

Green and Environment Audit Report

2019-2024



Nalbari College,
Nalbari,
Assam-781335

Third cycle of NAAC
Accreditation

Criteria 7
Institutional Values
and Best Practices

Prepared by

**Green Audit Committee,
Nalbari College, Nalbari (Assam)**



GOVT. OF ASSAM

Environment and Forest Department
Office of the Divisional Forest Officer
Social Forestry Division, Nalbari, Pin: 781335

Email :dfosfnalbari2021@gmail.com:

Email: dfo-sf-nalbari@gov.in

Letter No. B/NLB/Gen/Misc/1050

Date.13/05/2024

Certificate


This is to certify that Nalbari College has undergone a comprehensive green and environmental audit, demonstrating its commitment to environmental sustainability and responsible resource management. The entire practice was carried out by a team of qualified members of the college and under the supervision of the undersigned.

The audit covered various aspects of environmental management, including

1. Physical profile and land use pattern of the college campus.
2. Assessment of the biodiversity (Both flora and fauna) inside the college campus.
3. Assessment of plantation soil, air, drinking water, noise quality in the college campus.
4. Estimation of the yearly energy consumption of the college.
5. Estimation of waste generated (organic/inorganic/e-waste) in various corners of the college and review of waste disposal system of the college.
6. Assessment of best environmental practices.

The college has demonstrated effective environmental management practices, proactive measures to minimize its environmental footprint, and a commitment to continuous improvement.

I offer my best wishes to the college in its pursuit for excellence in higher education and all its future endeavours.


7/3/5/24
(Mukut Ch. Das AFS, DCF)
Divisional Forests Officer
Social Forestry Division
Divisional Forest Officer
Social Forestry Division
Nalbari



DEPARTMENT OF BOTANY
GAUHATI UNIVERSITY

Gauhati University
Assam 781014, India
botany@gauhati.ac.in

20th May, 2024

Certificate

This is to certify that Nalbari College, Nalbari, Assam has conducted a detailed 'Green and Environmental Audit' for its campus during the academic year 2019-2024. The audit was conducted in accordance with the applicable standards prescribed norms of the Ministry of Environment, Forest and Climate Change, New Delhi. The audit involves water, waste water, energy, air, green inventory, 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, the Green and Environmental Audit gives a true and fair view in conformity with environmental auditing principles' accepted in India.

(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
GAUHATI UNIVERSITY
Guwahati, Assam 781014, India
Tel: +91-94012-03977(M)
Email: btanti@gauhati.ac.in

**Green audit assessment committee
Nalbari college, Nalbari, Assam –
781335**

Facilitator and chief patron

Dr. Kamal Nayan Patowary, Chairman, Green Audit Committee & Principal, Nalbari College,
Nalbari

Coordinator, Editor, compiler of the Report

Dr. Rupak Kumar Sarma, Assistant Professor, Department of Botany, Nalbari College, Nalbari

Advisers

Mr. Kumud Ch Rabha, Assistant Professor, Department of Zoology, Nalbari College, Nalbari

Dr. Nabajyoti Deka, Associate Professor, Department of Chemistry, Nalbari College, Nalbari

Mr. Hitesh Thakuria, Assistant Professor, Department of Geography, Nalbari College, Nalbari

Technical consultants

Dr. Purabi Sarmah, Assistant Professor, Department of Chemistry, Nalbari College, Nalbari

Dr. Meetali Deori, Assistant Professor, Department of Zoology, Nalbari College, Nalbari

Dr. Dibashree Tamuli, Assistant Professor, Department of Zoology, Nalbari College, Nalbari

Dr. Pranita Bora, Assistant Professor, Department of Chemistry, Nalbari College, Nalbari

Ms. Dhritashri Das, Assistant Professor, Department of Botany, Nalbari College, Nalbari

Mr. Giren Ch. Deka, Assistant Professor, Department of Geography, Nalbari College, Nalbari

Field surveyors and assistance providers

Ms. Himashree Sarma, Student, 4th Semester, Botany (Hons) Nalbari College, Nalbari

Md. Nurul Haque, Student, 4th Semester, Botany (Hons) Nalbari College, Nalbari

Mr. Madhurjya Talukdar, Student, 6th Semester, Botany (Hons) Nalbari College, Nalbari

Mr. Arnabjaan Talukdar, Student, 6th Semester, Chemistry (Hons) Nalbari College, Nalbari

Mr. Bhargab Parashar, Student, 6th Semester, Chemistry (Hons) Nalbari College, Nalbari

Ms. Urnisha Deka, Student, 6th Semester, Chemistry (Hons) Nalbari College, Nalbari

Ms. Rimzim Bharadwaj, Student 6th Semester, Zoology (Hons) Nalbari College, Nalbari

Mr. Bhargab Kamal Baishya, Student, 4th Semester, Zoology (Hons) Nalbari College, Nalbari

Mr. Kaushik Kumar Deka, Student, 4th Semester, Zoology (Hons) Nalbari College, Nalbari

Mr. Nibir Deka, Student, 4th Semester, Geography (Hons) Nalbari College, Nalbari

Mr. Sonmani Kalita, Student, 4th Semester, Geography (Hons) Nalbari College, Nalbari

Mr. Manash Pratim Kashyap, Student, 4th Semester, Geography (Hons) Nalbari College, Nalbari

Acknowledgement

The completion of the green audit report reflects the dedication of the college administration, faculty, non-teaching staff, and students toward fostering an eco-friendly campus environment.

Our sincere thanks go to Dr. Kamal Nayan Patowary, Principal of Nalbari College, and Chairman, of the Green Audit Committee for his constant guidance throughout the practice.

We would like to offer our gratitude to all the faculty members of the Department of Botany, Zoology, Chemistry, and Geography for their overwhelming support during the compilation of the report.

Students are the sole energy of an academic institution. Students from all the departments helped with field surveys and data collection during the process. We are grateful to them.

We sincerely acknowledge Dr. Arup Kumar Misra, Chairman, Pollution Control Board, Guwahati, and his surveying team in assessing the air, and noise quality inside the college campus.

We would like to thank concern officials of the Department of Public Health Engineering, Nalbari for analyzing the drinking water quality inside the college premises.

Our sincere thank goes to Krishi Vigyan Kendra Nalbari and AAU-Horticultural Research Station, Kahikuchi, Guwahati for their support in analyzing the plantation soil quality of the college.

Through the meticulous assessment of environmental practices and the implementation of sustainable initiatives, Nalbari College exemplifies leadership in promoting a greener future. The findings and recommendations outlined in the green audit report serve as valuable insights for further enhancing sustainability efforts within the college community.



Dr. Rupak Kr. Sarma
Co-ordinator
Green audit committee
Nalbari College, Nalbari

Table of contents

Unit	Topic title	Page No
1.	Introduction	1-3
2.	Exploring the physical landscape: Land use practices within the college campus	4-6
3.	Biodiversity survey: Mapping the natural wealth of Nalbari college campus	7-18
4.	Energy audit	19-27
5.	Assessment of the plantation soil, water, air, and noise quality in the college campus	28-40
6.	Generation of waste materials and their management	41-43
7.	Best environmental practices	44-45
8.	Overall recommendations	46
9.	Bibliography	47

1. Introduction

1.1 About the college – a bird’s eye view

Nalbari college stands as a beacon of academic excellence in Assam, tracing its roots back to the pre-independence era when it was established on July 4th, 1945. Since its inception, the college has played a pivotal role in fostering higher education across the lower Brahmaputra valley, earning recognition as one of the premier institutions in the region. Originally affiliated with Calcutta University, the college transitioned to being under the academic jurisdiction of Gauhati University in 1948, following the establishment of the latter. This shift marked a new chapter in its academic journey, aligning it closely with the educational landscape of the lower Brahmaputra valley.



Nalbari college offers a diverse range of educational streams, catering to both male and female students. From Higher Secondary education to the Postgraduate level, the institution provides a comprehensive platform for students to pursue their academic aspirations across various disciplines. With a commitment to academic rigor, innovation, and holistic development, Nalbari college continues to uphold its legacy as a hub of learning and intellectual growth in the region. The college has been at the forefront of innovation in higher education, continually expanding its offerings to meet the evolving needs of students and the job market. Through its proactive approach, the college has initiated several UGC-sponsored jobs-oriented programs, including Travel and Tourism Guidance and Disaster Management. These programs equip students with practical skills and knowledge essential for thriving in these specialized fields.

Notably, the introduction of Bachelor of Physical Education (B.P.E) makes Nalbari

college a pioneer in offering this course in the entire Assam region, showcasing its dedication to staying ahead in educational trends and demands. In recent years, it has introduced self-financing courses, including Bachelor of Computer Application (BCA) and Post Graduate Diploma in Computer Application (PGDCA), catering to the growing demand for expertise in the field of computer science and technology. Through these stint-demanding initiatives, Nalbari college continues to demonstrate its commitment to academic excellence and preparing students for successful careers in a rapidly changing global landscape.

1.2. Exploring environmental footprints in Nalbari college: The essence of green audit

The green audit is a comprehensive assessment of environmental sustainability practices within an organization. Conducting green audits demonstrates a commitment to environmental responsibility. It reflects an organization's dedication to minimizing its ecological footprint and contributing positively to the environment. With this practice organizations can identify opportunities for improving resource efficiency; waste (organic/inorganic) management; landscape utilization, floral-faunal diversity, yearly energy consumption, and ambient soil/air/water/noise quality inside the college campus. The overall practice can lead to cost savings through reduced energy consumption, water usage, and waste disposal, enhancing the organization's overall efficiency and competitiveness.

Nalbari college, with its steadfast commitment to environmental sustainability and responsibility, presents the Green Audit Report for the period 2019-2024. In compliance with the National Assessment and Accreditation Council, New Delhi (NAAC) guidelines advocating for an annual Green Audit in higher educational institutions, Nalbari college embraces its responsibility to uphold environmental sustainability and maintain a green campus. The current report encapsulates the college's proactive efforts towards fostering a greener and more sustainable future. Through systematic identification, quantification, recording, reporting, and analysis of various environmental parameters, Nalbari college aims to assess and enhance its eco-friendly practices. Overall, the Green Audit serves as a structured mechanism to assess, monitor, and enhance the college's environmental performance, aligning with NAAC's mandate and reflecting Nalbari college's dedication to fostering a greener and more sustainable environment for current and future generations.

The overall audit practices ensured fostering the knowledge of land use patterns; biodiversity inside the college campus (both floral and faunal); waste management tactics, ideas on annual power consumption, monitoring of ambient air, water, soil, noise quality of the campus; and proper utilization of natural resources. Additionally, the Green Audit identifies specific measures necessary to sustain our green campus initiative, ensuring the well-being of both our campus community and the surrounding external community. Thus, the broad objectives of the audit report include

1. To document the physical profile of the college, including the land use pattern and build up area inside the college campus.
2. To estimate the biodiversity inside the college campus.
3. To assess the plantation soil, air, drinking water, noise quality in the college campus.
4. To calculate the yearly energy consumption of the college.
5. To audit waste generation (organic/inorganic/e-waste) in various corners of the college and review the waste disposal system of the college.
6. To assess the best environmental practices.
7. To promote awareness amongst the students on protection of environment for a sustainable future.

Our Core Values



Vidyayaa Vindate Amritam

Pursuit of excellence through student centric approach



Employability through development of skills

Reaching out to the unreachable



2. Exploring the physical landscape: land use practices within the college campus

2.1 Geographical location:

Nalbari college is a multi-streamed coeducational institution located in the Nalbari district of Assam, India. The college extends between 26°26'5" North to 26°26'10" North Latitude and 91°26'30" East to 91°26'45" East Longitude. The southern campus of the college lies within Japarkuchi village while the main campus is located at Ward No. 06 of Nalbari town of Nalbari district. The north and west side of the college is bounded by Bidyapur area and Ward No. 07 respectively. The southern and eastern side of the college is bounded by Japarkuchi and Digheli revenue villages of Nalbari district, Assam.

2.2 Physical profile of the college

The college covers a total area of around 14 acres of land. The physical topography of the college is a part of the low lying plain of the mighty river Brahmaputra. The college is located at a height of 42 metre above Mean Sea Level (MSL). The college as a part of the sub-tropical monsoonal climatic zone enjoys hot & wet summer and dry winter with an annual average rainfall around 250 cm & temperature ranges between 10° to 45° C. The soil type of the college campus is alluvial in nature.

