ENERGY AUDIT REPORT
2021-2022 & 2022-23

GOVERNMENT GENERAL DEGREE COLLEGE CHAPRA
VILL. SHIKRA, PO. PADMAMALA, PS. CHAPRA, NADIA-741123

REPORT PREPARED BY

INSTITUTE OF NATURE RESEARCH AND CONSERVATION [INRC]

&

ENERGY AUDIT TEAM

GOVERNMENT GENERAL DEGREE COLLEGE CHAPRA

TECHNICAL SUPPORT, MONITORING, ASSISTANCE & CERTIFIED BY

EXECUTIVE ENGINEER (P.W.D.)

NADIA ELECTRICAL DIVISION, KRISHNAGAR, NADIA

&

JUNIOR ENGINEER (P.W.D.)

KRISHNAGAR ELECTRICAL SECTION-II, NADIA

INRC

INSTITUTE OF NATURE RESEARCH AND CONSERVATION

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

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

Reference No:……

Date-14/11/23

ENERGY AUDIT CERTIFICATE
ACADEMIC YEAR 2022--2023

This is to certify that Government General Degree College, Chapra located at the outskirts of Shikra Village, PO. Padmamala, PS. Chapra, Dist. Nadia, West Bengal, PIN-741123, has steadfastly strived to establish a robust and ecologically sustainable environment, as well as sustainable way of energy usage and dedicated to the preservation of nature and biodiversity. Institute of Nature Research and Conservation (INRC) expresses satisfaction following the successful completion of the Energy Audit for the academic year 2022-2023.

This accomplishment has been made possible through the active and moral support extended by the Honorable Principal, the dedicated ENERGY AUDIT TEAM, GGDC Chapra, the IQAC Team, the dedicated teaching and support staff, and the enthusiastic student body of Government General Degree College, Chapra. Their collective efforts have significantly contributed to the creation of a positive and eco-friendly atmosphere in the campus.

The commitment demonstrated by both staff and students towards Sustainable way of Energy Usage is truly commendable. This proactive approach aligns with the highest standards of ecological stewardship, reflecting a genuine dedication to sustainable practices.

This certificate serves as recognition for the outstanding efforts undertaken by Government General Degree College, Chapra towards fostering a healthier and more environmentally conscious campus. We applaud their commitment to creating a positive impact on the sustainable environment and sustainable way of energy usage, which encourage the continuation of such admirable initiatives in the future.

DR. SUMIT MANNA
Lead Auditor EMS
UIN: 840180406937
INRC

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

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

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

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

INSTITUTE OF NATURE RESEARCH AND CONSERVATION

INRC

SATYEN BOSE ROAD, BASUDEBPUR,
P.O.- BANIPUR, P.S.- SANKRAIL,
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website: www.inrc-india.org

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

Reference No: .....

Date-11/03/24

GREEN, ENVIRONMENT AND ENERGY AUDIT CERTIFICATE

ACADEMIC YEAR 2023-2024

This is to certify that Government General Degree College Chapra, located at Chapra, Nadia-741123, West Bengal, has steadfastly strived to establish a robust and ecologically sustainable environment, dedicated to the preservation of nature and biodiversity. Institute of Nature Research and Conservation (INRC) expresses satisfaction following the successful completion of the Green, Environment, and Energy Audit for the academic year 2023-2024.

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

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

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

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INRC

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

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

DR. AMIT MANNA
Lead Auditor EnMS
UIN: 292286787454
INRC

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

ENERGY AUDIT DATA ANALYSIS, MONITORING, ASSISTANCE & CERTIFIED BY

EXECUTIVE ENGINEER (P.W.D.), NADIA ELECTRICAL DIVISION, KRISHNAGAR

&

JUNIOR ENGINEER (P.W.D.), KRISHNAGAR ELECTRICAL SECTION-II, NADIA

Observation

Electricity is the main energy source of the college. During data collection for energy audit, we find the actual load distribution among different Dept./Sections inside the college campus. Filament bulbs are completely replaced by LED bulbs to save power consumption in the rural area. Besides this we are going to install photovoltaic cells soon in the campus as an alternate renewable source of energy. Computers, AC and other instruments run in power saving mood. Unnecessary consumption of power is restricted. Most of the plug points are used for low wattage devices and all switches are immediately turned off, whenever they are not operating.

Conclusion

Energy auditing is an effective implement in detecting and perusing a compressive energy management program. A careful audit of any institution gives a road-map with which it can effectively manage the energy consumption at minimum charge as well as saving the electricity. Even this study may prevent the accidental event caused by overload or short-circuit. The given data helps us for this particular precautionary measurement in the future of the organisation.

Govt. General Degree College, Chapra * ESTD.- 2013 * Government of W.B. *

Signature of Energy Audit Committee:

Name

Signature of the Principal
(Dr. Subhasis Panda)

Principal
Govt. General Degree Colleg.

1. Mr. Sudipta Das .....Sudipta Das.....

2. Dr. Ayan Bandyopadhyay ....Ayan Bandopadhyay.....

3. Dr. Shaikh Safikul Alam ....Sheikh Safiqul Alam.....

THE ENERGY AUDIT REPORT IS CERTIFIED BY

11.03.2024
Junior Engineer (P.W.D)
Krishnagar Electrical Section-II
Govt. of West Bengal

11/03/2024
Executive Engineer (P.W.D.)
Nadia Electrical Division
Krishnanagar, Nadia

Certificate of Compliance

This is to certify that
of

GOVERNMENT GENERAL DEGREE COLLEGE CHAPRA

P.O.- CHAPRA, DIST - NADIA - 741123, WEST BENGAL, INDIA.

Has been assessed and found to operate in Compliance the requirements of following standard:

ISO 50001:2018

Energy Management System

For the following scope of activities

PROVIDING BACHELOR DEGREE PROGRAMS

Certificate Number: UKAI-DRAFT

Validity of this certificate can be verified at www.ukai.org.uk

Date of Certification	XXTH November 2022
Issuance Date	XXTH November 2022
1st Surveillance Due	XXTH November 2023
2nd Surveillance Due	XXTH November 2024
Re-Certificate Due	XXTH November 2025

Auth. Signatory

UK Assessment & Inspection Ltd. CAB ADDRESS : 63 Maple Road, Surbiton, England, KT6 4AG

Validity of this certificate is subject to annual surveillance audits to be done successfullyThis certificate is the property of UK Assessment & Inspection Ltd. and shall be returned immediately on requestUK Assessment & Inspection Ltd. is an independent Systems Products and Personal assessment Body, UK Assessment & Inspection Ltd.is a accredited by UG-AC.ORG

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ACKNOWLEDGEMENTS

We, The Energy Audit Team of Institute of Nature Research And Conservation (INRC) would like to show our indebt gratitude to the management of Govt General Degree College Chapra for assigning us such an important work on Energy audit. Our special thanks go to the Principal of GGDC Chapra. We appreciate the cooperation to our team for the assigned study, giving us necessary inputs to carry out audit activities. Our special thanks also go to IQAC members, Teaching and supporting nonteaching staff without whose intricate involvement the present work cannot be possible.

AREAS OF CONCERN

ENERGY AUDIT

- Energy consumption
- Energy management

RECOMMANDATIONS

- To reduce energy consumption and management

This Audit has been conducted by a committee constituted by the Experts & Scientists from different reputed Institutes as well as College internal Experts. The Committee developed a questionnaire for audit based on the regulatory and statutory requirements of Centre as well as State. The basic data was gathered and compiled, which the committee analyzed. The committee has suggested sustainable way of Energy use.

AUDIT COMMITTEE MEMBERS

An expert committee of 7-members was formed to conduct the Energy Audit from different fields of expertization such as Energy Management, Electrical Engineering, Chemistry, Physics and Mathematics.

The Committee members are listed below

SL No.	NAME	Area of interest	Designation
	EXTERNAL EXPERTS		
1.	**Dr. Sumit Manna**	Ecology, Environment, Biodiversity Economics and Conservation	Assistant Professor, HOD. Dept. of Botany and IQAC coordinator Moyna College & Green Auditor
2.	**Dr. Amit Manna** [Environment & Energy Auditor & External Expert]	Energy management, green synthesis of Nano particle and characterization, Spectroscopic analysis	Vice President, Institute of Nature Research and Conservation & Former Project Scientist Spectroscopic Analysis Team, NASA
3.	**Sri Rajarshi Moulick** Executive Engineer, P.W.D., Nadia Electrical Division	Energy Auditor Advisor & Advisor in Electrical Work	Executive Engineer, P.W.D., Nadia Electrical Division, Krishnagar
4.	**Sri Sujan Bhowmcik** Junior Engineer, P.W.D., Krishnagar Electrical Section-II	Energy Auditor Expert & Expert in Electrical Work	Junior Engineer, P.W.D., Krishnagar Electrical Section-II
	INTERNAL EXPERTS		
6.	Dr. Ayan Bandyopadhyay [Convenor]	Chemistry	Assistant Professor of Chemistry, GGDC, Chapra & Convenor, Energy Audit Team
7.	Dr. Shaikh Safikul Alam	Physics	Assistant Professor of Physics, GGDC, Chapra & Member, Energy Audit Team
8.	Sri Sudipta Das [Joint Convenor]	Physics	Assistant Professor of Physics, GGDC, Chapra & Joint Convenor, Energy Audit Team.

