
22	*Melanoplus sp.*	Acrididae	Grasshopper

Table 6.6: Other arthropods

Sl No.	**Scientific name**	**Family**	**Common/Vernacular name**
1	*Carcinus sp.*	Portunidae	Common crab
2	*Scolopendra sp.*	Scolopendridae	Centepede
3	*Julus sp.*	Julidae	Millipede
4	*Palamnaeus sp.*	Scorpionidae	Scorpion
5	*Aranea sp.*	Araneidae	Common house spider

Table 6.7: Fish

Sl No.	Scientific name	Family	Common/Vernacular name
1	*Ophiocephalus pnetatus*	Channidae	Goroi
2	*Channa bleheri*	Channidae	Cheng
3	*Anabas testudineus*	Anabantidae	Kawai
4	*Heteropneustes fossilis*	Heteropneustidae	Singi
5	*Clarias magur*	Clariidae	Magur
6	*Channa striata*	Channidae	Shole
7	*Amblypharyngodon mola*	Cyprinidae	Mowa fish
8	*Mystus tengara*	Bagridae	Tinra fish
9	*Macrognathus aral*	Mastacembelidae	Tora
10	*Puntius sophore*	Cyprinidae	Puthi
11	*Rasbora daniconius*	Cyprinidae	Dorikona

Table 6.8: Reptiles

Sl No.	Scientific name	Family	Common/Vernacular name
1	*Lymnaea sp.*	Lymnaeidae	Fresh water snail
2	*Planorbis sp.*	Planorbidae	Common water snail
3	*Limax sp.*	Limacidae	Grey slug
4	*Pila globosa*	Ampullariidae	Apple snail
5	*Achatina sp.*	Achatinidae	Garden snail

8. Ambience and Aesthetics Audit

A questionnaire survey was conducted to determine the satisfaction of students and teachers on the ambience of the college campus on a scale of 1 to 10 which yielded the following responses as noted in Fig 8 below.

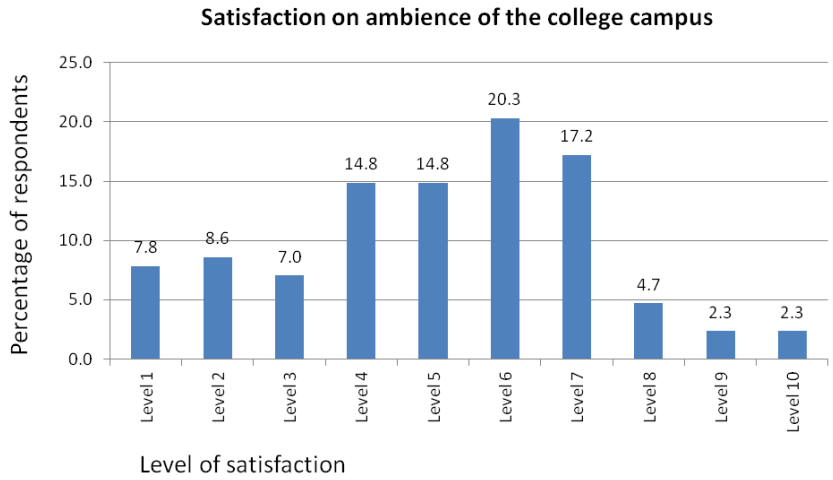


Fig 8: The level of satisfaction of respondents on the ambience of the college campus on a scale of 1 to 10.

From the responses obtained it was clear that 53% of the respondents expressed their satisfaction on the ambience of the college campus at level 5 or below. 37.5% of the respondents expressed their satisfaction at levels 6 or 7. Only 9.3% of the respondents expressed satisfaction at more than level 7. The response is suggestive of the mixed satisfaction of the stakeholders on the college ambience. Different cells of the college such as the Eco Club, the NSS and the NCC units have held cleanliness and plantation drives alongwith environmental awareness campaigns to boost the college environment and ambience. However, many suggestions were obtained from the respondents in the survey as measures to enhance the visual ambience of the college campus, which are as below:

i) To maintain a clean campus by placing additional dustbins at different locations within the college campus and encouraging their proper use alongwith clean maintenance of the open grounds within the college campus,

ii) To take measures for organized plantations, proper maintenance of gardens, organizing plantation drives, hanging plant-pots wherever possible, lining passageways with ornamental hedge shrubs and grooming of the campus grass,

iii) Proper implementation of waste management and waste segregation procedures,

iv) Allotment of organized vehicle parking space for teachers and students alongwith increasing the parking area,

v) Developing modern infrastructure,

vi) Construction of proper drainage channels for prevention of waterlogging during monsoon,

vii) Setting up of sitting facilities for students outside the classrooms at different locations within the campus for their leisure periods,

viii) Construction of a proper badminton/basketball court alongwith a modern playground, completion of indoor stadium,

ix) Concrete paving of the arts-science connecting lane alongwith the addition of pavements within the campus,

x) Modification/re-construction of the main entrance gate and painting of the science gate,

xi) Proper planning during layout and construction of buildings, proper construction/renovation of college office, auditorium interior, redesign of the office interior, addition of modern furnitures, demolishion of old dilapidated building (assam type),

xii) Completion of the college boundary wall,

xiii) Paint jobs wherever necessary,

xiv) Addition of a botanical garden.

As additional measures to improve the liveliness of the college environment the respondents suggested the following measures:

i) Increasing the availability of drinking water in the college campus,

ii) Providing proper sanitation facilities,

iii) Creating environmental awareness by celebrating occasions like world environment with mass plantation drives,

iv) Declaration of no tobacco zone inside the college campus,

v) Installation of solar panels,

vi) Cleaning of the college pond and earth filling in low lying areas.

SUMMARY AND RECOMMENDATIONS

The Green Audit 2021-22 of North Gauhati College has been a thorough exercise of investigations and scientific analysis of data of various environmental parameters influenced by the functioning and maintenance of the college. The Green Audit has revealed a number of aspects in which the college has been performing satisfactorily in terms of environmental benchmarks. There are however a few aspects which highlight the need of urgent action to meet up to the environmental safety and sustainability goals. The college is endowed with an extensive land area of which a large proportion remains under-utilized and bears great potential. The water resources of the college also need proper care and bear potentials. Overall, the air and water quality of the college is found satisfactory, except for the amount of particulate matter (PM_{10}) in the air during dry seasons. Some of the ongoing construction projects of both Government and private undertakings around the college render this unavoidable, except for the fact that the in-campus quality of air can be improved by extensive and ordered plantations throughout the campus. Regarding the plantations, an MoU is underway with a private undertaking for the setting up of a Miyawaki pattern forest/garden within the college premises which will be a boost to increasing the forest cover in addition to being a part of the study of botany. As the college is located close to industrial establishments, it is also felt as a critical need of the college to have a proper air quality monitoring system installed within campus for year-round monitoring of the quality of air. With this objective an MoU is underway with IIT Guwahati regarding the setting up of an ambient air quality monitoring station in the college premises which is expected to be effective in the upcoming session 2022-23.

The waste management procedures followed in the college are found to be below satisfactory. The college needs to step up measures of reusing and recycling of materials to reduce waste generation and also make use of scientific procedures of waste management. There needs to be an addition of the number of dustbins throughout the campus for that purpose. It is also advisable to seek the service of the North Guwahati Town Committee for provision of special waste pick-up services for the college as there is no such facility available to the college at present.

From the point of view of health and hygiene of the students, teachers and other members of the college, the audit report highlights the requirement of additional facilities for drinking water and sanitation throughout the college. Moreover an urgent need is felt for hygienic canteen facility in the college campus that is accessible to all.

In terms of the energy consumption and conservation, the college has already stepped up efforts to reduce energy expenditure by switching over to the use of energy efficient lighting equipments such as LED bulbs, LED tublights and LED campus lighting in a phased manner. Moreover the college is also augmented with a solar panel facility of 10 KWP capacity. Addition of more solar panels can reduce dependence on grid electricity to a further extent.

In regards of biodiversity, the college campus is blessed with a rich biodiversity. There can however be efforts to boost the biodiversity even further. The addition of a botanical garden can go a long way in achieving that. As mentioned earlier, the Miyawaki forest to be set up as part of the MoU with private undertaking is expected to play important role in this front.

The ambience of the college campus has received mixed reviews from various stakeholders. A large percentage of the stakeholders believe there are a number of aspects which need attention in order to enhance the ambience of the college. A number of recommendations have already been enlisted in the previous section. The most important considerations to be made are well-planned constructions and modern infrastructural development, ordered plantations, proper waste management and regular up keeping of the college campus.

GREEN AUDIT REPORT

2022-23

NORTH GAUHATI COLLEGE

Guwahati- 781031

DEPARTMENT OF BOTANY
GAUHATI UNIVERSITY
Gauhati University
Assam781014,India
botany@gauhati.ac.in

29 June, 2023

Certificate

This is to certify that North Gauhati College, Kamrup, Assam has conducted a detailed "Green Audit" for its campus during the academic year 2022-2023. The green audit was conducted in accordance with the applicable standards prescribed norms of the Ministry of Environment, Forest and Climate Change, Govt. of India. The audit involves water, waste water, energy, air, biodiversity, solid waste, etc., and gives an 'Environmental Management Plan', which the college can follow to minimize the impact on the institutional working framework. In an opinion and to the best of my knowledge and according to the information given to me, said green audit gives a true and fair view in conformity with environmental auditing principles' accepted in India.