2.3 Land use pattern

2.3.1. Methodology adopted for land use mapping

Land use and land cover (LULC) map provides information about the types of land use activities and the physical cover of the land surface within a specific area. It distinguishes between different land use categories such as residential, commercial, industrial, agricultural, and recreational areas as well as natural land cover types like forests, wetlands, water bodies and barren land.

For preparing LULC map of Nalbari college Google Earth Pro is used to acquire high-resolution satellite imagery of the region. After obtaining the imagery, it was downloaded into a Geographic Information System (GIS) environment and georeferenced for accurate spatial alignment. Digitization is done for distinguish each of the index of LULC. The study area was classified into four primary categories: Built-up areas (encompassing structures like buildings and houses), Plantation (encompassing vegetated areas, tree covers and gardens), Water bodies (including pond), Open spaces (comprising areas devoid of significant human development, such as fields, vacant land, and recreational grounds). Subsequently, the analysis and area calculation for each category was conducted using ArcGIS 10.8 software.



Figure 2.1. Schematic representation of the methodology adopted for land use mapping

2.3.2. Observations: The land use type of the college is classified into Built up, Open space, Plantation and Water Bodies. The present land use pattern of the college is depicted in the following map:

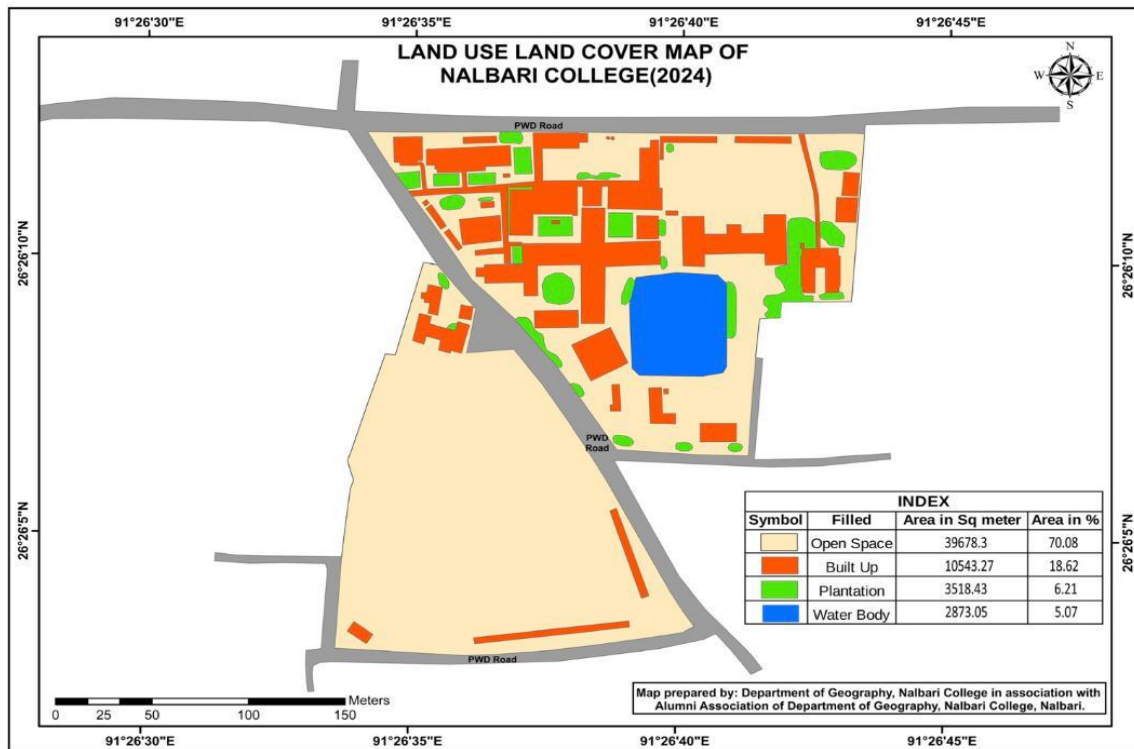


Figure 2.2. Land use map of the Nalbari, College, Nalbari, Assam (Prepared by Department of Geography, Nalbari College, Nalbari)

The college has a wide range of open area with area coverage of 39678.3 sq. mtrs. which occupies around 70.08% of total land area of the college. Its built-up area covers 18.62% of its total area coverage. The percentage of plantation within the campus occupies 6.21% of the total area whereas water body covers 5.07% of the total area of the college.

Table 2.1. Land Use Pattern of Nalbari college, Nalbari, Assam

Category of Land Use	Area in Square Metre	Area in %
Open Space	39678.3	70.08
Built Up	10543.27	18.62
Plantation	3518.43	6.21
Water Body	2873.05	5.07

2.3.2.1. Category of built-up area verses area occupied

The college covers a total area of around 14 acres of land out of which built up area covers 10543.27 Square metres of area. The built-up area is consisting of administrative building of the college, academic buildings, library, alumni house, indoor stadium, boy's & girl's hostel, healthcare centre, student's union room, gymnasium, security room, college canteen, day Care centre, waste disposal site, cycle stand, bike stand, car parking etc.

2.3.2.2. Green area - future planning in its extension

The college aims to protect and enhance its green area coverage in the near future. The projected green area extension is depicted in the following map:

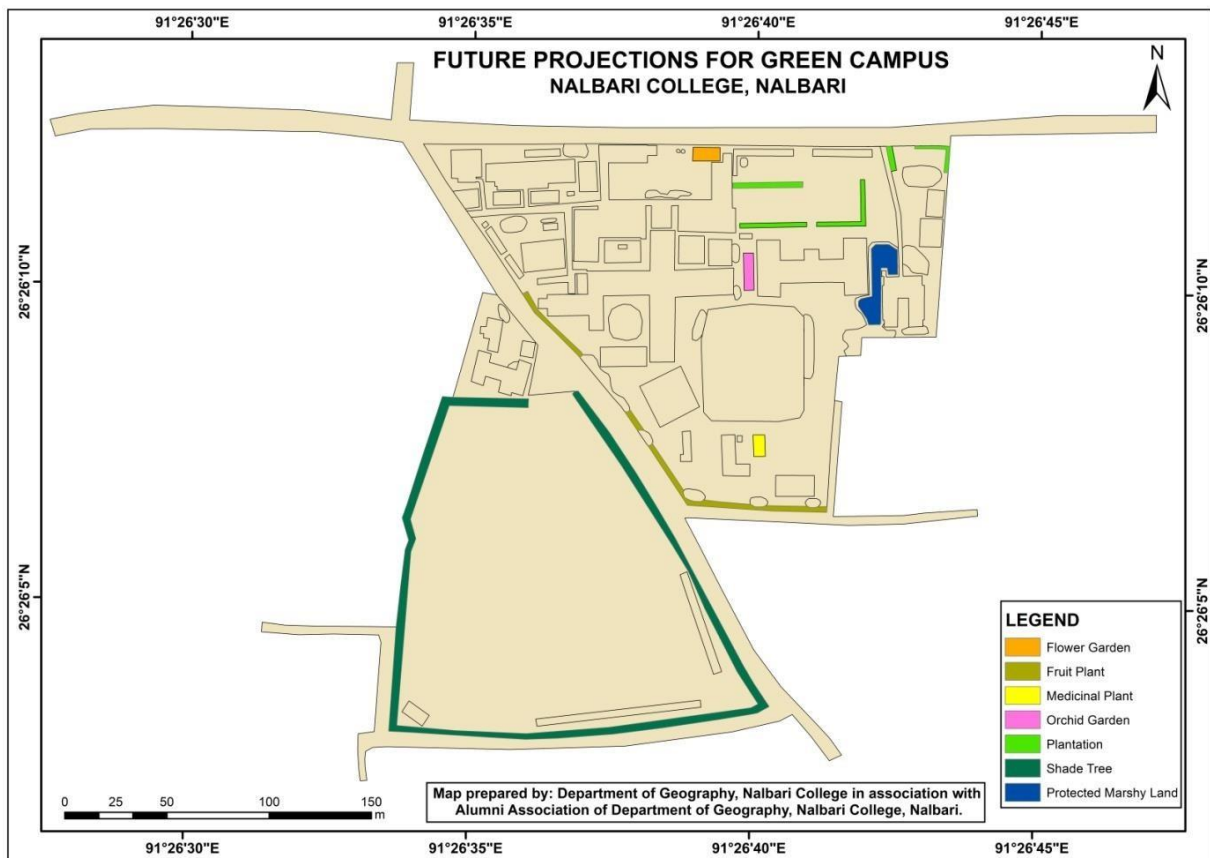


Figure 2.3. Future projections for the extension of green cover inside the college campus

The future planning of Green Area extension of the college includes addition of medicinal garden, Orchard Garden, Flower Garden, Fruit plantation, Shade Tree plantation & protection of the Marshy land existed in the college campus.

3. Biodiversity survey: mapping the natural wealth of Nalbari college campus

The estimation of biodiversity within the Nalbari college campus offers a fascinating glimpse into the rich tapestry of life thriving in our midst. Through meticulous surveying and documentation, we endeavour to explore and understand the diverse array of plant and animal species that call our campus home. Our biodiversity estimation efforts encompass a variety of methodologies, including field surveys, specimen collection, and data analysis. We systematically catalogue the flora and fauna found within different habitats, ranging from wooded areas and green spaces to water bodies and urban landscapes. Each species identified is documented with details on its taxonomy, distribution, abundance, and ecological significance. We involved our degree students of Department of Botany and Zoology of Nalbari college during the bio-diversity survey inside the college campus. This hands-on learning experiences will foster a deeper knowledge for students in understanding the natural world.

The Botanical garden of Nalbari college encompasses 46 different types of plant genera having wide degrees of economic and medicinal importance. Approximately 6.21% of the college campus is covered with green topography comprising of different plants types including trees, shrubs, and herbs. The floral diversity is encompassed with timber yielding plants, fruiting plants, medicinal plants, and ethno-botanically important plant groups.

3.1. Check list of floral diversity of Nalbari college campus

Table 3.1.1. List of floral diversity in the Botanical garden

Sl. No.	Vernacular name	English name	Scientific name	Family	Number of plants
1.	Arjun	Arjun tree	<i>Terminalia arjuna</i> (Roxb.) Wight & Arn.	Combretaceae	02
2.	Debadaru	Buddha tree or False Ashok	<i>Monoon longifolium</i> Sonn. B.Xue & R.M.K.Saunders	Annonaceae	04
3.	Kala Jamu	Java plum	<i>Syzygium cumini</i> (L.) Skeels	Myrtaceae	04
4.	Nahar	Iron Wood Tree	<i>Mesua ferrea</i> L.	Calophyllaceae	02
5.	Xilikha	Haritaki	<i>Terminalia chebula</i> Retz.	Combretaceae	01
6.	Bokul	Asian bullet wood	<i>Mimusops elengi</i> L.	Sapotaceae	03
7.	Robor-goch	Rubber	<i>Hevea brasiliensis</i> (Willd. ex A.Juss.) Müll.Arg.	Euphorbiaceae	02

Sl. No.	Vernacular name	English name	Scientific name	Family	Number of plants
8.	Mou-dimoru	Cluster fig	<i>Ficus racemosa</i> L.	Moraceae	01
9.	Tokou	Doub palm	<i>Borassus flabellifer</i> L.	Arecaceae	02
10.	Momai Tamul	Areca palm	<i>Chrysalidocarpus lutescens</i> H.Wendl.	Arecaceae	05
11.	Ashok-goch	Ashok tree	<i>Saraca indica</i> L.	Fabaceae	02
12.	Ximalu	Cotton tree	<i>Bombax ceiba</i> L.	Malvaceae	02
13.	Harisankar	Chinese Colli	<i>Cordyline fruticosa</i> (L.) A.Chev.	Asperagaceae	10
14.	Tejpat	Indian bay leaf	<i>Cinnamomum tamala</i> (Buch.-Ham.) T.Nees & C.H.Eberm.	Lauraceae	01
15.	Mati Kothal	Pineapple	<i>Ananas comosus</i> L.	Bromeliaceae	02
16.	Maha-neem	Neem tree	<i>Azadirachta indica</i> A.Juss.	Meliaceae	01
17.	Joba Phul	China rose	<i>Hibiscus rosa-sinensis</i> L.	Malvaceae	05
18.	Karabi Phul	Yellow Oleander/ Nerium	<i>Cascabela thevetia</i> (L.) Lippold	Apocynaceae	02
19.	Kopah-goch	Arabian Cotton	<i>Gossypium herbaceum</i> L.	Malvaceae	02
20.	Bor-thekera	Mangosteen	<i>Garcinia pedunculata</i> Roxb. ex Buch.-Ham.	Clusiaceae	01
21.	Khejur	Pygmy date palm	<i>Phoenix roebelenii</i> O'Brien	Arecaceae	01
22.	Madhuri Aam	Guava	<i>Psidium guajava</i> L.	Myrtaceae	01
23.	Kathanda Phul	Pinwheel flower	<i>Tabernaemontana divaricata</i> R.Br. ex Roem. & Schult.	Apocynaceae	02
24.	Jalpai	Indian olive	<i>Elaeocarpus serratus</i> L.	Elaeocarpaceae	01
25.	Aamlokhi	Indian gooseberry	<i>Emblica officinalis</i> Gaertn.	Phyllanthaceae	01