ENERGY AUDIT SURVEY BY INSTITUTE OF NATURE RESEACH & CONSERVATION [INRC, Regd No. 0239/2023, Howrah, West Bengal]—2022-23

AUDIT TEAM SURVEY: 2022-2023

The Audit team started the audit at the College Campus on 27 February, 2023

Important dates and of Initiative:-

SL NO	PURPOSE	DATE	REMARKS
1	Communication with College authority	26.12.2022	Discuss about term and condition
2	Opening Meeting	03.01.2023	Submitted the Survey schedule
3	Collection information about the College	03.01.2023	Introduced to Administrative Officer
4	Campus visit and observation	27.02.2023	Outdoor observation with Photo-camera
5	Campus enquiry	27.02.2023	Physically enquiry with experts
6	Departments visit and enquiry	27.02.2023	Laborator yenquiry
7	Interview with other stake holder	27.02.2023	Meet with other stakeholders
8	Interview with staff	27.02.2023	Collected different information
9	Review data and Assessment	28.02.2023	Data generate
10	Pre-Closing meeting	01.03.2023	Meeting with IQAC
11	Closing Meeting	01.03.2023	Pre-submission of the Report
12	Submit audit report	12.04.2023	Submit of the Report

ENERGY AUDIT SURVEY BY INSTITUTE OF NATURE RESEACH & CONSERVATION [INRC, Regd No. 0239/2023, Howrah, West Bengal]—2023-24

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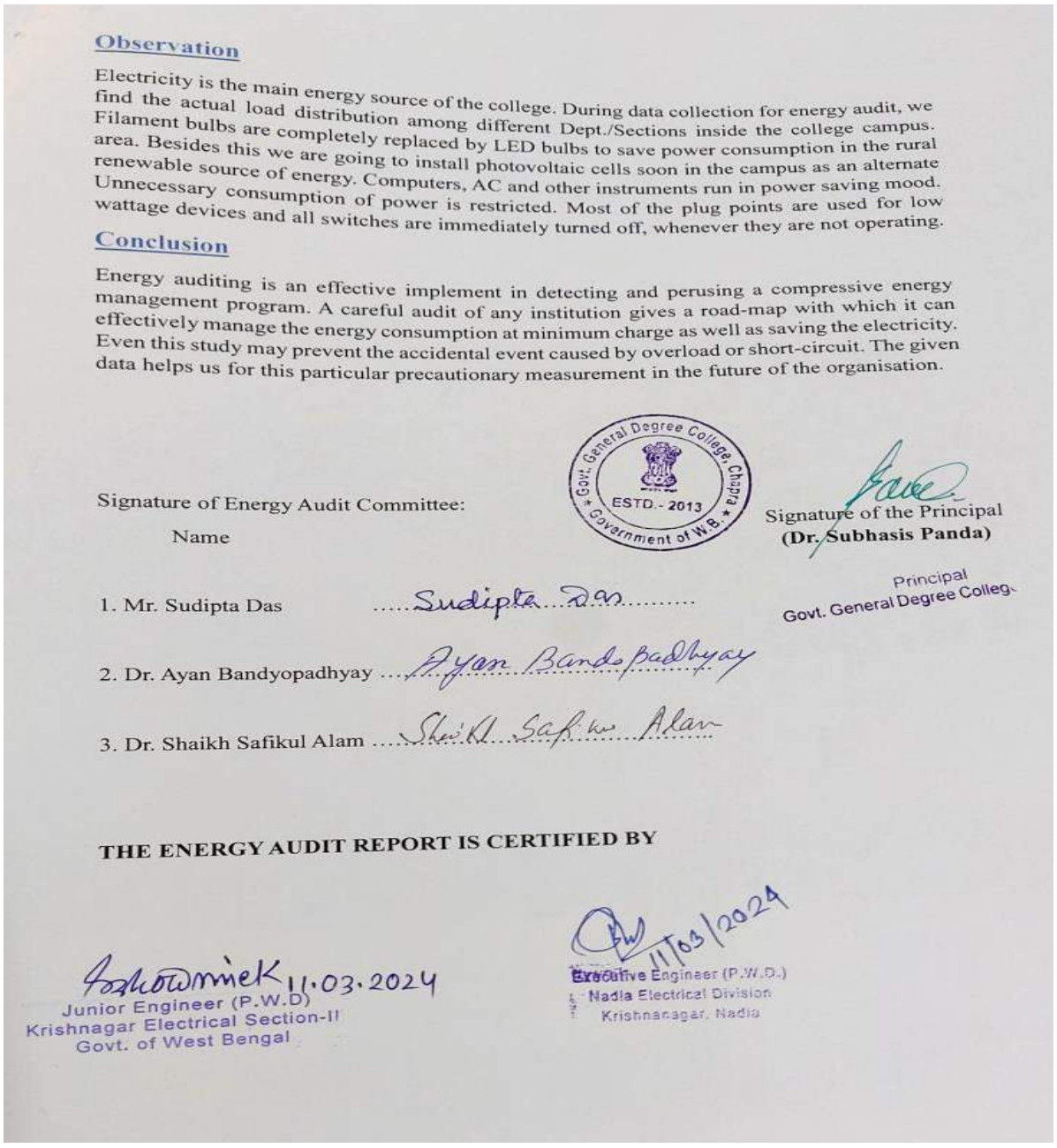
11	Closing Meeting	29.02.2024	Pre-submission of the Report
12	Submit audit report	11.03.2024	Submit of the Report

ENERGY AUDIT DATA COLLECTION & ANALYSIS BY

EXECUTIVE ENGINEER (P.W.D.), NADIA ELECTRICAL DIVISION, KRISHNAGAR
JUNIOR ENGINEER (P.W.D.), KRISHNAGAR ELECTRICAL SECTION-II, NADIA
ENERGY AUDIT TEAM, GOVT GENERAL DEGREE COLLEGE CHAPRA

SURVEY & DATA COLLECTION: 15th Feb. 2024 till 10th March 2024
REPORT & CERTIFIED BY: 11th March 2024



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Signature of Energy Audit Committee:

Name

Govt. General Degree College, Chapra ESTD.- 2013 Government of W.B.

Signature of the Principal
(Dr. Subhasis Panda)
Principal
Govt. General Degree College

1. Mr. Sudipta Das .....Sudipta Das.....
2. Dr. Ayan Bandyopadhyay ....Ayan Bandopadhyay....
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THE ENERGY AUDIT REPORT IS CERTIFIED BY

11.03.2024
Junior Engineer (P.W.D)
Krishnagar Electrical Section-II
Govt. of West Bengal

11/03/2024
Executive Engineer (P.W.D.)
Nadia Electrical Division
Krishnagar, Nadia

ABOUT GOVT GENERAL DEGREE COLLEGE CHAPRA

Government General Degree College Chapra is a rural Undergraduate General College, situated at the outskirt of the village Shikra in the Chapra Block of Nadia district, approximately 3 km from India-Bangladesh International Border. Affiliated to the University of Kalyani, the college was established on 30-10-2013 and is one of the four newly constructed public colleges in the district of Nadia. The college is surrounded by enriched cultivated crop fields possessing both cultivated and wild crop relatives, naturalized and exotic flora and fauna of Indo-Bangladesh in origin, especially diversity of snakes attracting researchers in the field of herpetology to familiarize this rural-based remote and economically backward minority college to the global arena. The college will be a world biodiversity study centre in very near future. Primarily catering to the interests of the minority community in the neighboring areas, the college has since its inception, worked ceaselessly towards the spread of education among the poor students and rural communities inhabiting the areas. Every year it has been seen that there is an increase in the student enrollment in various academic departments.

The college offers undergraduate Honours programmes in both Humanities and Science subjects. Since 2023-2024 Academic Session, GGDC Chapra offered Major Programme as per NEP (equivalent to Honours Programme) for FIVE Arts Departments viz., Bengali, English, History, Political Science and Sociology and THREE Science Departments viz., Chemistry, Physics and Mathematics. The dedicated faculty members of the institution provide their complete co-operation in fostering a strong academic integrity and encourage the students to follow the path of excellence.

ACADEMIC DEPARTMENTS

SL NO	Departmentof Arts	Department of Science
1	Bengali	Chemistry
2	English	Mathematics
3	History	Physics
4	Political Science	
5	Sociology	

Area Coverage of the College Campus:

College campus	Area in sq. Mts.	Area in Percentage
Main Building	1890.00	9.68
Students Activity Centre	322.00	1.65
Private Security Room	15.40	0.07
Night Guard Room	15.20	0.07
Buttefly Conservation Park	982.00	5.03
Biodiversity Conservation Park	842.00	4.31
Medicinal Plant Garden	712.00	3.65
Cactus Garden	272.00	1.39
Playground	9072.00	46.50
Pond	32.00	0.16
Fallowland [including Forcefully Occupied Land by farmers]	2812.28	14.41
Kitchen Garden	124.00	0.63
Two Cycle Shed	924.00	4.73
Staff Open garrage	14.22	0.07
Vermicompost Shed	16.20	0.08
Biodegradable and Non-Biodegradable (Plastic) zone	15.20	0.07
Sajal Dhara with Solar Light	8.5	0.04
Leach Pit area	32.00	0.16
Outside Campus Common passage for Cultivators	1405.00	7.20
Total area of the campus	19506.00 [4.82 acres]	

GOVERNMENT GENERAL DEGREE COLLEGE CHAPRA

GOVERNMENT GENERAL DEGREE COLLEGE CHAPRA

ARIAL VIEW: GOVT GENERAL DEGREE COLLEGE CHAPRA

Arial View of Govt General Degree College Chapra Campus depicting the green cover, pond, building Areas, Play Ground, Temporary fencing area, Vermicompost area and surrounding Concrete roads.

