ENVIRONMENTAL AUDIT REPORT

January 2021- December 2021

DUDHNOI COLLEGE

Dudhnoi, Goalpara, Assam- 783124

February -2022

Prepared by

Thunderbolt Energy Consultancy

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1. Disclaimer

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2. Acknowledgement

We express our sincere gratitude to the authorities of Dudhnoi College, Dudhnoi for entrusting and offering the opportunity of Environmental Audit of their college premises.

- Dr. Lalit Chandra Rabha - Principal
- Mrs. Bondita Borbora - Assistant Professor

We are also thankful to all field staff and agencies working with whom we interacted during the field studies for their wholehearted support in undertaking measurements and eagerness to assess the system / equipment performance and saving potential. Also thankful to all concerned staff interacted during the conduct of this exercise for completing official documentations.

We hope that the recommendations stated in this report will be useful and worthy of discussions to take things forward to help implementation of Environmental practices. While we have made every attempt to adhere to high quality standards, in both data collection and analysis through the report, we would welcome your suggestions so as to improve upon this report further.

3. Why Environmental Audit?

An audit which aims at verification and validation to ensure that various environmental laws are compiled with and adequate care has been taken towards environmental protection and preservation.

Environmental auditing is essentially an environmental management tool for measuring the effects of certain activities on the environment against set criteria or standards. Depending on the types of standards and the focus of the audit. Organizations of all kinds now recognize the importance of environmental matters and accept that their environmental performance will be scrutinized by a wide range of interested parties. Environmental auditing is used to investigate, Understand and identify.

These are used to help improve existing human activities, with the aim of reducing the adverse effects of these activities on the environment. An environmental auditor will study an organization environmental effects in a systematic and documented manner and will produce an environmental audit report.

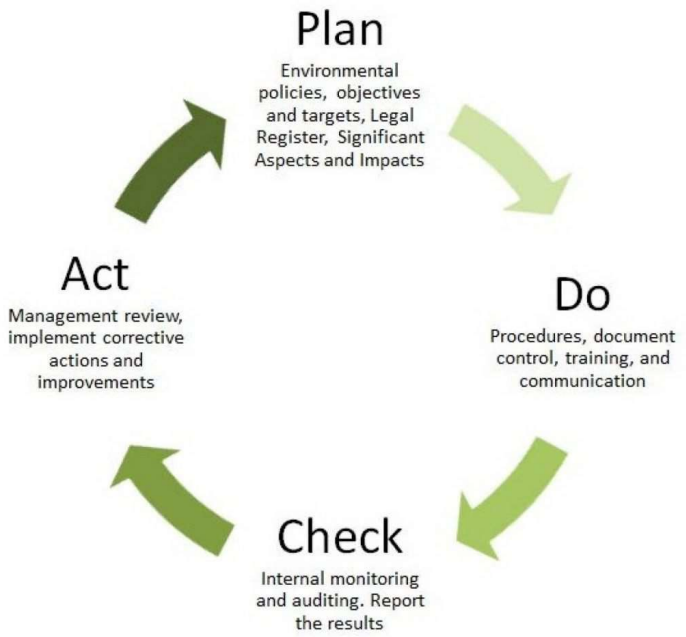

Figure 1 Activity Chart

4. Environmental Audit Team

Table 1 Details of the team members of Thunderbolt Energy Consultancy

Name	Role	Field of expertise
Mr. Mahesh Khode	Project coordinator, Report verification	Graduate Electrical engineer with experience in Energy Efficiency Assessment, Electrical distribution system, Design, Power assets Evaluation and Project Management, resource management.
Mr.Kaustubh Bhatwadekar	Energy Auditor	Graduate Mechanical engineer, M.Tech IIT Bombay, Bureau of Green Efficiency Certified Energy Auditor, Experience In Industrial Energy, distribution system, Energy Efficiency Assessment.
Mr. Prashant Yadav	Data tabulation and analysis & report preparation	Graduate in Electrical & Electronics Engineering with experience in Energy & Power projects.

5. Executive Summary

The rapid urbanization and economic development at local, regional and global level has led to several environmental and ecological crises. On this background it becomes essential to adopt the system of the Green campus for the institute which lead for sustainable development.

Dudhnoi college, Dudhnoi is deeply concerned and unconditionally believes that there is an urgent need to address these fundamental problems and revers the trends. The purpose of the audit was to ensure that the practices followed in the campus are in accordance with the Environmental Policy adopted by the institution. The methodology included: Physical inspection of the campus, observation and review of the documentation, interviewing key person and data analysis, measurements and recommendations. It works on the several facets of Green Campus including Water Conservation, Tree Plantation, Waste Management, Paperless Work, Alternative Energy and Mapping of Biodiversity. With this in mind, the specific objectives of the audit was to evaluate the adequacy of the management control framework of environment sustainability as well as the degree to which the Departments are in compliance with the applicable regulations, policies and standards. It can make a tremendous impact on student health and learning college operational costs and the environment. The criteria, methods and recommendation used in the audit were based on the identified risks.

After the Field measurements & analysis, we present herewith important observations made and various measures to reduce the dependency on Natural resources & reduce the pollution.
Dudhnoi college, Dudhnoi consumes various resources for day to day operations, namely: Air, Water, Electrical Energy and LPG.

5.1 Present Level of CO_2 Emissions

In the following Table, we present the details of CO_2 Emissions Consumption.

Table 2 Details of CO2 Emissions Consumption

Sr no	Parameter	Boys Hostel		Girls Hostel		College Building	
		Energy consumed, (Units)	CO2 Emissions, MT	Energy consumed, (Units)	CO2 Emissions, MT	Energy consumed, (Units)	CO2 Emissions, MT
1	Maximum	210	0.17	390	0.31	3764	3.01
2	Minimum	120	0.10	240	0.19	2445	1.96
3	Average	152	0.12	293	0.23	3524	2.82

Note- Due to defective meter above figure is based on estimated data as per electricity bill.

5.2 Various Measures Adopted for Energy Conservation

1. Solar lighting system Installed.
2. Installation of Rooftop Rain Water Harvesting system.
3. Installation of Bio composting pit.
4. Usage of Energy Efficient LED.
5. Usage of Energy Efficient BEE STAR Rated equipment.
6. Usage of Natural Day light in corridors.
7. Implementation of Bio Composting pit for disposal of Bio degradable waste.
8. Installation Solid waste collection unit.
9. Training and capacity building of students about Environment laws, E waste drives, efficient use of water and other natural resources.

5.3 Waste Management

The College has already installed a Bio composting Plant, wherein, the bio-degradable waste is composted & is used as fertilizer for the garden.

The internal communication is through emails and hence there is hardly any generation of e-Waste in the premises.

5.4 Rain Water Harvesting

The College has installed the Rainwater harvesting project, to reduce dependency on municipal corporation water supply.

6. Abbreviations

CFL	:	Compact Fluorescent Lamp
FTL	:	Fluorescent Tube Light
LED	:	Light Emitting Diode
V	:	Voltage
I	:	Current
kW	:	Kilo- Watt
kWh	:	kilo-Watt Hour
kVA	:	Active Power
AC	:	Air conditioner
PES	:	Progressive Education Society
Qty	:	Quantity
W	:	Watt
PF	:	Power Factor
M D	:	Maximum Demand
PC	:	Personal Computer
APDCL	:	Assam Power Distribution Company Ltd

7. Introduction

Dudhnoi College is the manifestation of the collective dreams of people of the locality and the result of their aspirations and perspirations. The college is located in Dudhnoi, which is now headquarter of the Rabha Hasong Autonomous Council and is 110 km from Assam's capital city Guwahati and 42 km from district headquarter town Goalpara. The College had a modest beginning with only Pre-University (Higher Secondary) Arts classes in 1972. Degree classes of Arts stream started in 1974.Latter on Science and Commerce streams were added in session 1985-86 and 2015-16 respectively. Presently the college has 18 different departments offering both Honours (Major) and General Courses. The college has a pristine green and scerne campus spreading over a vast area of 33.05 acres. A big horse-shoe shaped pond runs around the main building. A foot-bridge over the pond enhances the beauty.

7.1 Objectives

The main objective of the Environmental audit is to promote the Environment Management and Conservation in the College Campus. The purpose of the audit is to identify, quantify, describe and prioritize framework of Environment Sustainability in compliance with the applicable regulations, policies and standards.

The main objectives of carrying out Environmental Audit are:

- To introduce and aware students to real concerns of environment and its Sustainability.
- To secure the environment and cut down the threats posed to human health by analyzing the pattern and extent of resource use of the campus.
- To establish a baseline data to assess future sustainability by avoiding the interruptions in environment that are more difficult to handle and their corrections requiring high cost.
- To bring out a status report on environmental compliance.
- To study present usage of natural resources the college is consuming.
- To Study the present pollution sources.

7.2 Audit methodology

In order to perform environmental audit, the methodology included different tools such as Physical inspection of the campus, observation and review of the documentation, interviewing key persons and data analysis, measurements and recommendations. The study covered the following areas to summaries the present status of environment management in the campus:

- Resource of pollution
- Water management
- CO2 emissions
- Waste management
- E-Waste management
- Environmental area management

7.3 About Thunderbolt Energy Consultancy

We are pleased to introduce ourselves as **Thunderbolt Energy Consultancy**. We are a team of young Energy professionals, working to help Businesses and facilities become Energy efficient and promote green and clean Energy.

Our highly competent team of 'Bureau of Energy Efficiency Certified Energy Auditors and Certified Energy Managers having experience in variety of sectors and managing various functions for over years.

We using most advanced instruments in order to help you reduce Energy consumption and achieve better efficiency.

We are providing services in various areas like

- Energy Audit, Electrical Audit, Electrical Survey
- Green Audit & Environmental Audit for all Entities
- Safety Audit, Electrical safety audit, Safety survey
- Street Light EA, SL Survey, SL Sales & Installation
- Electrical Repair & Maintenance Services
- Project Management Consultancy
- Third-Party Audit

We have a highly trained and experienced team of certified Energy and Safety Auditors, Energy Manager, Analyst, Engineers & Retailers. We are presently working in pan India.

8. General Details of College

Table 3 Details of College campus

Particulars	:	Details
College name	:	Dudhnoi College
Date of Establishment	:	1972
Address	:	Dudhnoi, Goalpara- 783124
Contact details	:	8638103337, Email- iqacdudhnoicollege@gmail.com/ dudhnoicollege@gmail.com
Scope of audit	:	Green Audit for college
Number of staffs	:	Teaching – 47 Male, Female - 42 **Total- 89** Non-Teaching - 39 Male: Female: 12. **Total - 51**
Number of students	:	Total: 3760, Male: 1755, Female: 2005. (Academic Year 2021-22)
Courses offered	:	H.S. (Arts, Science and Commerce), B.A., B. Sc., B. Com., KKHSOU (B.A. and M. A.), IDOL (M.A, M. Sc. And M. Com)
College members	:	Guwahati University

Table 4 Details of College Building

Sr. No.	Details
1	Total campus area: 1,33,779 (Approximately 33.05 Acres)
2	Building: 12015.62 square meters.
3	Number of Class Rooms: 37
4	Number of Laboratories: 23
5	Number of Computers: 107 Desktop and 06 Laptop
6	Water filters with aqua guard: 12
7	Aqua guard for staff: 06
8	Water coolers: 01
9	Number of Fire Extinguishers: 15
10	Classrooms with sufficient cross ventilation and light-37
11	Number of Air Conditioner's: 04
12	LCD: 10
13	Smart Board: 03

9. Resource of Pollution

Majority of the students, non-teaching staff and some faculty members depends public transport to reach college, indicating lesser carbon foot print of the student community. Usage of bicycles and vehicle pooling are noted in the college. Both these should be upgraded as an institutional policy in order to reduce carbon foot print. Student hostels are located in college campus. Many students live in hostel campus. Many of the Out of total students coming to Institute, about 40% students use own Automobile.

The Institute consumes following basic/derived resources:

1. Air- Clean natural air.
2. Water- Supply from bore well.
3. Electrical Energy- Government grid supply.
4. Liquefied Petroleum Gas- Government authorized agencies.

We try to draw a schematic diagram for the College System & Environment as under.

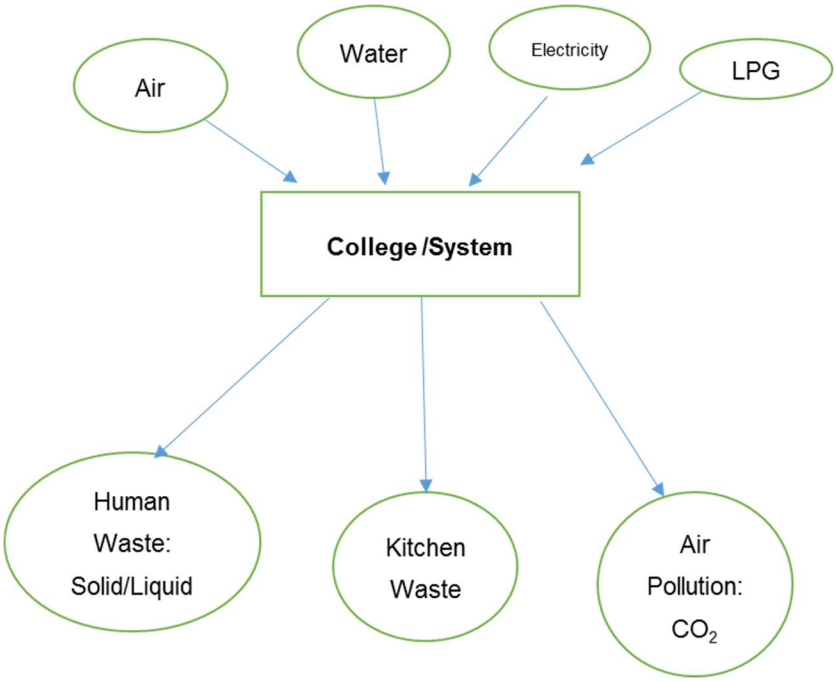

Figure 2 Resource of pollution

Pollution Under Control (PUC) is mandatory for the Vehicles coming in the campus. Awareness sessions and training of noise meters have been given to the students.

The following practices are observed in college premises.

1. Staff and student entries are strictly prohibited without wearing of helmets.
2. The college organized orientation sessions and on road safety, traffic rules and regulations, safety measures.
3. The subject Environment Awareness is mandatory for students. Under this subject the air pollution, noise pollution, EIA, green practices etc. performed.
4. Most of plants play major role in minimize the air and noise pollution.

Figure 3 Vehicle Parking in Campus

10. Study of Water Management System

10.1 Source of Water

The study observed College campus uses water from tube well ground water system. Water is used for drinking, Toilets and gardening purpose. The Waste water from the RO water purifier is used for gardening purpose. During the survey no loss of water is observed. The consumption of water of college is around 21,000 liters per day and all tanks are cleaned once in a month by proper use of chemicals.

Details of water tank in the College:

Table 5 Campus Water Tank Details

Sr No	Building Name	No. of Tanks	Capacity (L)	Total (L)
1	Boys Hostel	2	1000	2000
2	Girls Hostel	4	1000	4000
3	Science Building	2	1000	2000
4	Botany Department	2	1000	2000
5	Girls Common Room	1	1000	1000
6	New Toilet, Adjacent to Botany Department	1	1000	1000
7	Library Building	2	1000	2000
8	Administrative Building	1	1000	1000
9	Canteen	1	1000	1000
10	Commerce Building	1	1000	1000
11	Principal Quarter	1	1000	1000
12	Boys Common Room	1	1000	1000
13	Bagdebi Ghat	1	1000	1000
14	Indoor Stadium	1	1000	1000

10.2 Drinking water

Drinking water quality is tasted weekly and water filters are cleaned.

10.3 Waste water management

Number of washrooms: Toilets – 46 (Total in the College), 25 Urinal, 21 Toilet. Waste water and human excreta is properly treated, the treated water is then used for lawns, plants and gardening purpose.

Figure 4 Waste Water lawns, Plants and Gardening Purpose

In campus small, medium or large-scale reuse and recycle of water system is necessary. Minimize wastage of water and use of electricity during water filtration process, if used, such as RO filtration process and ensure that the equipment's use for such usage are regularly serviced. Ensure that all cleaning products used by college staff have a minimal detrimental impact on the environment. Garden should be watered by using drink/ sprinkler irrigation system to minimize water use.

10.4 Rooftop Rainwater Harvesting (RWH) – Potential assessment

Roof-top rain water harvesting techniques are most simple, but neglected in the water harvesting programs. It requires two basic elements: - a catchment's a broad surface to catch the rain and method or device for storing the captured rain. Rooftop rainwater harvesting is one of the optimistic and economically viable methods of rainwater harvesting. Rooftop rainwater is allowed to percolate in the ground and become helpful to increase ground water recharging groundwater aquifers. Dudhnoi college have huge potential to trap the rainwater and enable for groundwater recharge through bore-well recharge.

The College has already installed Rooftop Rain Water Harvesting project in some building, wherein the rain water falling on the terrace is collected and through pipes it is fed to underground Water Storage tank.

Figure 5 Roof-Top Rain Water Collection

11. Study of CO2 Emission

11.1 Energy Details

The electricity supply for Dudhnoi College is provided by Assam Power Distribution Company Limited. The Energy consumed by Dudhnoi College falls under LT Category. The facility also has 2 DG sets of 15 kVA. The DG set is mainly used for power failure from APDCL.

Table 6 Details of Energy Consumption

Sr. No	DG details	Name of the building
1	15 kVA	College Building
2	15 kVA	College Building

The Energy efficiency assessment was conducted for the load connected to the mains supply of college building, Boys hostel and Girls hostel.

Table 7 Details of Energy consumption

Name of Consumer	Tariff Category	Consumer Account No.
Principal Dudhnoi College	LT V(A) supply	039000007449
Girls Hostel Dudhnoi College	LT V(A) supply	039000007450
Boys Hostel Dudhnoi College	LT V(A) supply	039000007451

As per the electricity bill all 3 Energy meter is defective and the reading is on estimated base so it is recommended to put compliant in nearest APDCL office and change the meter as soon as possible.

11.2 Energy Use

This indicator addresses energy consumption, energy source, energy monitoring, lighting, appliance, natural gas and vehicles, Energy use is clearly an important aspect of campus sustainability and thus requires no explanation for its inclusion in the assessment.

Mainly Energy is used on this facility for the following purposes:

1) Lighting's load
2) Air conditioners
3) Fan
4) Water pump
5) Office equipment

The entire campus including common facility center are equipped with LED lamps and LED tube lights, except at few locations. Beside this, photovoltaic cells are also installed in the campus as an alternative renewable source of energy but due to some technical reason it's not in working condition. Computers are set to automatic power saving mode when not in use.