29/06/2023

(Bhaben Tanti)

Dr. Bhaben Tanti, M.Sc. (GU); Ph.D.(TU); Postdoc (USA); FLS(London)
Professor & Head, Department of Botany
Director, Research and Development Cell
Director, Internal Quality Assurance Cell
GAUHATIUNIVERSITY
Guwahati, Assam 781014, India
Tel: +91-94012-03977(M)
Email: btanti@gauhati.ac.in

Foreword from the Principal

Green Audit 2022-23 of the North Gauhati College has been conducted in compliance with the NAAC recommendations as per Criterion VII of assessment of academic institutions. The main objective of conducting the Green Audit is to scientifically record different environmental parameters of the institution and analyse the sustainability of the various activities going on within the institution. The aim is to be able to identify the flaws in complying with environmental standards and develop strategies to reduce the negative impacts on the environment. The Green Audit 2022-23 is the third Green Audit conducted in the college, and there have been sincere efforts to reduce the weaknesses identified in the previous Green Audits in the last two years. The North Gauhati College is committed to environmental sustainability goals of the Governments at the state and centre as well as global bodies, aimed at negating the impacts of climate change and environmental degradation which followed the rapid industrialization and urbanization of the 19th century.

I am hereby pleased to present the Green Audit 2022-23 report of the North Gauhati College which is the result of thorough scientific investigation and comprehensive analysis of data by the audit team. I appreciate the sincere efforts of coordinator of the IQAC, Dr. Achyutananda Baruah, convenor of the Green Audit, Dr. Jyotirmay Kalita and all members of the Green Audit committee, whose rigorous exercise has resulted in successful completion of the audit and preparation of this report. I sincerely hope that this audit will have positive impact on the college environment and guide future academic and development projects.

Dr. Dilip Das

Principal,

North Gauhati College

Principal

North Gauhati College

Foreword from the IQAC Co-ordinator

North Gauhati College's Green Audit 2022–2023 was carried out in accordance with NAAC recommendations in accordance with Criterion VII of the evaluation of academic institutions. The primary goal of the Green Audit is to objectively document the institution's many environmental metrics and evaluate the sustainability of the various operations carried out there. The goal is to be able to spot the gaps in environmental standards compliance and create plans to lessen the adverse effects on the environment. This year's Green Audit 2022–2023 is the college's third Green Audit, and during the past two years, real efforts have been made to lessen the shortcomings found in the prior Green Audits. In order to mitigate the effects of climate change and environmental degradation that followed the rapid industrialization and urbanisation of the 19th century, the North Gauhati College is dedicated to the environmental sustainability goals of the state, federal, and international governments.

I am grateful to Dr. Dilip Das, the principal of North Gauhati College, who coordinated the Green Audit, Dr. Jyotirmay Kalita, the convenor of the Green Audit, and all other members of the committee for their heartfelt efforts, which culminated in the audit's successful conclusion and the creation of this report. It is my genuine hope that this audit will improve the campus atmosphere and serve as a roadmap for upcoming research and development initiatives.

Dr. Achyutananda Baruah

IQAC Co-ordinator,

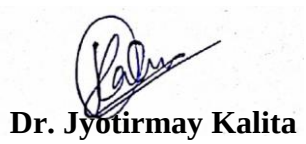
North Gauhati College

Acknowledgement

The Green Audit 2022-23 is a follow up to the previous two Green Audits conducted in the North Gauhati College in order to identify areas of environmental impact, estimate consumption of resources, and develop strategies to reduce the deleterious effects on the environment and promote sustainability in operations. This Audit has been conducted in compliance with the recommendations of the National Assessment and Accreditation Council as per the assessment criterion VII for accreditation of higher educational institutions.

This audit has been possible due to the tireless efforts of every member of the Green Audit Committee in addition to other teaching and non-teaching members of the college. I would firstly like to thank our Principal, Dr. Dilip Das, for providing every possible support to the effort. I am grateful to Dr. Bhaben Tanti, Professor and Head, Department of Botany, Gauhati University, for reviewing the audit process. I thank Dr. Achyutananda Baruah, Co-ordinator of IQAC, North Gauhati College, for his relentless help in conducting the audit. I am thankful to Dr. Bhavna P. Baroowa, Assistant Professor, Department of Zoology, North Gauhati College, for her help in recording the fauna of the college campus. I thank Dr. Ruby Doley, Assistant Professor and Head, Department of Botany, North Gauhati College, for offering her expertise in recording the flora of the college campus. I express my heartfelt thanks to Dr. Sujata Deori, Assistant Professor, Department of Geography, North Gauhati College, for her help in preparation of the college map and the land use survey. I thank Mr. Pradip Kumar Kalita and Dr. Himadri Borah for their assistance in conducting the air and water quality reviews. I am extremely grateful to Mr. Sukamani Deka for his assistance in conducting review of documents during the energy audit of the college. Finally, I would also offer my sincere thanks to all faculty members, non-teaching staff, and students for their active participation in the questionnaire survey and other helpful acts which made this audit possible.

I am hopeful that the Green Audit 2022-23 of the North Gauhati College will be a useful document in assessing the environmental impact of the operations of the Institution. Moreover the Audit report is expected to be a guiding document in planning future development and academic activities of the College.



Dr. Jyotirmay Kalita
Convenor,
Green Audit 2022-23
North Gauhati College

GREEN AUDIT TEAM

Convenor:	Dr. Jyotirmay Kalita, Assistant Professor, Department of Botany
Members:	Mr. Pradip Kumar Kalita, Associate Professor, Department of Chemistry
	Dr. Sujata Deori, Assistant Professor, Department of Geography
	Dr. Ruby Doley, Assistant Professor, Department of Botany
	Dr. Purabi Hazarika, Assistant Professor, Department of Geography
	Dr. Himadri Borah, Assistant Professor, Department of Chemistry
	Dr. Swati Nawami Aideo, Assistant Professor, Department of Physics
	Mr. Sukamani Deka, Office Assistant

CONTENTS

INTRODUCTION

Established on the 4th of September, 1962, North Gauhati College was the only institution of Higher Education in the greater North Kamrup region of the old Kamrup District at that time. At present, the college campus encompasses an area of 34999 square metres. The college has a total of 14 Departments comprising the Arts and Science streams, which impart education to Undergraduate and Higher Secondary students, in addition to a B.Voc. Department which provides vocational education to undergraduate students. The college was accredited in 2016 with the grade B by the National Assessment and Accreditation Council (NAAC).

The college is located nearby to an area of rich biological diversity, in being close to the forests under the Sila Forest Range. However as the demands of urbanization and industrialization has an impact on the surrounding environments and the college falls in the vicinity of the industrial regions of Amingaon and North Guwahati, there is a possibility of resultant impact on the college environment through emissions and construction related pollution. In addition, the activities within the college demand the use of resources and energy, which results in resource exhaustion and generation of wastes. These are the factors which demand an audit of the environmental impact and sustainability of the operations going on in the institution and a general assessment of the environmental quality of the institution. The aim of the Green Audit 2022-23 of the North Gauhati College is to help in devising strategies for negating the environmental ramifications of the operations of the institution as well as for improvement of the college environment.

Green Audit of North Gauhati College

North Gauhati College, with its strength of 14 departments from the science and arts faculties, and a B.Voc. department for vocational education has been mobilizing a lot of human and other resources through the years. In the process, there has been a demand on the environment through the use of land, energy, materials and various products, and the generation of wastes. In addition, there have been efforts for the maintenance of a basic standard of cleanliness and health infrastructure for a proper hygienic environment in the campus. Moreover, the college has strived to uphold and enrich the richness of the biological diversity in the campus through various programmes. As such, it is deemed important to hold an audit for the assessment of the

environmental assets, and the impacts of various operations of the institution on the environment. The same has been given due weightage by the National Assessment and Accreditation Council (NAAC) under its assessment criterion VII.

A Green Audit is a methodical procedure that involves identifying, documenting, and evaluating the college's various environmental impact activities as well as the activities that take place within and outside the campus. It is an essential instrument for assessing the institution's environmental sustainability of operations and the abundance of ambience it possesses, as well as for raising awareness among various stakeholders for environmental preservation. The audit offers the chance to establish a standard for the college's healthy environment. Additionally, it gives authorities and interested parties the authority to establish goals and put plans into action for enhancing the campus environment. "Environmental Consciousness" is listed under criterion VII of the National Assessment and Accreditation Council's (NAAC) assessment criteria for educational institution accreditation.

The following objectives were defined by the North Gauhati College Green Audit:

- Gathering baseline data on a range of significant environmental factors.
- Determining the college's operational strengths and weaknesses in the areas of the administrative department, academic units, laboratories, the hostel, and campus management activities.
- Determining the advantages and disadvantages of putting into practice environmentally friendly management and improving the campus's aesthetic atmosphere.
- Raising awareness among many stakeholders regarding the sustainable use and management of environmental resources.

TARGET AREAS OF GREEN AUDIT

1. Land Use and Land Cover:

The purpose of the land use and land cover (LULC) survey was to accurately determine the overall area covered by the college's grounds as well as the variety of uses for which the space is put to use. The goal of this study was to map the college's geographic strengths, pinpoint locations that show potential for enhancing the campus environment, and open up possibilities for the college to create environmentally friendly infrastructure in the future.