Purpose of Energy Auditing

- In any organization, the three primary operating expenses typically comprise energy (both electrical and thermal), labour, and materials. When assessing the manageability of costs or potential savings in these components, energy consistently emerges as a prominent factor, making the energy management function a strategic area for cost reduction.

- An Energy Audit plays a crucial role in comprehending the utilization of energy and fuel within an an institute, pinpointing areas susceptible to waste and areas with potential for improvement.

- It provides valuable insights that contribute to a positive orientation towards reducing energy costs, enhancing preventive maintenance, and improving quality control programs, all of which are critical for production and utility activities.

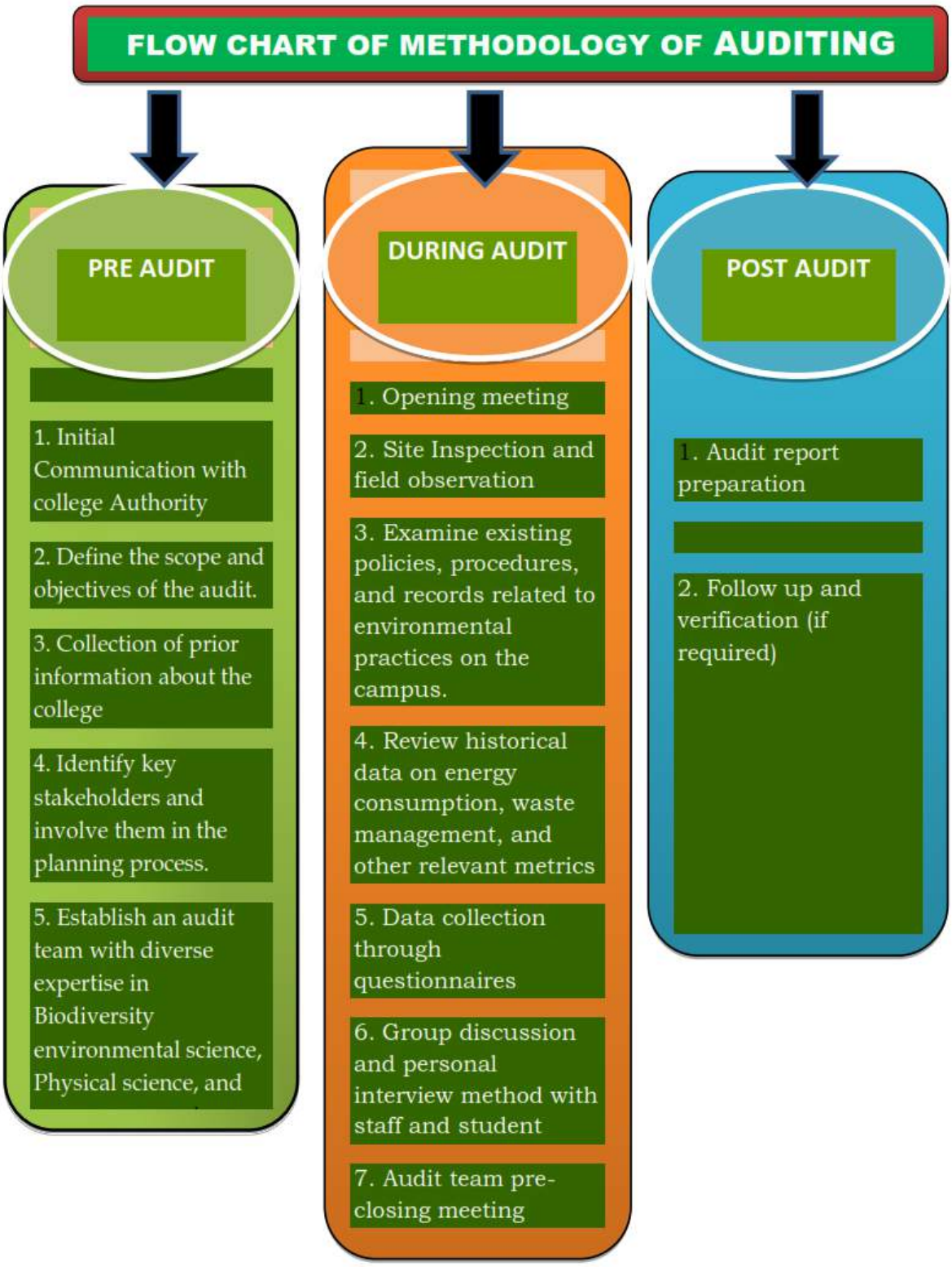
- This audit program facilitates a focused examination of variations in energy costs, the reliability of energy supply, decisions on an appropriate energy mix, identification of energy conservation technologies, and retrofitting for energy-efficient equipment. Essentially, the Energy Audit translates conservation ideas into practical solutions, offering technically feasible recommendations with due consideration to economic and organizational factors within a specified timeframe.

- The primary objective is to devise strategies for reducing energy consumption per unit of product output or lowering operating costs. Serving as a benchmark, the Energy Audit establishes a reference point for managing energy within the organization and forms the basis for planning more effective energy utilization throughout the entire organization.

- The eco-campus concept primarily emphasizes the efficient utilization and conservation of energy, aiming for savings in a sustainable manner. Additionally, it targets the reduction of carbon emissions, involves the calculation of carbon footprint, advocates for the procurement of star-rated equipment to ensure cost-effective and secure energy supply, promotes and enhances energy conservation in all buildings, strives to diminish the organization's overall energy consumption, minimizes landfill wastes, and incorporates environmental considerations into all contracts and services that are deemed to have substantial environmental impacts.

- Examining Energy Management through auditing involves a focus on energy savings and potential opportunities. While energy itself remains imperceptible, its presence is evident in wires, pipes, and other inanimate materials through observable effects such as heat, light, and power.
-
- The indicator for energy management encompasses considerations such as energy consumption, energy sources, monitoring, lighting, vehicle movement, electrical and electronic appliances, and transportation. Energy usage stands as a pivotal facet of campus sustainability, warranting its inclusion in assessments without further explanation.

- Despite the ubiquity of energy usage, attention to energy-saving possibilities remains crucial. For instance, a conventional incandescent bulb consumes approximately 60W to 100W, whereas an energy-efficient light-emitting diode (LED) uses less than 10W, highlighting the positive impact on energy savings. Energy auditing is integral to conservation efforts and the implementation of methods to curtail consumption, thus mitigating environmental degradation.


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

Site Visit:

- A comprehensive walk through of the campus was conducted to observe and document environmental aspects such as waste disposal areas, energy infrastructure, greenspaces, and water management systems.
- The number and types of vehicles utilized by stakeholders were recorded, and the fuel consumption for each vehicle was verified in consultation with the users.
- A thorough examination of water taps was conducted, revealing the identification of a few leaky taps and overflowing tanks during the site inspection.
- Data collected from all electrical appliances used and energy consumption data
- Last one year Electrical Bills of the College was taken
- Main Switch Board, Supply lines, EI Switch Boards, Canteen, Library, Office, Class Rooms everywhere our team visited and collected data.

Steps of data collection:

- At first the audit team was divided into three groups. The expert member of first group started the collection of data for energy audit. Expert members of second and third group started to accumulate data for green and environment audit.
- Members of each group visited total area of the college campus, garden, playground, canteen, kitchen, library and each department with respective laboratories of the college.
- A Questionnaire was developed covering all aspects for Green, Environment and Energy audit and circulated to the stakeholders to get the data.
- All the information and data are collected through observation, personal interview and group discussion with different stakeholders.

- Assessment of different parameters of environment at different point of the college premises was done on the basis of different electronic devices such as Atmospheric O_2 and CO_2 meter, TDS meter etc. and measurement.
- Different Species of Mammals, Birds, Reptiles, amphibians, Butterflies and dragon flies were noted and identified during field visit.