In campus premises electricity should be shut down when not in use and during leaving office and class rooms. Support renewable and carbon-neutral electricity options on nay energy purchasing consortium, with the aim of supplying all college properties with electricity that can be attributed to renewable and carbon neutral sources. It is preferable to purchase electricity from a company that invest in new source of renewable and carbon-neutral electricity. Installation of LED lamps instead of CFL or load lams and replacing the old tube lights with the new LED tubes. 5 star rated ACs, Fans and CFLs should be used in the campus area. Cleaning of tube lights and bulbs to be done periodically to remove dust over it.

Figure 6 Roof-Top Solar System

11.3 Carbon Footprint

1. **A Carbon Foot print** is defined as the Total Greenhouse Gas emissions (CO_2 emissions), emitted due to various activities. In this we compute the emissions of Carbon-Di-Oxide, by usage of the various form of Electrical Energy used by the College for performing its day-to-day activities
2. **Basis for computation of CO_2 Emissions:**
   The basis of Calculation for CO_2 emissions due to Electrical Energy is as under

1 Unit (kWh) of Electrical Energy releases **0.8 Kg of CO_2** into atmosphere. Based on the above Data we compute the CO_2 emissions which are being released in to the atmosphere by the College due to its Day-to-Day operations. We herewith furnish the details of various forms of Energy consumption as under

Consumer Name- Boys Hostel College, Dudhnoi

Consumer Number- 039000007451

Table 8 Month wise Consumption of Energy & CO2 Emissions of consumer 039000007451

No	Month	Energy Consumed, kWh	CO2 Emissions, MT
1	Dec-21	124	0.10
2	Nov-21	120	0.10
3	Oct-21	124	0.10
4	Sep-21	120	0.10
5	Aug-21	124	0.10
6	Jul-21	123	0.10
7	Jun-21	123	0.10
8	May-21	123	0.10
9	Apr-21	210	0.17
10	Mar-21	210	0.17
11	Feb-21	210	0.17
12	Jan-21	210	0.17
	Total	**1,820**	**1.46**

In the following Chart we present the CO2 emissions due to usage of Electrical Energy.

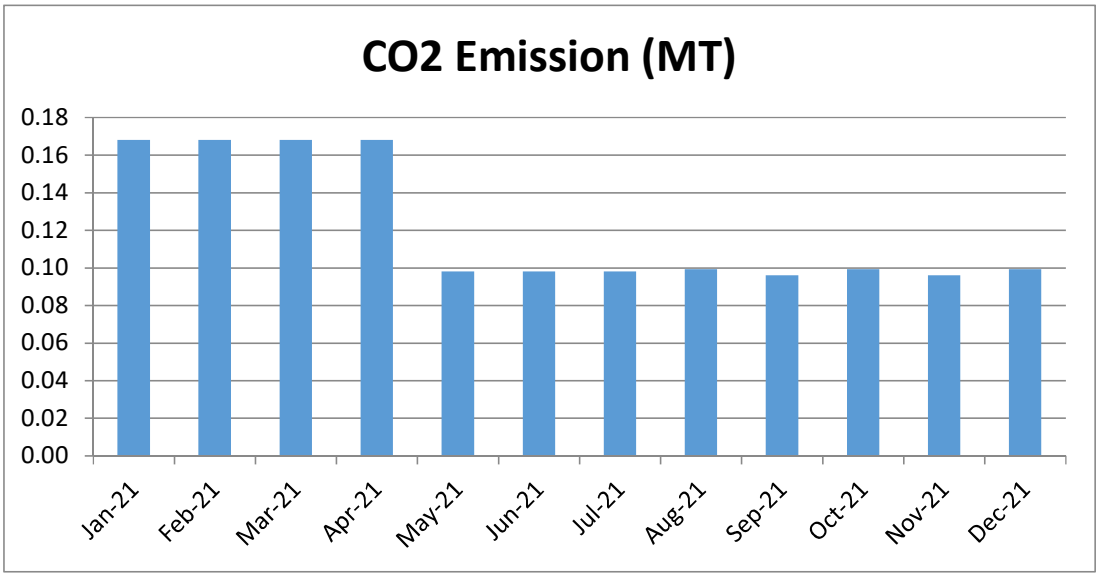

Figure 7 Representation of Month wise CO2 emissions of consumer 039000007451

Consumer Name- Girls Hostel Dudhnoi College, Dudhnoi

Consumer Number- 039000007450

Table 9 Month wise Consumption of Energy & CO2 Emissions of consumer 039000007450

No	Month	Energy Consumed, kWh	CO2 Emissions, MT
1	Dec-21	248	0.20
2	Nov-21	240	0.19
3	Oct-21	248	0.20
4	Sep-21	240	0.19
5	Aug-21	248	0.20
6	Jul-21	245	0.20
7	Jun-21	245	0.20
8	May-21	245	0.20
9	Apr-21	390	0.31
10	Mar-21	390	0.31
11	Feb-21	390	0.31
12	Jan-21	390	0.31
	Total	**3,520**	**2.82**

In the following Chart we present the CO2 emissions due to usage of Electrical Energy.

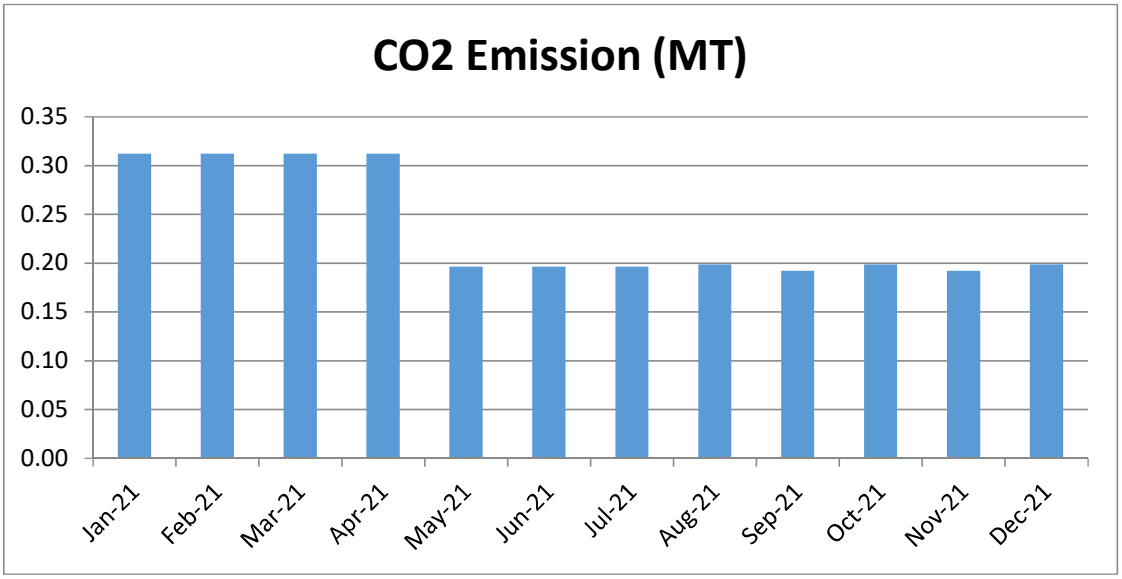

Figure 8 Representation of Month wise CO2 emissions of consumer 039000007450

Consumer Name- Principal Dudhnoi College, Dudhnoi

Consumer Number- 039000007449

Table 10 Month wise Consumption of Energy & CO2 Emissions of consumer 039000007449

No	Month	Energy Consumed, kWh	CO2 Emissions, MT
1	Dec-21	2445	1.96
2	Nov-21	3643	2.91
3	Oct-21	3764	3.01
4	Sep-21	3643	2.91
5	Aug-21	3764	3.01
6	Jul-21	3764	3.01
7	Jun-21	3643	2.91
8	May-21		
9	Apr-21		
10	Mar-21		
11	Feb-21		
12	Jan-21		
	Total	**24,666**	**19.73**

In the following Chart we present the CO2 emissions due to usage of Electrical Energy.

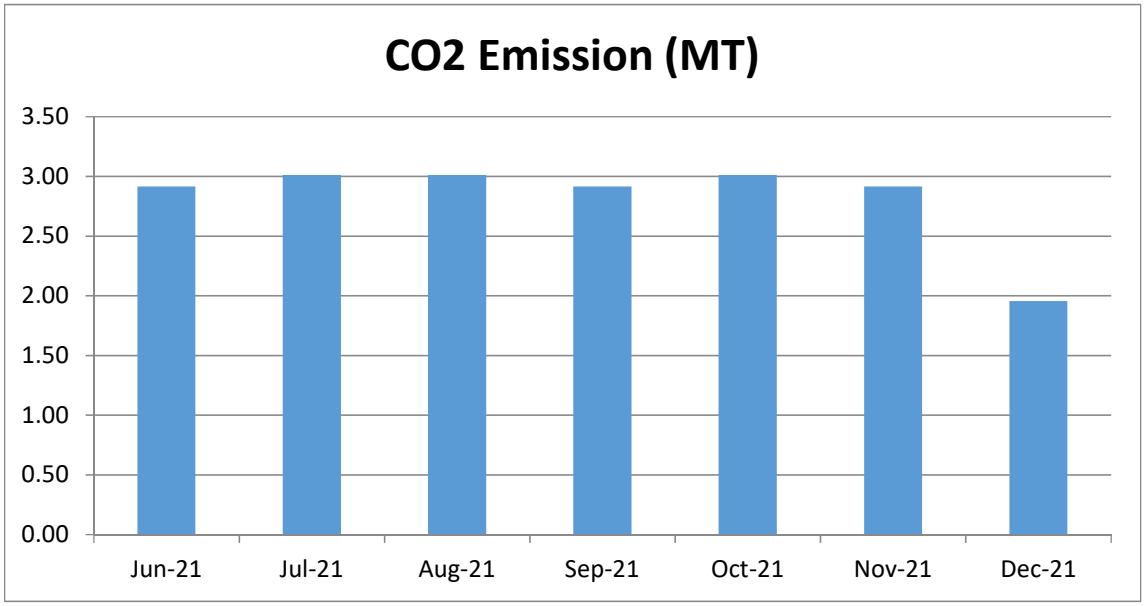

Figure 9 Representation of Month wise CO2 emissions of consumer 039000007449

12. Study of Waste Management

Campus area waste production and disposal wastage like paper, food, plastic, biodegradable, construction, glass, dust etc. and recycling, Furthermore, solid waste often includes wasted material resources that could otherwise be channelled into better service through recycling, repair and reuse. Solid waste generation and management is a burning issue, Unscientific handling of solid waste can create threats to everyone. The survey focused on volume, type and current management practices of solid waste generated in the campus.

12.1 Source of Waste Generation

Waste generation from tree droppings and lawn management is a major solid waste generated in the campus. The waste is segregated at source by providing separate dustbins for Bio-degradable and plastic waste.

The waste generated by newspapers 100 kg/year, Magazine 10 kg/year and of cartons is 15 kg/year, very less plastic waste 0.5 kg/year is generated by the department, office, garden etc. Metal waste and wooden waste is stored and given to authorized scrap agents for further processing.

Figure 10 Vermicomposting Unit

12.2 Waste Management Techniques

- Reduce the absolute amount of waste that is produced from college staff offices.
- Make full use of all recycling facilities provided by city Municipality and private supplier.
- Try to recycling of glass, cans, white, colored and brown paper, plastic bottles, batteries, print cartridges, carbon board and furniture.
- Provide sufficient, accessible and well-publicized collection points for recyclable waste with responsibility for clearly allocated.
- Important and confidential papers after their validity to be sent for pulping.
- Single sided used papers reused for writing and printing in all departments.
- Both side printing papers reused as per requirements.

Figure 11 Waste Collection Dustbin

13. Study of E-Waste Management

E-Waste can be described as consumer and business electronic equipment's that is near or at the end of its useful life. This makes up about 5% of all municipal solid waste worldwide but is much more hazardous than other waste because electronic components contain cadmium, lead, mercury and polychlorinated biphenyls (PCBs) that can damage human health and the environment.

E-waste is any electrical or electronic equipment that's been discarded. This includes working and broken items that are thrown in the garbage or donated to a charity reseller like Goodwill. Often, if the item goes unsold in the store, it will be thrown away. E-waste is particularly dangerous due to toxic chemicals that naturally leach from the metals inside when buried.

Figure 12 E-Waste Type

According to the World Health Organization (WHO), health risks may result from direct contact with toxic materials that leach from e-waste. These include minerals such as lead, cadmium, chromium, brominated flame retardants, or polychlorinated biphenyls (PCBs). Danger can come from inhalation of the toxic fumes, as well as from the accumulation of chemicals in soil, water, and food.

This puts not just people in danger but land and sea animals as well. In developing countries, the risks are exceptionally high because some developed countries send their e-waste there. Studies have shown this global e-waste has detrimental effects on the people that work with the e-waste but also the people that live around it. Because of this, a proper recycling process needs to be put in place to protect us and future generations.

It is observed that E-Waste generated in the campus is very less in quantity, Administration conducts the awareness programs regarding E-Waste Management with that help of various departments. The E-waste and defective item from computer laboratory is being stored properly. The institution has decided to contact approved W-waste management and disposal facility in order to dispose E-waste in scientific manner.

It is recommendation to institution that recycle or safely dispose of white goods, computers and electrical appliances. Use reusable resources and containers and avoid unnecessary packaging where possible. Always purchase recycled resource where there are both suitable and available.

Figure 13 E-Waste in Store Room

14. Study of Environmental Management

14.1 Definition

Definition as per environment Protection Act: 1986, Environment includes water, air and land and the inter-relationship which exists among and between Water, Air, Land and Human beings, other living creatures, plants microorganism and property.

According to UNEP, 1990, "Environmental audit can be defined as a management tool comprising systematic, documented and periodic evaluation of how well environmental organization management and equipment are performing with an aim of helping to regularize the environment.

14.2 Observation

It is observed that campus is located in the vicinity of many trees to maintain the bio-diversity. Various tree plantation programs are being organized at college campus. This program helps in encouraging eco- friendly environment which provides pure oxygen within the institute and awareness amount villagers. This includes the plants, greenery and sustainability of the campus to ensure that the buildings conform to green standards. This also helps in ensuring that the Environmental policy is enacted, enforced and reviewed using various environmental awareness programs.

Figure 14 Tree Plantation program

14.3 Environmental Laws and Policy

Environmental Pollutant means any solid, liquid and gaseous substance present in the concentration as may be, or tend to be, injurious to Environment.

Table 11 Details of Relevant Environmental Laws in India

Sr No	Year	Environmental Laws
1	1927	The Indian Forest Act
2	1972	The Wildlife Protection Act
3	1974	The Water (Prevention and Control of Pollution) Act
4	1977	The Water (Prevention & Control of Pollution) Cess Act
5	1980	The Forest (Conservation) Act
6	1981	The Air (Prevention and Control of Pollution) Act
7	1986	The Environment Protection Act
8	1991	The Public Liability Insurance Act
9	2002	The Biological Diversity Act
10	2010	The National Green Tribunal Act

Some of the laws are part of curriculum for second year students of all streams of SPPU. The students are oriented for the various laws through Environment Awareness subject.

Table 12 Details of Important Environmental Rules in India

Sr No	Year	Environmental Rules
1	1989	Hazardous Waste (Management and Handling) Rules
2	1989	Manufacture, Storage and Import of Hazardous Chemical Rules
3	2000	Municipal Solid Waste (Management and Handling) Rules
4	1998	The Biomedical Waste (Management and Handling) Rules
5	1999	The Environment (Siting for Industrial Projects) Rules
6	2000	Noise Pollution (Regulation and Control) Rules
7	2000	Ozone Depleting Substances (Regulation and Control) Rules
8	2011	E-waste (Management and Handling) Rules
9	2011	National Green Tribunal (Practices and Procedure) Rules
10	2011	Plastic Waste (Management and Handling) Rules

Table 13 Details of National Environmental Plans & Policy Documents

Sr no	Environmental Plans & Policy Documents
1	National Forest Policy, 1988
2	National Water Policy, 2002
3	National Environment Policy or NEP (2006)
4	National Conservation Strategy and Policy Statement on Environment and Development, 1992
5	Policy Statement for Abatement of Pollution (1992)
6	National Action Plan on Climate Change
7	Vision Statement on Environment and Human Health
8	Technology Vision 2030 (The Energy Research Institute)
9	Addressing Energy Security and Climate Change (MoEF and Bureau of Energy Efficiency
10	The Road to Copenhagen; India's Position on Climate Change Issues (MoEF)

Figure 15 Photo of Environment program

14.4 Recommendations

In order to reduce the dependency on natural resources and also in order to reduce the various pollutions arising due to the day to day operations of the College we herewith recommend following recommendations.

- It is recommendations to promote environmental awareness as a part of course work in various curricular area, independent research projects and community service.
- Create awareness of environmental sustainability and take actions to ensure environmental sustainability.
- Establish a college environmental committee that will hold responsibility for that enactment, enforcement and review of the environmental policy.
- The Environmental Committee shall be the source of advice and guidance to staff and students on how to implement this policy.
- Ensure that an audit is conducted annually and action is taken on the basis of audit report, recommendation and findings.
- Indoor plantation to inculcate interest in students, bonsai can plant in corridor to bond a relation with nature.
- Celebrate every year 5th June as "Environment day" and plant tree on this day to make the campus Greener.

Figure 16 Ten Commandants of Sustainability

15. Green Campus Site Photograph

ANNUAL ENERGY AUDIT REPORT

Dudhnoi College

Address- Dudhnoi, Goalpara- 783124

January -2022

Prepared by

Thunderbolt Energy Consultancy

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Disclaimer

This report was prepared for Dudhnoi College, Dudhnoi. The information herein is confidential and shall not be divulged to a third party without the prior written permission of Thunderbolt Energy Consultancy, its affiliates and subsidiaries, including Thunderbolt Energy Consultancy, and their respective officers, employees or agents, individually and collectively, referred to in this clause as ' Thunderbolt Energy Consultancy'.

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All the calculations for energy savings and recommendations to achieve these savings given in this report is fully based on the data shared by the college with Thunderbolt Energy Consultancy.

Acknowledgement

We express our sincere gratitude to the authorities of Dudhnoi College, Dudhnoi for entrusting and offering the opportunity of energy performance assessment assignment.

- Dr. Lalit Chandra Rabha – Principal
- Mrs. Bondita Borbora - Assistant Professor

We are thankful to Dudhnoi College Dudhnoi for their positive support in undertaking the task of system mapping and energy efficiency assessment of all electrical system, air conditioners, utilities and other equipment. The field studies would not have been completed on time without their interaction and guidance. We are grateful to their cooperation during field studies and providing necessary data for the study.

We are also thankful to all field staff and agencies working with whom we interacted during the field studies for their wholehearted support in undertaking measurements and eagerness to assess the system / equipment performance and saving potential. Also thankful to all concerned staff interacted during the conduct of this exercise for completing official documentations.

Why Energy Audit?

An energy audit determines the amount of energy consumption affiliated with a building and the potential savings associated with that energy consumption. Additionally, an energy audit is designed to understand the specific conditions that are impacting the performance and comfort in your facility to maximize the overall impact of energy-focused building improvements.