Sl. No.	Vernacular name	English name	Scientific name	Family	Number of plants
26.	Rangan	Jungle geranium	<i>Ixora coccinea</i> L.	Rubiaceae	01
27.	Keteki	Pygmy screwpine	<i>Pandanus pygmaeus</i> Thouars	Pandanaceae	02
28.		Dwarf century plant	<i>Agave desmettiana</i> Variegata	Asparagaceae	01
29.	Giloi, Xaguni lata	Gulonch	<i>Tinospora cordifolia</i> (Thunb.) Miers	Menispermaceae	01
30.	Har jora lata	Veld grape	<i>Cissus quadrangularis</i> L.	Vitaceae	01
31.	Tulsi	Holy Basil	<i>Ocimum tenuiflorum</i> L.	Lamiaceae	01
32.	Podina	Mint	<i>Mentha piperita</i> L.	Lamiaceae	01
33.	Maisundri	Fish mint	<i>Houttuynia cordata</i> Thunb.	Saururaceae	01
34.	Brahmi Xak	Water hyssop	<i>Bacopa monnieri</i> (L.) Pennell	Plantaginaceae	01
35.	Bhedai lata	Skunkvine	<i>Paederia foetida</i> L.	Rubiaceae	01
35.	Podum phul	American lotus	<i>Nelumbo lutea</i> (Willd.) Pers	Nelumbonaceae	01
36.	Bhet, kumud	White waterlily	<i>Nymphaea alba</i> L.	Nymphaeaceae	01
37.	Kopou Phul	Foxtail orchid	<i>Rhynchostylis retusa</i> (L.) Blume	Orchidaceae	01
38.	Dendrobium	Dendrobium	<i>Dendrobium</i>	Orchidaceae	01
39.	Vanda	Cylindrical vanda	<i>Papilionanthe teres</i> L.	Orchidaceae	01
40.	Jetuka	Mehendi	<i>Lawsonia inermis</i> L.	Lythraceae	02
41.	Pirali Palenga	Ceylon Spinach	<i>Talinum fruticosum</i> (L.) Juss.	Talinaceae	01
42.	Meseka tenga	Roselle	<i>Hibiscus sabdariffa</i> L.	Malvaceae	02

Sl. No.	Vernacular name	English name	Scientific name	Family	Number of plants
43.	Assomiya angur	China root	<i>Smilax china</i> L.	Smilacaceae	01
44.	Bottle Brush	Bottle Brush	<i>Callistemon speciosus</i> L.	Myrtaceae	04
45.	Golap	Rose	<i>Rosa cinnamomea</i> L.	Rosaceae	03
46.	Kazi Nemu	Lemon	<i>Citrus limon</i> (L.) Osbeck	Rutaceae	02

Table 3.1.2. Floral diversity inside the college campus (other than the Botanical Garden)

Sl. No.	Vernacular name	English name	Scientific name	Family	Number of plants
1.	Azar	Giant Crape-myrtle	<i>Lagerstroemia speciosa</i> (L.) Pers.	Lythraceae	20
2.	Kala Jamu	Java plum	<i>Syzygium cumini</i> (L.) Skeels	Myrtaceae	06
3.	Xilikha	Haritaki	<i>Terminalia chebula</i> Retz.	Combretaceae	03
4.	Som plant	Som plant	<i>Persea bombycina</i>	Lauraceae	02
5.	Ximalu	Cotton tree	<i>Bombax ceiba</i> L.	Malvaceae	03
6.	Momai Tamul	Areca palm	<i>Chrysalidocarpus lutescens</i> H.Wendl.	Arecaceae	03
7.	Nuni	Noni	<i>Morinda citrifolia</i> L.	Rubiaceae	01
8.	Rudraksha	Rudraksha	<i>Elaeocarpus angustifolius</i> Blume	Elaeocarpaceae	02
9.	Bandor loti	Pink Shower Tree	<i>Cassia javanica</i> L.	Fabaceae	10
10.	Krishnasura	Gulmohar	<i>Delonix regia</i> L.	Fabaceae	05
11.	Bokul	Asian bullet wood	<i>Mimusops elengi</i> L.	Sapotaceae	08
12.	Aamlokhi	Indian gooseberry	<i>Emblica officinalis</i> Gaertn.	Phyllanthaceae	01
13.	Madhuriaam	Guava	<i>Psidium guajava</i> L.	Myrtaceae	03

Sl. No.	Vernacular name	English name	Scientific name	Family	Number of plants
14.	Thuja	Thuja	<i>Thuja occidentalis L.</i>	Cupressaceae	04
15.	Xewali	Night-blooming jasmine	<i>Nyctanthes arbor tristis L.</i>	Oleaceae	01
16.	Kanchan	white orchid-tree	<i>Bauhinia acuminata L.</i>	Fabaceae	01
17.	Bottle Brush	Bottle Brush	<i>Callistemon speciosus L.</i>	Myrtaceae	05
18.	Bougainvillea	Bougainvillea	<i>Bougainvillea glabra L.</i>	Nyctaginaceae	03
19.	Xirikh plant	Rain tree	<i>Samanea saman (Jacq.) Merr</i>	Fabaceae	08
20.	Nahar	Iron Wood Tree	<i>Mesua ferrea L.</i>	Calophyllaceae	04
21.	Bowal gach	Brown -cedar	<i>Ehretia acuminata R. Br.</i>	Boraginaceae	02
22.	Karabi Phul	Yellow Oleander/ Nerium	<i>Cascabela thevetia (L.) Lippold</i>	Apocynaceae	04
23.	Zamia	cardboard palm	<i>Zamia furfuraceae Lf.</i>	Zamiaceae	01
24.	Cycas	Sago palm	<i>Cycas revoluta Thunb</i>		
25.	Kathanda Phul	Pinwheel flower	<i>Tabernaemontana divaricata R.Br. ex Roem. & Schult.</i>	Apocynaceae	01
26.		Mauritius-hemp	<i>Furcraea foetida (L.) Haw.</i>	Asparagaceae	01
27.	Golap	Rose	<i>Rosa cinnamomea L</i>	Rosaceae	05
28.	Debadaru	Buddha tree or False Ashok	<i>Monoon longifolium Sonn. B.Xue & R.M.K.Saunders</i>	Annonaceae	04
29.	Snake plant	Snake plant	<i>Dracaena trifasciata (Prain) Mabb</i>	Asparagaceae	01
30.	Arjun	Arjun tree	<i>Terminalia arjuna (Roxb.) Wight & Arn.</i>	Combretaceae	03
31.	Chiri	Indian Laurel Fig	<i>Ficus retusa L.</i>	Moraceae	01

Sl. No.	Vernacular name	English name	Scientific name	Family	Number of plants
32.	Kala Jamu	Java plum	<i>Syzygium cumini</i> (L.) Skeels	Myrtaceae	02
33.	Bot Goch	Banayan tree	<i>Ficus benghalensis</i> L.	Moraceae	01
34.	Bor-naheri-bor	Weeping Fig	<i>Ficus benjamina</i> L.	Moraceae	04
35.	Aatlos	Custard Apple	<i>Annona reticulata</i> L.	Annonaceae	01
36.	Narikol	Coconut	<i>Cocos nucifera</i> L.	Arecaceae	03
37.	Ashok-goch	Ashok tree	<i>Saraca indica</i> L.	Fabaceae	01
38.	Xonaru	Golden shower tree	<i>Cassia fistula</i> L.	Fabaceae	02
39.	Christmas Tree	Christmas Tree	<i>Araucaria columnaris</i> J.R.Forst. Hook.	Araucariaceae	01
40.	Christmas Tree	Christmas Tree	<i>Araucaria heterophylla</i> (Salisb.) Franco	Araucariaceae	01
41.	Arjun	Arjun tree	<i>Terminalia arjuna</i> (Roxb.) Wight & Arn.	Combretaceae	02
42.	Maha-neem	Neem tree	<i>Azadirachta indica</i> A.Juss.	Meliaceae	03
43.		Powderpuff Plant	<i>Calliandra surinamensis</i> Benth.	Fabaceae	03
44.	Aatloch Kothal	Sugar apple	<i>Annona squamosa</i> L.	Annonaceae	01
45.	Chegun	Teak	<i>Tectona grandis</i> L.f.	Lamiaceae	02
46.	Saranga Pushpo	Mexican lilac	<i>Gliricidia sepium</i> (Jacq.) Steud	Fabaceae	02
47.	Acacia	Australian acacia	<i>Acacia moniliformis</i>	Caesalpiniaceae	02
48.	Aam	Mango	<i>Mangifera indica</i> Linn.	Anacardiaceae	04
49.	Kothal	Jack fruit	<i>Artocarpus heterophyllus</i> Linn.	Moraceae	02
50.	Gakhirati ban	Euphorbia	<i>Euphorbia hirta</i> Linn	Euphorbiaceae	Numerous

Sl. No.	Vernacular name	English name	Scientific name	Family	Number of plants
51.	Palash	Flame of the forest	<i>Butea monosperma (Lam.) Taub.</i>	Fabaceae	05
52.	Meteka	Water hyacinth	<i>Eichhornia crassipes (Mart.) Solms</i>	Pontederiaceae	Numerous



Samanea saman (Jacq.) Merr.



Papilionanthe teres L



Delonix regia L

3.2. Check list of faunal diversity of Nalbari college campus

3.2.1. Mammal diversity:

Sl. No.	Vernacular name	English Name	Scientific name	Family
1	Shiyal	Asiatic Jackal	<i>Canis aureus</i>	Canidae
2	Neul	The Indian grey mongoose	<i>Urva edwardsii</i>	Herpestidae
3	Kerketuwa	Pallas's squirrel	<i>Callosciurus erythraeus</i>	Sciuridae
4	Nigani	Mouse	<i>Mus musculus</i>	Muridae
5	Dalsaliya	The black-footed tree-rat	<i>Mesembriomys gouldii</i>	Muridae

3.2.2. Aves

Sl. No.	Vernacular name	English Name	Scientific name	Family Name
1	Phehu	Black Drongo	<i>Dicrurus macrocercus</i>	Dicruridae
2	Go Bagali	Cattle Egret	<i>Bubulcus ibis</i>	Ardeidae
3	Machroka	Common Kingfisher	<i>Alcedo atthis</i>	Alcedinidae
4	Konamuchuri	Indian Pond Heron	<i>Ardeola grayii</i>	Ardeidae
5	Kauri	House Crow	<i>Corvus splendens</i>	Corvidae
6	Shamuk khola	Asian Open bill Stork	<i>Anastomus oscitans</i>	Ciconiidae
7	Dhadang	Lesser Adjutant Stork	<i>Leptotilos javanicus</i>	Ciconiidae
8	Kuli	Asian koel	<i>Eudynamis scolopaceus</i>	Cuculidae
9	Phutuki kopou	spotted dove	<i>Spilopelia chinensis</i>	Columbidae
10		Eurasian collared dove, collared dove or Turkish dove	<i>Streptopelia decaocto</i>	Columbidae
11	Moupiya	The purple sunbird	<i>Cinnyris asiaticus</i>	Nectariniidae
12	Kathkhola	pileated woodpecker	<i>Dryocopus pileatus</i>	Picidae
13	Ghanchirika	house sparrow	<i>Passer domesticus</i>	Passeridae

Sl. No.	Vernacular name	English Name	Scientific name	Family Name
14	Dauk	The white-breasted waterhen	<i>Amaurornis phoenicurus</i>	Rallidae
15	Shalika	The common myna	<i>Acridotheres tristis</i>	Sturnidae
16	Sharali hah	Lesser whistling duck	<i>Dendrocygna javanica</i>	Anatidae
17	Chute shalika	The jungle myna	<i>Acridotheres fuscus</i>	Sturnidae
18	Phutuki phecha	The spotted owl	<i>Strix occidentalis</i>	Strigidae
19	Bulbuli	The red-vented bulbul	<i>Pycnonotus cafer</i>	Pycnonotidae
20	Pat shiya	The common tailorbird	<i>Orthotomus sutorius</i>	Cisticolidae
21	Sakhiyati	The black-hooded oriole	<i>Oriolus xanthornus</i>	Oriolidae
22	Hutuktukra	The blue-throated barbet	<i>Psilopogon asiaticus</i>	Megalaimidae
23	Haitha	The yellow-footed green pigeon	<i>Treron phoenicopterus</i>	Columbidae