Data Analysis:

- Calculation of green area, concrete area, and aquatic land of the college campus.
- Calculation of energy consumption and energy generation from renewable energy sources.
- Analysis of ground water and rain water storage procedure and reused
- Waste generation & disposal arrangements.
- Measurement of O_2 and CO_2 level in college campus.
- Measurement of TDS of water of the water bodies and tank water was taken into account

ENERGY AUDIT

1. Introduction: An energy audit includes a structured breakdown of energy utilization within a corporation, intending to preserve energy. It involves evaluating methodologies and frameworks to reduce energy usage while maintaining operations. Suggestions for different methodologies to achieve increased energy conservation are given. With traditional energy supplies like fossil fuels facing depletion, there's a need to explore alternatives and prioritize energy preservation. The main goal is to provide goods or services at minimal cost while lessening environmental impact. Carrying out an energy evaluation helps identify potential savings, understand fuel usage patterns, spot wasteful areas, and find ways for improvement. It's essential for educational and industrial sectors to adopt energy-saving practices sustainably. The evaluation process involves creating surveys, inspecting facilities, reviewing records, conducting interviews, analysing data, taking measurements, and offering recommendations. Energy auditing considers the potential for energy savings, management approaches, and alternative energy sources. Specific aims include assessing sustainability management systems and ensuring departmental compliance with regulations. The outcomes of the evaluation significantly impact operational costs and environmental footprint. Initiatives like the Energy Conservation Building Code and the Bureau of Energy Efficiency promote energy-efficient methods. Energy ratings and star labels aid consumers in making informed choices. The Energy Audit acts as a standard for energy management, assisting in devising more effective strategies. It's a systematic assessment of energy resources with the goal of preserving the environment and natural resources. At Government General Degree College Chapra, the audit begins with identifying, measuring, recording, reporting, and analyzing energy components.

Plate 1. Government General Degree College Chapra

2. Need for an Energy Audit: At each institution, the three primary operational costs typically involve energy (both electrical and thermal), labour, and materials. Amid these, energy consistently emerges as a significant factor when evaluating cost management or potential savings, making energy management a crucial area for cost reduction. An Energy Evaluation plays a key role in understanding energy and fuel usage within a sector, identifying areas prone to waste and those with potential for improvement. It provides insights that contribute to reducing energy expenses, increasing preventive maintenance, and enhancing quality assurance programs, all essential for manufacturing and utility operations. This evaluation effort enables a

focused examination of energy cost fluctuations, energy supply reliability, decisions regarding energy sources, identification of energy conservation methods, and retrofitting for energy-efficient equipment. Essentially, the Energy Evaluation translates conservation principles into practical solutions, offering technically feasible recommendations considering financial and organizational factors within a specified timeframe. The primary goal is to devise strategies for reducing energy use per unit of product output or reducing operational costs. Serving as a benchmark, the Energy Evaluation establishes a foundation for managing energy within the institution and lays the groundwork for planning more efficient energy utilization throughout the facility. The eco-campus concept emphasizes efficient energy use and conservation, aiming for sustainable savings. Additionally, it targets reductions in carbon emissions, involves calculating carbon footprint, advocates purchasing star-rated equipment for cost-effective and safe energy supply, promotes energy conservation in all buildings, aims to decrease overall energy consumption, minimize waste, and incorporate environmental considerations into contracts and facilities with significant environmental impacts. Examining Energy Governance through audits focuses on energy savings and potential opportunities. While energy itself is invisible, its presence manifests in cables, pipes, and other materials through visible effects like heat, light, and efficiency. Energy governance assessments cover energy consumption, sources, monitoring, lighting, transportation, electrical appliances, and distribution. Energy use is a critical aspect of campus sustainability, requiring inclusion in evaluations without further clarification. Despite widespread energy use, attention to energy-saving potential remains crucial. For instance, a traditional incandescent bulb consumes 60W to 100W, whereas an energy-efficient LED uses less than 10W, highlighting significant energy savings. Energy auditing is essential for conservation efforts and implementing methods to reduce consumption, thereby mitigating environmental degradation. Furthermore, audits provide invaluable suggestions and recommendations for efficient energy-saving practices. Environmentally aware institutions are encouraged to review their energy practices at least once every two years, utilizing both internal and external auditors. The conduct of energy assessments, facilitated by both internal and external auditors, plays a significant role in institution energy governance. These assessments effectively evaluate the energy potential within an institution, identifying more efficient approaches to mitigate environmental impact.

Beyond assessments of water, liquid and solid waste, biomedical and electronic waste, and biodiversity, there is a need to assess the institution's carbon footprint. This involves quantifying carbon emissions from electrical appliances, vehicles, and the human population, forming the basis for carbon accounting. It is essential to determine the extent to which an institution contributes to sustainable development through its energy governance practices. Therefore, conducting carbon footprint measurements in each institution is recommended, providing valuable insights for maintaining an eco-friendly campus and addressing stakeholder concerns.

Plate 2. Energy Audit Meeting with the Expert and Energy audit Survey at GGDC Chapra: Top-Left: Energy audit team meeting with Principal; Top-Right: Energy Audit team with Energy audit expert, Dr. S. Manna; Below: Energy auditing data collection during Survey at GGDC Chapra.

3. Aims and Objectives of an Energy Audit: An energy assessment is a vital tool for formulating and implementing comprehensive energy governance strategies within an organization. Its main goal is to systematically pinpoint opportunities for enhancing energy efficiency, conservation, and cost-saving at the assessment site. The evaluation process involves the following stages:

3.1 Evaluating the energy-saving initiatives and actions implemented at the assessment sites. 3.2 Identifying various opportunities for energy conservation measures and additional avenues for cost-saving.

3.3 Utilizing alternative energy sources to explore potential energy savings and guide decision-making in the realm of energy governance.

3.4 Providing technical advice on establishing an energy balance and offering precise application-focused guidance.

3.5 Conducting a thorough examination of energy usage, analysing recent electricity bills for the campus, and understanding the tariff structures offered by the central and State Electricity Boards.

3.6 Listing various ways in which energy is utilized, including electricity for appliances such as stoves, pots, microwaves, as well as other sources like LPG, wood, gasoline, diesel, and more.

3.7 Reviewing electricity bill totals over the past two to three years, expenditures on LPG cylinders for the previous year.

3.8 Assessing the usage of various devices and equipment, including incandescent (tungsten) bulbs, CFL bulbs, fans, air conditioners, cooling devices, heaters, computers, photocopiers, inverters, generators, and laboratory equipment. This analysis involves calculations based on factors such as wattage and duration of use.

3.9 Evaluating the adoption of alternative energy sources/non-traditional energy sources within the organization, such as photovoltaic cells for solar power, energy-efficient appliances, biogas, etc. Additionally, implementing initiatives to raise awareness among stakeholders regarding energy conservation and efficient use. In essence, Energy Auditing in the institutional environment is a multi-faceted approach that not only strives for efficiency in resource utilization but also emphasizes the importance of sustainable practices, cost-saving, and collective responsibility for the well-being of the institution and its surroundings.

4. Campus Area and Infrastructure:

- Total area of the college campus: 4.82 acres.
- Playground and fallow land area: 01
- Number of building blocks: 02
- Total number of class room: 14
- Total number of laboratories: 07
- Number of common rooms: 02
- Total number of toilets: 11
- Library: 01
- Reading room:02 (For students & teachers)
- Auditorium/seminar hall: 02
- Garage & Cycle Shade: 03
- Open stage: NIL
- Indoor playground: NIL


Plate 3. Physics Laboratories 1 & 2

Plate 4. 1st Row-left: Chemistry Theory Class room; 1st Row Right: Library Reading Room; 2nd Row-Left: Chemistry Lab1; 2nd Row-Right: Library Book shelves; 3rd Row 1st: Bengali Class Room; 3rd Row 2nd: Canteen; 3rd Row 3rd: Library; 4th Row below: College Renovated Playground with net Fencing.

Plate 5. Top: Biodiversity conservation Park; Middle left: newly constructed Pond; Middle: Cycle Shed; Middle Right: Guest Room; Bottom left: College Playground before renovation in 2022; Bottom Right: College Seminar hall no 1.

5. Methodology and Survey Schedules: To conduct an energy inspection, various methodologies are utilized at the inspection sites, primarily emphasizing on-site inspection scrutiny. This process involves balancing total energy inputs with total energy outputs and identifying all energy flows within a premise. Concrete verification of diverse components such as lighting, rooftops, desks, ventilation fans, air conditioning units, solar panels, heaters, generators, uninterrupted power supply units, and air circulation systems is performed during the inspection. This includes validating the capabilities of installed energy-efficient systems. The inspection highlights examining the costs or potential cost savings associated with each of these components, with energy consistently emerging as a crucial area for cost reduction. The task of

energy governance becomes vital in achieving cost-saving objectives. Additionally, the energy bill from the utility company is collected for inspection. This assessment involves evaluating load requirements and efficient energy usage. Stakeholders are engaged during the inspection to explore opportunities for improvement in energy governance. Potential areas for energy conservation and cost-saving opportunities are identified and recommended for implementation within the establishment. Energy Inspection can be classified into the following types:

I. Initial Energy Inspection.

II. Comprehensive Energy Inspection.

III. Potential and Scope of Energy Inspection.

IV. Thorough Energy Inspection

6. Survey Form for data collection:

1. List ways in which the college utilizes energy (Power, digital stove, cooking pot, microwave, LPG, Petrol, fuel, and others).
2. Total of electricity bills for the past pair of years.
3. Overall expenditure for LPG cylinders over the previous year.
4. Spending on petrol/diesel/ others for power generators.
5. Number of CFL bulbs installed and specify their operational lifespan.
6. Energy consumed by each bulb monthly.
7. How many LED bulbs are used within college premises (with detailed operational lifespan)?
8. Number of incandescent (tungsten) bulbs installed?
9. How many fans are installed (with detailed operational lifespan)?
10. Number of air conditioners installed (Hours used/day, for how many days monthly)?
11. Energy consumed by each electrical device monthly? (kwh)
12. Number of computers in use? Specify usage (Hours used/day for how many days monthly).
13. How many photocopiers are installed?
14. Number of cooling devices installed?
15. Energy consumed by each inverter monthly? (kwh)
16. Number of electrical devices used in various laboratories along with their power ratings.
17. How many heaters are used in the cafeteria? (Specify usage, hours used per day for how many days monthly).
18. Are any alternative energy source modules installed? Provide detailed specifications.
19. Are computers and additional devices set to energy-saving mode?
20. Do machines (TV, AC, Computer, weighing scale, printers, etc.) frequently operate on standby mode? If yes, specify the duration in hours.
21. What energy conservation methods does the college adopt?
22. How many panels are displayed to promote awareness of energy conservation?