An energy audit is a systematic review of the energy consuming installations in a building or premises to ensure that energy is being used sensibly and efficiently. An energy audit usually commences with the collection and analysis of all information that may affect the energy consumption of the building or premises, then follows with reviewing and analyzing the condition and performance of various building services installations and building management, with an aim at identifying areas of inefficiency and suggesting means for improvement.

Through implementation of the suggested improvement measures, building owners can get the immediate benefit for paying less for energy bills. On the other hand, lowering of energy consumption in buildings will lead to the chain effect that less fossil fuel will be burnt for electricity generation by the power supply companies and relatively less pollutants and greenhouse gases will be introduced into the atmosphere, thus contributing to conserve the environment and to enhance sustainable development.

Energy Audit Team

The team members of Thunderbolt Energy Consultancy:

Name	Role	Field of expertise
Mr. Mahesh Khode	Project coordinator, ECM verification, Report verification	Graduate Electrical engineer with experience in Energy Efficiency Assessment, Electrical distribution system, Design, Power assets Evaluation and Project Management, resource management.
Mr.Kaustubh Bhatwadekar	Energy Auditor	Graduate Mechanical engineer, M.Tech IIT Bombay, Bureau of Energy Efficiency Certified Energy Auditor, Experience In Industrial energy, distribution system, Energy Efficiency Assessment.
Mr. Prashant Yadav	Data tabulation and analysis & report preparation	Graduate in Electrical & Electronics Engineering with experience in Energy & Power projects.

Executive Summary

After the Field measurements & analysis, we present herewith important observations made and various measures to reduce the Energy Consumption & mitigate the CO_2 emissions.
Dudhnoi College, Dudhnoi, consumes Energy in the form of Electrical Energy used for various gadgets, Office & other facilities.

1. Present Energy Consumption

In the following Table, we present the details of Energy Consumption.

Table 1 Details of energy consumption

Sr no	Parameter	Boys Hostel		Girls Hostel		College Building	
		Energy consumed, (Units)	Bill Amount (Rs)	Energy consumed, (Units)	Bill Amount (Rs)	Energy consumed, (Units)	Bill Amount (Rs)
1	Maximum	210	1315	390	2443	3764	23149
2	Minimum	120	738	240	1476	2445	15037
3	Average	152	941	293	1819	3524	21671

Note- Due to defective meter above figure is based on estimated data as per electricity bill.

2. Energy Conservation Projects already installed

1. Usage of LED lights at some indoor locations.
2. Usage of LED Lights for outdoor lighting.
3. Solar lighting system Installed.
4. BEE Star rated air conditioners Installed.

3. Key Observations

1. There are about 254 Nos old Tube light fittings which need to be replaced by 18 W LEDs.
2. Few halogen and sodium lighting available.
3. There are 464 Nos of ceiling fans which need to be replaced with STAR rated fans.
4. Optimize the temperature setting to 23-25 degree Celsius.
5. Rush wiring found in DB panel.
6. Inverter system available for lab and server.
7. All 3 Energy meter found defective and billing is based on estimated.

4. Recommendations

Table 2 Recommendations for energy savings

Sr. No	Recommendation	Annual Saving potential, kWh/Annum	Annual Monetary Gain, Rs.	Investment Required, Rs.	Payback period, Months
1	Replacement of 254 Nos Tube light fittings with 18 W LED fittings	3,429	21,088	1,62,814	93
2	Replacement of 464 Nos Old Ceiling Fans with STAR rating fans	12,180	74,907	10,08,736	162
	Total	**15609**	**95995**	**1171550**	**-**

5. Notes & Assumptions

1. Daily working hours-03
2. Annual working days- 250
3. Rate of Electrical Energy- Rs 6.15 /- per kWH.

Abbreviations

CFL	:	Compact Fluorescent Lamp
FTL	:	Fluorescent Tube Light
LED	:	Light Emitting Diode
V	:	Voltage
I	:	Current
kW	:	Kilo- Watt
kWh	:	kilo-Watt Hour
kVA	:	Active Power

1. Introduction

Dudhnoi College is the manifestation of the collective dreams of people of the locality and the result of their aspirations and perspirations. The college is located in Dudhnoi, which is now headquarter of the Rabha Hasong Autonomous Council and is 110 km from Assam's capital city Guwahati and 42 km from district headquarter town Goalpara. The College had a modest beginning with only Pre-University (Higher Secondary) Arts classes in 1972. Degree classes of Arts stream started in 1974.Latter on Science and Commerce streams were added in session 1985-86 and 2015-16 respectively. Presently the college has 18 different departments offering both Honours (Major) and General Courses. The college has a pristine green and scerne campus spreading over a vast area of 33.05 acres. A big horse-shoe shaped pond runs around the main building. A foot-bridge over the pond enhances the beauty.

The energy audit of college is conducted by our company.

1.1 Objectives

1. To study present level of Energy Consumption
2. To Study Electrical Consumption
3. To assess the various equipment/facilities from Energy efficiency aspect
4. To study various measures to reduce the Energy Consumption

1.2 Audit methodology

The objective of Energy Audit is to balance the total energy inputs with its use and to identify the energy conservation opportunities in the stream. Energy Audit also gives focused attention to energy cost and cost involved in achieving higher performance with technical and financial analysis. The best alternative is selected on financial analysis basis.

1.3 Historical Data Analysis

The historical data analysis involves establishment of energy consumption pattern to establish base line data on energy consumption and its variation with change in production volumes.

1.4 Actual measurement and data analysis

This step involves actual site measurement and field trials using various portable measurement instruments. It also involves input to output analysis to establish actual operating equipment efficiency and finding out losses in the system.

1.5 Identification and evaluation of Energy Conservation Opportunities

This step involves evaluation of energy conservation opportunities identified during the energy audit. It gives potential of energy saving and investment required to implement the proposed modifications with payback period. All recommendations for reducing losses in the system are backed with its cost benefit analysis.

1.6 Monitoring and Control

Energy accounting followed by energy monitoring and controlling is the first step of an Energy Management Program. With increasing energy prices, many organizations have incorporated sub-metering system in their plants. Sub metering is essential for monitoring, establishing energy consumption pattern, detailed engineering and energy saving after implementation of energy conservation projects. It is required to identify and monitor parameters for energy consumption per unit of production or services i.e., Specific Energy Consumption (SEC). SEC monitoring is an important tool for monitoring and proving of energy conservation measures.

1.7 About Thunderbolt Energy Consultancy

We are pleased to introduce ourselves as **Thunderbolt Energy Consultancy**. We are a team of young Energy professionals, working to help Businesses and facilities become energy efficient and promote green and clean energy.

Our highly competent team of 'Bureau of Energy Efficiency Certified Energy Auditors and Certified Energy Managers having experience in variety of sectors and managing various functions for over 10 years.

We using most advanced instruments in order to help you reduce energy consumption and achieve better efficiency.

We are providing services in various areas like

- Energy Audit, Electrical Audit, Electrical Survey
- Green Audit and Environmental Audit for college
- Safety Audit, Electrical safety audit, Safety survey
- Street Light EA, SL Survey, SL Sales & Installation
- Electrical Repair & Maintenance Services
- Project Management Consultancy
- Third-Party Audit

We have a highly trained and experienced team of certified Energy and Safety Auditors, Energy Manager, Analyst, Engineers & Retailers. We are presently working in pan India.

2. Energy Details

Energy Details

The electricity supply for Dudhnoi College is provided by Assam Power Distribution Company Limited. The energy consumed by Dudhnoi College falls under LT Category. The facility also has 2 DG sets of 15 kVA. The DG set is mainly used for power failure from APDCL.

Table 3 Details of energy consumption

Sr. No	DG details	Name of the building
1	15 kVA	College Building
2	15 kVA	College Building

The energy efficiency assessment was conducted for the load connected to the mains supply of college building, Boys hostel and Girls hostel.

Consumer details:

Table 4 Details of energy consumption

Name of Consumer	Tariff Category	Consumer Account No.
Principal Dudhnoi College	LT V(A) supply	039000007449
Girls Hostel Dudhnoi College	LT V(A) supply	039000007450
Boys Hostel Dudhnoi College	LT V(A) supply	039000007451

As per the electricity bill all 3 Energy meter is defective and the reading is on estimated base so it is recommended to put compliant in nearest APDCL office and change the meter as soon as possible.

Mainly energy is used on this facility for the following purposes:

1) Lighting's load
2) Air conditioners
3) Fan
4) Water pump
5) Office equipment

3. Study of connected load

In this chapter, we present details of various connected electrical equipment and electrical load.

Table 5 Location wise study of Electrical fittings in various buildings

Sr. No	Type	Equipment	Wattage	Total number	Load, kW
1	LED Lighting	LED (9 Watt)	9	159	1.43
2	LED Lighting	LED (10 Watt)	10	12	0.12
3	LED Lighting	LED (20 Watt)	20	1	0.02
4	LED Lighting	LED (28 Watt)	28	12	0.34
5	LED Lighting	LED (50 Watt)	50	2	0.10
6	LED Lighting	LED	28	54	1.51
7	LED Lighting	Bulb	5	35	0.18
8	LED Lighting	Tube (LED)	18	159	2.86
9	Non-LED Lighting	Tube (General)	36	254	9.14
10	Non-LED Lighting	Halogen light	20	1	0.02
11	Non-LED Lighting	Halogen light	28	2	0.06
12	Non-LED Lighting	Halogen light	50	17	0.85
13	Non-LED Lighting	Street Light	50	2	0.10
14	Non-LED Lighting	Sodium Light	250	1	0.25
15	Fan Load	Ceiling Fan	70	464	32.48
16	Fan Load	Wall Fan	50	22	1.10
17	Fan Load	Stand Fan	50	3	0.15
18	Fan Load	Stand Fan	100	1	0.10
19	Office Load	Computer	250	103	25.75
20	Office Load	Aqua guard	500	15	7.50
21	Office Load	Refrigerator	1000	7	7.00
22	Office Load	CCTV Monitor	200	9	1.80
23	Office Load	Xerox Machine	1000	4	4.00
24	Office Load	Printer	500	15	7.50
25	Submersible Pump	Jet Pump	1000	6	6.00
26	Submersible Pump	Water Pump	1000	2	2.00
27	Office Load	Water Cooler	500	1	0.50
28	Office Load	T.V.	300	3	0.90
29	Air Conditioner	A.C.	3000	4	12.00
Total Load kW					**125.80**

Table 6 Lighting load consumption details

Sr. No	Type	Equipment	Wattage	Total number	Load, kW
1	LED Lighting	LED (9 Watt)	9	159	1.43
2	LED Lighting	LED (10 Watt)	10	12	0.12
3	LED Lighting	LED (20 Watt)	20	1	0.02
4	LED Lighting	LED (28 Watt)	28	12	0.34
5	LED Lighting	LED (50 Watt)	50	2	0.10
6	LED Lighting	LED	28	54	1.51
7	LED Lighting	Bulb	5	35	0.18
8	LED Lighting	Tube (LED)	18	159	2.86
9	Non-LED Lighting	Tube (General)	36	254	9.14
10	Non-LED Lighting	Halogen light	20	1	0.02
11	Non-LED Lighting	Halogen light	28	2	0.06
12	Non-LED Lighting	Halogen light	50	17	0.85
13	Non-LED Lighting	Street Light	50	2	0.10
Total				**711**	**16.98**

Table 7 Lighting load percentage in total consumption

Particulars		Total Lighting requirement	Lighting met Through LED Bulb	Lighting met through other type lamp
(A)	Load in kW	16.98	6.56	10.42
	Percentage %	100	38.62	61.38
(B)	Energy in kWH per year	12,732	4,917	7,815
	Percentage %	100	38.62	61.38

Note- Above calculation is based on 3 hours working and 250 days per annum.

Apart from above load, the college has pumps, street lights. Individual fitting wise load is as under

Table 8 Equipment wise Connected Load

Sr. No.	Equipment	Qty	Load, kW
1	LED Lighting	434	6.56
2	Non-LED Lighting	277	10.42
3	Fan Load	490	33.83
4	Office Load	157	54.95
5	Submersible Pump	8	8.00
6	Air Conditioner	4	12.00
Total		**1370**	**125.8**

Data can be represented in terms of PIE chart as under,

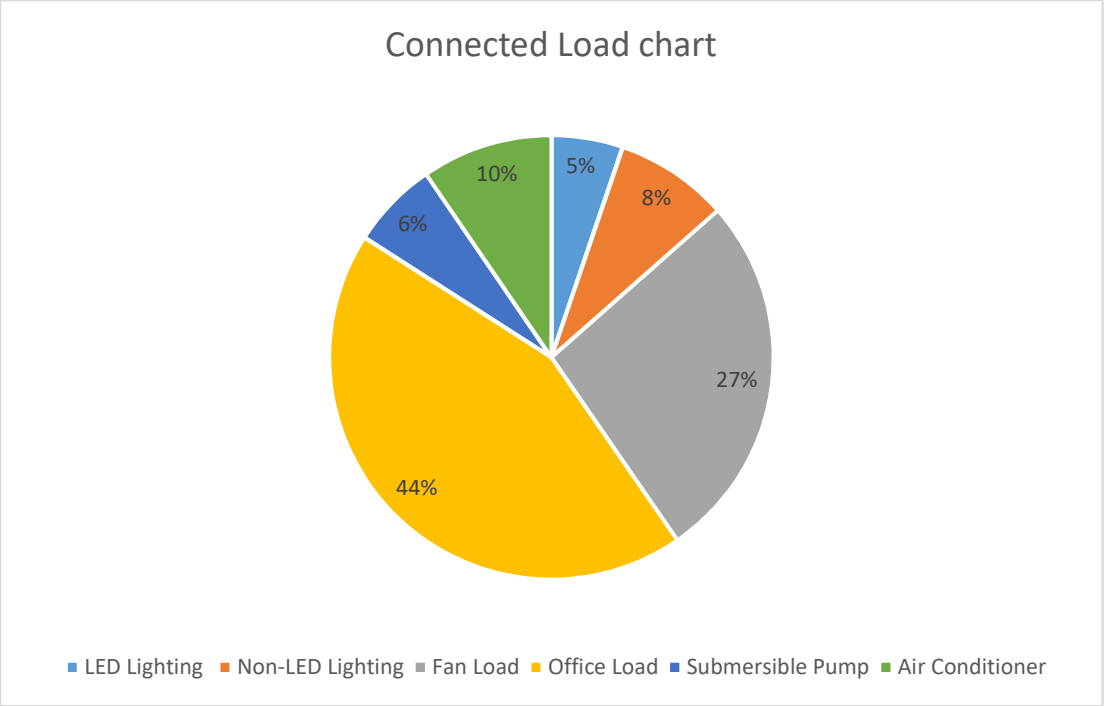


Figure 1 Distribution of connected load

4. Study of Electrical Energy Consumption

Consumer Name- Boys Hostel Dudhnoi College, Dudhnoi

Consumer Number- 039000007451

In this chapter, electricity bills are studied for the analysis of electrical energy consumption.

Table 9 Summary of electricity bills of consumer 039000007451

Sr. No	Month	Energy (kWh)	Bill Amount (Rs)
1	Dec-21	124	763
2	Nov-21	120	738
3	Oct-21	124	763
4	Sep-21	120	738
5	Aug-21	124	763
6	Jul-21	123	754
7	Jun-21	123	754
8	May-21	123	754
9	Apr-21	210	1315
10	Mar-21	210	1315
11	Feb-21	210	1315
12	Jan-21	210	1315
	Total	**1,820**	**11,289**

Note- Due to defective meter above figure is based on estimated data as per electricity bill.

Key observations of electricity bill are as follows,

Table 10 Key observations of consumer 039000007451

Sr no	Parameter	Energy consumed, (Units)	Bill Amount (Rs)
1	Maximum	210	1315
2	Minimum	120	738
3	Average	152	941

Variation in energy consumption is as follows,

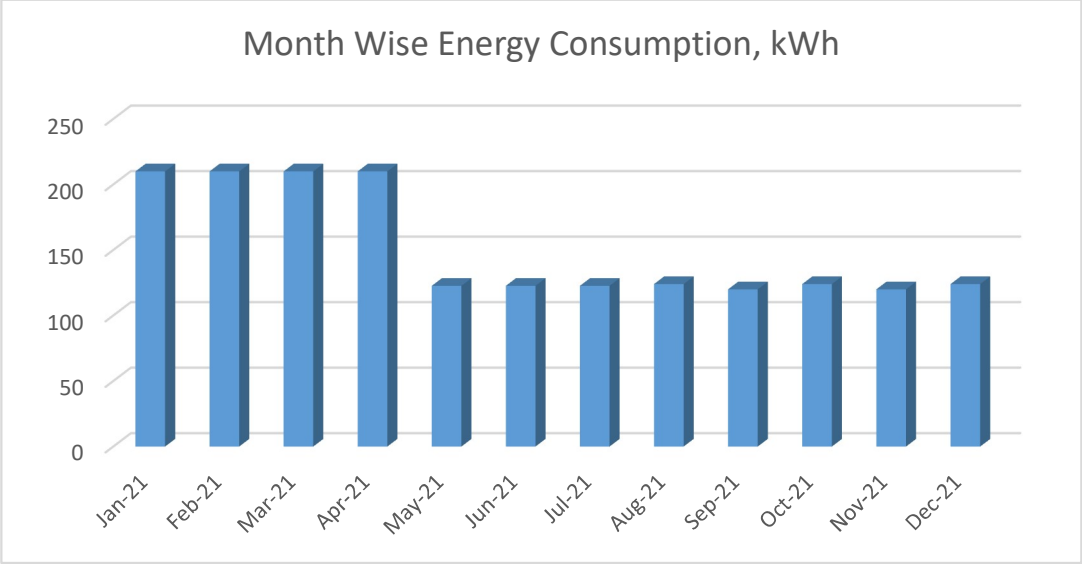


Figure 2 Month wise energy consumption of consumer 039000007451

Monthly variation in electricity bill is as follows,

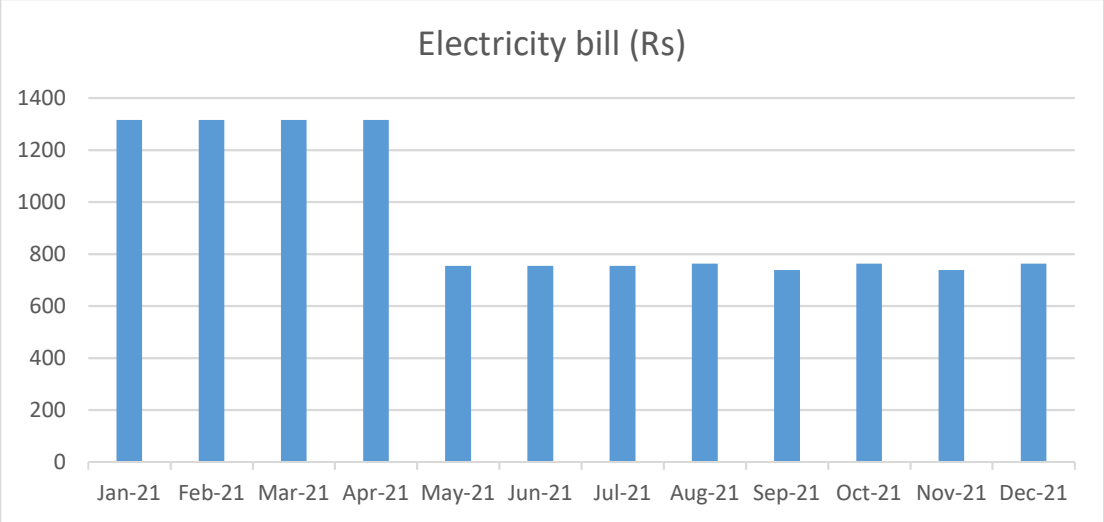


Figure 3 Month wise electricity bill of consumer 039000007451

Consumer Name- Girls Hostel Dudhnoi College, Dudhnoi

Consumer Number- 039000007450

In this chapter, electricity bills are studied for the analysis of electrical energy consumption.