3.2.3. Lizards:

Sl. No.	Vernacular name	English Name	Scientific name	Family Name
1	Tejpiya	Oriental garden lizard	<i>Calotes versicolor</i>	Agamidae
2	Jethi	Common house gecko	<i>Hemidactylus frenatus</i>	Gekkonidae
3	Chakari pheti	Indian cobra	<i>Naja naja</i>	Elapidae
4	Chakari pheti	Monocled cobra	<i>Naja kaouthia</i>	Elapidae
5	Monikara	Garden skink	<i>Lampropholis delicata</i>	Scincidae
6	Bairokh	western rat snake, black rat snake	<i>Pantherophis obsoletus</i>	Colubridae
7	Dhunduli pheti	copperhead rat snake, or copper-headed trinket snake	<i>Coelognathus radiata</i>	Colubridae

Sl. No.	Vernacular name	English Name	Scientific name	Family Name
8	Dhora	Checked keelback, also known commonly as Asiatic keelback	<i>Fowlea piscator</i>	Colubridae
9	Bamuni	Buff striped keelback	<i>Amphiesma stolatum</i>	Colubridae
10	Gowala	The banded krait	<i>Bungarus fasciatus</i>	Elapidae

3.2.4. Amphibian:

Sl. No.	Vernacular name	English Name	Scientific name	Family Name
1	Chuk Bhekuli	Asian common toad	<i>Duttaphrynus melanostictus</i>	Bufoidea
2	Bhamon Bhekuli	Indian bullfrog	<i>Hoplobatrachus tigerinus</i>	Dicroglossidae
3	Pat beng	West China tree toad	<i>Hyla annectans</i>	Hylidae

3.2.5. Fishes:

Sl. No.	Vernacular name	English Name	Scientific name	Family Name
1	Goroi	spotted snakehead	<i>Channa punctata,</i>	Channidae
2	Shingi	Asian stinging catfish or fossil cat	<i>Heteropneustes fossilis</i>	Heteropneustidae
3	Magur	Philippine catfish	<i>Clarias batrachus,</i>	Clariidae
4	Botia	<i>Botia</i>	<i>Botia dario</i>	Botiidae
5	Puthi	Pool barb, spotfin swamp barb, or stigma barb	<i>Puntius sophore</i>	Cyprinidae
6	Puthi	Systemus	<i>Systemus sarana(p.sarana)</i>	Cyprinidae
7	Puthi	The ticto barb, also known as the twospot barb	<i>Puntius ticto</i>	Cyprinidae
8	Shingora	Tengara catfish, Gangetic Mystus, or Tengra fish	<i>Mystus tengara</i>	Bagridae
9	Cheng		<i>Channa gachua</i>	Channidae
10	Chenar	Bulls eye snakehead,	<i>Channa marulius,</i>	Channidae

Sl. No.	Vernacular name	English Name	Scientific name	Family Name
11	Kholihona	banded gourami/ striped gourami, or Kholshhe	<i>Colisa fasciata</i> ,	Osphronemidae
12	Darikona	Indian flying barb	<i>Esomus danricus</i>	Cyprinidae
13	Chanda	longate glassy perchlet	<i>Chanda nama</i>	Ambassidae

3.2.6. Butterflies:

Serial no	English name	Scientific name	Family name
1	Common Mormon	<i>Papilio polytes</i>	Papilionidae
2	Lime Butterfly	<i>Papilio demoleus</i>	Papilionidae
3	Tailed Jay	<i>Graphium Agamemnon</i>	Papilionidae
4	Psyche	<i>Leptosia nina</i>	Pieridae
5	Indian Cabbage White	<i>Pieris canidia indica</i>	Pieridae
6	Common Gull	<i>Cepora nerissa Phryne</i>	Pieridae
7	Common Jezebel	<i>Delias eucharis</i>	Pieridae
8	Common Emigrant	<i>Catopsilia pomona</i>	Pieridae
9	Small Grass Yellow	<i>Eurema brigitta</i>	Pieridae
10	Common Grass Yellow	<i>Eurema hecabe</i>	Pieridae
11	Three-Spot Grass Yellow	<i>Eurema blanda</i>	Pieridae
12	Common Gem	<i>Poritia hewitsoni</i>	Lycaenidae
13	Common Pierrot	<i>Castalius rosimon</i>	Lycaenidae
14	Pale Grass Blue	<i>Pseudozizeeria maha</i>	Lycaenidae
15	Common Hedge Blue	<i>Actolepis puspa</i>	Lycaenidae

Sl. No.	English Name	Scientific name	Family Name
16	Plain Tiger	<i>Danaus chrysippus</i>	Nymphalidae
17	Striped Tiger	<i>Danaus genutia</i>	Nymphalidae
18	Common Evening Brown	<i>Melanitis leda</i>	Nymphalidae
19	Grey Pansy	<i>Junonia atlites</i>	Nymphalidae
20	Rice Swift	<i>Borbo cinnara</i>	Hesperiidae



Asian Open bill Stork



The white-breasted waterhen



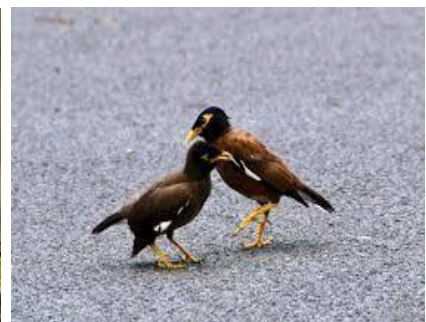
Spotted dove



House Sparrow



Cattle egret



Common myna



The red-vented bulbul



Indian Cabbage



White Oriental Garden lizard

Through the college lens: capturing the essence of faunal biodiversity

4. Energy audit

Nalbari college, situated in the vibrant academic landscape of Assam, India, stands committed to this global initiative. In alignment with its mission to foster a culture of sustainability and responsible stewardship, the college has undertaken a comprehensive energy audit spanning the period from 2019 to 2024. This audit seeks to evaluate and analyse the college's energy consumption patterns, identify areas of inefficiency, and propose actionable strategies to optimize energy usage. By scrutinizing the campus's energy infrastructure, operational practices, and behavioural dynamics, this audit endeavours to cultivate a culture of energy consciousness and propel the institution towards a greener and more sustainable future. In the following sections, we will delve into the methodology, findings, and recommendations derived from the energy audit of Nalbari college, offering insights into the institution's journey towards a more energy-efficient and environmentally conscious future.

4.1 Methodology: The entire energy audit practice based on the development of questionnaires and field survey and data collection, followed by analysis of the collected data set.

4.1.1. Questionnaires

- What are the sources of energy in the college campus (Electricity, Petrol, Diesel, Solar energy, and others)?
- What is the typical daily energy consumption in different campus buildings (e.g., classrooms, laboratories)?
- How many electrical equipment installed in the departments, classroom, and administrative block?
- What is the electricity bill in the last five years?
- What is the amount spent for the purchasing of diesel for generator set for last five years?
- Are there any energy-efficient practices currently in place within the college facilities (e.g., use of LED lighting, motion sensors, energy-efficient appliances)?
- Are there any renewable energy sources utilized on campus (e.g., solar panels, wind turbines)?
- How often are maintenance checks performed on energy-consuming equipment to ensure optimal efficiency?
- Are there any energy-saving policies or initiatives in place within the college (e.g., energy conservation campaigns, incentives for energy-efficient behaviours)?
- How does the college track and monitor its energy consumption and efficiency over time?
- Are there any potential areas for improvement identified by students, faculty, or staff regarding energy usage within the college?

4.1.2. Data collection

The committee members of the energy audit with the help of administrative office staff and students collected the data sets like energy sources, energy equipment installed in the department and classrooms, energy consumption pattern, electricity bill, fuel consumption, year

wise expense etc. in different sites of the college. The data recorded were further substantiated through survey and discussions.

4.2. Observation

i. Energy sources and consumption areas in Nalbari college

- The main energy source in Nalbari college is the electricity source supplied through overhead line from state electricity department (APDCL). The transformer installed in the college campus have the capacity of 100 kVA. Power is distributed to different units of the college from this transformer.
- In case of load shedding, the power demand is fulfilled through diesel fuel-based generator system.
capacity of the generator: 20 kVA
Power efficiency: ~80%
- Inverter based power backup system in selected departments and units.
- Solar panel with capacity of 20kW. Although, the solar panel was installed during 2023, it becomes functional from the current year, i.e. 2024.
- The highest amount of energy consumption was noted in the hostel, followed by library, science block, canteen, digital classroom, and administrative block.

ii. Energy consumption:

The electrical energy consumption pattern per year from 2018-2024 was determined from the electricity bill paid. Similarly, the diesel consumption was calculated from the purchasing voucher. The cost incurred during the installation/repairing of the solar panel is also included here. The detailed is documented in tabular form as under –

Table 4.1. Details of energy consumption per year

Sl No.	Year	Electricity bill (INR)	Diesel charges (INR)	Solar panel installation/repairing charges (INR)
01	2019-20	4,64,329/-	98,900/-	
02	2020-21	3,13,453/-	54,300/-	
03	2021-22	5,24,760/-	60,100/-	
04	2022-23	4,97,908/-	62,500/-	
05	2023-24	5,85,340/-	54,700/-	1,75,000/-

iii. Comparison between maximum electricity demand (KVa) and Contract electricity demand (KVa) in a year

Maximum electricity demand is the highest level of electrical power consumption during a specific period. Likewise, the contract demand is the amount of electric power that a customer demands from utility in a specified interval. We have analysed both the parameter for a complete financial year 2023-2024. The findings are tabulated as under

Table 4.2. Month-wise comparison between maximum electricity demand (KV_a) and Contract electricity demand (KV_a) considering 2023-2024 as the standard.

Sl No.	Month	Maximum electricity demand (KV _a)	Average electricity demand (KV _a)	Contract electricity demand (KV _a)
01	April, 2023	34.36		67
02	May, 2023	33		67
03	June, 2023	33.36		67
04	July, 2023	20.56		67
05	August, 2023	36.46		67
06	September, 2023	35.88	26.405	67
07	October, 2023	43.08		67
08	November, 2023	22.68		67
09	December, 2023	11.88		67
10	January, 2024	13.56		67
11	February, 2024	13.56		67
12	March, 2024	18.48		67

iv. Key Findings and Observations of Energy Usages in the last five years (2019-2024)

a) Total electricity charges	:23,85,790/-
b) Total cost incurred in diesel as generator fuel	:3,30,500/-
c) Total cost of energy {electricity(a) + Diesel(b)}	: 27,16,290/-
d) Solar panel installation	: Free installation
e) Solar panel repairing	:1,75,000/-
f) Average cost of energy per month	: 45,272/-
g) Average cost of energy per year	: 5,43,264/-
h) Average in maximum electricity demand (KV _a)	:26.405

* The solar panel was installed in the college during 2023. However, it remained non-functional due to technical issues. During 2023-24, the panel was repaired again and installed properly. Therefore, the overall energy cost will be reduced from the upcoming financial year.