2. Water Use Audit

The purpose of this audit component was to record the sources of water that the college has access to, the amount of water that is extracted and utilized each day, any avoidable water waste, and the many categories in which the water is used. It was also decided to record any actions made for rainwater collection or waste water reuse. In order to identify and mitigate any potential hazards from poor water quality, this study also intends to conduct a qualitative examination of the water acquired from the various sources.

3. Waste Management Audit

One important factor in determining a place's hygiene is how well garbage is managed. The goal of the green audit was to record the wastes produced by college activities and classify them as hazardous, non-hazardous, and biodegradable. Its goal was to determine whether the college's many departments and administrative entities adhered to trash segregation regulations. The audit attempts to record the level of awareness among all stakeholders about hazardous waste management and any practices that are specifically followed by the science laboratories for the correct disposal of hazardous wastes. The management of hazardous wastes is particularly important. Additionally, it was intended to record any actions made for the college's non-biodegradable waste recycling programme. The audit also sought to record the general waste disposal procedures that the college followed.

4. Health and Hygiene Audit

This portion of the audit was focused on recording the facilities that provide clean drinking water and the various stakeholders' access to appropriate sanitary facilities.

5. Energy Audit

The purpose of this audit section was to record how many energy sources were used to power college operations. Electricity was the main energy type that needed to be recorded, along with LPG and other fossil fuels that release emissions directly into the atmosphere. The audit's goal was to find out what steps were done to cut down on energy use on campus or convert to "clean" and renewable energy sources. Additionally, a survey on usage and energy conservation initiatives was to be conducted among the various stakeholders.

6. Air Quality Audit

As a result of efforts since the first green audit of the college, there has been an agreement with the IIT Guwahati for installation of an ambient air quality monitoring station within the college campus. Since the college is in close proximity to industrial establishments, a record of the air quality within the campus is an important determinant of the environmental quality within the college campus and its probable health impacts.

7. Biodiversity Audit

Additionally, a survey was to be conducted to record the richness of the college campus's flora and wildlife. Rich floral and faunal diversity contributes to the college's atmosphere and supports the upkeep of a homeostatic ecology. In addition to lowering carbon emissions, many large trees also serve as thermoregulators in the sweltering summer months. This audit section's goal was to supply the baseline data needed to pinpoint places where college biodiversity can be increased in conjunction with environmental enrichment.

8. Ambience and Aesthetics Audit

A survey was intended to be done among various stakeholders as part of the green audit in order to get their opinions on the college's atmosphere as well as suggestions for how to make it better.

THE AUDIT

Faculty from the departments of zoology, botany, geography, chemistry, and physics, as well as non-teaching staff from the college, conducted the green audit. The audit was conducted using the following methodologies:

1. Site visits were made for the land use and land cover survey, the biodiversity audit, portions of the water audit, the energy audit, and the health and hygiene audit.

2. Data on water sources and daily water requirements, waste management, and the usage of energy sources other than electricity were collected through interviews.

3. Different stakeholders were given questionnaires to complete in order to gather information about water use, waste segregation, waste management awareness, a portion of the energy audit, a portion of the health and hygiene audit, and opinions about the atmosphere of the college grounds.

4. Documents were examined to gather information on the amount of electricity used throughout the campus.

5. To acquire geographical data as well as data on the quality of the air and water, technology, software, and standard operating procedures were used.

AUDIT FINDINGS

1. Land Use and Land Cover:

The total land area within the college campus (Fig. 1) is 34999 square metres, of which 6616 square metres are occupied by various buildings. A playground spanning 6154 square metres is located on the college's Northwestern side, while a pond spanning 2809 square metres is situated on the southern side of the campus, East of the library building. One of the various structures is an indoor stadium located East of the playground on the campus's northern border. In the open space on the Southern side of the social sciences building, there is a 140 square metre garden; the remaining area is used for parking. There is a 270 square metre bicycle stand along the roadside boundary wall on the parking area's Western side.

A weather station belonging to the meteorological department occupies an approximately 40 square metre open space on the southeast side of the Physics and Life Sciences building. On the remainder of the free space, talks are being held with private sector parties to set up a Miyawaki-style forest cum medicinal and fruit-tree plantation covering about 1100 square metres where earth fill up has already been done by the college.

The walkways on the college campus span approximately 413 metres and are entirely made of concrete. Of these, 50 metres has been newly constructed, while 148 metres has been paved with concrete. The construction of new walkways and paving of previously existing loose brick and bare soil ones was suggested in questionnaire responses of the stakeholders in aesthetic and ambience audit as part of previous green audits of the college.

The following table (Table 1) highlights different categories of land use in the college campus.

Table 1: Categories of Land Use.

Sl. No.	Categories	Area (Sq. M.)	Length (M.)
1	College Campus Total Area	34999	
2	Administrative Building with adjacent general classrooms	861	
3	Social Sciences Building	655	
4	Auditorium	693	
5	Economics/Assamese Dept, Examination & Conference Building	694	
6	Education Dept. Building	456	
7	New Chemistry/Mathematics Dept. Building with general classrooms	506	
8	Cycle stand	270	
9	Old Chemistry/Mathematics Dept. Building	342	
10	Boys' Common Room	123	
11	BOI Garden	140	
12	Playground	6154	
13	Pond	2809	
14	Water supply scheme	308	
15	Indoor Stadium	767	
16	Library and English Dept. Building	271	
17	Girls' Common Room	106	
18	Girls' Hostel	471	
19	Physics and Life Sciences Dept. Building	615	
20	Urinal 2 (between Education Dept. and New Chemistry Dept building)	31	
21	B-Voc Dept. Building	25	
22	Path 1 (main gate to Economics/Assamese/Examination Building)		108
23	Path 2 (Admin Building to boys common room)		58
24	Path 3 (Path 1 to Education dept)		54
25	Path 4 (Science gate to Girls' hostel)		99
26	Path 5 (Path 3 to Path 4)		71
27	Path 6 (Path 2 to Auditorium)		06
28	Path 7 (New Chemistry Department building to Path 4)		11
29	Path 8 (Path 2 to Girls' Common Room)		06

Fig 1: North Gauhati College campus map (Source: Google Earth; Prepared using: ArcGIS, v. 10.6.1).

2. Water Use Audit

The subsurface aquifers serve as the college's primary source of water for a variety of purposes. Four submersible pumps, one behind the college library, one behind the B.Voc. building, one behind the department of Botany and one in the ladies' hostel, draw water from the aquifers through borewell installations. Water is used for many different purposes at the college, including drinking, cleaning and washing, science labs, gardening, occasional construction, restrooms and lavatories, the kitchens in different departments, the girls' hostel, and the daily needs of the hostel boarders.

Every day, around 18500 Litres of water are drawn from the borewells. During an ordinary working day, the college's various departments, laboratories, and offices require a total of 10,000 litres of water. The girls' hostel uses roughly 8,500 litres of water a day in total. Eleven overhead tanks, each with a different capacity and positioned at various points over the college campus, carry a total of 14,650 litres of water that is acquired from the borewells. Pipelines transport the water from these tanks to the many locations where it is used. There is a sizable pond on the college campus, but it is completely overgrown with invasive plant species, such as *Eichhornia crassipes*. As a result, the water cannot be used for tasks like construction, gardening, or other activities that would have required the use of pond water, which lowers the demand for ground water. The college does not have any facilities in place for collecting rainwater or reusing waste water. The majority of the rainwater runs off into the college pond and the campus's low-lying sections. Additionally, the waste water is allowed to trickle down to lower areas.

A quality assessment was carried out at the District Level Laboratory (PHED), Kamrup District, under the Government of Assam, located in Bamunimaidam, Guwahati-21. The ground water that is held in overhead tanks and distributed to various units of the college was assessed. Table 2 below is a tabulation of the water quality report. The physical and chemical properties of the tested water were satisfactory and conforming within government prescribed permissible limits. The presence of Calcium, Magnesium, Fluoride, Iron and Sulphate was determined in the water, but within government prescribed limits.

Table 2: Water quality report obtained from District Level Laboratory (PHED), Kamrup district.

Sl. No.	Parameter	Protocol Used	Results	Desirable Limit	Maximum permissible Limit	Unit
1	Taste	IS: 3025 (part 8)	Aggregable	Aggregable	Aggregable	-
2	Odour	IS: 3025 (part 5)	Aggregable	Aggregable	Aggregable	-
3	Turbidity	IS: 3025 (part 10)	0	1	5	NTU
4	pH	IS: 3025 (part 11)	7.08	6.5-8.5	No relaxation	-
5	TDS	IS: 3025 (part 16)	265.5	500	2000	mg/L
6	Chloride	IS: 3025 (part 32)	14	250	1000	mg/L
7	Total Alkalinity	IS: 3025 (part 23)	186	200	600	mg/L
8	Total Hardness	IS: 3025 (part 21)	151.2	200	600	mg/L
9	Calcium (as Ca)	IS: 3025 (part 40)	48	75	200	mg/L
10	Magnesium	APHA (23rd ED) 3500 Mg B	7.6	30	100	mg/L
11	Total Iron	APHA 3500 (23rd ED) Fe B	0.17	0.3	No relaxation	mg/L
12	Arsenic	APHA 3500 (23rd ED) As B	-	0.01	0.05	mg/L
13	Fluoride	APHA (23rd ED) 4500 F F	0.25	1	1.5	mg/L
14	Nitrate	APHA (23rd ED) 4500 NO3 D	0	45	No relaxation	mg/L
15	Sulphate	IS: 3025 (part 24)	10	200	400	mg/L

In the questionnaire, when asked if the management of water resources of the college was satisfactory or not, the responses obtained from teachers as well as the students were different (Fig. 2). While majority of the teachers (65.5%) felt that there was more to be done in the field of water resource management in the college, most of the student respondents (75.9%) felt there was proper management of the same.