Table 11 Summary of electricity bills of consumer 039000007450

Sr. No	Month	Energy (kWh)	Bill Amount (Rs)
1	Dec-21	248	1525
2	Nov-21	240	1476
3	Oct-21	248	1525
4	Sep-21	240	1476
5	Aug-21	248	1525
6	Jul-21	245	1509
7	Jun-21	245	1509
8	May-21	245	1509
9	Apr-21	390	2443
10	Mar-21	390	2443
11	Feb-21	390	2443
12	Jan-21	390	2443
	Total	**3,520**	**21,825**

Note- Due to defective meter above figure is based on estimated data as per electricity bill.

Key observations of electricity bill are as follows,

Table 12 Key observations of consumer 039000007450

Sr no	Parameter	Energy consumed, (Units)	Bill Amount (Rs)
1	Maximum	390	2443
2	Minimum	240	1476
3	Average	293	1819

Variation in energy consumption is as follows,

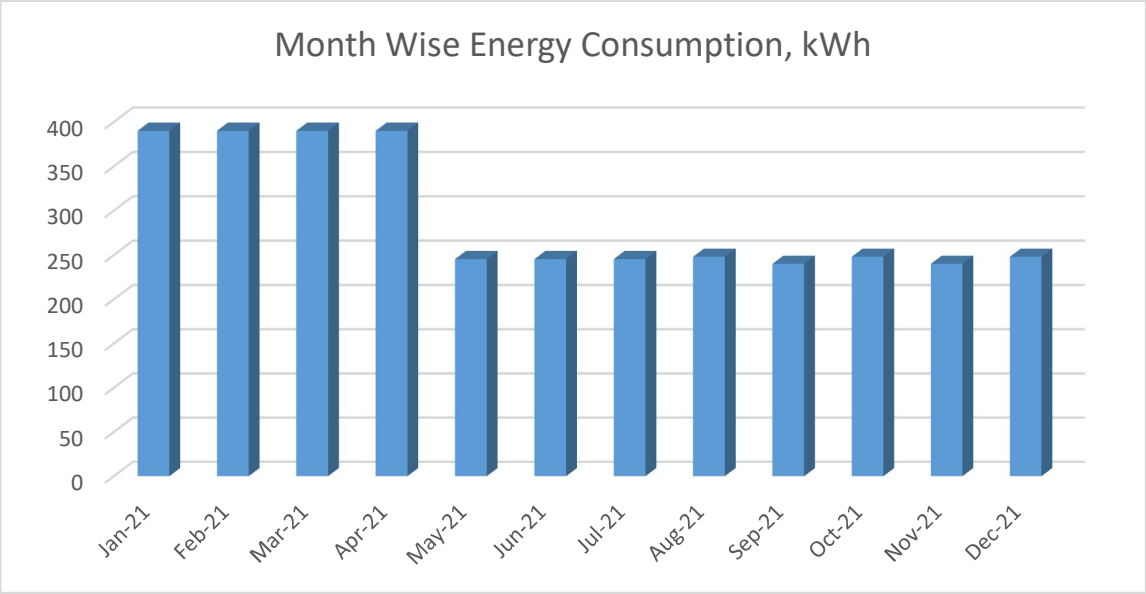


Figure 4 Month wise energy consumption of consumer 039000007450

Monthly variation in electricity bill is as follows,

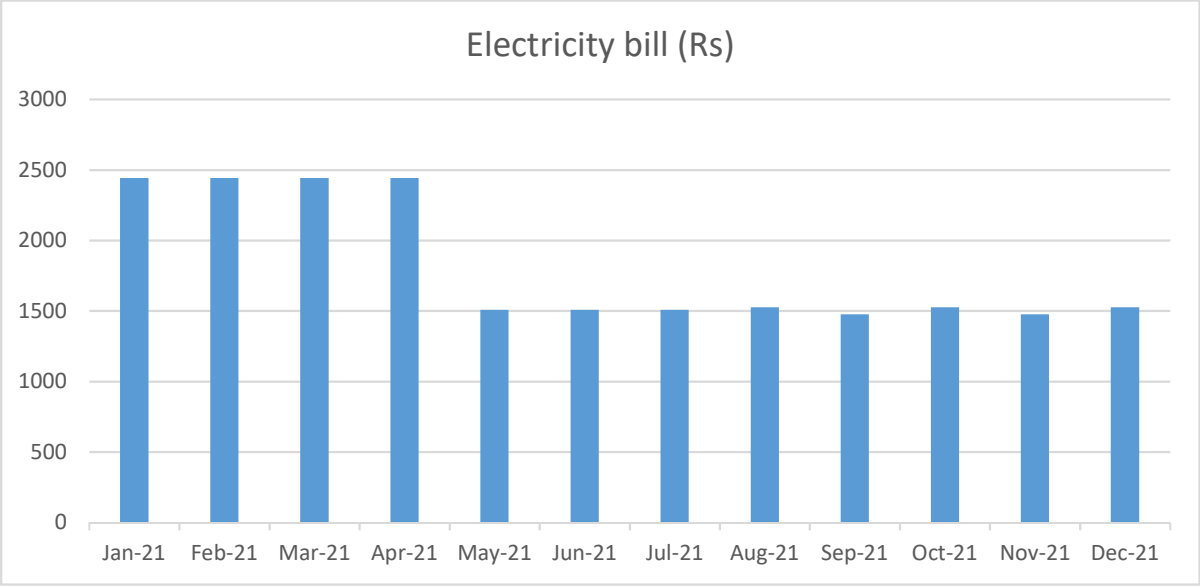


Figure 5 Month wise electricity bill of consumer 039000007450

Consumer Name- Principal Dudhnoi College, Dudhnoi

Consumer Number- 039000007449

In this chapter, electricity bills are studied for the analysis of electrical energy consumption.

Table 13 Summary of electricity bills of consumer 039000007449

Sr. No	Month	Energy (kWh)	Bill Amount (Rs)
1	Dec-21	2445	15037
2	Nov-21	3643	22404
3	Oct-21	3764	23149
4	Sep-21	3643	22404
5	Aug-21	3764	23149
6	Jul-21	3764	23149
7	Jun-21	3643	22404
8	May-21		
9	Apr-21		
10	Mar-21		
11	Feb-21		
12	Jan-21		
	Total	**24,666**	**1,51,696**

Note- Due to defective meter above figure is based on estimated data as per electricity bill.

Key observations of electricity bill are as follows,

Table 14 Key observations of consumer 039000007449

Sr no	Parameter	Energy consumed, (Units)	Bill Amount (Rs)
1	Maximum	3764	23149
2	Minimum	2445	15037
3	Average	3524	21671

Variation in energy consumption is as follows,

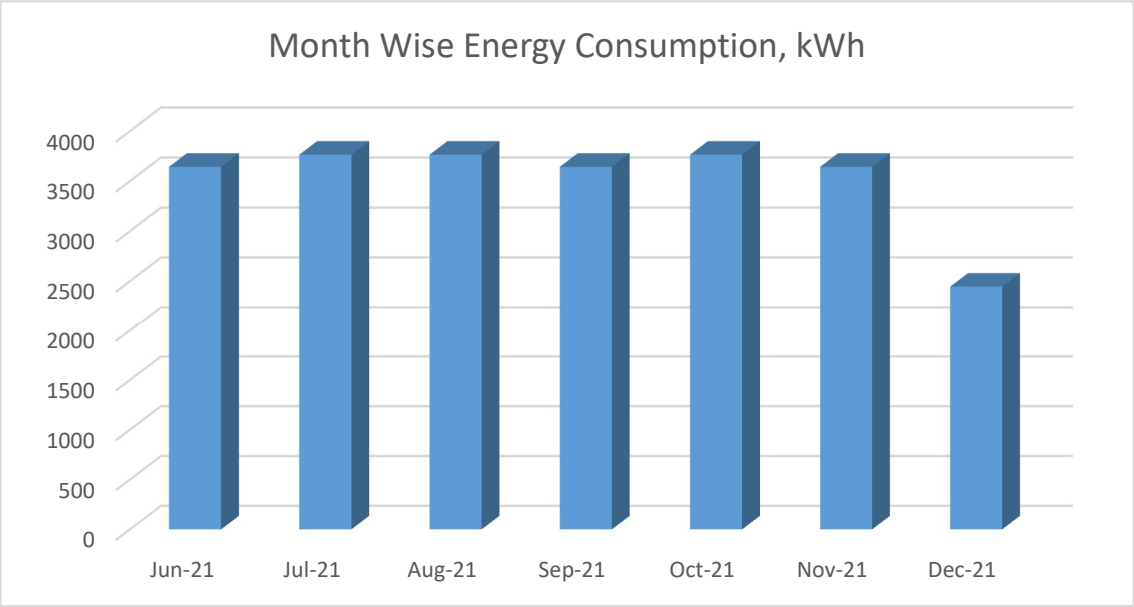


Figure 6 Month wise energy consumption of consumer 039000007449

Monthly variation in electricity bill is as follows,

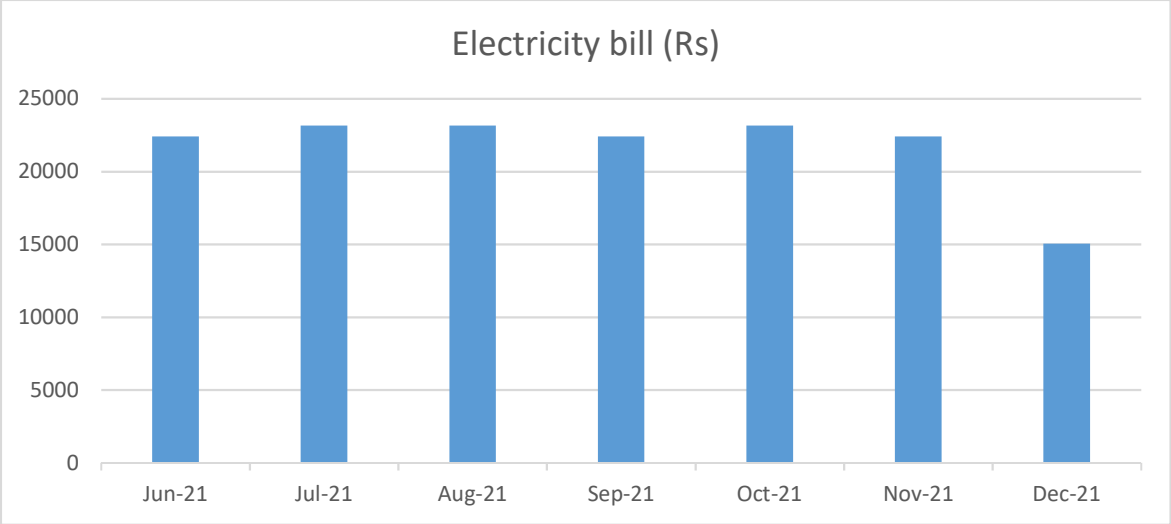


Figure 7 Month wise electricity bill of consumer 039000007449

5. Carbon Footprint

1. **A Carbon Foot print** is defined as the Total Greenhouse Gas emissions (CO_2 emissions), emitted due to various activities. In this we compute the emissions of Carbon-Di-Oxide, by usage of the various form of Electrical Energy used by the College for performing its day-to-day activities
2. **Basis for computation of CO_2 Emissions:**

   The basis of Calculation for CO_2 emissions due to Electrical Energy is as under

1 Unit (kWh) of Electrical Energy releases **0.8 Kg of CO_2** into atmosphere.

Based on the above Data we compute the CO_2 emissions which are being released in to the atmosphere by the College due to its Day-to-Day operations.

We herewith furnish the details of various forms of Energy consumption as under

Consumer Name- Boys Hostel College, Dudhnoi

Consumer Number- 039000007451

Table 15 Month wise Consumption of Energy & CO2 Emissions of consumer 039000007451

No	Month	Energy Consumed, kWh	CO2 Emissions, MT
1	Dec-21	124	0.10
2	Nov-21	120	0.10
3	Oct-21	124	0.10
4	Sep-21	120	0.10
5	Aug-21	124	0.10
6	Jul-21	123	0.10
7	Jun-21	123	0.10
8	May-21	123	0.10
9	Apr-21	210	0.17
10	Mar-21	210	0.17
11	Feb-21	210	0.17
12	Jan-21	210	0.17
	Total	**1,820**	**1.46**

In the following Chart we present the CO2 emissions due to usage of Electrical Energy.

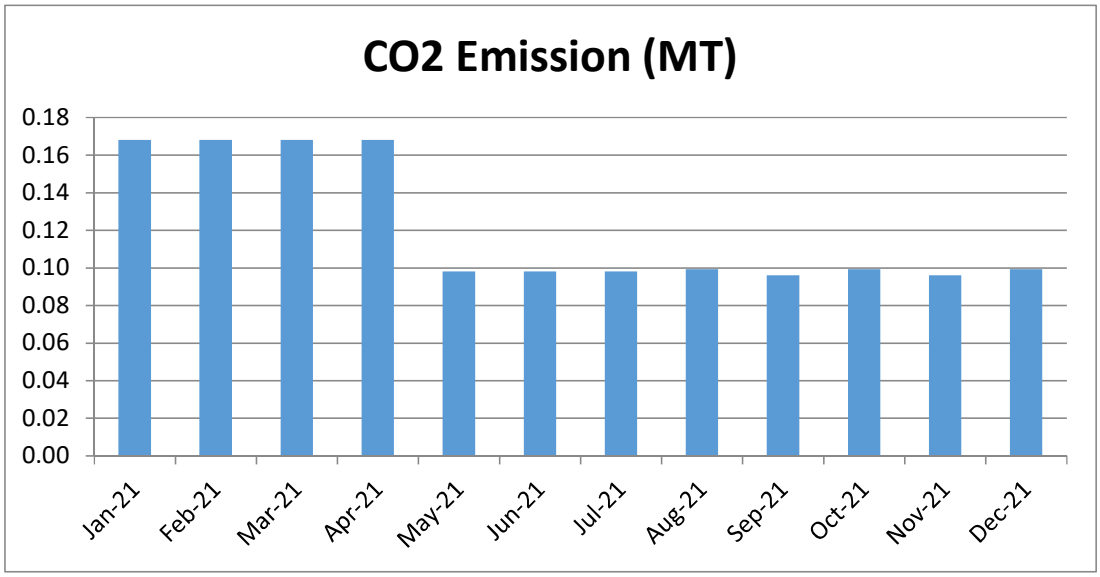


Figure 8 Representation of Month wise CO2 emissions of consumer 039000007451

Consumer Name- Girls Hostel Dudhnoi College, Dudhnoi

Consumer Number- 039000007450

Table 16 Month wise Consumption of Energy & CO2 Emissions of consumer 039000007450

No	Month	Energy Consumed, kWh	CO2 Emissions, MT
1	Dec-21	248	0.20
2	Nov-21	240	0.19
3	Oct-21	248	0.20
4	Sep-21	240	0.19
5	Aug-21	248	0.20
6	Jul-21	245	0.20
7	Jun-21	245	0.20
8	May-21	245	0.20
9	Apr-21	390	0.31
10	Mar-21	390	0.31
11	Feb-21	390	0.31
12	Jan-21	390	0.31
	Total	**3,520**	**2.82**

In the following Chart we present the CO2 emissions due to usage of Electrical Energy.

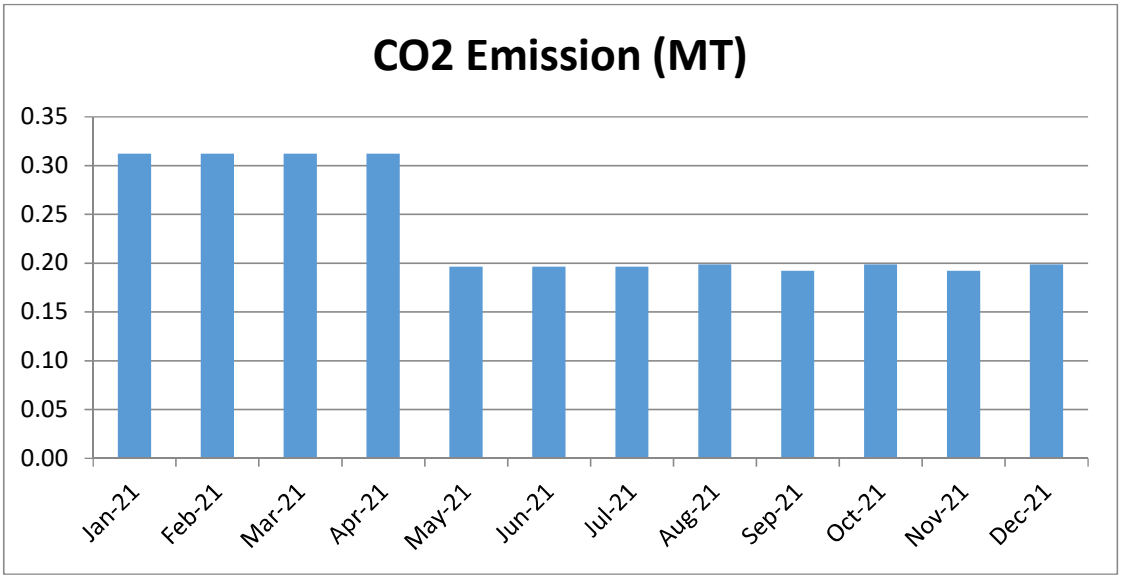


Figure 9 Representation of Month wise CO2 emissions of consumer 039000007450

Consumer Name- Principal Dudhnoi College, Dudhnoi

Consumer Number- 039000007449

Table 17 Month wise Consumption of Energy & CO2 Emissions of consumer 039000007449

No	Month	Energy Consumed, kWh	CO2 Emissions, MT
1	Dec-21	2445	1.96
2	Nov-21	3643	2.91
3	Oct-21	3764	3.01
4	Sep-21	3643	2.91
5	Aug-21	3764	3.01
6	Jul-21	3764	3.01
7	Jun-21	3643	2.91
8	May-21		
9	Apr-21		
10	Mar-21		
11	Feb-21		
12	Jan-21		
	Total	**24,666**	**19.73**

In the following Chart we present the CO2 emissions due to usage of Electrical Energy.