** The contract electricity demand could be reduced as the average of the maximum electricity demand is 26.405 during the financial year 2023-2024. This will save additional budget incurred as electricity charges yearly.

v. Energy-saving policies or initiatives in place within the college

- Solar panels installed in the RCC roof of the college building.
- Installation of solar street lights inside the college campus.
- New construction projects give more priority on the energy-efficient design principles.
- Older buildings are under the process of retrofitting to improve insulation, upgrade windows, and implement other energy-saving measures.
- Colleges is deploying smart meters and building automation systems to monitor and optimize energy usage in real-time, identifying areas for improvement and adjusting energy settings accordingly.
- Turn OFF electrical equipment's when not in use
- CFLs and other lights are being replaced by more efficient LED
- Use of computer and electronic equipment's in power saving mode.

vi. Recommendations for better energy efficiency

Improving energy efficiency within colleges requires a multifaceted approach that encompasses both technical solutions and behavioural changes. Here are some recommendations for enhancing energy efficiency:

a) No investment/low-cost measures:

- i. Rooms need to be well ventilated for maximized sunlight.
- ii. The ceiling fans need to be cleaned for better motor efficiency of the fan.
- iii. Use minimum amount of light and fan inside the classrooms. Switch off the fan and light if not required.
- iv. Try to avoid air-conditioners. Maximize the use of low energy consuming electrical fans.
- v. The switches of the ceiling fan and light inside the classroom should be arranged in such a way that we can minimize their unnecessary use.
- vi. Install a master switch outside each classroom, so that anyone can switch off the light and fan of the classroom from outside if it is locked.
- vii. Optimize the use of existing infrastructure and resources, such as scheduling classes and activities in a way that minimizes energy consumption, consolidating space usage to reduce heating and cooling needs, and implementing water-saving measures.
- viii. The college authority and teaching staff need to aware the students about the future benefits of energy conservation.

b) Long term planning/high investment

- i. Implement campus-wide policies and guidelines to promote energy conservation, such as setting thermostat limits, implementing power management settings on computers, and encouraging the use of energy-efficient appliances and equipment.
- ii. Replace the overhead power supply line with underground system. Frequent storm and heavy rain are common in Assam during the monsoon season. Sometimes, it causes heavy destruction in the overhead electricity supply system. Extra cost incurred in this period as college need to purchase additional diesel to run the generator. Similarly, the repairing of the overhead electrical line is an extra burden on the college fund. The overall recurring expenditure can be cut down with the installation of the underground electrical supply system.

c) During the survey, the audit team found the high contract electricity demand. Additional cost is incurred annually due to the allocation of extra contract electricity demand. The college authority needs to discuss with the competent authority of IRCA, APDCL, Rangia to reduce the amount into an optimum level.

vii. Overall consolidated findings of the energy audit

- i. Assessment and future probable electrical load calculation is adequate.
- ii. The college is paying the monthly electricity bill continuously.
- iii. Monthly electricity consumption is not above the benchmark level.
- iv. The college is giving much emphasis on reducing the power consumption and replace the non-renewable energy source with renewable energy.
- v. The competent college authority is giving importance on energy conservation awareness among the stakeholders of the college.

viii. Post audit phage

Energy audit is a regular practice. This is required for the proper management of the energy sources. Minimum energy utilization and innovative energy saving ingenuities need to be

followed for a sustainable future. College needs to give emphasis on the recommendations of the of the audit team before the next audit.

ix. Supplementary materials used during energy audit

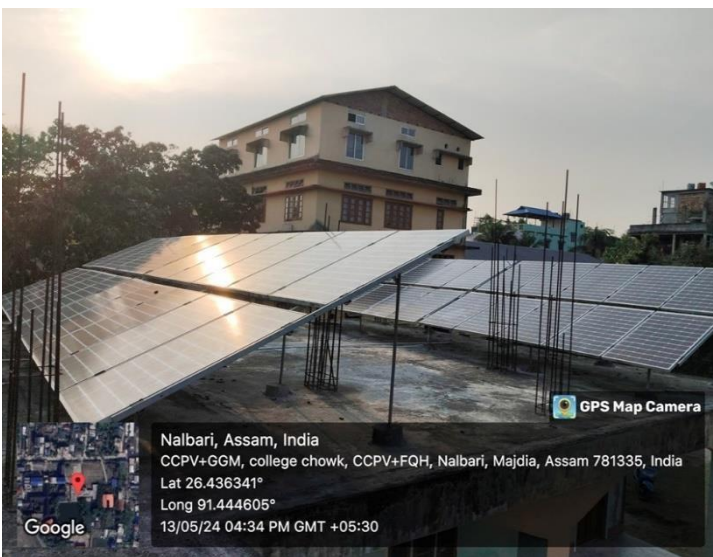
Table 4.3. Account of electrical stuffs in the departments/classrooms of Nalbari college

Sl no	Department/ Room	No of Laptop	No of desktop computer	No. of printer	No. of projector	No. of refrigerator	No. of fan	No. of light	Other electronic devices
1	Principals' Office & Administrative Block	01	12	06		01	14	25	Air conditioner 02
2	Assamese	NIL	01	01	01	NIL	05	05	Pure drop water filter 01
3	Economics	NIL	02	01	01	NIL	07	06	NIL
4	Education	NIL	01	NIL	NIL	NIL	04	03	NIL
5	English	NIL	03	01	01	NIL	02	03	Pure drop water filter 01
6	Geography	02	10	01	01	NIL	10	15	Pure drop water filter 01
7	History	NIL	01	01	01	NIL	12	09	NIL
8	Philosophy	NIL	01	NIL	NIL	NIL	02	01	NIL
9	Political Science	NIL	01	01	01	NIL	04	05	NIL
10	Sanskrit	NIL	01	01	01	NIL	05	03	NIL
11	Botany	NIL	05	01	01	01	11	07	Pure drop water filter 01
12	Chemistry	01	02	01	01	01	15	25	Pure drop water filter 01
13	Mathematics	01	01	01	01	NIL	05	07	NIL
14	Physics	01	03	01	01	NIL	07	06	Pure drop water filter 01

Sl no	Department/ Room	No of Laptop	No of desktop computer	No. of printer	No. of projector	No. of refrigerator	No. of fan	No. of light	Other electronic devices
15	Statistics	01	20	01	01	NIL	04	02	Pure drop water filter 01
16	Zoology	NIL	01	01	02	01	27	18	Pure drop water filter 01
17	Geology	NIL	01	NIL	NIL	NIL	01	02	NIL
18	Computer Application	NIL	02	01	01	NIL	08	04	NIL
19	Computer Application lab	NIL	30	04	01	NIL	10	10	NIL
20	Central computer laboratory	NIL	30	04	01	NIL	08	06	NIL
21	Library	NIL	18	03	NIL	NIL	41	60	Pure drop water filter 01
22	IQAC	01	02	02	01	NIL	02	08	Air conditioner 01
23	NRC	NIL	04	01	NIL	NIL	03	02	NIL
24	PGA	NIL	NIL	NIL	NIL	NIL	12	08	NIL
25	R-09	NIL	NIL	NIL	NIL	NIL	05	04	NIL
26	R-10	NIL	NIL	NIL	NIL	NIL	05	05	NIL
27	BOT-01	NIL	NIL	NIL	01	NIL	04	02	Air conditioner 01
28	BOT-02	NIL	NIL	NIL	NIL	NIL	04	06	NIL
29	R-07	NIL	NIL	NIL	NIL	NIL	06	05	NIL
30	R-08	NIL	NIL	NIL	NIL	NIL	04	03	NIL
31	ZOO-01	NIL	NIL	NIL	NIL	NIL	04	02	NIL
32	ZOO-02	NIL	NIL	NIL	NIL	NIL	04	02	NIL

Sl no	Department/ Room	No of Laptop	No of desktop computer	No. of printer	No. of projector	No. of refrigerator	No. of fan	No. of light	Other electronic devices
33	ZOO-03	NIL	NIL	NIL	NIL	NIL	04	02	NIL
34	ZOO-04	NIL	NIL	NIL	NIL	NIL	04	03	NIL
35	ZOO-05	NIL	NIL	NIL	NIL	NIL	04	03	NIL
36	CHEM-01	NIL	NIL	NIL	NIL	NIL	02	02	NIL
37	CR	NIL	NIL	NIL	NIL	NIL	11	08	NIL
38	NB-02	NIL	NIL	NIL	NIL	NIL	05	04	NIL
39	BB-01	NIL	NIL	NIL	NIL	NIL	04	02	NIL
40	BB-02	NIL	NIL	NIL	NIL	NIL	03	06	NIL
41	BB-11	NIL	NIL	NIL	NIL	NIL	03	04	NIL
42	AB-11	NIL	NIL	NIL	NIL	NIL	05	04	NIL
43	AB-12	NIL	NIL	NIL	NIL	NIL	04	04	NIL
44	Examination Room	NIL	NIL	NIL	NIL	NIL	02	06	NIL
45	Teachers' Common Room	NIL	02	NIL	NIL	01	04	06	NIL
46	AB12	NIL	NIL	NIL	NIL	NIL	02	02	NIL
47	AB13	NIL	NIL	NIL	NIL	NIL	05	02	NIL
48	AB14	NIL	NIL	NIL	NIL	NIL	04	02	NIL
49	AB21	NIL	NIL	NIL	NIL	NIL	03	02	NIL
50	AB22	NIL	NIL	NIL	NIL	NIL	03	03	NIL
51	Digital Class room	NIL	NIL	NIL	NIL	NIL	01	24	Air conditioner 03
52	KMBH1	NIL	NIL	NIL	NIL	NIL	02	02	NIL
53	KMBH2	NIL	NIL	NIL	NIL	NIL	02	02	NIL
54	KMBH3	NIL	NIL	NIL	NIL	NIL	02	02	NIL
55	KMBH4	NIL	NIL	NIL	NIL	NIL	02	02	NIL

Sl no	Department/ Room	No of Laptop	No of desktop computer	No. of printer	No. of projector	No. of refrigerator	No. of fan	No. of light	Other electronic devices
56	KMBH21	NIL	NIL	NIL	NIL	NIL	06	02	NIL
57	SB01	NIL	NIL	NIL	NIL	NIL	06	05	NIL
58	SB02	NIL	NIL	NIL	NIL	NIL	06	04	NIL
59	SB03	NIL	NIL	NIL	NIL	NIL	04	02	NIL
60	SB04	NIL	NIL	NIL	NIL	NIL	03	02	NIL
61	SB05	NIL	NIL	NIL	NIL	NIL	02	02	NIL



20 kW capacity Solar panel is installed on the roof of science block

Solar street light in the college campus



Energy audit certificate


This is to certify that the 'energy audit' for Nalbari College, P.O.: Nalbari, Nalbari - 781335, (Assam) has been conducted from 2019 to 2024, evaluate its energy consumption patterns, identify areas of inefficiency, and recommend measures for improvement. This audit typically outlines the findings of the energy audit, including energy-saving opportunities, potential cost savings, and suggested actions to enhance energy efficiency and reduce energy consumption.

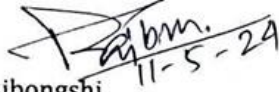
Place: Nalbari

Date: 11/05/2024


Principal
Nalbari College, Nalbari
Assam
Dr. Kamal Mayan Patowary
Principal & Chairman, Green Audit Committee
Nalbari College, Nalbari




Dr. Rupak Kr. Sarma
Assistant Professor, Department of Botany &
Co-ordinator, Green audit committee
Nalbari College, Nalbari


Ananta Rajbongshi
Associate Professor & Head, Department of Physics &
Internal auditor, Energy audit committee
Nalbari College, Nalbari


11-05-2024
Area Manager
IRCA, APDCL (LAR)
MEC, Mangaldai
Jayanta Bhatta
Area Manager, IRCA, Mangaldoi Electrical Circle, APDCL, LAR &
External Energy auditor

5. Assessment of the plantation soil, water, air, and noise quality in the college campus.

5.1. Plantation soil quality inside the college campus: Testing of plantation soil inside the college campus is one of the prime requirements of green audit. The scientific analysis of soil samples from different corners of the college campus will provide an in-depth idea about the fertility and future probable application of the college and resource for sustainable and smart agriculture.

5.1.1. Methodology: The soil sample was collected from different soil horizon upto 45cm depth from 06 different collection sites covering the whole college campus. At first the surface grass was clearly removed and collected the surface soil, followed by the collection of soil sample of 15 cm and 45cm of depth. All the three soil sets were mixed, air dried, removed the plant parts, sieved properly and analysed the soil pH, organic carbon, available nitrogen, P₂O₅, and K₂O. The analysis was carried out at Department of Botany, Nalbari college, Nalbari in collaboration with AAU-Horticultural Research Station, Kahikuchi, Guwahati.