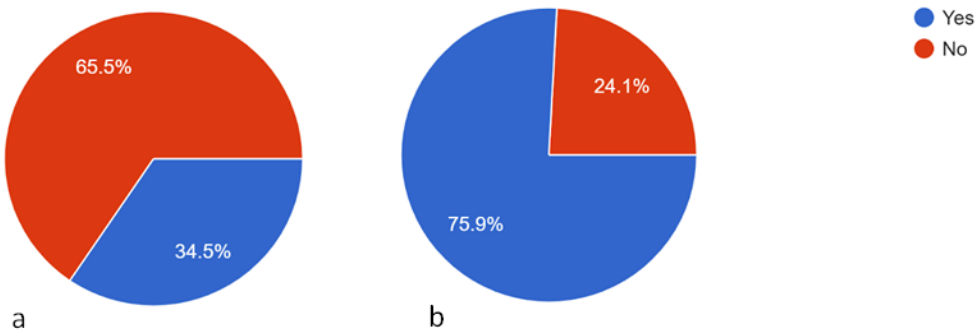


Fig 2: Responses (**a** – teachers, **b** – students) to – "*According to you, are the water resources managed properly in the college?*"

In the context of the availability of water for various uses already mentioned ahead, most of the respondents from the teachers and students were found to be satisfied (Fig. 3).

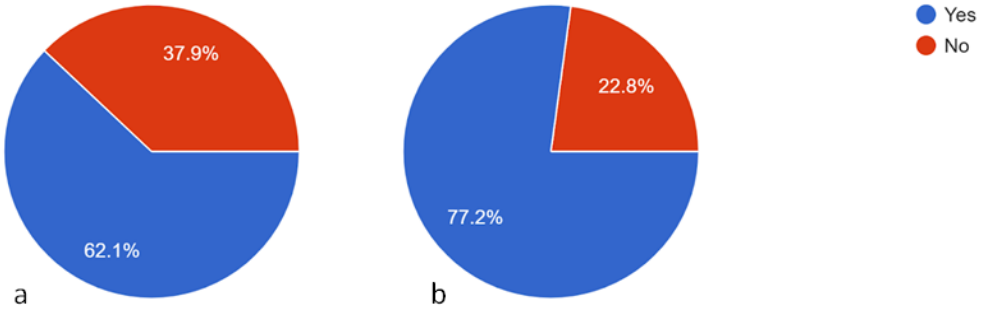


Fig 3: Responses (**a** – teachers, **b** – students) to – "*Do you find the availability of water in the college satisfactory?*"

The following aspects were recommended by a questionnaire survey administered to instructors and students in an effort to find potential ways to increase water consumption efficiency—or, more accurately, to prevent waste:

i) Water is wasted due to leaks in pipelines, particularly in sinks and toilets, as well as the existence of broken taps. These issues can be resolved with a comprehensive service.

ii) During the rainy season, the college land being low-lying, there is a plenty of rainwater inundating the open areas within the campus, which slowly drains out and ultimately gets wasted. Some of that water can be stored using scientific methods of rainwater harvesting, which will subsequently reduce the use of groundwater.

iii) Water waste also results from overflow from the overhead water storage tanks during filling. Water level sensors can be installed in the tanks to help identify this and help turn off the water jet pumps in a timely manner.

iv) Some of the waste water can also be reused in gardening activities through proper planning.

v) The use of groundwater can be reduced to a great extent by cleaning the campus pond and using that water for activities like building and gardening, etc.

3. Waste management audit

Waste is produced as a result of the operations of the college's many sections. Since the majority of wastes are disposed of right away by the appropriate departments and offices, there is no record of the quantity of wastes produced on a regular basis. In the college, trash segregation techniques are not followed, and all waste kinds are disposed of together in the dump. It was discovered that none of the departments had specific protocols in place for managing hazardous trash, and that all waste ended up in the landfills. The college burns off a portion of its solid trash. Additional garbage is disposed of in low-lying locations. Laboratory waste water is permitted to seep into low-lying areas. In the questionnaire survey (Fig. 4), 82.8% of the teachers admitted to having generated biodegradable wastes, 55.2% having generated non-biodegradable wastes, and 13.8% having generated hazardous wastes as a result of their activities in the college. Among the students, 75.9% admitted to having generated biodegradable wastes, 22.8% having generated non-biodegradable wastes, and 11.6% having generated hazardous wastes by their activities in the college.

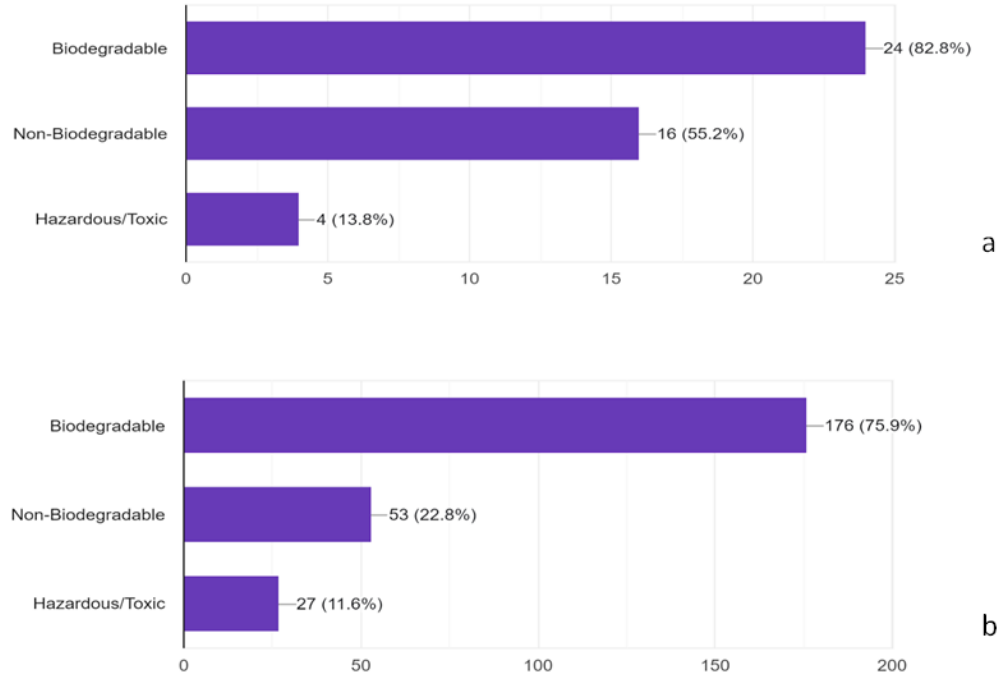


Fig 4: Responses (**a** – teachers, **b** – students) to – "*What are the categories of waste generated in the college as a result of your activities that you are aware of?*"

On being enquired about the level of awareness regarding proper disposal of hazardous wastes on a scale of 1 to 5, with 1 meaning 'zero awareness' and 5 meaning 'fully aware', the responses recorded from the teachers and students (Fig. 5) were as follows:

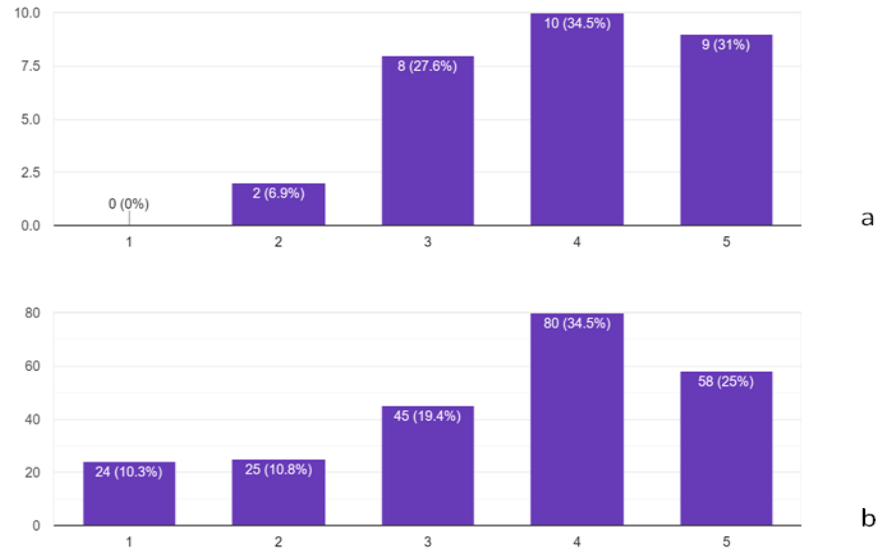


Fig 5: Responses (**a** – teachers, **b** – students) to – "*How would you rate yourself in terms of your awareness regarding disposing of hazardous wastes?*"

The following feedback was gathered from different stakeholders in an effort to determine steps that may be taken to lessen waste generation in the college:

i) Limitation on the use of single use plastic in the college campus,

ii) Use of paper bags or reusable bags for carrying loose items instead of polythene bags,

iii) Recycling and repurposing as many items as possible and create awareness regarding the same,

iv) Use of duplex printing wherever possible to reduce paper consumption and waste,

v) Procurement of products with better durability ratings.