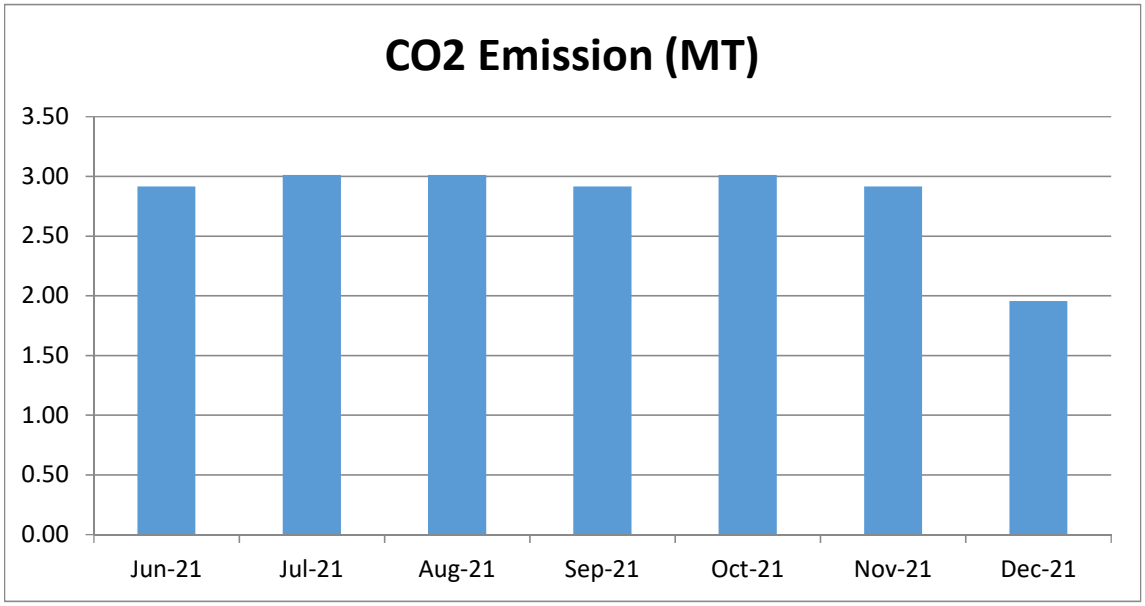


Figure 10 Representation of Month wise CO2 emissions of consumer 039000007449

6. Study of utilities

6.1 Study of Lighting

In the facility, the lighting system can be divided mainly in two parts, indoor lighting and outdoor lighting. There are 254 FTL fittings with electronic/ magnetic chokes and 434 LEDs in lightings fitting. It is recommended to install the 18 W LED Tube light fittings in place of these old Tube light fittings. Apart from this, there are 20 no of Halogen fitting and 1 no is sodium vapor fitting.

6.2 Air-conditioners

In the facility, there are about 4 Nos. of 1.5 Tr Air-conditioners. It is found that all ACs with BEE STAR Rated ACs.

6.3 Ceiling Fans

At building facility, there are about 464 Nos Old Ceiling Fans, which consumed about 70 W of Electrical Energy. It is recommended to replace these old Fans with BEE STAR Rated Ceiling Fans.

6.4 Water Pumps

There are 2 water pumps. It is submersible pump with 1 kW capacity. It is recommended to replace existing pump with BEE star rated pump.

6.5 Office Load

In Office load facility have 103 nos of computer, CCTV monitor, Aqua guard, Refrigerator, Xerox Machine, Printer, Water Cooler, T.V. and Invertor system for office use.

7. Energy conservation proposals

7.1 Replacement of 254 Nos Old, FTLs with 18 W LED fittings

In the facility, there are about 254 Nos, FTL fittings with electronic/magnetic chokes. It is recommended to the install 18 W LED Tube light fittings in place of these old fittings. In the following Table, we present the savings, investment required & payback analysis.

Table 18 Tube light calculation

Sr. No	Particulars	Value	Unit
1	Present Qty of Tube light fittings	254	Nos
2	Energy Demand of Tube light fitting	36	W/Unit
3	Energy Demand of 18 W LED fitting	18	W/Unit
4	Reduction in demand	18	W/Unit
5	Average Daily Usage period	3	Hrs/Day
6	Daily saving in Energy	14	kWh/Day
7	Annual Working Days	250	Nos
8	Annual Energy Saving possible	3429	kWh/Annum
9	Rate of Electrical Energy	6.15	Rs/kWh
10	Annual Monetary saving	21088	Rs/Annum
11	Cost of 18 W LED Tube	641	Rs/Unit
12	Investment required	162814	Rs lump sum
13	Simple Payback period	93	Months

It is recommended to change rest of the Halogen lighting and Sodium Vapor lighting with energy saving LED lighting.

7.2 Replacement of 464 Nos Old Ceiling Fans with STAR Rated Ceiling Fans

During the Audit, it was observed that there are 464 Nos, old ceiling fans. It is recommended to replace these old fans with 5 STAR Rated Fans.

In the following Table, we present the savings, investment required & payback analysis.

Table 19 Fan calculation

Sr. No	Particulars	Value	Unit
1	Present Qty of Old Ceiling Fan fittings	464	Nos
2	Energy Demand of Old Ceiling Fan fitting	70	W/Unit
3	Energy Demand of STAR Rated Fan	35	W/Unit
4	Reduction in demand	35	W/Unit
5	Average Daily Usage period	3	Hrs/Day
6	Daily saving in Energy	49	kWh/Day
7	Annual Working Days	250	Nos
8	Annual Energy Saving potential	12180	kWh/Annum
9	Rate of Electrical Energy	6.15	Rs/kWh
10	Annual Monetary saving	74907	Rs/Annum
11	Cost of STAR Rated Ceiling Fan	2174	Rs/unit
12	Investment required	1008736	Rs lump sum
13	Simple Payback period	162	Months

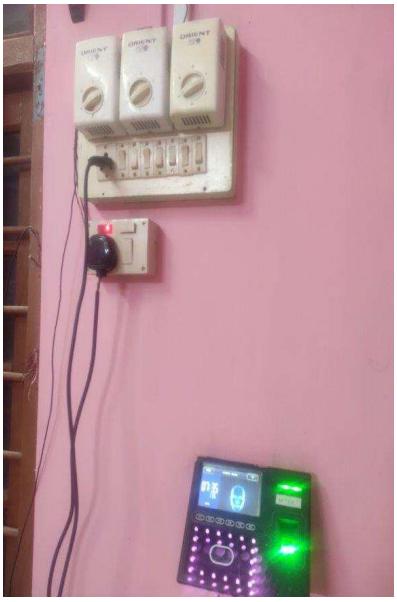
It is recommended to replace rest of the wall fan and stand fan with energy efficient fan accordingly.

8. Summary of Savings

Table 20 Summary of savings

Sr. No	Recommendation	Annual Saving potential, kWh/Annum	Annual Monetary Gain, Rs.	Investment Required, Rs.	Payback period, Months
1	Replacement of 254 Nos Tube light fittings with 18 W LED fittings	3,429	21,088	1,62,814	93
2	Replacement of 464 Nos Old Ceiling Fans with STAR rating fans	12,180	74,907	10,08,736	162
Total		**15,609**	**95,995**	**11,71,550**	**-**

9. Site Photograph



GREEN AUDIT REPORT

January 2021- December 2021

DUDHNOI COLLEGE

Dudhnoi, Goalpara, Assam- 783124

February -2022

Prepared by

Thunderbolt Energy Consultancy

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1. Disclaimer

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2. Acknowledgement

We express our sincere gratitude to the authorities of Dudhnoi College, Dudhnoi for entrusting and offering the opportunity of Green Audit of their college premises.

- Dr. Lalit Chandra Rabha - Principal
- Mr. Soumin Nath - Assistant Professor

We are also thankful to all field staff and agencies working with whom we interacted during the field studies for their wholehearted support in undertaking measurements and eagerness to assess the system / equipment performance. Also thankful to all concerned staff interacted during the conduct of this exercise for completing official documentations.

We hope that the recommendations stated in this report will be useful and worthy of discussions to take things forward to help implementation of green practices. While we have made every attempt to adhere to high quality standards, in both data collection and analysis through the report, we would welcome your suggestions so as to improve upon this report further.

3. Why Green Audit?

Green Audit can be defined as systematic identification, quantification, recording, reporting and analysis of components of environmental diversity, The Green Audit aims to analyze environmental practice within and outside the college campus, which will have an impact on the eco-friendly ambiance. It was initiated with the motive of inspecting the work conducted within the organizations whose exercises can cause risk to the health of inhabitants and the environment. Through Green Audit, once gets a direction as how to improve the condition of environment and there are various factors that have determined the growth of carrying out green audit.

Green Audit is assigned to the criteria 7 of NAAC, National Assessment and Accreditation Council which is a self-governing organization of India which declares the institutions as Grade A, B or C according to the scores assigned during the accreditation.

4. Green Audit Team

Table 1 Details of the team members of Thunderbolt Energy Consultancy

Name	Role	Field of expertise
Mr. Mahesh Khode	Project coordinator, Report verification	Graduate Electrical engineer with experience in Energy Efficiency Assessment, Electrical distribution system, Design, Power assets Evaluation and Project Management, resource management.
Mr.Kaustubh Bhatwadekar	Energy Auditor	Graduate Mechanical engineer, M.Tech IIT Bombay, Bureau of Green Efficiency Certified Energy Auditor, Experience In Industrial Energy, distribution system, Energy Efficiency Assessment.
Mr. Prashant Yadav	Data tabulation and analysis & report preparation	Graduate in Electrical & Electronics Engineering with experience in Energy & Power projects.

5. Executive Summary

The rapid urbanization and economic development at local, regional and global level has led to several environmental and ecological crises. On this background it becomes essential to adopt the system of the Green campus for the institute which lead for sustainable development.

Dudhnoi college, Dudhnoi is deeply concerned and unconditionally believes that there is an urgent need to address these fundamental problems and revers the trends. The purpose of the audit was to ensure that the practices followed in the campus are in accordance with the Green Policy adopted by the institution. The methodology included: Physical inspection of the campus, observation and review of the documentation, interviewing key person and data analysis, measurements and recommendations. It works on the several facets of Green Campus including Water Conservation, Tree Plantation, Waste Management, Paperless Work, Alternative Energy and Mapping of Biodiversity. With this in mind, the specific objectives of the audit was to evaluate the adequacy of the management control framework of environment sustainability as well as the degree to which the Departments are in compliance with the applicable regulations, policies and standards. It can make a tremendous impact on student health and learning college operational costs and the environment. The criteria, methods and recommendation used in the audit were based on the identified risks.

5.1 Present Energy Consumption

In the following Table, we present the details of Energy Consumption.

Table 2 Details of Energy Consumption

Sr no	Parameter	Boys Hostel		Girls Hostel		College Building	
		Energy consumed, (Units)	Bill Amount (Rs)	Energy consumed, (Units)	Bill Amount (Rs)	Energy consumed, (Units)	Bill Amount (Rs)
1	Maximum	210	1315	390	2443	3764	23149
2	Minimum	120	738	240	1476	2445	15037
3	Average	152	941	293	1819	3524	21671

Note- Due to defective meter above figure is based on estimated data as per electricity bill.

5.2 Various Measures Adopted for Energy Conservation

1. Usage of LED lights at some indoor locations.
2. Usage of LED Lights for outdoor lighting.
3. Solar lighting system Installed.
4. BEE Star rated air conditioners Installed.
5. Installation of Rooftop Rain Water Harvesting system
6. Installation of Bio composting pit
7. Usage of Energy Efficient LED
8. Usage of Energy Efficient BEE STAR Rated equipment

5.3 Waste Management

The College has already installed a Bio composting Plant, wherein, the bio-degradable waste is composted & is used as fertilizer for the garden.

The internal communication is through emails and hence there is hardly any generation of e-Waste in the premises.

5.4 Rain Water Harvesting

The College has installed the Rainwater harvesting project, to reduce dependency on ground water supply.

5.5 Notes & Assumptions

1. Daily working hours-03
2. Annual working days- 250
3. Rate of Electrical Green- Rs 6.15 /- per kWH.

6. Abbreviations

CFL	:	Compact Fluorescent Lamp
FTL	:	Fluorescent Tube Light
LED	:	Light Emitting Diode
V	:	Voltage
I	:	Current
kW	:	Kilo- Watt
kWh	:	kilo-Watt Hour
kVA	:	Active Power
AC	:	Air conditioner
PES	:	Progressive Education Society
Qty	:	Quantity
W	:	Watt
PF	:	Power Factor
M D	:	Maximum Demand
PC	:	Personal Computer
APDCL	:	Assam Power Distribution Company Ltd

7. Introduction

Dudhnoi College is the manifestation of the collective dreams of people of the locality and the result of their aspirations and perspirations. The college is located in Dudhnoi, which is now headquarter of the Rabha Hasong Autonomous Council and is 110 km from Assam's capital city Guwahati and 42 km from district headquarter town Goalpara. The College had a modest beginning with only Pre-University (Higher Secondary) Arts classes in 1972. Degree classes of Arts stream started in 1974. Later on, Science and Commerce streams were added in session 1985-86 and 2015-16 respectively. Presently the college has 18 different departments offering both Honours (Major) and General Courses. The college has a pristine green and serene campus spreading over a vast area of 33.05 acres. A big horse-shoe shaped pond runs around the main building. A foot-bridge over the pond enhances the beauty.

7.1 Objectives

The main objective of the green audit is to promote the Environment Management and Conservation in the College Campus. The purpose of the audit is to identify, quantify, describe and prioritize framework of Environment Sustainability in compliance with the applicable regulations, policies and standards.

The main objectives of carrying out Green Audit are:

- To introduce and aware students to real concerns of environment and its Sustainability.
- To secure the environment and cut down the threats posed to human health by analyzing the pattern and extent of resource use of the campus.
- To establish a baseline data to assess future sustainability by avoiding the interruptions in environment that are more difficult to handle and their corrections requiring high cost.
- To bring out a status report on environmental compliance.

7.2 Audit methodology

In order to perform green audit, the methodology included different tools such as Physical inspection of the campus, observation and review of the documentation, interviewing key persons and data analysis, measurements and recommendations. The study covered the following areas to summaries the present status of environment management in the campus:

- Water management
- Energy Conservation
- Waste management
- E-Waste management
- Green area management

7.3 About Thunderbolt Energy Consultancy

We are pleased to introduce ourselves as **Thunderbolt Energy Consultancy**. We are a team of young Energy professionals, working to help Businesses and facilities become Energy efficient and promote green and clean Energy.

Our highly competent team of 'Bureau of Energy Efficiency Certified Energy Auditors and Certified Energy Managers having experience in variety of sectors and managing various functions for over years.

We using most advanced instruments in order to help you reduce Energy consumption and achieve better efficiency.

We are providing services in various areas like

- Energy Audit, Electrical Audit, Electrical Survey
- Green Audit & Environmental Audit for all Entities
- Safety Audit, Electrical safety audit, Safety survey
- Street Light EA, SL Survey, SL Sales & Installation
- Electrical Repair & Maintenance Services
- Project Management Consultancy
- Third-Party Audit

We have a highly trained and experienced team of certified Energy and Safety Auditors, Energy Manager, Analyst, Engineers & Retailers. We are presently working in pan India.

8. General Details of College

Table 3 Details of College campus

Particulars	:	Details
College name	:	Dudhnoi College
Date of Establishment	:	1972
Address	:	Dudhnoi, Goalpara- 783124
Contact details	:	8638103337, Email- iqacdudhnoicollege@gmail.com/ dudhnoicollege@gmail.com
Scope of audit	:	Green Audit for college
Number of staff	:	Teaching – 47 Male, Female - 42 **Total- 89** Non-Teaching - 39 Male: Female: 12. **Total - 51**
Number of students	:	Total: 3760, Male: 1755, Female: 2005. (Academic Year 2021-22)
Courses offered	:	H.S. (Arts, Science and Commerce), B.A., B. Sc., B. Com., KKHSOU (B.A. and M. A.), IDOL (M.A, M. Sc. And M. Com)
College members	:	Gauhati University

Table 4 Details of College Building

Sr. No.	Details
1	Total campus area: 1,33,779 (Approximately 33.05 Acres)
2	Building: 12015.62 square meters.
3	Number of Class Rooms: 37
4	Number of Laboratories: 23
5	Number of Computers: 107 Desktop and 06 Laptop
6	Water filters with aqua guard: 12
7	Aqua guard for staff: 06
8	Water coolers: 01
9	Number of Fire Extinguishers: 15
10	Classrooms with sufficient cross ventilation and light-37
11	Number of Air Conditioner's: 04
12	LCD: 10
13	Smart Board: 03

Table 5 Details of College Building Build-up-Area

Dudhnoi College Build-up-Area						
Block	Sr No	Building name	Meter		Square Feet	Square Meter
			Long	wide		
Block-A	1	Library Building	203	39	8004	744
	2	Administrative Building	82	41	3362	312
	3	Heritage Building	102	39	4002	372
	4	Old Geography Dept. Building	49	30	1452	135
	5	English & Pol. Science Department	36	49	1775	165
	6	Philosophy, Assamese, Economics, Bodo Dept. Building	131	26	3443	320
	7	Examination Cell	69	56	3841	357
	8	Room No. R-19	49	30	1452	135
	9	Room No. NB-1, NB- & NB-3	112	43	4755	442
	10	Girls Common Room	20	20	387	36
Block-B	1	Botany Class Rooms	115	33	3765	350
	2	do	26	13	344	32
	3	do	66	30	1937	180
	4	Statistics Dept. Building	134	49	6616	615
	5	Teachers Common Room	82	33	2690	250
	6	Room No-1	62	39	2453	228
	7	Examination Zone-Room No-20	39	20	775	72
	8	Science Building	75	75	5691	529
	9	DCTA, KKHSOU & IDOl Office			884	82
Block-C	1	Commerce Building	72	26	1893	176
	2	Anandibala Rabha Memorial Hall	72	46	3314	308
	3	Auditorium Hall (Mathematics Dept.)	95	49	4680	435
	4	Boys Common Room	69	30	2033	189
	5	Union Body & Rabha Literary Society	49	30	1452	135
	6	Bodo Literary Society-1	33	26	861	80
	7	Bodo Literary Society-2	39	16	646	60
	8	Indoor Stadium	89	66	5810	540
Others	1	Girls Hostel	112	39	4389	408
	2	Girls Hostel	56	30	1646	153
	3	Girls Hostel	98	16	1614	150
	4	Girls Hostel	30	30	871	81
	5	Boys Hostel	102	161	16342	1518