5.1.2. Findings: The findings are mentioned in tabular form below –

Table 5.1.1. Study of soil quality in the college campus

Sl No.	Parameters	Collection sites					
		G1	S1	S2	S3	S4	S5
1.	pH (1:2)	7.6	7.6	7.5	7.7	8.1	8.2
2.	Water holding capacity (%)	42.5	40.3	45.2	41.1	46.3	44.2
3.	Organic carbon (%)	2	1.64	1.78	1.67	0.88	0.85
4.	Available N (Kg/ha)	453.4	219.2	546.3	468.5	316.3	205.4
5.	Available Phosphorus (Kg/ha)	45.2	16.6	63.00	56.3	11.02	13.05
6.	Available Potassium (Kg/ha)	70.2	60.13	78.01	55.10	13.43	22.03

5.1.3. Inference: Overall observations denote the good plantation soil quality inside the college campus. The soil is found to be neutral to slightly alkaline in site G1, S1, S2, and S3. This suggests good pH conditions for soil microbial activity. However, slightly high pH was noticed in the study sites S4 and S5. Accordingly, the two sites can be opted for the plantation of the alkaline soil-loving plants. The soil samples of all the collection sites have good water holding capacity, depicting the clayey soil nature, beneficial for the proper growth and development of plants. Similarly, the soil organic carbon content higher than 1.5% in the surface soil is considered adequate for soil plant nutrition. Besides the two collection sites (S4 and S5), soil of all the other collection sites is nourished with a good amount of organic carbon, a good sign for plantation soil. Accordingly, the available N, P, and K in the soil samples were monitored and found in better condition. The quantity of N, P, and K in the collection sites S4 and S5 can be accelerated with biological methods in near future.

5.2. Management of water resource


5.2.1. Drinking water quality: Assessing the drinking water quality of a college campus is essential to ensure the health and safety of students, faculty, and staff. Ground water sampling and testing for various parameters like pH, turbidity, alkalinity, total hardness, Ca hardness, TDS; and contaminants like bacteria (such as *E. coli*), heavy metals (e.g. Iron, fluoride, arsenic), and chlorine should be a regular practice for any educational institutions.

5.2.1.1. Methodology: Drinking water samples from four different boring sites inside the college campus were collected in clear plastic bottles and sent for analysis to District Level Laboratory (DLL), Public Health Engineering (PHE) Office, Nalbari, Assam.

5.2.1.2. Result and inference:

The competent authority of DLL, PHE, Nalbari have analysed the water sample and provided the results as stated below

Table 5.2.1.1. Drinking water quality inside the college campus

Sl No.	Pin point location	pH	Turbidity (NTU)	Iron (mg/l)	Alkalinity (mg/l)	Chlorine (mg/l)	Total Hardness (mg/l)	Ca Hardness (mg/l)	TDS (mg/l)	Fluoride (mg/l)	Arsenic (mg/l)	Bacteria (MPN)
		Permissible limit 										
		6.5-8.5	1-5	0.3-1.0	200-600	250-1000	300-600	75-200	500-1000	1.0-1.5	0.01	0/100mL
1.	College canteen	7.05	0	0.091	112.0	11.34	72.0	30.0	132.0	0.000	0.005	Nil
2.	Administrative office	6.82	0	0.391	82.0	15.59	62.0	42.0	220.0	0.221	0.006	Nil
3.	Sanskrit Dept.	7.21	0	0.651	56.0	11.34	118.0	18.0	162.0	0.352	0.007	Nil
4.	College Library	6.62	0	0.336	102.0	9.92	98.0	42.0	220.0	0.251	0.006	Nil

*Based on the above result, it is concluded that the water samples are POTABLE as per BIS: 10500.

WATER ANALYSIS REPORT

**DISTRICT LEVEL LABORATORY (DLL)
(PHE) NALBARI DIVISION, NALBARI**

REPORT NO. - PHE/NAL/DL/WQR/2024-25/1108

Dated- 13-05-2024


Date of Sample Collection: 03/05/2024


Date of Testing Completed: 06/05/2024

Sl No.	Pin Point Location	Block	GP	Village	Type of Source	TEST RESULT (TREATED WATER through IRP)										
						pH	Turbidity	Iron	Alkalinity	Chloride	Total Hardness	Ca Hardness	TDS	Fluoride	Arsenic	Bacteria (by vial)
(Desirable Limit ----- Permissible Limit) ----->						(6.5 --- 8.5)	(1-5)	(0.3 --- 1.0)	(200 --- 600)	(250 --- 1000)	(300 --- 600)	(75 --- 200)	(500 --- 1000)	(1.0 --- 1.5)	(0.01 --- 0.03)	Nil
UNIT -->							NTU	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	
1	Nalbari College Canteen	Pub Nalbari	4 No. Khata	Japarkuchi	Bore Well	7.05	0	0.091	112.0	11.34	72.0	30.0	132.0	0.000	0.005	Nil
2	Nalbari College Office	Pub Nalbari	4 No. Khata	Japarkuchi	Bore Well	6.82	0	0.391	82.0	15.59	62.0	42.0	220.0	0.221	0.006	Nil
3	Sanskrit Deptt., Nalbari College	Pub Nalbari	4 No. Khata	Japarkuchi	Bore Well	7.21	0	0.651	56.0	11.34	118.0	18.0	162.0	0.352	0.007	Nil
4	Library, Nalbari College	Pub Nalbari	4 No. Khata	Japarkuchi	Bore Well	6.62	0	0.336	102.0	9.92	98.0	42.0	220.0	0.251	0.006	Nil

N.B.:- The water of the samples are **POTABLE** as per BIS: 10500.
Result correspondence as per sample received.


Microbiologist, DLL (PHE)
NALBARI DIVISION, NALBARI


Asstt. Chemist
District Level Laboratory (PHE)
NALBARI DIVISION, NALBARI

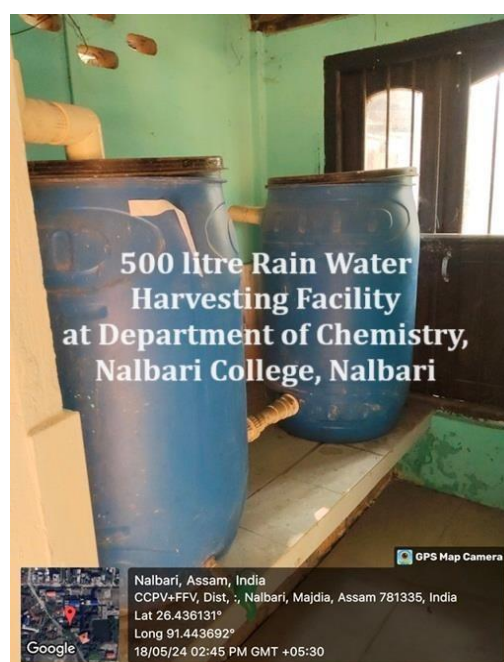

Lab In-charge (PHE)
Assistant Executive Engineer (PHE)
NALBARI DIVISION, NALBARI

5.2.2. Water use and conservation

Water use and conservation within a college campus is an important aspect of sustainability and responsible resource management. The Nalbari college is highly dependent on ground water for daily activities of almost the average of 2000 people. The college has 05 numbers of boring wells and sub permissible pumps. Subsequently, the college has installed a good number of cemented and polymer (PVC) water tank across the campus (Table 5.2.2.1). Although the ground water level in the district is not under threatened state, continuous deep boring exercise may lead to geogenic contamination of the water with arsenic, fluoride, or any other heavy metal. Recently, the arsenic and fluoride contamination in the ground water of Nalbari district has been reported (Central Ground water Report 2023). Such type of contamination may lead to the serious health issues to the consumers like kidney damage, liver failure, gastric issues, mental retardation, bone and teeth decomposition etc. Thus, we need to minimize the extraction of ground water in day-to-day activities, other than the drinking water. Taking this point in mind, the college has installed two rain harvesting units with 1000Ltr and 500Ltr capacity. One such facility is installed in the department of Chemistry of the college. The department store the rain water adequately for future use in rinsing the laboratory glass wares. The collected rain water in the other harvesting tank is used in the watering of the college gardens. Moreover, this facility is need to be arranged in each building to reduce the use of ground water. Similarly, the college authority has conserved the wetland areas and a large fresh water pond for proper ground water recharging.

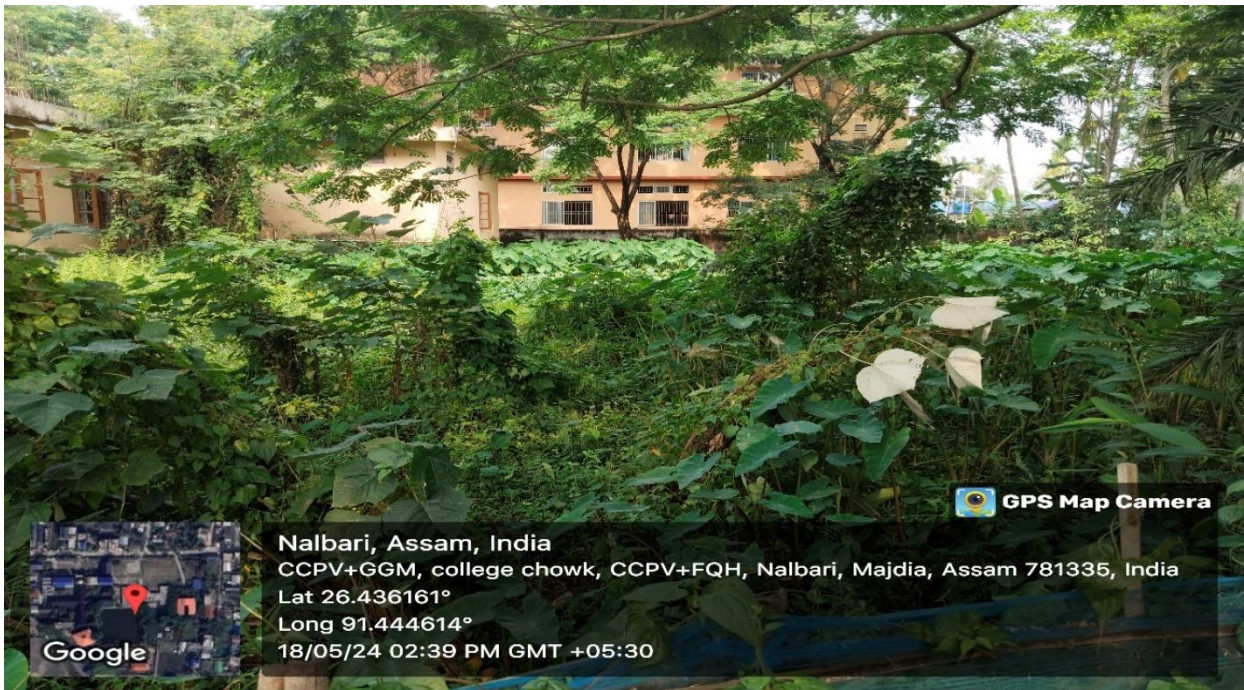
Table 5.2.2.1. Storage capacities of water tanks inside the college campus

Sl No.	Number of Tank	Cemented/polymer (PVC) water tank	Total Capacity (Ltr)
1	01	Cemented	12000
2	01	Cemented	6000
3	07	Polymer (PVC) water tank	1000
4	06	Polymer (PVC) water tank	500





Using college pond for groundwater replenishment



Preserving wetlands to enhance groundwater recharge

5.2.3. Weather and air quality in the college campus (2019-2024)

Good weather and air quality is significantly important in any educational institution. Failing to provide good air quality can lead to an increase in long-term and short-term health problems for students and staff as well. Accordingly, air quality inside the Nalbari college campus is monitored by Assam Pollution Control Board, Guwahati. However, some of the data of air quality and weather condition was retrieved from the official website of Central Pollution Control Board (Govt. of India) and other authentic sources.

5.2.3.1. Observations

5.2.3.1.1. Weather: Yearly average of Temperature, Rainfall and Humidity in the college during 2019-2024 was collected from the online sources <https://weatherandclimate.com>, and <https://www.accuweather.com>.