4. Health and Hygiene audit

Sanitary facilities, clean meals, and pure drinking water are crucial markers of an institution's hygiene and health-consciousness. For the purpose of providing clean drinking water, the college has installed a total of five water electronic filter/cooler units. However, there isn't a working canteen providing hygienic meals at the campus.

The college offers a total sixteen toilet facilities for both teaching and non-teaching personnel. For the students, there are four toilet facilities for male students, three for female students, and one common toilet facilities which both male and female students can use.

In regards of the quality of drinking water provided in the campus (Fig. 6), close to 50% of the teacher responents expressed dissatisfaction. However majority of the student respondents (81.9%) said they were satisfied with the drinking water provided in the campus.

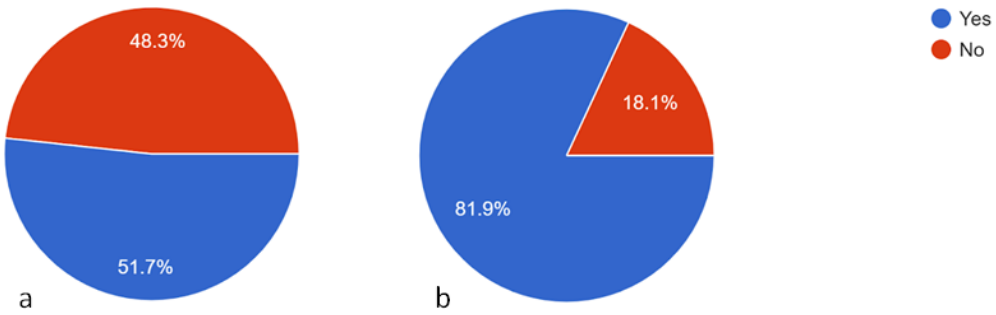


Fig 6: Responses (**a** – teachers, **b** – students) to – "*Are you satisfied with the quality of drinking water available in the college?*"

5. Energy Audit

Electrical energy, which is delivered by the government-run Assam Power Distribution Company Limited from its Amingaon (021) sub division, makes up the majority of the energy used in the college's varied activities. With consumer numbers 021000006032, 021000006034, and 021010041547 (Connections 1, 2, and 3 in Table 3 accordingly), the college has a total of three connections. In 2021, a total of 31424 units of energy were utilised, resulting in an overall power bill of Rs. 2,64,853 (Table 3). As shown in the table, some electricity bills, however, were generated using the provider's anticipated number of units utilized, which does not accurately represent the state of energy usage.

Recently, 10 KWP worth of solar panels were placed on the campus of the college ladies' hostel in an effort to lower the amount of electricity consumed from the grid, and boost sustainability.

Table 3: Monthly electricity consumption in North Gauhati College during the year 2021.

Month	**Connection 1**		**Connection 2**		**Connection 3**	
	Units	**Bill Amount (Rs)**	**Units**	**Bill Amount (Rs)**	**Units**	**Bill Amount (Rs)**
July 2022	1908	13347/-	1078	9674/-	23	330/-
August 2022	2347	16955/-	1094	10184/-	22	90/-
September 2022	2694	19455/-	1209	11107/-	24	98/-
October 2022	1495	10916/-	1140*	10560/-	9	235/-
November 2022	1526	11124/-	350	3987/-	17	286/-
December 2022	1547	11284/-	582	5944/-	7	221/-
January 2023	1220	9384/-	473	5225/-	11	255/-
February 2023	1355	10164/-	569	11144/-	7	206/-
March 2023	1570	11760/-	769	7646/-	10	249/-
April 2023	1390	10370/-	828	8030/-	10	298/-
May 2023	1911	15468/-	1052	10663/-	-*	406/-
June 2023	2393	19260/-	784	8213/-	-*	315/-
Total	21356	159487/-	9928	102377/-	140	2989/-

**Estimated Units consumed as recorded by service provider.*

Total Units consumed (approx.)	31424
Total Bill Amount Paid (Rs)	264853/-

Gradually, the college is replacing its outdated fluorescent tubes and halogen or CFL lights with more energy-efficient LED tubes and bulbs. The college currently has 248 fans, 124 LED bulbs, 76 LED tubes, 56 fluorescent tube lights, and 10 CFL bulbs. Furthermore, the entire college campus is lit up at night by a total of 28 LED lamp posts that are in operation. 42 desktop PCs, 20 printers, 4 projectors, 4 refrigerators, 5 air conditioners, 3 Xerox machines, 5 water pumps, and different laboratory equipment are among the other energy-utilizing appliances in the college. Because there are no independent power sub-meters for each department, it is not possible to determine the overall energy consumption of each department.

In addition to electric energy the college also consumes certain amount of LPG and diesel fuels. A total of about 230 kgs of LPG are consumed annually in the college girls' hostel, alongwith about 30 kgs of LPG annually in the chemistry laboratory. Moreover, a monthly average of 25 Litres of diesel is consumed for the operation of DC generator at times of electric outage.

On being enquired about the level of self-consciousness regarding the use of energy efficient methods in day-to-day activities within the campus on a scale of 1 to 5, with 1 meaning 'not conscious' and 5 meaning 'highly conscious', the responses recorded from the teachers and students were as recorded in Fig. 7). The figure indicates a necessity for creation of a general awareness among a small group of students and teachers who rate themselves lower in the graph representing consciousness for energy-efficient means of operation.

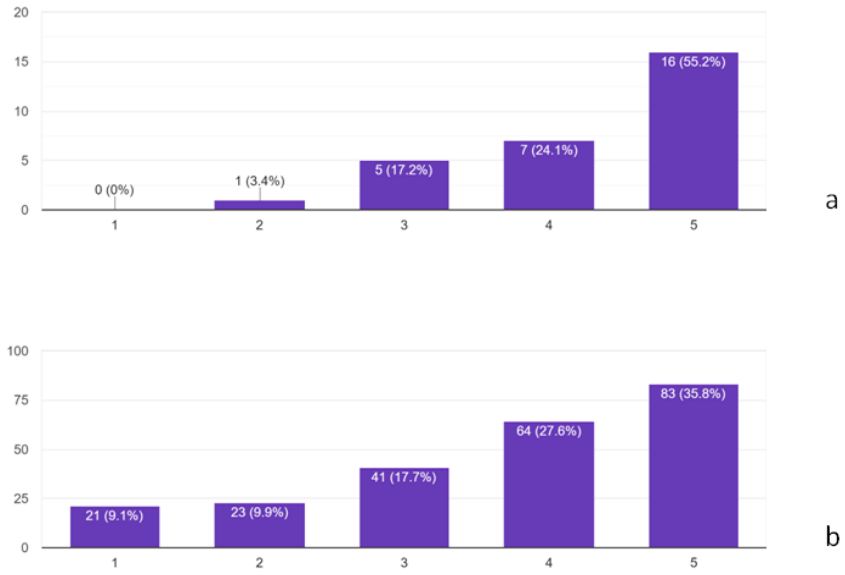


Fig 7: Responses (**a** – teachers, **b** – students) to – "*How would you rate yourself on a scale of 1 to 5 regarding your consciousness on energy saving in your day-to-day college activities?*"

In an effort to cut down on energy use on college campus, teachers and students provided the following ideas in response:

i) Turning off electrical appliances when not in use;

ii) Developing strategies to use renewable energy sources, such as installing solar panels across the campus to generate solar energy;

iii) Strategies to replace more energy-intensive appliances with energy-efficient alternatives; these strategies could include replacing old fans (where feasible) with less energy-consuming fans with BLDC motors, which can save up to 65% on electricity; utilising energy-efficient electrical appliances rated five stars; etc.,

iv) Switching to laptops from desktop computers whenever feasible;

v) Rewiring old electrical systems when needed;

vi) Regularly inspecting for energy waste;

vii) Installing solar lights in place of the present campus lights;

viii) Raising awareness among various stakeholders about the need for and strategies for energy conservation.

6. Air Quality Audit

The air particulate matter of the college campus recorded during the months of October-December, 2023 is presented in Table 4.

Table 4: Air particulate matter (24 hrs) data for the year 2021

	PM_{10} (µg/m^3)		**$PM_{2.5}$ (µg/m^3)**	
Month	**Average**	**Highest**	**Average**	**Highest**
October	52.48	96.00	30.97	58.24
November	91.68	151.30	55.81	95.88
December	148.12	221.20	93.95	142.22
Overall	97.42	221.20	60.24	142.22

PM_{10} is made up of all airborne solid and liquid particles that range in size from 2.5 to 10 µm. Both organic and inorganic particles, such as dust, pollen, soot, smoke, and liquid droplets, are included in this complicated mixture. Similarly, $PM_{2.5}$ is made up of particles that are no larger than 2.5 microns. Particulate matter can lead to serious respiratory and cardiovascular disorders, as well as irritation of the eyes, nose, throat, and lungs. PM_{10} pollution is frequently released into the atmosphere by road dust and microscopic particles released into the air during stone crushing and other crushing processes. On the other hand, the main source of $PM_{2.5}$ is combustion, which includes cars, fireplaces, and power plants that burn coal or natural gas.