Dudhnoi College Build-up-Area						
Block	Sr No	Building name	Meter		Square Feet	Square Meter
			Long	wide		
	6	Principal Quarter	39	43	1678	156
	7	Hostel Warden Quarter	69	30	2033	189
	8	College Canteen	66	26	1721	160
	9	Store room-2 (Back side of Statistics)	131	79	10328	959
	10	Store room-3 (Inside of Principal Quarter)	197	52	10328	959
Total Area					**129269**	**12009**

Table 6 Details of Campus class Room

Class Rooms of Dudhnoi College, Dudhnoi				
Sr No	Name of Rooms	Size (in feet)	Square Feet	Square Meter
1	Psychological Laboratory Room No-1	16/30	480	45
2	Music Gallery Room No-2	20/15	300	28
3	Art Gallery Room No-3	20/25	500	46
4	Room No-4	20/60	1200	111
5	Room No-5	30/30	900	84
6	Room No-6	30/30	900	84
7	Room No-7	30/50	1500	139
8	Room No-8	30/30	900	84
9	Room No-9	18/25	450	42
10	Room No-10	18/30	540	50
11	Chemistry class Room (No-11)	28/14	392	36
12	Physics class Room (No-12)	28/14	392	36
13	Room No-13	27/15	405	38
14	Room No-14	27/15	405	38
15	Language Laboratory Room No-15	27/15	405	38
16	Cartography Lab. Cum Class Room-16	27/30	810	75
17	Geography Class Room (No-17)	27/15	405	38
18	Room No-18	30/30	900	84

Class Rooms of Dudhnoi College, Dudhnoi				
Sr No	**Name of Rooms**	**Size (in feet)**	**Square Feet**	**Square Meter**
19	Room No-19	30/40	1200	111
20	Room No-20	20/40	800	74
21	Multipurpose Room (AB Hall)	35/60	2100	195
22	Math Class Room-1 (Arayabhata)	21/30	630	59
23	Math Class Room-2 (Srinivas Ramanujan)	21/30	630	59
24	Math Class Room-3 (Brahmagupta)	10/30,	300	28
25	Botany Class Room No-1	12/12	144	13
26	Botany Class Room No-2	12/12	144	13
27	Class Room Zoology-1	15/12	180	17
28	Class Room Zoology-2	15/12	180	17
29	Commerce Room No-2	20/20	400	37
30	Commerce Room No-3	20/20	400	37
31	Commerce Room No-4	20/20	400	37
32	Commerce Room No-5	20/20	400	37
33	Commerce Room No-6	20/20	400	37
34	Assamese Class Room No-1	20/20	400	37
35	Assamese Class Room No-2	20/20	400	37
36	English Class Room No-1	20/20	400	37
37	English Class Room No-2	20/20	400	37
Total Area			**21692**	**2015**

Table 7 Details of Campus Administrative Rooms

Administrative Rooms of Dudhnoi College, Dudhnoi				
Sr No	**Name of Rooms**	**Size (in feet)**	**Square Feet**	**Square Meter**
1	Office Room	32/40	1280	119
2	Principal Office room	32/20	640	59
3	Library (Office, Reading room & store room)	27/110	2970	276
4	Accounts Room/Visiting Room	32/20	640	59
5	Vice-Principal & Visiting room	18/20	360	33
6	Conference Hall	32/40	1280	119
7	RUSA	32/30	960	89
8	IQAC	32/15	480	45
9	Vice-principal room- 2	12/20	240	22
10	Exam Branch	18/20	360	33
11	Exam Zone Room-1	18/30	540	50
12	Exam Zone Room-2	12/12	144	13
13	Exam Zone Room-3	12/12	144	13
14	IDOL Office	18/12	216	20
15	KKHSOU Office	18/25	450	42
16	DCTA Office	18/12	216	20
Total Area			**10920**	**1014**

Table 8 Details of Campus Administrative Rooms

Common Rooms of Dudhnoi College, Dudhnoi				
Sr No	**Name of Rooms**	**Size (in feet)**	**Square Feet**	**Square Meter**
1	Teachers' Common Room	18/35	630	59
2	Boys Common Room	20/34	680	63
3	Girls Common Room	20/20	400	37
4	Students Union Office	22/27	594	55
5	Rabha Library Society	22/22	484	45
6	Bodo Literary Society-1	27/17	459	43
7	Bodo Literary Society-2	20/16	320	30
Total Area			**3567**	**331**

Table 9 Details of Campus Hostel, Quarter and Stadium

Details size of Hostels, Warden Quarter, Principal Quarter & Indoor Stadium				
Sl No	**Particulars**	**Size (in feet)**	**Square Feet**	**Square Meter**
1	Boys Hostel-New Building	80/100	8000	743
2	Boys Hostel-Old Building	12/60	720	67
3	Boys Hostel Kitchen	20/30	600	56
4	Girls Hostel-Old Building	13/170	2210	205
5	Girls Hostel-New Building	35/110	3850	358
6	Warden Quarter	20/60	1200	111
7	Principal Quarter	30/20	600	56
8	Indoor Stadium	67/87	5829	542
Total Area			**23009**	**2138**

Table 10 Details of Campus Store Room

Details size of Store Rooms, Dudhnoi College, Dudhnoi				
Sr No	**Particulars**	**Size (in feet)**	**Square Feet**	**Square Meter**
1	Store Room-1 (Examination Branch)	20/18	360	33
2	Store Room-2 (Back side of Chemistry Laboratory)	40/24	960	89
3	Store Room-3 (Inside of Principal's Residence)	60/16	960	89
Total Area			**2280**	**212**

Table 11 Details of Campus Laboratory's

Department wise Laboratory's size, Dudhnoi College, Dudhnoi				
Sr No	**Department**	**Size (in feet)**	**Square Feet**	**Square Meter**
1	Computer Laboratory	32/30	960	89
2	Anthropology Lab.-cum-Museum	27/30	810	75
3	Geography GIS Laboratory	27/15	405	38
4	Geography LCD/Smart Class Room	27/15	405	38
5	Botany Laboratory-1	20/24	480	45
6	Botany Laboratory-2	26/24	624	58
7	Botany Laboratory-3	16/14	224	21
8	Botany Instrument Lab	12/10,	120	11
9	Botany Specimen	8/7,	56	5
10	Chemistry Laboratory-1 (New)	26/30	780	72
11	Chemistry Laboratory-2 (Old)	36/30	1080	100
12	Chemistry Laboratory-3 (Old)	28/28	784	73
13	Physics Laboratory-1	26/20	520	48
14	Physics Dark Room	28/28	784	73
15	Physics Laboratory-3 (Old)	36/30	1080	100
16	Zoology Museum	24/30	720	67
17	Zoology Laboratory-1	30/15	450	42
18	Zoology Laboratory-2	15/12,	180	17
19	Store Zoology-1	15/5	75	7
20	Store Zoology-2	10/5,	50	5
21	Statistics Laboratory	36/10	360	33
22	Mathematics Library	16/10	160	15
23	Mathematics Computer Lab	20/35	700	65
Total Area			**11807**	**1097**

Table 12 Details of Campus Staff Room

Department wise Staff Room, Dudhnoi College, Dudhnoi				
Sr No	**Department**	**Size (in feet)**	**Square Feet**	**Square Meter**
1	Education	30/16	480	45
2	Anthropology	27/15	405	38
3	Geography	27/15	405	38
4	Political Science	30/13	390	36
5	Economics	18/15	270	25
6	History	10/30	300	28
7	Philosophy	18/12	216	20
8	Assamese	18/20	360	33
9	Bodo	18/15	270	25
10	English	30/13	390	36
11	Commerce	20/20	400	37
12	Mathematics	20/30	600	56
13	Botany	24/18	432	40
14	Statistics	20/17	340	32
15	Chemistry	28/14	392	36
16	Physics	28/14	392	36
17	Zoology	20/17	340	32
Total Area			**6382**	**593**

9. Study of Water Management System

9.1 Source of Water

The study observed College campus uses water from tube well ground water system. Water is used for drinking, Toilets and gardening purpose. The Waste water from the RO water purifier is used for gardening purpose. During the survey no loss of water is observed. The consumption of water of college is around 21,000 liters per day and all tanks are cleaned once in a month by proper use of chemicals.

Details of water tank in the College:

Table 13 Campus Water Tank Details

Sr No	Building Name	No. of Tanks	Capacity (L)	Total (L)
1	Boys Hostel	2	1000	2000
2	Girls Hostel	4	1000	4000
3	Science Building	2	1000	2000
4	Botany Department	2	1000	2000
5	Girls Common Room	1	1000	1000
6	New Toilet, Adjacent to Botany Department	1	1000	1000
7	Library Building	2	1000	2000
8	Administrative Building	1	1000	1000
9	Canteen	1	1000	1000
10	Commerce Building	1	1000	1000
11	Principal's Quarter	1	1000	1000
12	Boys Common Room	1	1000	1000
13	Bagdevi Ghat	1	1000	1000
14	Indoor Stadium	1	1000	1000

9.2 Drinking water

Drinking water quality is tasted weekly and water filters are cleaned.

9.3 Waste water management

Number of washrooms: Toilets – 46 (Total in the College), 25 Urinal, 21 Toilet. Waste water and human excreta is properly treated, the treated water is then used for lawns, plants and gardening purpose.

Figure 1 Waste Water lawns, Plants and Gardening Purpose

In campus small, medium or large-scale reuse and recycle of water system is necessary. Minimize wastage of water and use of electricity during water filtration process, if used, such as RO filtration process and ensure that the equipment's use for such usage are regularly serviced. Ensure that all cleaning products used by college staff have a minimal detrimental impact on the environment. Garden should be watered by using drink/ sprinkler irrigation system to minimize water use.

9.4 Rooftop Rainwater Harvesting (RWH) – Potential assessment

Roof-top rain water harvesting techniques are most simple, but neglected in the water harvesting programs. It requires two basic elements: - a catchment's a broad surface to catch the rain and method or device for storing the captured rain. Rooftop rainwater harvesting is one of the optimistic and economically viable methods of rainwater harvesting. Rooftop rainwater is allowed to percolate in the ground and become helpful to increase ground water recharging groundwater aquifers. Dudhnoi college have huge potential to trap the rainwater and enable for groundwater recharge through bore-well recharge.

The College has already installed Rooftop Rain Water Harvesting project in some building, wherein the rain water falling on the terrace is collected and through pipes it is fed to underground Water Storage tank.

Figure 2 Roof-Top Rain Water Collection

10. Study of Energy Consumption

10.1 Energy Details

The electricity supply for Dudhnoi College is provided by Assam Power Distribution Company Limited. The Energy consumed by Dudhnoi College falls under LT Category. The facility also has 2 DG sets of 15 kVA. The DG set is mainly used for power failure from APDCL.

Table 14 Details of Energy Consumption

Sr. No	DG details	Name of the building
1	15 kVA	College Building
2	15 kVA	College Building

The Energy efficiency assessment was conducted for the load connected to the mains supply of college building, Boys hostel and Girls hostel.

10.2 Energy Use

This indicator addresses energy consumption, energy source, energy monitoring, lighting, appliance, natural gas and vehicles, Energy use is clearly an important aspect of campus sustainability and thus requires no explanation for its inclusion in the assessment.

Mainly Energy is used on this facility for the following purposes:

1) Lighting's load
2) Air conditioners
3) Fan
4) Water pump
5) Office equipment

The entire campus including common facility center are equipped with LED lamps and LED tube lights, except at few locations. Beside this, photovoltaic cells are also installed in the campus as an alternative renewable source of energy but due to some technical reason it's not in working condition. Computers are set to automatic power saving mode when not in use.

In campus premises electricity should be shut down when not in use and during leaving office and class rooms. Support renewable and carbon-neutral electricity options on nay energy purchasing consortium, with the aim of supplying all college properties with electricity that can be attributed to renewable and carbon neutral sources. It is preferable to purchase electricity from a company that invest in new source of renewable and carbon-neutral electricity. Installation of LED lamps instead of CFL or load lams and replacing the old tube lights with the new LED tubes. 5 star rated ACs, Fans and CFLs should be used in the campus area. Cleaning of tube lights and bulbs to be done periodically to remove dust over it.

Figure 3 Roof-Top Solar System

Figure 4 Solar Street Light

10.3 Consumer details

Table 15 Details of Energy consumption

Name of Consumer	Tariff Category	Consumer Account No.
Principal Dudhnoi College	LT V(A) supply	039000007449
Girls Hostel Dudhnoi College	LT V(A) supply	039000007450
Boys Hostel Dudhnoi College	LT V(A) supply	039000007451

As per the electricity bill all 3 Energy meter is defective and the reading is on estimated base so it is recommended to put compliant in nearest APDCL office and change the meter as soon as possible.

Consumer Name- Boys Hostel Dudhnoi College, Dudhnoi

Consumer Number- 039000007451

In this chapter, electricity bills are studied for the analysis of electrical Energy consumption.

Table 16 Summary of electricity bills of consumer 039000007451

Sr. No	Month	Energy (kWh)	Bill Amount (Rs)
1	Dec-21	124	763
2	Nov-21	120	738
3	Oct-21	124	763
4	Sep-21	120	738
5	Aug-21	124	763
6	Jul-21	123	754
7	Jun-21	123	754
8	May-21	123	754
9	Apr-21	210	1315
10	Mar-21	210	1315
11	Feb-21	210	1315
12	Jan-21	210	1315
	Total	**1,820**	**11,289**

Note- Due to defective meter above figure is based on estimated data as per electricity bill.

Key observations of electricity bill are as follows,

Table 17 Key observations of consumer 039000007451

Sr no	Parameter	Energy consumed, (Units)	Bill Amount (Rs)
1	Maximum	210	1315
2	Minimum	120	738
3	Average	152	941

Variation in Energy consumption is as follows,

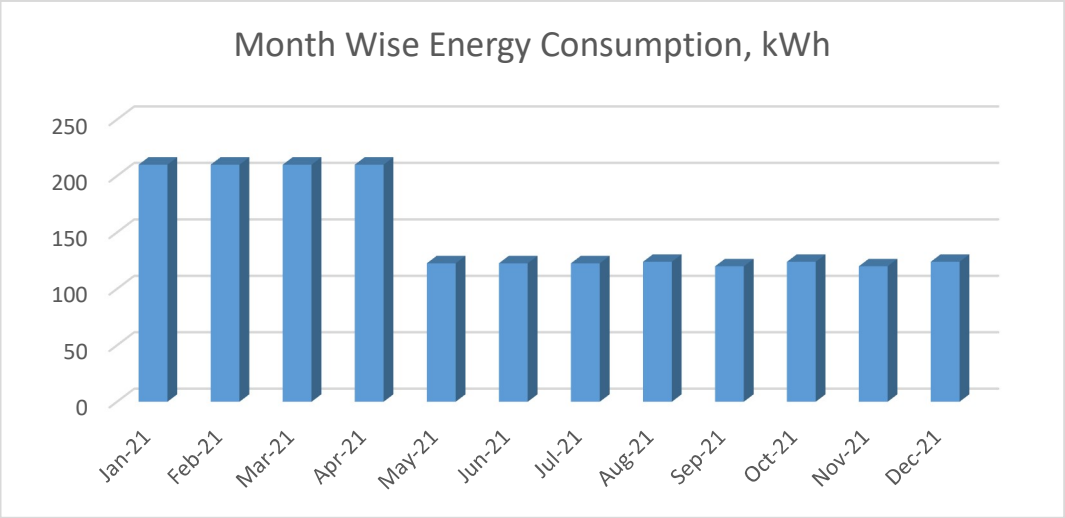

Figure 5 Month wise Energy consumption of consumer 039000007451

Monthly variation in electricity bill is as follows,

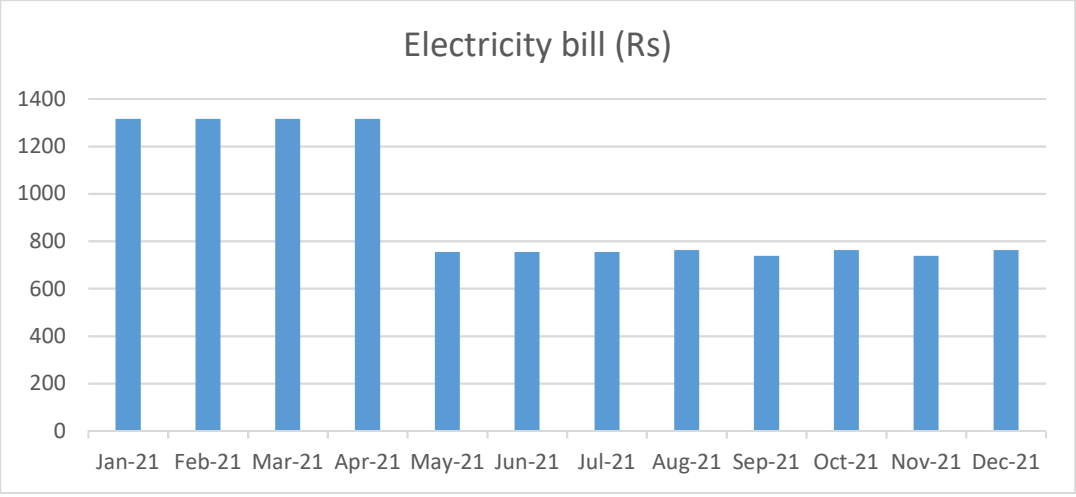

Figure 6 Month wise electricity bill of consumer 039000007451

Consumer Name- Girls Hostel Dudhnoi College, Dudhnoi

Consumer Number- 039000007450

In this chapter, electricity bills are studied for the analysis of electrical Energy consumption.

Table 18 Summary of electricity bills of consumer 039000007450

Sr. No	Month	Energy (kWh)	Bill Amount (Rs)
1	Dec-21	248	1525
2	Nov-21	240	1476
3	Oct-21	248	1525
4	Sep-21	240	1476
5	Aug-21	248	1525
6	Jul-21	245	1509
7	Jun-21	245	1509
8	May-21	245	1509
9	Apr-21	390	2443
10	Mar-21	390	2443
11	Feb-21	390	2443
12	Jan-21	390	2443
	Total	**3,520**	**21,825**

Note- Due to defective meter above figure is based on estimated data as per electricity bill.