7. Detailed Energy Audit Methodology:A thorough inspection provides a detailed energy initiative implementation plan for a facility by evaluating all significant energy-consuming systems. This kind of inspection offers the most accurate assessment of both energy savings and costs. It considers the combined effects of all initiatives, taken into consideration the energy consumption of major appliances, and involves meticulous calculations for both energy cost savings and project expenses. In a comprehensive inspection, the energy balance is a crucial component, relying on an inventory of energy-consuming systems, assumptions about current operational conditions, and calculations of energy usage. This estimated usage is then compared with charges on utility bills. Initial site visits and groundwork are essential stages preceding detailed scrutiny. An initial site visit typically lasts a day, allowing the Energy Auditor/Engineer to interact with relevant personnel, familiarize themselves with the area, and assess the procedures necessary for conducting the energy inspection.

8. Source of Energy: Through the enquiry process it is noted that the mostly used energy source is conventional.

Plate 6. Power Supply with proper safety Guidelines at Govt General Degree College Chapra

Plate 7. Top left: Energy Audit data collection by Dr. Ayan Bandopadhyay, HOD, Dept of Chemistry, GGDC Chapra;Top-Right & Below-left: Power supply switches and Source room ; Below-right: Newly installed and set up of EI work during Feb 2024 by the PWD te Nadia Electrical Division, Krisnagar, Nadia.

Energy Cost (Year 2021-22):

Total electricity consumption (conventional) : 22788 U (99%)

Total electricity consumption (non-conventional): 224 U (1%)

Amount paid for conventional energy used : Rs. 3,88,424/-

Consumption of Energy (units) for the period July' 2021 to June' 2022

Month, Year	Energy Consumed (in units) Cust. ID: 950027608	Bill Amount (in Rs.)
JULY' 2021	1531	28788.00
AUGUST' 2021	1497	29214.00
SEPTEMBER' 2021	1515	29234.67
OCTOBER' 2021	1396	28858.73
NOVEMBER' 2021	2303	36946.00
DECEMBER' 2021	1728	31414.00
JANUARY' 2022	1585	30452.00
FEBRUARY' 2022	1430	29402.00
MARCH' 2022	2649	37752.00
APRIL' 2022	2366	35405.00
MAY, 2022	2378	35513.00
JUNE, 2022	2410	35446.00

Energy Cost (Year 2022-23):

Total electricity consumption (conventional) : 22717.0 U (99%)

Total electricity consumption (non-conventional): 229.0 U (1%)

Amount paid for conventional energy used : Rs. 3,87,229.30/-

Consumption of Energy (units) for the period July' 2022 to June' 2023

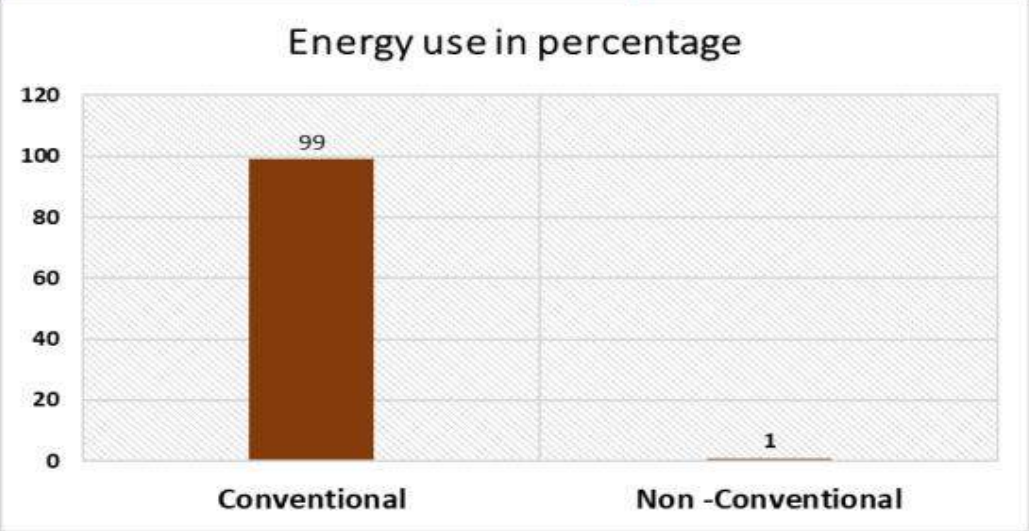
Month, Year	Energy Consumed (in units) Cust. ID: 950027608	Bill Amount (in Rs.)
JULY' 2022	2770	38257.00
AUGUST' 2022	2245	35350.00
SEPTEMBER' 2022	2209	35320.00
OCTOBER' 2022	1535	29852.00
NOVEMBER' 2022	1651	30932.00
DECEMBER' 2022	1966	32771.00
JANUARY' 2023	1742	30540.00
FEBRUARY' 2023	1479	28815.00
MARCH' 2023	1494	29265.00
APRIL' 2023	1587	29847.30
MAY, 2023	1938	32136.00
JUNE, 2023	2101	34144.00

Fossil fuel consumption per year (Approx.)

a. Number of LPG gas cylinders used for cooking -20PCs
b. b. Number of LPG used in Laboratories-03PCs

Table 1. Represents the percentage use of conventional and non-conventional uses of energy and its corresponding plot is depicted in Figure 1.

Source of energy	In Percentage
Conventional	99%
Non -Conventional	1%



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

For the purpose of Preparing ENERGY AUDIT, after meeting and discussion with GGDC Chapra Energy Audit Committee, Principal applied a Formal Letter to the Executive Engineer, P.W.D.te, Nadia Electrical Division, Krishnagar, Nadia in the month of January 2023. Finally Executive Engineer accepted our request and sent one Junior Engineer to monitor the survey work and data collection along with GGDC Chapra Energy Audit Committee.

Our Energy Audit Committee members, Sri Sudipta Das, Assistant Professor of Physics & IQAC Coordinator, Dr. Ayan Bandyopadhyay, Assistant Professor of Chemistry and Dr. Shaikh Safikul Alam, Assistant Professor of Physics were guided by Sri Sujan Bhowmick, Junior Engineer (P.W.D.), Krishnagar Electrical Section-II, Govt of West Bengal. Our Audit team was also guided by Dr. Sumit Manna, Green Auditor & Assistant Professor of Moyna College in January, 2023 and Jan 2024 respectively.

ENERGY AUDIT of Govt General Degree College Chapra is guided by Sri Sujan Bhowmick, P.W.D. Junior Engineer since 15th February 2024 to 10th March 2024 and CERTIFIED by the Executive Engineer, Sri Rajarshi Moulick, Nadia Electrical Division, Krishnanagar, Nadia.

Energy Audit Team

1) Mr. Sudipta Das (Assistant Professor in Physics)

2) Dr. Ayan Bandyopadhyay (Assistant Professor in Chemistry)

3) Dr. Shaikh Safikul Alam (Assistant Professor in Physics)

Electric connection

We have one meter in our college campus with following meter number.