The average 24-hour PM_{10} and $PM_{2.5}$ concentrations during the period of recording were the highest in the month of December, and lowest in October, and of intermediate values in November. The highest 24-hour PM_{10} and $PM_{2.5}$ levels recorded were 508.8 µg/m^3 and 403.2 µg/m^3, both in the month of December. The CPBC Ambient Air Quality Standard for PM_{10} is 100 µg/m^3 for a 24 hour period, while that for $PM_{2.5}$ is 60 µg/m^3 for a 24 hour period. While the levels of these particulate matters exceeded the National Standard on occasions in all the recorded months, the monthly average for October and November were below the National Standard level, the lowest averages being in October. The December monthly average 24-hour PM_{10} and $PM_{2.5}$ levels however exceeded the National Standard for the respective 24-hour levels. With December being the driest of the three months, it is normal for PM levels to increase, however, the levels were far higher than National Standard, and need active action for control.

The main source of PM_{10} in the college is supposed to be the plying of public and heavy industrial carriage vehicles as well as ongoing constructions in the highly industrialized and rapidly urbanizing neighbourhood. $PM_{2.5}$ which is considered more hazardous seems to make its way to the college environment from the nearby industrial areas. It is however felt necessary at this point to keep record of ambient air quality throughout the year within the college campus to get a thorough year-round picture of the air quality inside the college premises.

7. Biodiversity Audit

The variety of plant and animal species present at the campus is rich. The following table lists the plants and animals that can be found on a college campus:

Flora of North Gauhati College

Table 5.1: Herbaceous Plants/ Grasses

Sl. No.	Scientific name	Family	Common/Vernacular name
1	*Achyranthes aspera*	Amaranthaceae	Apang
2	*Ageratum conyzoides*	Asteraceae	Gondhoa bon
3	*Agrostis capillaris*	Poaceae	-
4	*Alopecurus myosuroides*	Poaceae	-
5	*Alternanthera triandra*	Amaranthaceae	Gurundi
6	*Amaranthus viridis*	Amaranthaceae	khutura
7	*Amaranthus spinosus*	Amaranthaceae	Kata khutura
8	*Bambusa ventricosa*	Poaceae	Buddha's belly bamboo
9	*Bambusa vulgaris*	Poaceae	
10	*Blumea sp.*	Asteraceae	-
11	*Boerhavia diffusa*	Nyctaginaceae	Punounouwa
12	*Carex rostrata*	Cyperaceae	-
13	*Catharanthus roseus*	Apocynaceae	Nayantara
14	*Centella asiatica*	Apiaceae	Bor-manimuni
15	*Cheilocostus speciosus*	Costaceae	Jom lakhuti
16	*Chenopodium ficifolium*	Amaranthaceae	-
17	*Chrysopogon gryllus*	Poaceae	-
18	*Cleome rutidosperma*	Cleomaceae	-
19	*Cleome viscosa*	Cleomaceae	Hurhuriya
20	*Colocasia esculenta*	Araceae	Kachu
21	*Commelina benghalensis*	Commelinaceae	Kona himolu
22	*Cyanthillium cinereum*	Asteraceae	Sahadevi
23	*Cyperus rotundus*	Cyperaceae	Keya bon

24	*Cyperus strigosus*	Cyperaceae	-
25	*Dactyloctenium aegyptium*	Poaceae	Kakkakalan pullu
26	*Dicliptera roxburghiana*		-
27	*Diplazium esculentum*	Athyriaceae	Dhekia sak
28	*Diplazium polypodiodes*	Athyriaceae	-
29	*Echinochloa colona*	Poaceae	Binoi-bon
30	*Eclipta prostrata*	Asteraceae	Kehraj bon
31	*Eleusine indica*	Poaceae	Bobosa bon
32	*Euphorbia hirta*	Euphorbiaceae	Gakhiroti bon
33	*Gnaphalium uliginosum*	Asteraceae	-
34	*Heliotropium indicum*	Boraginaceae	Hati-huria
35	*Hydrocotyle sibthorpiodes*	Apiaceae	Saru manimuni
36	*Kyllinga brevifolia*		-
37	*Lantana camara*	Verbenaceae	Gu phul
38	*Lepidogathis incurva*		-
39	*Leucas plukentii*	Lamiaceae	Durun bon
40	*Leonurus sibiricus*	Lamiaceae	-
41	*Ludwigia sp.*	Onagraceae	-
42	*Mazus pumilus*	Mazaceae	-
43	*Malvastrum coromandelianum*	Malvaceae	Lafa
44	*Mimosa pudica*	Fabaceae	Lajuki lata
45	*Mirabilis jalapa*	Nyctaginaceae	Gadhuli gopal
46	*Ocimum sanctum*	Lamiaceae	Tulsi
47	*Oldenlandia sp.*	Rubiaceae	-
48	*Oplismenus sp.*	Poaceae	-
49	*Oxalis corniculata*	Oxalidaceae	Tengeshi
50	*Oxalis debelis*	Oxalidaceae	Tengeshi
51	*Parthenium hysterophorus*	Asteraceae	Gajor ghas
52	*Peperomia pellucida*	Piperaceae	-
53	*Pouzalzia zeylanica*	Urticaceae	-
54	*Portulaca oleracia*	Portulacaceae	-
55	*Phyla nodiflora*	Verbenaceae	Jal popali

56	*Phyllanthus urinaria*	Phyllanthaceae	Hajar moni
57	*Rorippa indica*	Brassicaceae	-
58	*Scoparia dulcis*	Plantaginaceae	-
59	*Sida rhombifolia*	Malvaceae	Son barial
60	*Solanum nigrum*	Solanaceae	Los kochi
61	*Solanum torvum*	Solanaceae	Tit bhekuri
62	*Spilanthus paniculata*	Asteraceae	NA
63	*Stachytapheta australis*	Verbenaceae	-
64	*Stellaria media*	Caryophyllaceae	-
65	*Synedrella nodiflora*	Asteraceae	Mudundrapacha
66	*Tridex procumbens*	Asteraceae	Akal kohadi
67	*Thysanolaena sp.*	Poaceae	-
68	*Vernonia cinera*	Asteraceae	Lohpohi

Table 5.2: Shrubs

Sl. No.	Scientific name	Family	Common/Vernacular name
1	*Allamanda cathartica*	Apocynaceae	Ghanta phul
2	*Bauhinia acuminata*	Fabaceae	Kanchan
3	*Bixa orellana*	Bixaceae	Sendur
4	*Bougainvillea glabra*	Nyctaginaceae	Kagaj phul
5	*Caesalpinia pulcherrima*	Fabaceae	Radhasura
6	*Calotropis gigantea*	Apocynaceae	Safed aak
7	*Citrus limon*	Rutaceae	Kaji nemu
8	*Hibiscus rosa-sinensis*	Malvaceae	Jaba phul
9	*Ixora coccinea*	Rubiaceae	Rangol
10	*Manihot esculenta*	Euphorbiaceae	Simolu alu
11	*Murraya koenigii*	Rutaceae	Narasingha
12	*Murraya paniculata*	Rutaceae	Kamini kanchan
13	*Musa acuminata*	Musaceae	Cheni kol
14	*Ricinus communis*	Euphorbiaceae	Era gosh
15	*Tabernaemontana divaricata*	Apocynaceae	Kathanda

Table 5.3: Trees

Sl. No.	Scientific name	Family	Common/Vernacular name
1	*Albizia saman*	Fabaceae	Sirish gos
2	*Areca catechu*	Arecaceae	Tamol
3	*Azadirachta indica*	Mweliaceae	Neem
4	*Butea monosperma*	Fabaceae	Palash
5	*Carica papaya*	Caricaceae	Amita
6	*Cassia tora*	Caesalpiniaceae	Medeluwa
7	*Cocos nucifera*	Arecaceae	Narikol
8	*Crescentia cujete*	Bignoniaceae	Calabash
9	*Cycas pectinata*	Cycadaceae	Nag champa
10	*Dalbergia sisso*	Fabaceae	Sishu
11	*Delonix regia*	Fabaceae	Krishna shura
12	*Dillenia indica*	Dilleniaceae	Ou tenga
13	*Dypsis lutescens*	Arecaceae	Momai tamol
14	*Ficus racemosa*	Moraceae	Dimoru
15	*Mesua ferrea*	Calophyllaceae	Nahor
16	*Mimusops elengi*	Sapotaceae	Bokul
17	*Nyctanthes arbor-tristis*	Oleaceae	Sewali phul
18	*Polyalthia longifolia*	Annonaceae	Debdaru
19	*Phyllanthus emblica*	Phyllanthaceae	Amla
20	*Psidium guajava*	Myrtaceae	Mathuriam
21	*Ravenala madagascariensis*	Strelitziaceae	Traveller’s Tree
22	*Terminalia arjuna*	Combretaceae	Arjun