Key observations of electricity bill are as follows,

Table 19 Key observations of consumer 039000007450

Sr no	Parameter	Energy consumed, (Units)	Bill Amount (Rs)
1	Maximum	390	2443
2	Minimum	240	1476
3	Average	293	1819

Variation in Energy consumption is as follows,

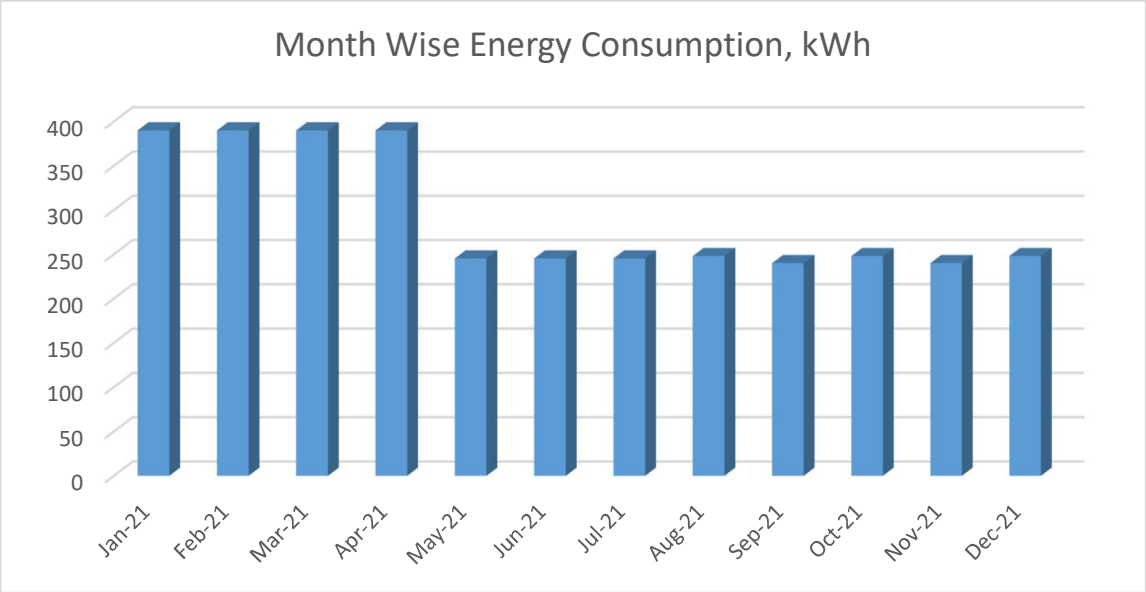

Figure 7 Month wise Energy consumption of consumer 039000007450

Monthly variation in electricity bill is as follows,

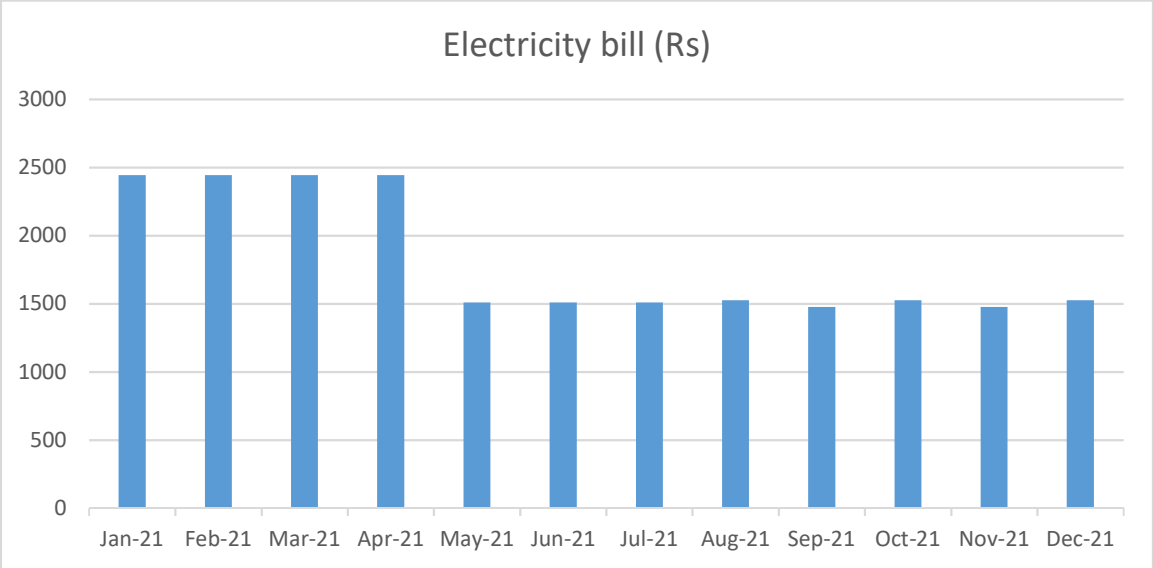

Figure 8 Month wise electricity bill of consumer 039000007450

Consumer Name- Principal Dudhnoi College, Dudhnoi

Consumer Number- 039000007449

In this chapter, electricity bills are studied for the analysis of electrical Energy consumption.

Table 20 Summary of electricity bills of consumer 039000007449

Sr. No	Month	Energy (kWh)	Bill Amount (Rs)
1	Dec-21	2445	15037
2	Nov-21	3643	22404
3	Oct-21	3764	23149
4	Sep-21	3643	22404
5	Aug-21	3764	23149
6	Jul-21	3764	23149
7	Jun-21	3643	22404
8	May-21		
9	Apr-21		
10	Mar-21		
11	Feb-21		
12	Jan-21		
	Total	**24,666**	**1,51,696**

Note- Due to defective meter above figure is based on estimated data as per electricity bill.

Key observations of electricity bill are as follows,

Table 21 Key observations of consumer 039000007449

Sr no	Parameter	Energy consumed, (Units)	Bill Amount (Rs)
1	Maximum	3764	23149
2	Minimum	2445	15037
3	Average	3524	21671

Variation in Energy consumption is as follows,

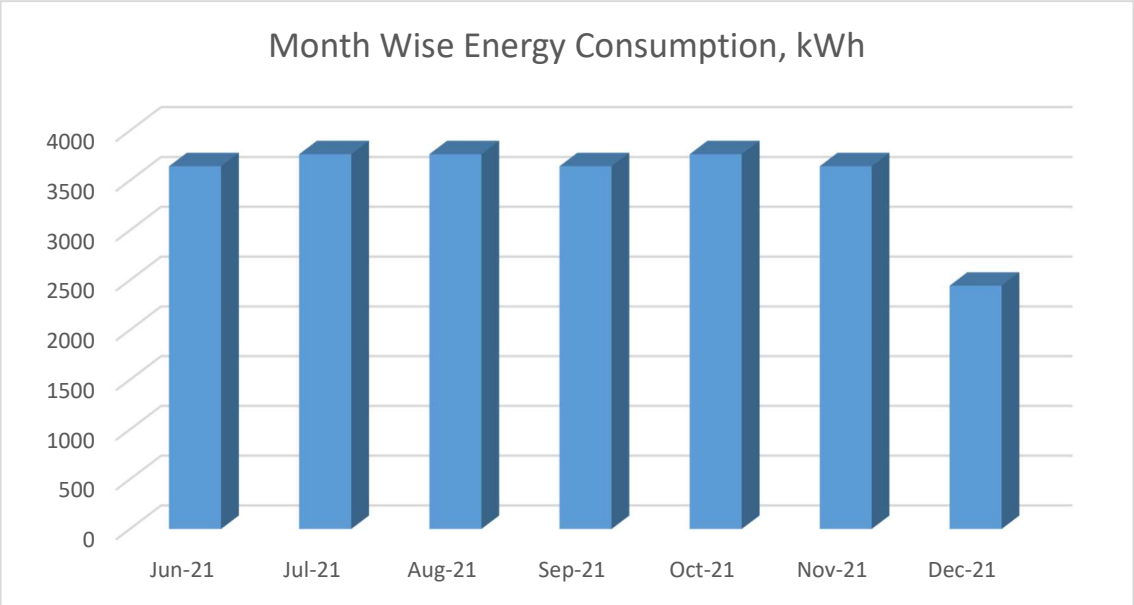

Figure 9 Month wise Energy consumption of consumer 039000007449

Monthly variation in electricity bill is as follows,

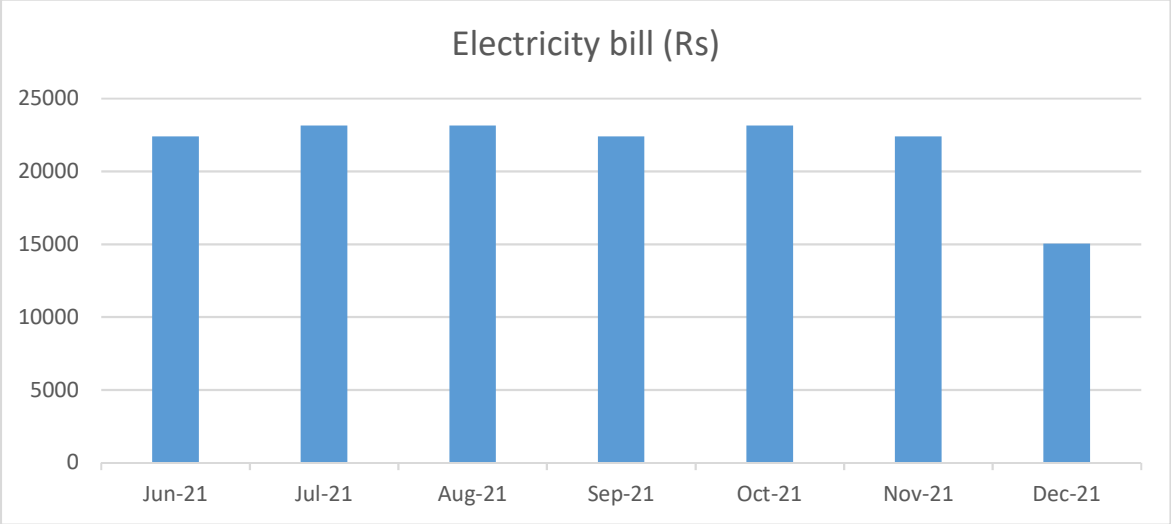

Figure 10 Month wise electricity bill of consumer 039000007449

10.4 Carbon Footprint

1. **A Carbon Foot print** is defined as the Total Greenhouse Gas emissions (CO_2 emissions), emitted due to various activities. In this we compute the emissions of Carbon-Di-Oxide, by usage of the various form of Electrical Energy used by the College for performing its day-to-day activities
2. **Basis for computation of CO_2 Emissions:**
   The basis of Calculation for CO_2 emissions due to Electrical Energy is as under

1 Unit (kWh) of Electrical Energy releases **0.8 Kg of CO_2** into atmosphere. Based on the above Data we compute the CO_2 emissions which are being released in to the atmosphere by the College due to its Day-to-Day operations. We herewith furnish the details of various forms of Energy consumption as under

Consumer Name- Boys Hostel College, Dudhnoi

Consumer Number- 039000007451

Table 22 Month wise Consumption of Energy & CO2 Emissions of consumer 039000007451

No	Month	Energy Consumed, kWh	CO2 Emissions, MT
1	Dec-21	124	0.10
2	Nov-21	120	0.10
3	Oct-21	124	0.10
4	Sep-21	120	0.10
5	Aug-21	124	0.10
6	Jul-21	123	0.10
7	Jun-21	123	0.10
8	May-21	123	0.10
9	Apr-21	210	0.17
10	Mar-21	210	0.17
11	Feb-21	210	0.17
12	Jan-21	210	0.17
	Total	**1,820**	**1.46**

In the following Chart we present the CO2 emissions due to usage of Electrical Energy.

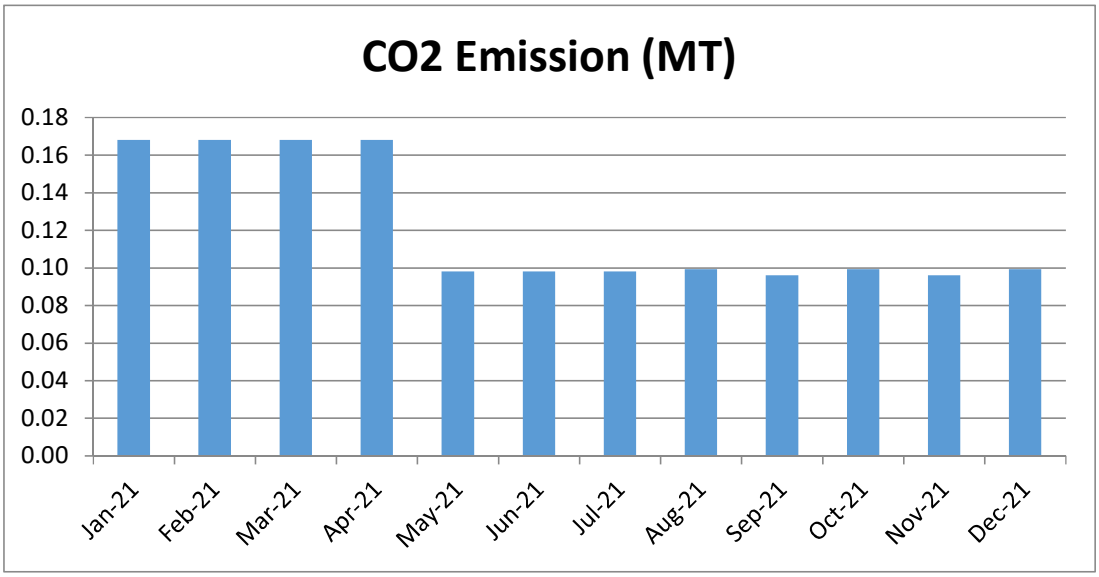

Figure 11 Representation of Month wise CO2 emissions of consumer 039000007451

Consumer Name- Girls Hostel Dudhnoi College, Dudhnoi

Consumer Number- 039000007450

Table 23 Month wise Consumption of Energy & CO2 Emissions of consumer 039000007450

No	Month	Energy Consumed, kWh	CO2 Emissions, MT
1	Dec-21	248	0.20
2	Nov-21	240	0.19
3	Oct-21	248	0.20
4	Sep-21	240	0.19
5	Aug-21	248	0.20
6	Jul-21	245	0.20
7	Jun-21	245	0.20
8	May-21	245	0.20
9	Apr-21	390	0.31
10	Mar-21	390	0.31
11	Feb-21	390	0.31
12	Jan-21	390	0.31
	Total	**3,520**	**2.82**

In the following Chart we present the CO2 emissions due to usage of Electrical Energy.

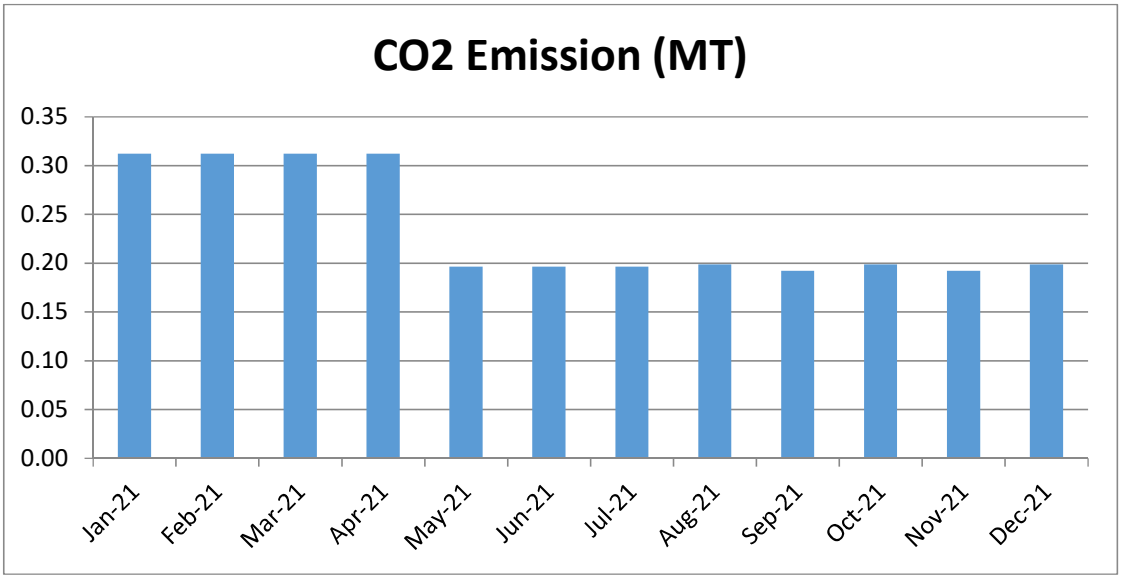

Figure 12 Representation of Month wise CO2 emissions of consumer 039000007450

Consumer Name- Principal Dudhnoi College, Dudhnoi

Consumer Number- 039000007449

Table 24 Month wise Consumption of Energy & CO2 Emissions of consumer 039000007449

No	Month	Energy Consumed, kWh	CO2 Emissions, MT
1	Dec-21	2445	1.96
2	Nov-21	3643	2.91
3	Oct-21	3764	3.01
4	Sep-21	3643	2.91
5	Aug-21	3764	3.01
6	Jul-21	3764	3.01
7	Jun-21	3643	2.91
8	May-21		
9	Apr-21		
10	Mar-21		
11	Feb-21		
12	Jan-21		
	Total	**24,666**	**19.73**

In the following Chart we present the CO2 emissions due to usage of Electrical Energy.

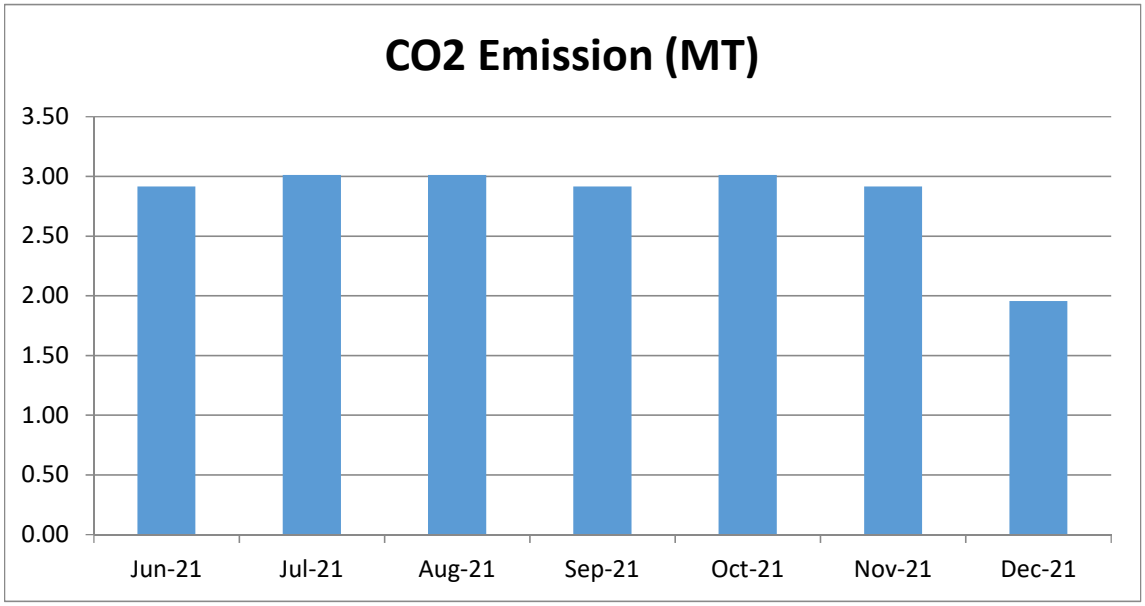

Figure 13 Representation of Month wise CO2 emissions of consumer 039000007449

11. Study of Waste Management

Campus area waste production and disposal wastage like paper, food, plastic, biodegradable, construction, glass, dust etc. and recycling, Furthermore, solid waste often includes wasted material resources that could otherwise be channelled into better service through recycling, repair and reuse. Solid waste generation and management is a burning issue, Unscientific handling of solid waste can create threats to everyone. The survey focused on volume, type and current management practices of solid waste generated in the campus.