Year 2019

Sl No	Year	Month	Average temperature (°C)		Average Humidity (%)	Average rainfall (inch)
			Maximum	Minimum		
1	2019	January	24.49	13.84	62.66	0.17
2		February	27.64	15.92	55.67	0.24
3		March	32.34	19.38	44.48	0.23
4		April	34.66	22.48	52.44	1.18
5		May	33.63	23.85	69.14	4.35
6		June	33.54	25.86	78.37	5.71
7		July	31.35	25.72	87.17	8.68
8		August	33.62	26	81.31	5.46
9		September	31.56	24.6	83.78	4.59
10		October	30.41	21.29	81.14	2.14
11		November	27.92	17.71	76.42	0.31
12		December	24.69	14.35	71.74	0.31

Year 2020

Sl No	Year	Month	Average temperature (°C)		Average Humidity (%)	Average rainfall (inch)
			Maximum	Minimum		
1	2020	January	25.13	12.22	62.16	0.15
2		February	26.16	15.14	54.23	0.22
3		March	32.56	18.21	42.12	0.21
4		April	32.21	21.56	52.23	1.15
5		May	33.14	23.46	65.21	4.34
6		June	33.33	24.35	75.67	5.64
7		July	33.67	26.62	85.13	8.71
8		August	34.10	25	79.42	4.68
9		September	31.23	24.11	84.63	4.59
10		October	30.21	21.23	83.22	2.23
11		November	26.52	16.34	75.23	0.29
12		December	22.87	13.43	72.16	0.30

Year 2021

Sl No	Year	Month	Average temperature (°C)		Average Humidity (%)	Average rainfall (inch)
			Maximum	Minimum		
1	2021	January	26.12	11.25	63.15	0.14
2		February	25.14	14.11	53.21	0.22
3		March	33.45	16.21	43.42	0.19
4		April	35.11	22.36	53.21	1.21
5		May	35.67	22.76	66.71	4.56
6		June	36.34	23.67	76.17	5.21
7		July	36.35	25.32	84.23	8.41
8		August	36.76	24.45	78.22	4.21
9		September	30.43	24.11	85.43	4.49
10		October	29.61	20.23	82.23	2.13
11		November	27.52	17.31	74.43	0.27
12		December	21.57	14.43	71.26	0.31

Year 2022

Sl No	Year	Month	Average temperature (°C)		Average Humidity (%)	Average rainfall (inch)
			Maximum	Minimum		
1	2022	January	27.22	12.15	62.35	0.13
2		February	27.24	15.12	54.21	0.23
3		March	34.35	16.34	42.12	0.18
4		April	34.51	21.76	52.41	1.23
5		May	36.17	23.86	67.51	3.36
6		June	36.34	25.77	77.17	5.21
7		July	36.21	26.54	83.73	7.86
8		August	36.30	25.25	79.12	4.71
9		September	31.23	26.51	86.33	4.49
10		October	30.44	21.43	81.53	2.14
11		November	28.62	18.31	75.73	0.27
12		December	23.57	15.23	73.36	0.29

Year 2023

Sl No	Year	Month	Average temperature (°C)		Average Humidity (%)	Average rainfall (inch)
			Maximum	Minimum		
1	2023	January	28.32	13.15	61.24	0.11
2		February	28.34	16.22	55.11	0.19
3		March	35.15	17.24	44.42	0.16
4		April	35.32	22.26	54.51	1.05
5		May	36.77	24.26	66.11	3.02
6		June	36.14	25.14	78.47	5.21
7		July	36.23	27.12	85.13	7.86
8		August	36.75	26.15	80.32	4.71
9		September	33.11	28.21	87.13	4.49
10		October	32.44	23.43	83.13	2.14
11		November	29.22	19.56	76.23	0.27
12		December	23.67	16.43	74.16	0.29

Year 2024

Sl No	Year	Month	Average temperature (°C)		Average Humidity (%)	Average rainfall (inch)
			Maximum	Minimum		
1	2024	January	27.72	12.20	63.22	0.13
2		February	29.34	17.32	56.71	0.15
3		March	34.16	20.34	47.34	0.17
4		April	34.66	25.66	56.53	1.01
5		May	36.34	27.20	67.51	2.67

Comment: The overall data set depicts the normal weather of the region. However, the temperature is increasing gradually. This is due to the ongoing urbanization and rapid industrialization in the nearby areas. The region experienced warmest month in August 2020. Similarly, the coldest month was January 2020.

5.2.3.1.2. Air quality:

The average data on air quality during 2019-2024 was collected from the air quality collection data centre installed inside the college campus by Assam pollution control board. However, some of the data were collected from the official website of central pollution control board (Govt. India).

Year 2019

Sl No	Parameters	Average data	Unit	AQI
01	PM ₁₀	75	µg/m ³	35
02	MP _{2.5}	42		
03	SO ₂	3		
04	NO ₂	4		
05	Ozone (O ₃)	45		
06	Carbon monoxide (CO)	0.11		

Year 2020

Sl No	Parameters	Average data	Unit	AQI
01	PM ₁₀	80	µg/m ³	39
02	MP _{2.5}	45		
03	SO ₂	4		
04	NO ₂	6		
05	Ozone (O ₃)	50		
06	Carbon monoxide (CO)	0.11		

Year 2021

Sl No	Parameters	Average data	Unit	AQI
01	PM ₁₀	95	µg/m ³	42
02	MP _{2.5}	50		
03	SO ₂	06		
04	NO ₂	08		
05	Ozone (O ₃)	62		
06	Carbon monoxide (CO)	0.16		

Year 2022

Sl No	Parameters	Average data	Unit	AQI
01	PM ₁₀	92		
02	MP _{2.5}	47		
03	SO ₂	06	µg/m ³	40
04	NO ₂	07		
05	Ozone (O ₃)	60		
06	Carbon monoxide (CO)	0.14		

Year 2023

Sl No	Parameters	Average data	Unit	AQI
01	PM ₁₀	100		
02	MP _{2.5}	53		
03	SO ₂	8	µg/m ³	45
04	NO ₂	10		
05	Ozone (O ₃)	75		
06	Carbon monoxide (CO)	0.21		

Year 2024 (up to 26th April 2024)

Sl No	Parameters	Average data	Unit	AQI
01	PM ₁₀	128		
02	MP _{2.5}	56		
03	SO ₂	9	µg/m ³	48
04	NO ₂	12		
05	Ozone (O ₃)	78		
06	Carbon monoxide (CO)	0.25		

Abbreviations: PM₁₀ - particulate matter 10 micrometres or less in diameter; MP_{2.5} - particulate matter 10 micrometres or less in diameter; NO₂ - Nitrogen Dioxide; CO - Carbon Monoxide; SO₂ - Sulphur Dioxide; µg/m³ - Micrograms per Cubic Meter of Air; AQI - Air Quality Index

Comment: From the above tabulated data, the average air quality index (AQI) from 2019 to 2024 was calculated as 41.5. This satisfies the satisfactory air quality index inside the college campus. However, the AQI is on the borderline between good and moderate air quality (according to the air quality index scale of the Central Pollution Control Board), which needs the utmost attention. The ongoing construction activities and industrialization in the nearby areas have gradually increased the contents of air pollutants which need proper regulation.



Pollution Control Board, Assam

Central Laboratory, Bamunimaidam, Guwahati

অসম প্ৰদূষণ নিয়ন্ত্ৰণ পৰিষদ

কেন্দ্ৰীয় পৰীক্ষাগাৰ, বামুনীমৈদাম, গুৱাহাটী



Test Report

REPORT NO.	AA- 06/24		
SERVICE REQUEST NO.	20/2024	SERVICE REQUEST DATE	08.04.2024
DATE OF ISSUE	30.04.2024	SAMPLE RECEIVED DATE	26.04.2024
NAME & ADDRESS	Nalbari College, Nalbari, Assam, PIN-781335		
Location Description			GPS Co-Ordinates
Within the college premises of Nalbari College, Nalbari.			Latitude: 26.436231°; Longitude: 91.441706°

AMBIENT AIR QUALITY ANALYSIS

Sampling Details:

Date and Time of Start of Sampling	25-04-2024; 12.00 Hrs
Date and Time of Completion of Sampling	26-04-2024; 12.30Hrs
Sampling done by	Sri R. Haque (AES); Sri M.K.Dutta (SA); Sri H.B. Deka(SA)
Sampling duration	24 hrs
Date of analysis	29-04-2024
Sampling equipment used	RDS:PCBA/Air/PM10/01& FPS: PCBA/Air/PM2.5/15
Ambient Temperature (°C)	Max: 33°C Min: 23°C
Weather condition	Clear sky
Sampler location w.r.t. height from GL	Approx..10 meters

Test Result:

Sl. No	Parameters	Test Method	Sampling Method	Unit	Result	National Ambient Air Quality Standards, 2009 as per CPCB
1	PM 10 or Particulate Matter of size ≤ 10 micron	IS:5182 (Part 23)-2006 (Re-affirmed 2017)	IS:5182 (Part 23)-2006 (Re-affirmed 2017)	$\mu\text{g}/\text{m}^3$	128	100 $\mu\text{g}/\text{m}^3$ (24 hours average)
2	PM2.5 or Fine Particulate matter of size ≤ 2.5 micron	IS:5182 (Part 24)2019	IS:5182 (Part 24) 2019	$\mu\text{g}/\text{m}^3$	56	60 $\mu\text{g}/\text{m}^3$ (24 hours average)
3	Sulphur Dioxide as SO ₂	IS:5182(Part2)-2001 (Re-affirmed 2017)	IS:5182(Part2)-2001(Re-affirmed 2017)	$\mu\text{g}/\text{m}^3$	9	80 $\mu\text{g}/\text{m}^3$ (24 hours average)
4	Oxides of Nitrogen as NO ₂	IS:5182(Part6) (Re-affirmed 2022)	IS:5182(Part6) (Re-affirmed 2022)	$\mu\text{g}/\text{m}^3$	12	80 $\mu\text{g}/\text{m}^3$ (24 hours average)

End of Report

Note: The results related to the parameter tested only.

Checked By

(G.K.Misra)

Addl. Chief Env. Scientist

Reviewed & Authorized by

(Monoj Saikia)

Chief Env. Scientist



Pollution Control Board, Assam

Central Laboratory, Bamunimaidam, Guwahati

অসম প্ৰদূষণ নিয়ন্ত্ৰণ পৰিষদ

কেন্দ্ৰীয় পৰীক্ষাগাৰ, বামুনীমৈদাম, গুৱাহাটী



Test Report

REPORT NO.	AA- 06/24		
SERVICE REQUEST NO.	20/2024	SERVICE REQUEST DATE	08.04.2024
DATE OF ISSUE	30.04.2024	SAMPLE RECEIVED DATE	26.04.2024
NAME & ADDRESS	Nalbari College, Nalbari, Assam, PIN-781335		
Location Description			GPS Co-Ordinates
Within the college premises of Nalbari College, Nalbari.			Latitude: 26.436231°; Longitude: 91.441706°

AMBIENT AIR QUALITY ANALYSIS

Sampling Details:

Date and Time of Start of Sampling	25-04-2024; 12.00 Hrs
Sampling done by	Sri R. Haque (AES); Sri M.K.Dutta (SA); Sri H.B. Deka(SA)
Sampling duration	8 hrs
Date of analysis	29-04-2024
Sampling equipment used	HORIBA APMA-370 & HORIBA APOA-370
Ambient Temperature (°C)	Max: 33°C Min: 23°C
Weather condition	Clear sky
Sampler location w.r.t. height from GL	Approx..10 meters

Test Result:

Sl.No	Parameters	Test Method	Unit	Result	National Ambient Air Quality Standards, 2009 as per CPCB
1	Ozone (O ₃)	UV Photometric Method	µg/m ³	78	100 µg/m ³ (8 hours average)
2	Carbon Monoxide (CO)	Non-Dispersive Infrared Method	mg/m ³	0.25	2 mg/m ³ (8 hours average)

Note:

1. The results given above are related to the tested sample, for various parameters as analyzed.

Checked By

(G.K.Misra)

Addl. Chief Env. Scientist

Reviewed & Authorized by

(Monoj Saikia)

Chief Env. Scientist

5.4. Ambient noise quality inside the college campus: Assessing noise quality inside a college campus is essential for maintaining an environment conducive to learning, research, and general well-being. The sampling and analysis of noise quality was performed in different sampling locations inside the college campus by the experts from Assam Pollution Control Board. The result is tabulated as under –

Table 5.4.1. Noise quality inside the college campus

Sl No.	Source/Location	Noise level in dB(A)	Noise (Ambient Standards) in dB(A)			
			During day time (in between 06 AM & 10 PM)		During night time (in between 10 PM & 06 AM)	
01	Near college main gate (within the college campus)	63.1	Industrial zone	75	Industrial zone	70
02	Near Botany Department	49.2	Commercial zone	65	Commercial zone	55
03	Near Zoology Department	57.7				
04	Near two-wheeler parking area	62.4	Silence zone	50	Silence zone	40

5.4.1. Comment: The assessment provides a comprehensive overview of the noise quality on campus and help to formulate practical solutions to mitigate identified issues in concerned locations. The practical solutions will enhance the academic and living environment for students and staff. Moreover, the above data establishes that the Nalbari college Camus is free from ambient noise as the sound decibels in all the testing sites is less than the threshold limit.