Table 5.4: Climbers

Sl. No.	Scientific name	Family	Common/Vernacular name
1	*Cardiospermum halicacabum*	Sapindaceae	Kopal phuta bon
2	*Clitoria ternatea*	Leguminosae	Aparajita
3	*Cuscuta campestris*	Convolvulaceae	Golden dodder
4	*Mikenia mikrantha*	Asteraceae	Japani lota

5	*Paederia foetida*	Rubiaceae	Bhedai lota
6	*Syngonium podophyllum*	Araceae	-
7	*Tinospora cordifolia*	Menispermaceae	Amor lota

Table 5.5: Hydrophytes

Sl No.	Scientific name	Family	Common/Vernacular name
1	*Agapanthus sp.*	Amaryllidaceae	Apang
2	*Eichhornia crassipes*	Convolvulaceae	Pani meteka
3	*Ipomea aquatica*	Convolvulaceae	Kolmi-sak
4	*Nymphaea pubescens*	Nymphaeaceae	Nal Mokuwa

Fauna of North Gauhati College

Table 6.1: Birds

Sl. No.	Scientific name	Family	Common/Vernacular name
1	*Phalacrocorax niger*	Phalacrocoracidae	Little cormorant
2	*Bubulens coromandus*	Ardeidae	Eastern cattle egret
3	*Egretta aeba*	Ardeidae	Large egret
4	*Andrea purpurea*	Ardeidae	Purple heron
5	*Egretta grazetta*	Ardeidae	Little egret
6	*Ardeola grayii*	Ardeidae	Indian pond heron
7	*Anastomus oscitans*	Ciconiidae	Openbill stork
8	*Leptoptilos javanicus*	Ciconiidae	Lesser adjutant
9	*Milvus migrans*	Accipitridae	Pariah kite
10	*Amaurornis phoenicurus*	Rallidae	White-breasted waterhen
11	*Streptopelia chinensis*	Columbidae	Spotted dove
12	*Haleyon smyrnensis*	Alcedinidae	White-breasted kingfisher
13	*Upupa epops*	Upupidae	Indian hoopoe
14	*Oriolus xanthornus*	Oriolidae	Black-headed oriole

15	*Copsychus saularis*	Muscicapidae	Magpie robin
16	*Orthotomus sutorius*	Cisticolidae	Common tailorbird
17	*Passer domesticus*	Passeridae	House sparrow
18	*Corvus splendens*	Corvidae	House crow
19	*Dendrocitta vagabunda*	Corvidae	Indian treepie
20	*Acridotheres tristis*	Sturnidae	Common myna
21	*Acridotheres fuscus*	Sturnidae	Jungle myna
22	*Motacilla alba*	Motacillidae	Common wagtail
23	*Dicrurus adsimilis*	Dicruridae	Common black drongs
24	*Turdoides striata*	Leiothrichidae	Jungle babbler
25	*Megalaima asiatica*	Megalaimidae	Blue-throated barbet
26	*Dendrocopos atratus*	Picidae	Stripe-breasted pied woodpecker

Table 6.2: Mammals

Sl No.	Scientific name	Family	Common/Vernacular name
1	*Macaca assamensis*	Cercopithecidae	Assamese macaque
2	*Tamiops macclellandi*	Sciuridae	Himalayan striped squirrel

Table 6.3: Amphibians

Sl No.	Scientific name	Family	Common/Vernacular name
1	*Bufo melanostictus*	Bufonidae	Common toad
2	*Hyla arborea*	Hylidae	Tree frog
3	*Rana tigrina*	Ranidae	Frog

Table 6.4: Reptiles

Sl No.	Scientific name	Family	Common/Vernacular name
1	*Calotes versicolor*	Agamidae	Indian garden lizard
2	*Mabuya carinata*	Scincidae	Indian mabuya
3	*Varanus bengalensis*	Varanidae	Monitor lizard

4	*Naja kaouthia*	Elapidae	Monocled cobra
5	*Natrix piscator*	Colubridae	Checkered keelback
6	*Bungarus fasciatus*	Elapidae	Banded krait

Table 6.5: Insects

Sl No.	Scientific name	Family	Common/Vernacular name
1	*Dacus cucurbitae*	Tephritidae	Melon fruit fly
2	*Pieris brassicae*	Pieridae	Cabbage fly
3	*Sitophilus oryzae*	Curculionidae	Rice weevil
4	*Tribolium castaneum*	Tenebrionidae	Red rust flour beetle
5	*Papilio demoleus*	Papilionidae	Lemon butterfly
6	*Mantis religiosa*	Mantidae	Praying mantis
7	*Odontotermes sp.*	Termitidae	White ants
8	*Anisoptera sp.*	Libellulidae	Dragon fly
9	*Gryllus sp.*	Gryllidae	Field cricket
10	*Gryllotalpa sp.*	Gryllotalpidae	Mole cricket
11	*Oryctes rhinoceros*	Scarabaeidae	Rhino beetle
12	*Epilachna sp.*	Coccinellidae	-
13	*Leptocorisa varicornis*	Alydidae	Gundhi beetle
14	*Belostoma sp.*	Belostomatidae	Giant water bug
15	*Nepa sp.*	Nepidae	Water scorpion
16	*Cicada sp.*	Cicadidae	Cicada
17	*Camponotus sp.*	Formicidae	Common house ant
18	*Monomorium sp.*	Formicidae	Large black ant
19	*Solenopsis sp.*	Formicidae	Small red ant
20	*Apis indica*	Apidae	Honey bee
21	*Carausius morosus*	Lonchodidae	Stick insect
22	*Melanoplus sp.*	Acrididae	Grasshopper

Table 6.6: Other arthropods

Sl No.	Scientific name	Family	Common/Vernacular name

1	*Carcinus sp.*	Portunidae	Common crab
2	*Scolopendra sp.*	Scolopendridae	Centepede
3	*Julus sp.*	Julidae	Millipede
4	*Palamnaeus sp.*	Scorpionidae	Scorpion
5	*Aranea sp.*	Araneidae	Common house spider

Table 6.7: Fish

Sl No.	Scientific name	Family	Common/Vernacular name
1	*Ophiocephalus pnetatus*	Channidae	Goroi
2	*Channa bleheri*	Channidae	Cheng
3	*Anabas testudineus*	Anabantidae	Kawai
4	*Heteropneustes fossilis*	Heteropneustidae	Singi
5	*Clarias magur*	Clariidae	Magur
6	*Channa striata*	Channidae	Shole
7	*Amblypharyngodon mola*	Cyprinidae	Mowa fish
8	*Mystus tengara*	Bagridae	Tinra fish
9	*Macrognathus aral*	Mastacembelidae	Tora
10	*Puntius sophore*	Cyprinidae	Puthi
11	*Rasbora daniconius*	Cyprinidae	Dorikona

Table 6.8: Reptiles

Sl No.	Scientific name	Family	Common/Vernacular name
1	*Lymnaea sp.*	Lymnaeidae	Fresh water snail
2	*Planorbis sp.*	Planorbidae	Common water snail
3	*Limax sp.*	Limacidae	Grey slug
4	*Pila globosa*	Ampullariidae	Apple snail
5	*Achatina sp.*	Achatinidae	Garden snail

8. Ambience and Aesthetics Audit

As a part of the Green Audit survey, responses were obtained from the teachers and students to record their perspective regarding the college environment and general ambience. The pictorial representations of their responses to questions pertaining to the subject are provided below (Figs. 8 – 10).

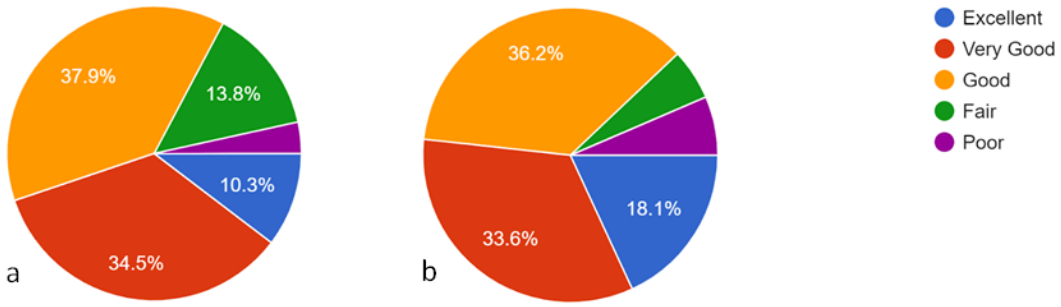


Fig 8: Responses (**a** – teachers, **b** – students) to – "*How do you find the environment of the college?*"

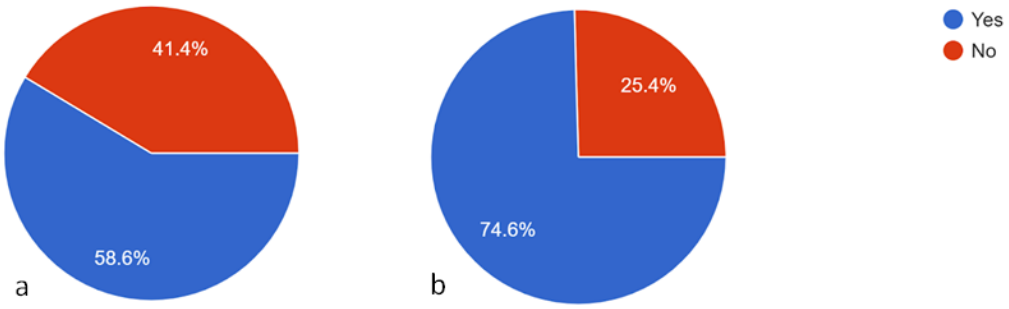


Fig 9: Responses (**a** – teachers, **b** – students) to – "*Is the college environment clean in your view?*"