WBBB0096

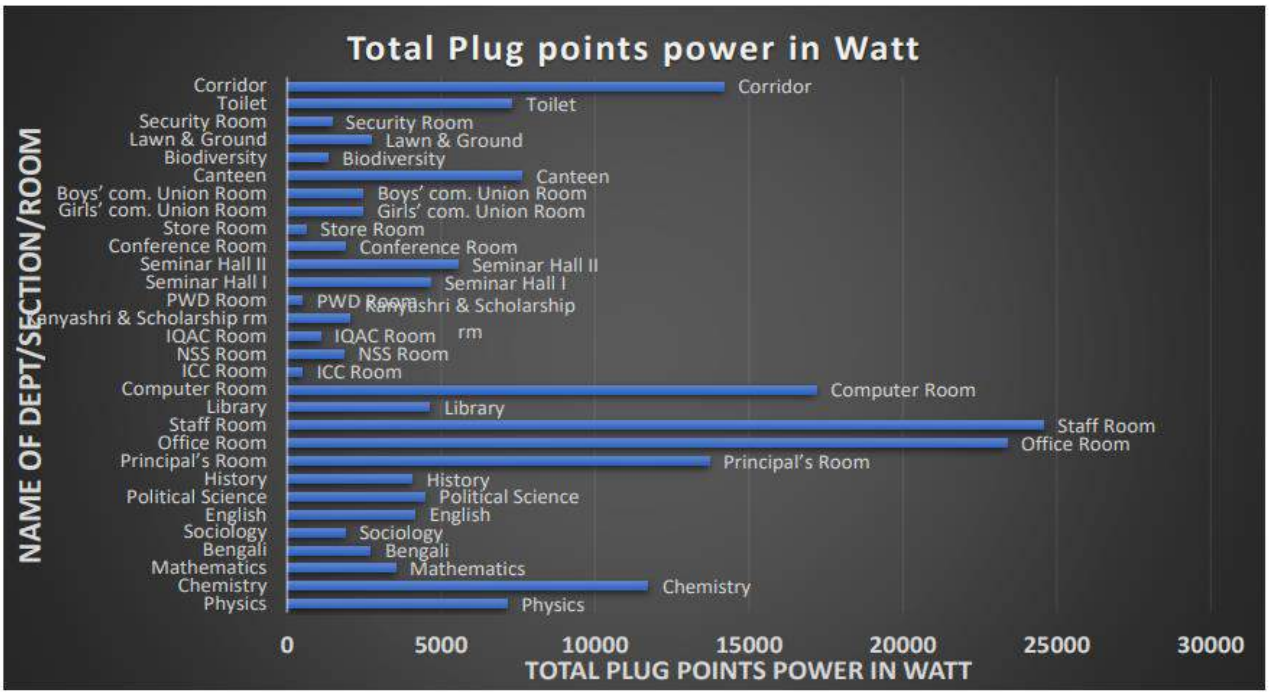
Data Collection

The College Building comprises eight isolated Depts (Physics, Chemistry & Mathematics,), Arts classrooms (for five Arts Depts: English, Bengali, History, Political Science & Sociology), Staff room, Seminar room, Conference room, Principal room, Office room, Library, Kanyashree room, NSS room, ICC room, IQAC room, Student's Common rooms, store room, PWD room, canteen, Biodiversity corridors, Toilet, Security room, Lawn & Ground. The energy audit report team has collected all connected loads and plug point loads (room wise) and then calculated the maximum power requirement, maximum energy consumption in a month and so many energy consumption analyses (using bar diagram). The team also analyse the actual power consumption (month wise) and made a comparative study on monthly consumption. Device wise consumption and their comparative are also presented in bar diagram.

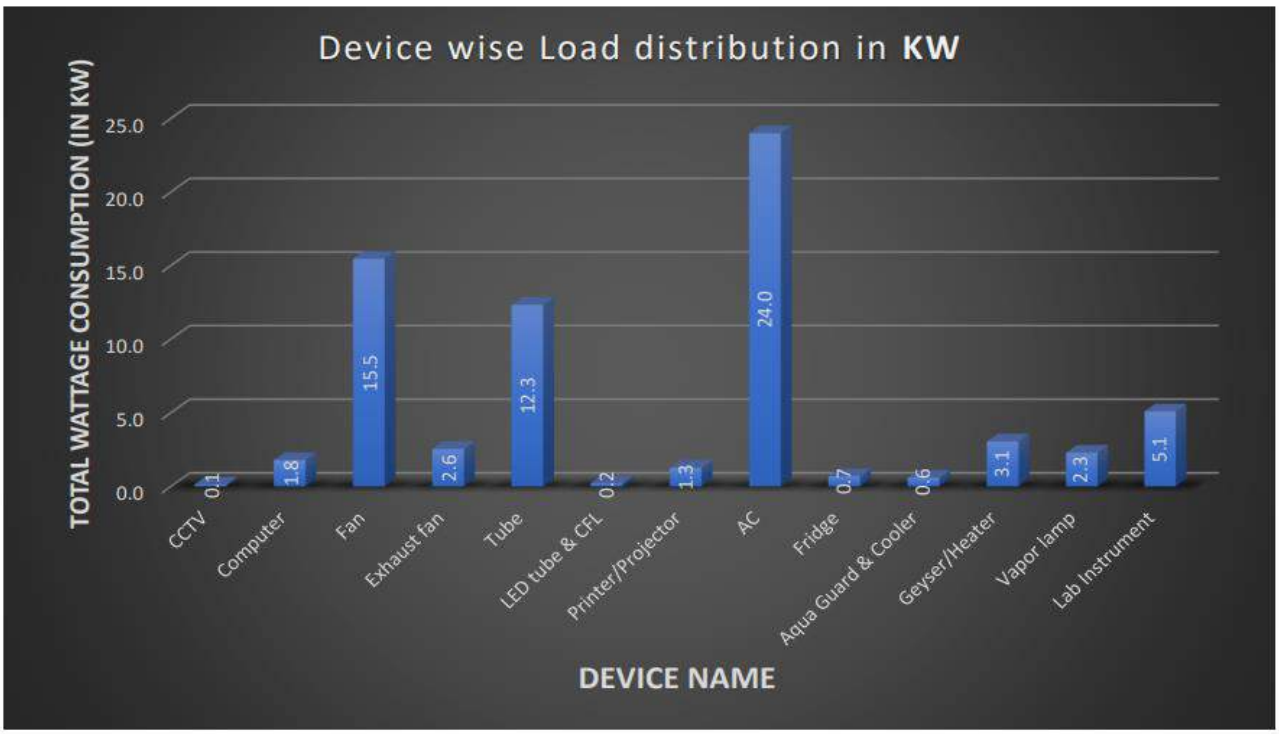
Plate 8. Left: Energy Audit Committee Members meeting with Principal, GGDC Chapra in 5th January 2023; Right: CCTV Camera and Energy Consumption data collection by the Experts.

List of Energy Consuming Sources: (Table Format) [Principal's Room, Principal Office and Department wise]

Dept./ Section/ Room	CC Camera (No.)	Computer (No.)	Fan (No.)	Ex- Fan (No.)	Tube (No.)	LED tube/ CFL (No.)	Printer/ Projector (No.)	AC (No.)	Fridge (No.)	Aqua guard & Cooler (No.)	Heater /Geyser (No.)	Vapor Lamp (No.)	16 Amp Plug (No.)	6 Amp Plug (No.)	Lab Instrument (No.)	Total Plug points power in Watt	Total Power without plug points in Watt	Total Watt
Physics	1	1	18	0	20	0	0	0	0	0	0	0	2	7	5	2420	4715	7135
Chemistry	1	0	26	0	31	0	0	0	2	0	0	0	4	10	7	4600	7115	11715
Mathematics	1	1	9	0	12	0	0	0	0	0	0	0	2	4	0	2240	1265	3505
Bengali	1	0	12	0	14	0	0	0	0	0	0	0	1	5	0	1300	1405	2705
Sociology	1	0	6	0	7	0	0	0	0	0	0	0	1	3	0	1180	705	1885
English	2	0	15	0	18	0	0	0	0	0	0	0	2	6	0	2360	1780	4140
Political Sc.	1	0	18	0	21	0	0	0	0	0	0	0	2	6	0	2360	2105	4465
History	1	0	15	0	16	0	0	0	0	0	0	0	2	6	0	2360	1695	4055
Principal's Room	3	2	5	0	6	0	1	2	0	0	0	0	8	10	0	8600	5105	13705
Office Room	1	5	7	0	8	0	3	4	0	0	0	0	12	20	0	13200	10165	23365
Staff Room	0	2	7	0	8	0	1	4	0	0	0	0	14	21	0	15260	9310	24570
Library	3	1	18	0	18	0	0	0	0	0	0	0	2	8	0	2480	2145	4625
Computer Room	0	1	6	0	6	0	0	2	0	0	0	0	11	23	0	12380	4810	17190
ICC Room	1	0	3	0	4	0	0	0	0	0	0	0	0	2	0	120	375	495
NSS Room	1	0	6	0	6	0	0	0	0	0	0	0	1	3		1180	665	1845
IQAC Room	1	1	3	0	4	0	1	0	0	0	0	0	0	6	0	360	725	1085
Kanyashri & Scholar. rm.	1	0	6	0	6	0	1	0	0	0	0	0	1	3	0	1180	865	2045
PWD Room	1	0	3	0	4	0	0	0	0	0	0	0	0	2	0	120	375	495
Seminar Hall I	2	1	15	0	16	0	1	0	0	0	0	0	2	10	0	2600	2050	4650
Seminar Hall II	2	0	15	0	22	0	0	0	0	0	0	0	3	10	0	3600	1940	5540
Conference Room	1	0	6	0	7	0	0	0	0	0	0	0	1	3	0	1180	705	1885
Store Room	2	0	4	0	4	0	0	0	0	0	0	0	0	3	0	180	450	630
Girls' comm. Room	0	0	8	0	18	0	0	0	0	0	0	0	1	3	0	1180	1280	2460
Boys' comm. Room	0	0	8	0	18	0	0	0	0	0	0	0	1	3	0	1180	1280	2460
Canteen	0	0	3	1	7	0	0	0	1	1	2	0	4	1	0	4060	3565	7625
Biodiversity	0	0	2	0	3	0	0	0	0	0	0	0	1	1	0	1060	260	1320
Lawn & Ground	3	0		0	0	0	0	0	0	0	0	18			0	0	2715	2715
Security Room	0	0	2	0	3	0	0	0	0	0	0	0	1	3	0	1180	260	1440
Toilet	0	0	1	19	24	22	0	0	0	0	1	0	2	0	0	2000	5300	7300
Corridor	6	0	13	0	32	4	0	0	0	2	0	0	11	7		11420	2760	14180
Grand Total	**37**	**15**	**260**	**20**	**363**	**26**	**8**	**12**	**3**	**3**	**3**	**18**	**92**	**189**	**12**	**103340**	**77890**	**181230**