The flowers that bloom tomorrow are the seeds you planted today



Pollution Control Board, Assam

Central Laboratory, Bamunimaidam, Guwahati

অসম প্ৰদূষণ নিয়ন্ত্ৰণ পৰিষদ

কেন্দ্ৰীয় পৰীক্ষাগাৰ, বামুনীমৈদাম, গুৱাহাটী



Lifestyle for
Environment

Test Report

REPORT NO.	AN- 05/24		
SERVICE REQUEST NO.	20/24	SERVICE REQUEST DATE	08.04.2024
DATE OF ISSUE	30.04.2024	SAMPLE RECEIVED DATE	-----
Location Details: Nalbari College, Nalbari, Assam.			
GPS Co-Ordinates: Latitude:26.436231°; Longitude:91.441706°			

Sampling Details:

Date of sampling	25-04-2024
Sampling done by	Sri R. Haque (AES); Sri M.K.Dutta (SA); Sri H.B. Deka(SA)
Date of analysis	29-04-2024
Sampling equipment used	PCBA/Air/SLM/01& PCBA/Air/SLM/02
Ambient Temperature (°C)	Max: 34°C
	Min: 21 °C
Weather condition	Clear sky

Test Result:

Source/Location	Noise Level in dB(A) in Leq	Remarks	Noise (Ambient Standards) in dB (A) in Leq			
			During day time (in between 6.00 AM & 10PM)		During night time (in between 10.00 PM & 6.00 AM)	
Near main gate, within the college campus, Nalbari College, Nalbari.	63.1	All activities are running at the time of monitoring	Industrial Zone	75	Industrial Zone	70
Near Botany Deptt., within the college campus, Nalbari College, Nalbari.	49.2					
Near Zoology Deptt., within the college campus, Nalbari College, Nalbari.	57.7		Commercial Zone	65	Commercial Zone	55
Near two wheeler parking Area, within the college campus, Nalbari College, Nalbari.	62.4		Silence Zone	50	Silence Zone	40

End of Report

*All data are collected during day time.

Note: The results related to the parameter tested only.

Checked By

(G.K.Misra)
Addl. Chief Env. Scientist

Reviewed & Authorized by

(Monoj Saikia)
Chief Env. Scientist

6. Generation of waste materials and their management

6.1. Auditing for waste management of college campus

Nowadays rapid urbanization, deforestation, massive population growth, etc. are the root causes of producing negative impacts on the environment leading to global warming, climate change, etc. To tackle the adverse impact of climate, change every individual has to reduce their carbon footprints at the individual level. So, higher educational institutions are expected to play a leading role in mitigating the issues responsible for environmental pollution by taking appropriate measures.

A scientific waste management protocol and efficient disposal mechanism are key for maintaining a healthy and livable environment on the college campus and the greater locality in general. The college has more than 4000 stakeholders, including students, teaching staff, non-teaching staff, and part-time workforce which produce a sizeable amount of waste material. Waste composition includes: Biodegradable- Organic waste, Paper Waste; Non-biodegradable- Plastic waste, Glassware waste, metal waste, electronic waste (E-waste); and liquid waste (Both biodegradable and non-bio-degradable).

In the science laboratories (Chemistry, Botany, and Zoology), a variety of solid and liquid wastes are generated during various experimental procedures. Proper management of both solid and liquid waste is crucial to minimize environmental impact and ensure laboratory safety. This can be done by segregating wastes according to their properties and by disposing them in place by using appropriate containers for storage. Appropriate practice of waste disposal would allow us to handle these waste materials safely and responsibly.

A good number of wastes are generated from the science laboratories of the Nalbari college. Here is a brief account of such generated wastes

A. Solid waste:

1. **Residues from chemical reactions:** During certain experiments like salt analysis, qualitative analysis of organic samples etc. because of chemical reactions, they produce solid by-products or residues that need to be disposed of properly.
2. **Expired or unusable chemicals:** Chemicals that have passed their expiration date or are no longer needed for laboratory practice become solid waste if they cannot be reused or recycled.
3. **Organic waste:** Some extents of organic wastes are generated in the Botany and Zoology Department of Nalbari college due to the day's practical activities. The principal organic waste materials are -
 - a. Plant Material: Leaves, stems, flowers, roots, and soil.
 - b. Unused Samples: Unused or decayed plant and animal specimens.
 - c. Laboratory Waste: Plant and animal tissues from experiments, culture media.
 - d. Herbarium Waste: Trimmings and discarded plant parts.
 - e. Animal Waste: Remains of small animals (e.g., invertebrates), feathers, fur.
 - f. Microbial Waste: Cultures and media used for studying microorganisms.
4. **Broken glassware:** Glassware like beakers, flasks, and test tubes may break during experiments, generating solid waste.
5. **Spatulas, stirrers, and other tools:** Tools used in experiments may become contaminated or damaged and need to be disposed off properly. Other things like used filter papers, blotting papers, chromatographic papers, gloves and any other benchtop items also become solid wastes.

B. Liquid waste:

1. **Solvent waste:** Used solvents, such as acetone, ethanol, or chloroform etc. become liquid waste after being used for cleaning or extraction processes.

2. **Unused chemicals:** Chemicals that are left over after experiments and cannot be reused often become liquid waste.
3. **Washings and rinsed solutions:** Liquid residues from washing glassware or equipment, which may contain traces of chemicals, become liquid waste.
4. **Decanted solutions:** Solutions that have been separated by decanting may contain impurities and become liquid waste.
5. **Neutralization solutions:** Some experiments require neutralization of acidic or basic solutions, which can produce liquid waste.
- C. **Electronic waste (e-waste):** Some amount of e-waste like; batteries, circuit boards, wires, capacitors, resistors, and other components from experimental set-up are generated in the laboratory of Department of Physics, Nalbari college. Similarly, the example of other types of e-wastes generated in the entire college are damaged computer components (monitors, CPU, UPS, printers), used printer cartridge, LED bulbs, charging and network cables, Wi-Fi devices, sound systems, display units, Biometric Machine, scientific instruments, and so on.

We have audited the overall waste generated in the college campus during the period 2019-2024. The major sources of wastes generated in the college campus, their types and approximate quantity are enlisted in tabular form below:

Table 6.1 Waste generated inside the college campus

S. No.	Source	Type of waste generated	Quantity of waste generated/ day in the college
1	Administrative office	Paper, plastic file, plastic bottles, pens, metal clips, pins, rubber band, Desktop computer UPS, old printer cartridges etc.	Approximately 70 kg including 35 kg (approx) of organic waste.
2	Laboratories	Paper, filter paper, plastic wares, broken glass wares, Chemicals and solvents, microbiological growth media	
3	Classrooms	Paper, plastic taps, Chalk pencil, pens, cardboard	
4	Library	Paper, pen, plastics	
5	Computer Sc Dept	Paper, metal clips, pins, old printer cartridges, old CDs, monitors, chips, non-working UPS, and other e-wastes.	
6	College canteen	Disposable plates, cups, paper boxes, plastic wrappers, aluminium foil, vegetable peels, rotten vegetables, leftover food, plastic bottles	
7	Hostel	vegetable peels, rotten vegetables, leftover food,	
8	Staff-rooms	Paper, plastic wrappers, plastic bottles, pens, leftover food	
9	Toilets	Paper, plastic, sanitary napkins	
9	College ground	Grass cuttings, dry leaves	

6.2. Management of waste: To foster green and clean environment within the campus proper management of waste is very much essential. The management practices of the different types of waste generated are mentioned as below

- a. The cemented waste bins are constructed in the college premises for proper segregation/disposal of the waste materials (organic, inorganic, and plastic wastes). The responsible college staff separates the wastes first after collection and segregated into the proper waste bins.
- b. The laboratory wastes are disposed of in separate waste bins to segregate them at the site itself. Depending upon the nature of wastes generated in the laboratory, we used to keep the storage containers with proper labelling. For solid wastes, we have two separate bins. One for broken glassware and second one for other solid wastes. For liquid wastes, we segregate them in two separate bins in terms of their aqueous and nonaqueous nature.
- c. For proper disposal of the waste materials (organic/inorganic/e waste), the college signed an MoU with an NGO called NESHR (North Eastern Society for Advancement of Human Resource) authorized by municipal board, Nalbari. This NGO is committed to provide a green and ecofriendly environment by maintaining a proper waste disposal mechanism. The competent authority of the NGO collects the wastes separately in weekly basis and disposed, recycle the same in scientific way.



Cemented waste bin for the segregation of organic, inorganic and plastic waste.

7. Best Environmental Practices

7.1 Setting up of vermicomposting unit: Vermicomposting is one the best practices, the college exercised from a long time. The plant leaf litters and other organic wastes generated from the college canteen and hostel are used in the vermicomposting unit. Similarly, the rice straw left in the mushroom cultivation unit are used as the food material for the earthworm. The generated vermicompost are used in the college gardens form proper growth and development of the ornamental plants. The vermi-washes are used as organic insecticides in the gardens.



7.2. Mushroom cultivation unit: Implementing a mushroom cultivation unit by the Department of Botany, Nalbari college as part of a green audit initiative is an excellent way for college to promote sustainability and environmental stewardship. Mushroom cultivation can efficiently utilize organic waste, enhance biodiversity, and provide educational and economic benefits. Use organic waste from the Botany and Zoology departments, kitchen waste, and garden trimmings as substrates for mushroom cultivation. After harvesting, we use spent mushroom substrate as compost for campus gardens or as animal feed, contributing to a zero-waste cycle.

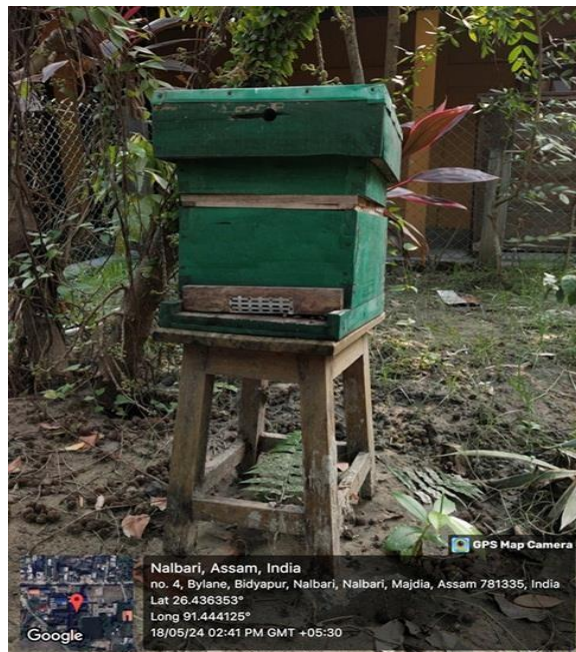


7.3. Wetland conservation and nesting tree initiative for water hens at Nalbari college: Nalbari college is taking initiatives for the protection of water hen population inside the college campus by conserving the wetlands and planting its nestling trees. The initiative is aiming to conserve the population of the bird due to its rapid decreasing in population.

Establishing a conservation site for wetlands and water hens (also known as moorhens or waterfowl) at Nalbari college can significantly enhance biodiversity, provide educational opportunities, and promote environmental sustainability.



7.4. Installation of honey bee rearing unit: Installation of honey bee rearing units in small scale inside the Botanical Garden, and other college gardens can be mentioned as one of the best practices inside the college premises. Installing a honey bee rearing unit at Nalbari college can offer numerous educational, environmental, and economic benefits. It promotes biodiversity, provides a hands-on learning experience for students, and supports the local ecosystem through pollination.



8. Overall recommendations

- 8.1.** Formation of an Institute Level Environment policy with a clear policy statement, vision of the institution, with its mission and values, elaborating on what it needs to achieve in targeted time frame both in qualitative and quantitative terms.
- 8.2.** Develop an Environment Management Information System (MIS) to streamline, the collection, flow and management of information. The institute may also go for ISO 14001:2015 Certification of the campus with an Environment Management plan
- 8.3.** There need to be a specific policy for managing the E – waste.
- 8.4.** The use of renewable energy resources needs to increase strategically.
- 8.5.** Proper audit of the use of water resource in different units of the college should be accomplished in the next green audit.

Bibliography

1. <http://naac.gov.in/index.php/en/menu/archive/19-quick-links/213-advisory-on-iso-9001-green-certificates-audits>.
2. <https://nalbari.assam.gov.in>
3. <https://desktop.arcgis.com/en/arcmap/latest/get-started/installation-guide/installing-on-your-computer.htm>.
4. <https://cgwb.gov.in/cgwbpnm/public/uploads/documents/17014272111704550895file.pdf>.
5. <https://weatherandclimate.com>
6. <https://www.accuweather.com>
7. Chakravarty M, Barooah A, Sarma UJ (2023) Soil fertility status of some villages of Nalbari district, Assam using nutrient index approach. The Pharma Innovation Journal 2(11): 1231-1237.