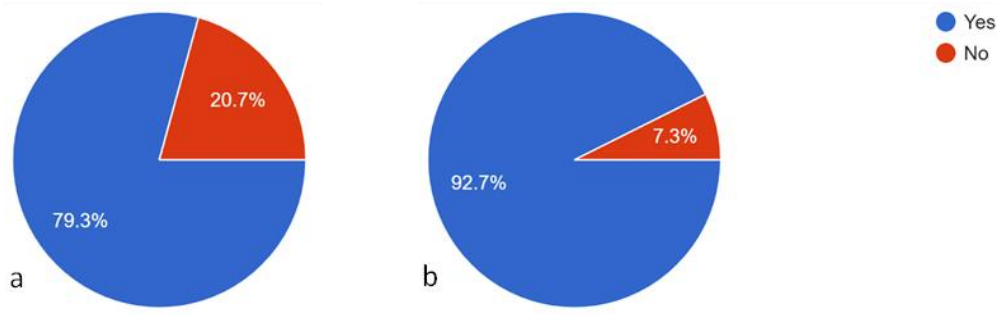


Fig 10: Responses (**a** – teachers, **b** – students) to – "*Is the college environment 'Green' in your view?*"

From the responses obtained it is evident that most of the students and teachers are happy with the college environment. There is however a large fraction from the teachers (41.4%) and students (25.4%) who believe there is more to be done in the campus in terms of cleanliness. More than 20% of the teachers and around 7% students also find that the college is still in need of an increased green cover than at present.

Different cells of the college such as the Eco Club, the NSS and the NCC units have held cleanliness and plantation drives alongwith environmental awareness campaigns to boost the college environment and ambience. 44.8% respondents from the teachers and 69% from the students have admitted to have taken part in such programmes during the 2022-23 session. The efficiency of the plantation programmes organized in the college was rated by respondents on a scale of 1 to 5, with 1 meaning inefficient and 5 signifying highly efficient (Fig. 11). Majority of the respondents expressed satisfaction regarding the efficiency of these programmes, which are organized by departments, different units of the college, or centrally by the college authority.

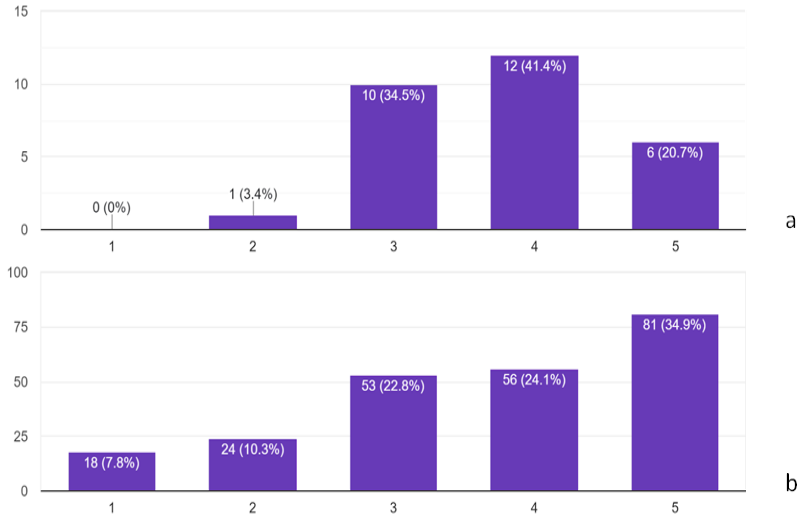


Fig 11: Responses (**a** – teachers, **b** – students) to – "*According to you, how efficient are the plantation programmes organized by the college/departments in enriching the environment?*"

The respondents were also asked to rate the visual ambience of the college on a scale of 1 to 5, with 1 denoting poor ambience, and 5 denoting very attractive ambience. The responses (Fig. 12) show that majority of the respondents feel the college has a good ambience, while around 20%

(approx.) of the respondents feel that there is a lack of proper visual ambience in the college campus.

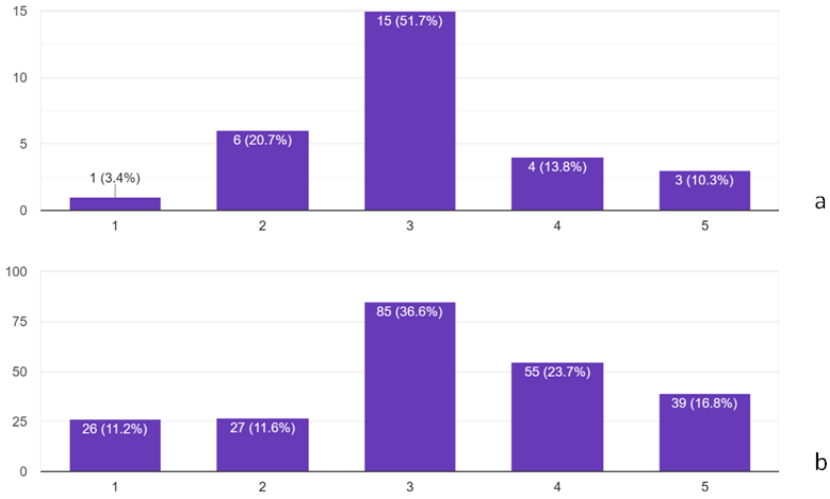


Fig 12: Responses (**a** – teachers, **b** – students) to – "*How would you rate the visual ambience of the college?*"

The following are only a few of the many recommendations that survey participants made to improve the aesthetic atmosphere of the college campus:

i) To maintain a clean campus by placing additional dustbins at different locations within the college campus and encouraging their proper use alongwith clean maintenance of the open grounds, classrooms, and other units of the college,

ii) To take measures for organized plantations, proper maintenance of gardens, organizing plantation drives, lining passageways with ornamental hedge shrubs and grooming of the campus grass, and for that purpose appointing a dedicated gardener,

iii) Developing modern infrastructure through proper planning,

iv) Demolishing of the old Assam type building,

v) Construction of proper drainage channels for prevention of waterlogging during monsoon,

vi) Proper implementation of waste management and waste segregation procedures,

vii) Completion of the college boundary wall,

viii) Setting up of sitting facilities for students outside the classrooms at different locations within the campus for their leisure periods,

ix) Paint jobs wherever necessary, especially in the science block,

x) Earth filling around the pond area, with proper demarcation of the pond by completion of its boundary wall.

SUMMARY AND RECOMMENDATIONS

The North Gauhati College's Green Audit 2022–2023 was finished by thorough investigations and scientific analysis of data pertaining to a variety of environmental indicators concerning the upkeep and operation of the college. After the audit, a number of the college's strong points as well as areas in need of real development efforts were revealed. The college is blessed with a considerable amount of land, much of which is underutilized despite having enormous potential. The college's water resources have potential and also require careful maintenance. As per government guidelines, the college's water quality is deemed acceptable. It has been discovered that the college's air quality, specifically its particulate matter, is concerning, particularly in dry weather. This is unavoidable due to some of the ongoing building projects surrounding the college, but it still requires proactive action from relevant authorities and solutions like widespread planting on campus. Due to its proximity to industrial facilities, the college feels that having an air quality monitoring system that records data all year round is essential. To install these units on campus, it might be necessary to ask the state pollution control board for assistance.

It is determined that the college's waste management practices fall short of satisfactory. The college must employ scientific waste management techniques, especially in tackling the hazardous wastes, in addition to stepping up material reuse and recycling initiatives to cut down on waste production. For that reason, there should be more dustbins placed throughout the campus, with clear indication of the type of waste to be put, so that segregation of the waste matter can be done. Since the college does not currently have access to a dedicated garbage pick-up facility, it could also be wise to request assistance from the North Guwahati Town Committee.

The audit report emphasizes the need for more facilities for drinking water and sanitation across the college, with a focus on the quality of drinking water supplied, from the perspective of health and hygiene of the students, instructors, and other college members. Furthermore, there is a pressing demand for an accessible, clean canteen on college campuses.

Regarding energy conservation and consumption, the college has already increased its efforts to save energy costs by gradually transitioning to energy-efficient lighting fixtures such LED campus lighting, LED tublights, and LED bulbs. Additionally, a 10-KWP solar panel facility has been added to the campus. Increasing the number of solar panels can further lessen reliance on grid electricity.

The college campus is endowed with a rich biodiversity in terms of biodiversity. Nonetheless, initiatives to increase biodiversity even further may be made. A botanical garden can be a great method to accomplish that.

A variety of stakeholders have expressed differing opinions about the college campus atmosphere. A significant portion of the stakeholders think that improving the college's atmosphere requires addressing a number of issues. Many suggestions were already listed in the preceeding section. The most crucial factors to take into account are carefully thought out building projects, contemporary infrastructure development, well-kept plantations, appropriate waste management, and routine college campus maintenance.