Bar diagram for Department/Section wise load distribution



Bar diagram for Device specific power consumption

Calculation of Electrical Load & Consumption: - (Table Format) [Equipment item wise]:

SL. No.	Name of the Equipment	Total No. of Equipment	Wattage	Total Wattage	Demand Factor	Max. Demand (Watt)	Max. Demand (KW)
1	CCTV	37	5 - 10	185	0.8	148	0.1
2	Computer	15	150	2250	0.8	1800	1.8
3	Fan	260	70 - 100	18200	0.85	15470	15.5
4	Exhaust fan	20	150 - 250	3000	0.85	2550	2.6
5	Tube	363	40	14520	0.85	12342	12.3
6	LED tube & CFL	26	9 - 22	260	0.85	221	0.2
7	Printer/Projector	8	200 - 300	1600	0.8	1280	1.3
8	AC	12	1500 -2000	24000	1	24000	24.0
9	Fridge	3	250-275	825	0.85	701	0.7
10	Aqua Guard & Cooler	3	250 - 350	750	0.8	600	0.6
11	Geyser/Heater	3	1200 - 3000	3600	0.85	3060	3.1
12	Vapor lamp	18	150	2700	0.85	2295	2.3
13	16 Amp Plug	92	1000	92000	0.25	23000	23.0
14	6 Amp Plug	189	60	11340	0.5	5670	5.7
15	Lab Instrument	12	200 - 2000	6000	0.85	5100	5.1

Total Wattage = 98237 Watt

Sum of individual maximum demand in KW = 98.237 KW

Simultaneous maximum demand (50% of Total Demand) = 49.119 KW

Maximum Energy consumption one hour per day (KWH) = 49 BOT unit

Maximum Energy consumption five hour per day (KWH) = 245 BOT unit

Maximum Energy consumption for one year (taking 240 working days) = 58800 BOT unit

Maximum Energy consumption for rest 125 days (taking 5% of normal consumption) = 1531 BOT unit

Maximum Energy consumption for one Year = 60331 BOT unit

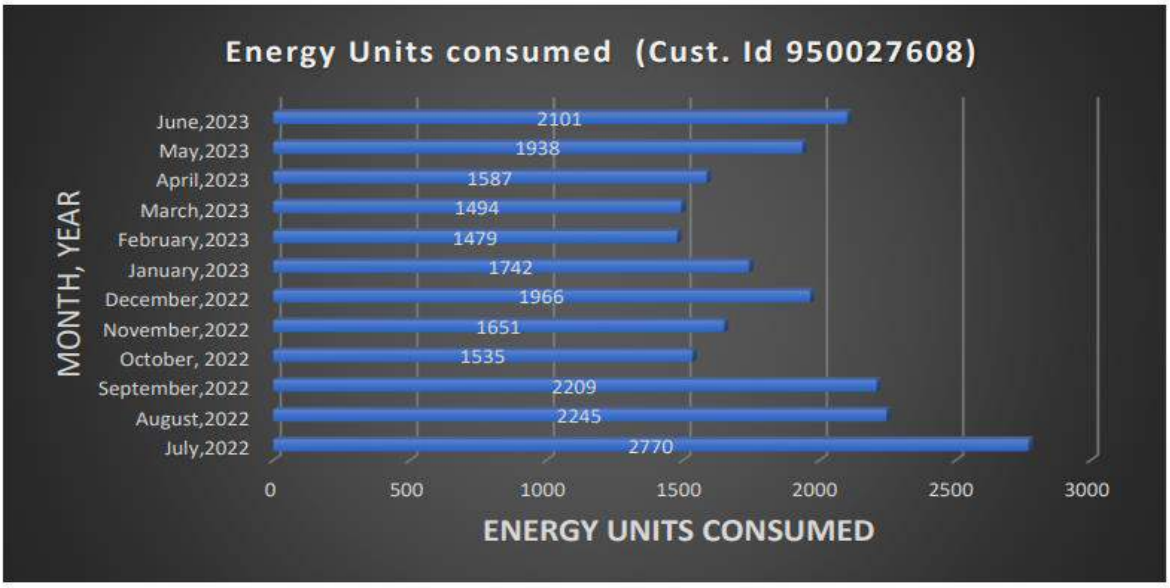
Maximum Energy consumption (average) for one month = 5028 BOT unit

Consumption of Energy (units) in the period July, 2022 to June, 2023 (Table Format):

Month, Year	Energy consumed (Cust. Id 950027608) (in Units)
July,2022	2770
August,2022	2245
September,2022	2209
October, 2022	1535
November,2022	1651
December,2022	1966
January,2023	1742
February,2023	1479
March,2023	1494
April,2023	1587
May,2023	1938
June,2023	2101

Yearly Total Energy units Consumed = 22717 units

Monthly (average) Energy units Consumed = 1893 units



Bar Chart showing the Energy Units Consumption in the different months for the Period- July, 2022 to June, 2023.

Observation

Electricity is the main energy source of the college. During data collection for energy audit, we find the actual load distribution among different Dept./Sections inside the college campus. Filament bulbs are completely replaced by LED bulbs to save power consumption in the rural area. Besides this we are going to install photovoltaic cells soon in the campus as an alternate renewable source of energy. Computers, AC and other instruments run in power saving mood. Unnecessary consumption of power is restricted. Most of the plug points are used for low wattage devices and all switches are immediately turned off, whenever they are not operating.

Conclusion

Energy auditing is an effective implement in detecting and perusing a compressive energy management program. A careful audit of any institution gives a road-map with which it can effectively manage the energy consumption at minimum charge as well as saving the electricity. Even this study may prevent the accidental event caused by overload or short-circuit. The given data helps us for this particular precautionary measurement in the future of the organisation.

Govt. General Degree College, Chapra * ESTD.- 2013 * Government of W.B. *

Signature of Energy Audit Committee:

Name

Signature of the Principal
(Dr. Subhasis Panda)

Principal
Govt. General Degree Colleg.

1. Mr. Sudipta Das ..... Sudipta Das .....

2. Dr. Ayan Bandyopadhyay ..... Ayan Bandopadhyay .....

3. Dr. Shaikh Safikul Alam ..... Shaikh Safikul Alam .....

THE ENERGY AUDIT REPORT IS CERTIFIED BY

11.03.2024
Junior Engineer (P.W.D)
Krishnagar Electrical Section-II
Govt. of West Bengal

11/03/2024
Executive Engineer (P.W.D.)
Nadia Electrical Division
Krishnanagar, Nadia

ENERGY AUDIT DATA COLLECTION IMAGES & OTHER RELEVANT IMAGES

Plate 9. 1st Row left: AC Block Principal Room & Guest Room; 1st Row Right: Principal Room LED Light & Fan. 2nd Row left: Energy consumed by Induction Oven at Canteen; 2nd Row Middle: Inverter at Principal's Room; 2nd Row-Right: Enegy consumed by Ground Floor Water Purifier system & CCTV Camera at Principal Room. 3rd Row Left: Computer & Printer at Principal Room; 3rd Row Right: AC at Principal Room.

Plate 10. 1st Row left: Energy consumed by Refrigerator at Canteen; 1st Floor Middle: 2 AC at Teachers & Principal Office Room; 1st Row-Right: data collection at Physics Lab. 2nd Row left: Another 2 AC at Principal Office Room; 2nd Row Middle & Right: Newly installed Power Switch on 1st Floor Corridor by P.W.D. 3rd Floor left & Right: Data collection at Physics Lab.

Plate 11. 1st Row left: Energy consumed data collection at Physics Lab during Practical Work; 1st Row Right: Energy Committee members final meeting with the Principal. 2nd Row: Data Collection by the Convenor at Main power Switch, Sajal Dhara and Water purifier at Canteen. 3rd Floor left: Energy Audit seminar at Hall no 1, GGDC Chapra; Right: in front Gate with the external expert, Dr. S. Manna.

The calculation of carbon footprint can be carried out according to the method outlined on www.carbonfootprint.com, which involves summing the annual electricity usage. The CO2 emissions from electricity are calculated using the formula:

CO2 emission from electricity = (electricity usage per year in kWh / 1000) x 0.84

Substituting the given values: = (18982.84 kWh / 1000) x 0.84 = 15.94 metric tons (year 2021-22)

Substituting the given values: = (25335.38 kWh / 1000) x 0.84 = 21.28 metric tons (year 2022-23)

Note: Annual electricity usage: 25335.38 kWh• 0.84 is the conversion coefficient from kWh to metric ton•

The amount of CO2 (ppm) in different places is depicted in table 3 and its corresponding pie diagram is shown in figure 5.

Table 2. Amount of CO2 (ppm) in different places

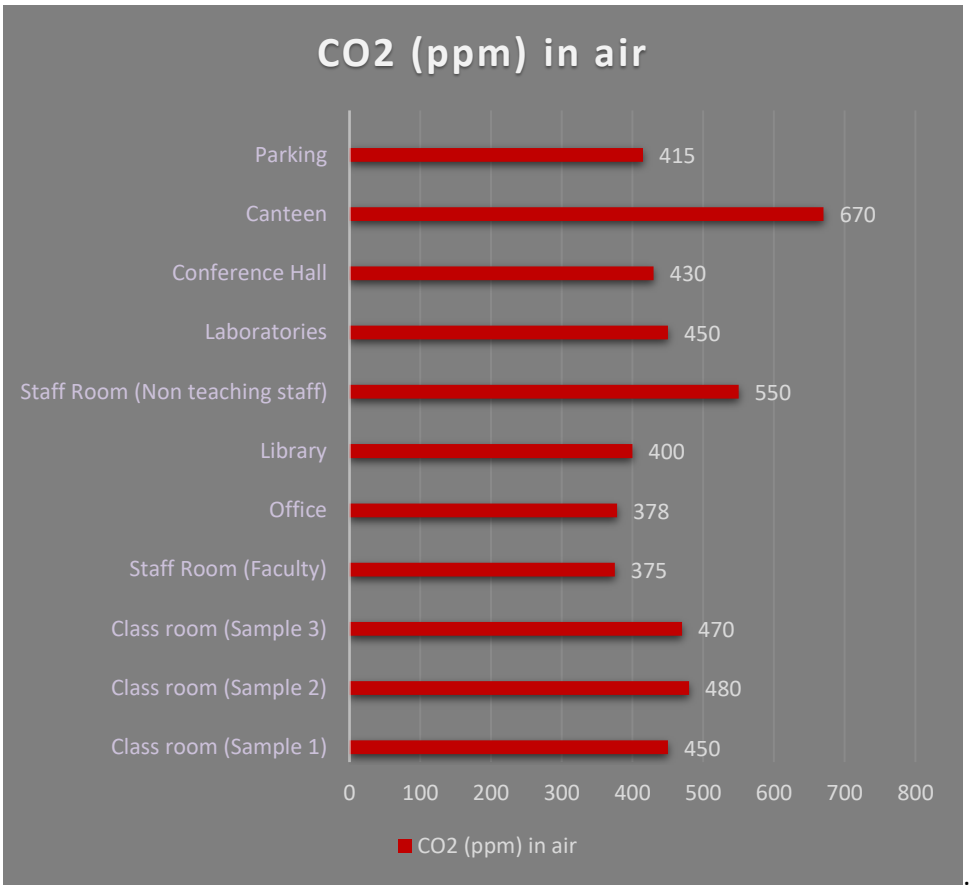
Locations inside college campus	CO2 (ppm) in air
Class room (Sample 1)	450
Class room (Sample 2)	480
Class room (Sample 3)	470
Staff Room (Faculty)	375
Office	378
Library	400
Staff Room (Non teaching staff)	550

Laboratories	450
Conference Hall	430
Canteen	670
Parking	415

CO2 Level Reference Ranges:

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

Amount of CO2 (ppm) of the Air in Different location of the college Premises


CO2 (ppm) in air
Parking
415
Canteen
670
Conference Hall
430
Laboratories
450
Staff Room (Non teaching staff)
550
Library
400
Office
378
Staff Room (Faculty)
375
Class room (Sample 3)
470
Class room (Sample 2)
480
Class room (Sample 1)
450
0
100
200
300
400
500
600
700
800
CO2 (ppm) in air

9. Major audit observation:

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

 # H denotes management policy level > 25%

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

 # L denotes management policy level< 15%

10. Best Practices followed in the Organization

- ✓ Converters, alternators, and backup power units are safely enclosed and accompanied by alert signs indicating 'Hazards' and 'Caution'.
- ✓ 'Activate' and 'Deactivate' signals are strategically positioned across many locations to encourage energy-conserving behaviours among participants.
- ✓ Electrical wires, switch boxes and stabilizers are adequately protected to prevent any potential hazards to staff and students.
- ✓ Power factor is maintained close to unity with Automatic Power Factor Correction mode.
- ✓ Old generation computers are replaced with LED monitors.
- ✓ Star rated equipment is used where applicable.

11. Energy Conservation Proposals:

The power evaluation offered suggestions for lessening energy expenditures, introducing precautionary upkeep actions, and improving quality assurance endeavors, all essential for the effective functioning of utilities at the assessment locales.Implementing Energy-Efficient Systems for Air Conditioning: These systems intelligently diminish compressor runtime via timing or temperature variance logic, all the while maintaining human comfort unchanged. This advancement may yield electricity reductions varying from 15% to 30%, depending on weather conditions and temperature presets. With a sum of 7 split-type air conditioners, it is recommended to progressively substitute older units with fresh, energy-saving designs designated with a minimum of 3 Stars by the Bureau of Energy Efficiency (BEE). Considering an average compressor activation duration of 5 hours daily, this shift assures notable energy preservation.

- Contemplate acquiring energy-saving machinery (4-5 star rated) during replacements.
- Incandescent bulb and Tube light must be replaced with LED where applicable.
- Solar module must be implemented to minimise conventional energy usage.

- It is recommended to deploy sub-meters in every edifice for energy supervision to monitor energy load and consumption per structure.
- Employ optimal water usage and temperature configurations through automated procedures to attain energy reductions.
- Arrange for continual surveillance and examination of energy usage with a specialized team on campus.
- Routinely conduct consciousness-raising drives on energy preservation (ECON) among stakeholders through societies, societies, forums, and segments.
- Promote deactivating electrical devices when not in operation.
- Guarantee upkeep and renewal of aged gadgets in all laboratories.
- Utilize energy-saving mode on PCs and electronic gadgets.
- Establish a Biogas facility for the dormitory kitchen and cafeteria.
- Enforce automated switches with occupancy detectors in communal zones.
- The substantial monthly electricity usage in the institution can be significantly diminished through recurrent energy evaluations.
- Substitute antiquated and non-energy-efficient fans with modern energy-efficient models.
- Systematically supervise apparatuses in all laboratories and promptly attend to any malfunctions.

12. Recommendations on Carbon Footprint in the Organization:

1. Implement Energy-Efficient Practices: Introduce energy-efficient technologies and practices such as LED lighting, smart heating and cooling systems, and energy-efficient appliances to reduce energy consumption and carbon emissions.

2. Promote Renewable Energy Sources: Invest in renewable energy sources such as solar panels, wind turbines, or geothermal systems to reduce reliance on fossil fuels and decrease carbon emissions.

3. Optimize Transportation: Encourage employees to carpool, use public transportation, or switch to electric or hybrid vehicles to reduce emissions from commuting and business travel.

4. Reduce, Reuse, recycle: Implement waste reduction and recycling programs to minimize carbon emissions associated with waste disposal and promote a circular economy.

5. Telecommuting and Remote Work: Offer telecommuting options or remote work opportunities to reduce the need for commuting and office space, thereby decreasing carbon emissions from transportation and building operations.

6. Sustainable Procurement: Source products and materials from suppliers with sustainable practices and consider the environmental impact of procurement decisions to reduce carbon emissions throughout the supply chain.

7. Carbon Offsetting: Invest in carbon offset projects such as reforestation, renewable energy projects, or methane capture to compensate for unavoidable carbon emissions.

8. Employee Education and Engagement: Provide training and educational resources to employees on carbon footprint reduction strategies and engage staff in sustainability initiatives to foster a culture of environmental responsibility.

9. Monitoring and Reporting: Establish systems to monitor and track carbon emissions, set reduction targets, and regularly report progress to stakeholders to demonstrate commitment to carbon footprint reduction.

10. Continuous Improvement: Continuously evaluate and improve upon carbon reduction initiatives, identify areas for further optimization, and adapt strategies to evolving sustainability goals and challenges.

13. Conclusions: Granted the institution's firmly established prestige and endurance, there emerges substantial prospect to enhance energy preservation pursuits and propel the grounds towards autonomy. The establishment has already taken admirable strides in this trajectory by deploying energy-sparing illumination, nurturing cognizance amidst stakeholders, and ensuring dependable power reserves. Moreover, the institution adheres to optimum

methodologies in energy assessment, encompassing the proper fortification of converters, alternators, and UPS systems with enclosures and cognizance panels accentuating plausible perils. Distinguished signposts endorsing energy-conserving behaviours, alongside scrupulous upkeep of electrical framework, further fortify energy preservation endeavors and ensure the welfare of educators and scholars.

The integration of sprinkler watering on campus to curtail energy usage is commendable. Nevertheless, there are supplementary proposals that could enhance the institution's capacity for energy economization

RECCOMMANDATION

To reduce energy consumption and management

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