11.1 Source of Waste Generation

Waste generation from tree droppings and lawn management is a major solid waste generated in the campus. The waste is segregated at source by providing separate dustbins for Bio-degradable and plastic waste.

The waste generated by newspapers 100 kg/year, Magazine 10 kg/year and of cartons is 15 kg/year, very less plastic waste 0.5 kg/year is generated by the department, office, garden etc. Metal waste and wooden waste is stored and given to authorized scrap agents for further processing.

Figure 14 Vermicomposting Unit

Figure 15 Waste Garbage Collection Unit

11.2 Waste Management Techniques

- Reduce the absolute amount of waste that is produced from college staff offices.
- Make full use of all recycling facilities provided by city Municipality and private supplier.
- Try to recycling of glass, cans, white, colored and brown paper, plastic bottles, batteries, print cartridges, carbon board and furniture.
- Provide sufficient, accessible and well-publicized collection points for recyclable waste with responsibility for clearly allocated.
- Important and confidential papers after their validity to be sent for pulping.
- Single sided used papers reused for writing and printing in all departments.
- Both side printing papers reused as per requirements.

Figure 16 Waste Collection Dustbin

12. Study of E-Waste Management

E-Waste can be described as consumer and business electronic equipment's that is near or at the end of its useful life. This makes up about 5% of all municipal solid waste worldwide but is much more hazardous than other waste because electronic components contain cadmium, lead, mercury and polychlorinated biphenyls (PCBs) that can damage human health and the environment.

E-waste is any electrical or electronic equipment that's been discarded. This includes working and broken items that are thrown in the garbage or donated to a charity reseller like Goodwill. Often, if the item goes unsold in the store, it will be thrown away. E-waste is particularly dangerous due to toxic chemicals that naturally leach from the metals inside when buried.

Figure 17 E-Waste Type

According to the World Health Organization (WHO), health risks may result from direct contact with toxic materials that leach from e-waste. These include minerals such as lead, cadmium, chromium, brominated flame retardants, or polychlorinated biphenyls (PCBs). Danger can come from inhalation of the toxic fumes, as well as from the accumulation of chemicals in soil, water, and food.

This puts not just people in danger but land and sea animals as well. In developing countries, the risks are exceptionally high because some developed countries send their e-waste there. Studies have shown this global e-waste has detrimental effects on the people that work with the e-waste but also the people that live around it.

Because of this, a proper recycling process needs to be put in place to protect us and future generations.

It is observed that E-Waste generated in the campus is very less in quantity, Administration conducts the awareness programs regarding E-Waste Management with that help of various departments. The E-waste and defective item from computer laboratory is being stored properly. The institution has decided to contact approved W-waste management and disposal facility in order to dispose E-waste in scientific manner.

It is recommendation to institution that recycle or safely dispose of white goods, computers and electrical appliances. Use reusable resources and containers and avoid unnecessary packaging where possible. Always purchase recycled resource where there are both suitable and available.

13. Study of Green Practices

This includes the plants, greenery and sustainability of the campus to ensure that the buildings conform to green standards. This also helps in ensuring that the Environmental policy is enacted, enforced and reviewed using various environmental awareness programs.

It is observed that campus is located in the vicinity of many trees to maintain the bio-diversity. Various tree plantation programs are being organized at college campus. This program helps in encouraging eco- friendly environment which provides pure oxygen within the institute and awareness amount villagers. The plantation program includes various type of indigenous species of ornamental and medicinal wild plant species.

13.1 Green Gardens

Students of related subjects are actively involved in gardening, maintenance, etc. of gardens within the campus. Further, they find the garden an apt place for discussions, combined studies, practical's, aesthetic purposes, spending leisure time, etc. Students are learning garden techniques by working in the garden with the help of teachers concerned. Garden makes ample space and scope for them to conduct practicals. for students of Botany and Environmental studies. They also find this as a good opportunity to observe and learn about birds and butterflies. Students from department of Zoology learn about insects and their role in pollination by observing the same in the botanical garden. Preparation of vermi-compost and training on the same for those who are interested are conducted in the garden. There are enough resources (species of flora and fauna) available in different gardens and these resources are being utilized by the Botany and Zoology students for project works.

Figure 18 Green Campus

Table 25 List of Plant Species (Tree & Weed)

Sr No	Scientific Name	Local Name
1	*Artocarpus heterophyllus* Lam *(*Moaaceae)	Kothal
2	*Magnifera indica* L. (Anacardiaceae)	Aam
3	*Michelia champaca* L. (Magnoliaceae)	Titachopa
4	*Phyllanthus emblica* L. (Euphorbiaceae)	Amlokhi
5	*Zizyphus mauritiana* Lamk. (Rhamnaceae)	Bogori
6	*Litchi chinensis (*Gaertn.) Sonn. (Sapindaceae)	Lichu
7	*Phyllanthus acidus* (L.) Skeels (Euphorbiaceae)	Por Amlokhi
8	*Mimusops elengi* L. (Sapotaceae)	Bokul
9	*Murraya paniculata* L. (Rutaceae)	Kamini
10	*Sizygium cumini* (l.) Skeels (Myrtaceae)	Kolajamu
11	*Prunus avium* L. (Rosaceae)	Cherry
12	*Elaeocarpus floribundus* Bl. (Elaeocarpaceae)	Jolphai
13	*Shorea robusta* Gaertn (Dipterocarpaceal)	Sal
14	*Bombax ceiba* L. (Bombacaceae)	Simolu
15	*Aegle marmelos (*L.) Carr, (Rutaceae)	Bel
16	*Terminalia chebula* Retz. *(*Combretaceae)	Silikha
17	*Mesua ferrea* L. (Clusiaceae)	Nahor
18	*Tectona grandis* l. (Verbenaceae)	Segun
19	*Flacourtia cataphracta* Roxb. (Flacourtiaceae)	Poniol
20	*Poinciana regia* Boj. (Caesalpiniaceae)	Krishnachura
21	*Cassia renigera* Roxb. (Caesalpiniaceae)	Golapi Radhachura
22	*Caesalpinia pulcherrima* swatz. (Caesalpiniaceae)	Radhachura

Sr No	Scientific Name	Local Name
23	*Acacia auriculiformis* L. (Momosaceae)	Acacia
24	*Bauhinia acuminata L*. (caesalpiniaceae)	Kanchan (Boga)
25	*Bauhinia purpurea L.* (Caesalpiniaceae)	Golapi Kanchan
26	*Erythrina indica* Lamk. (Papilionaceae)	Modar
27	*Eucalyptus globulus* Lab. (Myrtaceae)	Surobhi Goch
28	*Lagerstroemia indica* L. (Lythraceae)	Ajar
29	*Plumeria acutifolia* Poir (Apocynaceae)	Gulancha
30	*Thevetia peruviana Schum* (Apocynaceae)	Korobi
31	*Adenanthera pavonica* L. (Mimosaceae)	Ronga Chandan
32	*Albizzia lebbeck* Benth. (Mimosaceae)	Boga Koroi
33	*Alstonia scholaris* R.Br. (Apocynaceae)	Chotiona
34	*Azadirachta indica* A. Juss. (Meliaceae)	Nim
35	*Anthocephalus cadamba* Miq. (Rubiaceae)	Kodom
36	*Oroxylum indicum* Vent. (Bignoniaceae)	Bhat-ghila
37	*Butea monosperma* Lamk. (Papilionaceae)	Polas
38	*Cassia fistula* L. (Caesalpiniaceae)	Sonaru
39	*Dalbergia sissoo* Roxle. (Papilionaceae)	Sisu
40	*Dipterocarpus turbinatus* Gaertn. (Dipterocarpaceae)	Kural Sal
41	*Ficus benghalensis* L. (Moraceae)	Bot Goch
42	*Ficus elastic* Roxb. (Moraceae)	Atha-bor
43	*Ficus religiosa* L. (Moraceae)	Anhot
44	*Gmelina arborea* Roxb. (Verbenaceae)	Gomari
45	*Holarrhena pubescens* (Buch-Ham) Wall (Apocynaceae)	Dudhkuri
46	*Lannea caromondelica* Merr. (Anacardiaceae)	Jiya Goch
47	*Melia azadirach* L. (Meliaceae)	Ghora nim
48	*Tectona grandis* L. (Verbenaceae)	Segun
49	*Terminlia arjuna* Bedd. (Combretaceae)	Arjun
50	*Anacardium occidentale* L. (Anacardiaceae)	Kaju Badam
51	*Annona squamosa* L. (Annonaceae)	Atlas
52	*Cocos nucifera* L. (Arecaceae)	Narikol
53	*Spondias pinnata* Kuez (Anacardiaceae)	Amara
54	*Areca catechu* L. (Arecaceae)	Tamol
55	*Dillenia indica* L. (Dilleniaceae)	Ou tenga
56	*Moringa oleifera* Lamk. (Moringaceae)	Sojina
57	*Melastoma malabathricum* L. (Melastomaceae)	Phutki
58	*Cassia siamea* Roxb. (Caesalpinaceae)	Halodhia Radhachura
59	*Calotropis gigantia* (L.) R.Br. (Asclepiadaceae)	Aakon
60	*Streblus asper* Lour. (Moraceae)	Saora

Sr No	Scientific Name	Local Name
61	*Litsea gluitinosa* (Lour.) C.B. (Lauraceae)	Laham/Baghnol
62	*Jatropha curcas* L. (Euphorbiaceae)	Bhotera
63	*Chromolaena odorata* L. (Asteraceae)	Jarmani bon
64	*Terminalia bellirica* (Gaertn.) Roxb. (Combretaceae)	Bhomora
65	*Polyalthia longifolia* Benth (Annonaceae)	Debadaru
66	*Euterolobium saman* Prain (Mimosaceae)	Sirish
67	*Machilus bombycina* L. (Lauraceae)	Som Goch
68	*Pongamia pinnata* (L.) Pierre (Fabaceae)	Koros
69	*Tamarindus indica* L. (Caesalpiniaceae)	Teteli
70	*Meyna spinosa* Roxb. (Rubiaceae)	Bis moin/ Kothora
71	*Aqilaria agallocha* Roxb. (Thymelaeaceae)	Agaru/Sachi goch
72	*Artocarpus lakoocha* Roxb. (Moraceae)	Cham-Kothal
73	*Bougainvillaea spectabilis* L.	Baganbilas
74	*Cannabis sativa* L. (Cannabinaceae)	Bhang
75	*Cardiospermum helicacabum* L. (Sapindaceae)	Kopal-Phuta lota
76	*Crotalaria retusa* L. (Papilionaceae)	Ghantakarna
77	*Ficus infectoria* Roxb. (Moraceae)	Pakori
78	*Ficus cunea* Ham. (Moraceae)	Dimoru
79	*Glycosmis pentaphylla* Corr. (Rutaceae)	Chaul-dhowa
80	*Gynandropsis pentaphylla* DC. (Capparidaceae)	Bhut mula
81	*Hyptis suaveolens* Poit (Lamiaceae)	Tok-Mah
82	*Jatropha gossypifolia* L. (Euphorbiaceae)	Ronga-Bhotera
83	*Lantana camera* L. (Verbenaceae)	Bon bahar
84	*Leonurus sibiricus* L. (Lamiaceae)	Ronga Doron
85	*Loranthus longiflorus* L. (Loranthaceae)	Roghumola
86	*Mallotus philippinensis Muell.* Arg. (Euphorbiaceae)	Muga jori
87	*Morus indica* L. (Moraceae)	Nooni
88	*Physalis minima* L. (Solanaceae)	Teperi
89	*Polygonum hydropiper* L. (Polygonaceae)	Bih- longoni
90	*Sida acuta* Burm. (Malvaceae)	Boriola
91	*Solanum torvum* Swartz. (Solanaceae)	Hati-bhekuri
92	*Solanum xanthocarpum* Schrad. (Solanaceae)	Kantakari
93	*Spermacoce hispida* L. (Rubiaceae)	Sungal bon
94	*Spilanthes paniculata* Merr. (Asteraceae)	Huhuni sak
95	*Tephrosia purpurea* Pers. (Mimosaceae)	Bon nil
96	*Terminalia arjuna* W.&A. (Conbretaceae)	Arjun
97	*Tridax procumbens* L. (Asteraceae)	Bon-Narji
98	*Triumfetta rhomboidea* Jacq (Tiliaceae)	Ogora

Sr No	Scientific Name	Local Name
99	*Urena lolbata* L. *(*Malvaceae*)*	Soka mara
100	*Xanthium strumarium* L. *(*Asteraceae*)*	Agara
101	*Zanthoxylum trifoliatum* L.	Brojonali
102	*Ludwigia octavalvis (*Jacq.) Raven. (Onagraceae*)*	Bonoria long

13.2 Pedestrian Friendly Roads

The Institute has well defined pedestrian foot paths as to facilitate the easy movement of the students within the campus.

Figure 19 Pedestrian Friendly Roads

13.3 Plastic Free Campus

The Institute is an active participant in the Government of India's most prestigious project of SWATCHH BHART ABHIYAN. The Institute has displayed boards in the Campus, to make the campus plastic free.

Various measures adopted for this purpose are as follows

- Installation of Separate waste bins for dry waste & wet waste
- Usage of paper tea cups in the Institute canteen
- Display of boards in the campus for Plastic Free campus

13.4 Medicinal Plant Garden

The diversity of medicinal plants in any place, especially in an academic campus is indicative the emphasis that the institute given towards traditional knowledge. This would be a platform for awareness, learning, and source for local usage. College is maintaining a medicinal plant garden that consists of a good wealth of plant species. The present status of flora that have medicinal importance is representative of regional and local floristic diversity. Plant species in the medicinal plant garden were found maintained on the campus.

Figure 20 Medicinal Plant Garden

The college has following medicinal plants within the campus

Table 26 List of Medicinal Plants in the Garden

Sr No	Scientific Name	Local Name
1	*Averrhoa carambola* L. (Averrhoaceae)	Kordoi
2	*Citrus sinensis* (Linn.) Osbek (Rutaceae)	Mousombi
3	*Psidium guajava* L. (Myrtaceae)	Modhuri Am
4	*Protium serratum* (Wall. Ex Cable) Engl. (Burseraceae)	Niori
5	*Poinsettia pulcherrhima* R. Grah. (Euphorbiaceae)	Lalpat
6	*Hibiscus rosa* sinensis L. (Malvaceae)	Roktajoba
7	*Mirabilis jalapa* L. (Nyctaginaceae)	Godhuli Gopal
8	*Nyctanthes arbortristis* L. (Oleaceae)	Sewali
9	*Murraya koenigii* (L.) Spreng. (Rutaceae)	Narasingha
10	*Carica papaya* L. (Caricaceae)	Amita
11	*Cinamomum tamala* (Buch-Ham.) Nees & Eberm. (Lauraceae)	Tejpat
12	*Costus speciosus* (Koen.) Sm. (Zingiberaceae)	Jomlakhuti
13	*Euphorbia nerifolia* L. (Euphorbiaceae)	Siju
14	*Houttuynia cordata* Thumb. (Saururaceae)	Mosondari
15	*Justicia adhatoda* L. (Acanthaceae)	Boga bahok
16	*Phlogacanthus thyrsiformis* (Hard.) Mobb. (Acanthaceae)	Ronga bahok
17	*Justicia gendarussa* Burm. (Acanthaceae)	Kola bahok
18	*Kalanchoe pinnata* (Lamk.) Pers. (Crassulaceae)	Pategoja
19	*Phyllanthus fraternus* Webster (Euphorbiaceae)	Amlokhi
20	*Micromelum minutum* (Forest. F.) Wt & Arn. (Rutaceae)	Gonderi
21	*Ricinus communis* L. (Euphorbiaceae)	Era
22	*Vitex negundo* L. (Verbenaceae)	Posotia
23	*Abroma augusta* L. (Malvaceae)	Bon-Kopahi
24	*Achyranthes aspera* L. (Amaranthaceae)	Ubhoti –Soth
25	*Acorus calamus* L. (Araceae)	Boch
26	*Ageratum conyzoides* L. (Asteraceae)	Gondhoa Bon
27	*Aloe barbadensis* Willd (Liliaceae)	Chalkunwari
28	*Alternathera sessilis* R. Br. (Amaranthaceae)	Matikanduri
29	*Amaranthus spinosus* L. (Amaranthaceae)	Kata-Khutura
30	*Amaranthus viridis* L. (Amaranthaceae)	Hati-Khutura
31	*Andrographis paniculata* Nees. (Acanthaceae)	Kal-Megh
32	*Argemone mexicana* L. (Papaveraceae)	Sial-Kata
33	*Blumea lacera* DC. (Asteraceae)	Kukurshuta
34	*Boerhaavia diffusa* L. (Nyctaginaceae)	Punarnava
35	*Canna orientalis* Rosc. (Cannaceae)	Parijat
36	*Clitoria ternatea* L. (Papilionaceae)	Aparajita Phul

Sr No	Scientific Name	Local Name
37	*Commelina benghalensis* L. (Commelinaceae)	Kona Simolu
38	*Curcuma longa* L. (Zingiberaceae)	Halodhi
39	*Eclipta prostata* L. (Asteraceae)	Keheraj
40	*Euphorbia hirta* L. (Euphobiaceae)	Gakhiroti Bon
41	*Heliotropium indicum* L. (Boraginaceae)	Hatisuria
42	*Centella asiatica* Urban (Apiaceae)	Bor-manimuni
43	*Ichnocarpus frutescens* R. Br. (Apocynaceae)	Dugdha-lota
44	*Kaempferia rotunda* L. (Zingiberaceae)	Bhui-Champa
45	*Leucas aspera* Spreng. (Lamiaceae)	Doron
46	*Ocimum gratissimum* L. (Lamiaceae)	Ram Tulsi
47	*Oxalis corniculata* L. (Oxalidaceae)	Tengesi tenga
48	*Oxalis debilis* L. (Oxalidaceae)	Bor tengesi
49	*Paederia foetida* L. (Rubiaceae)	Bhedai lota
50	*Pogostemon parviflora* (L.) lamiaceae)	Sukloti
51	*Solanum indicum* L. (Solanaceae)	Tita-bhekuri
52	*Solanum nigrum* L. (Solanaceae)	Pichkoti
53	*Typhonium trilobatum* Schott. (Araceae)	Chama Kochu
54	*Dracaena spicata* Roxb. (Liliaceae)	Ram lakhuti
55	*Catharanthus roseus* G.Don. (Apocynaceae)	Nayan tora
56	*Bacopa monnieri* (L.) Pennell (Serophulariaceae)	Brahmi
57	*Eryngium foetdum* L. (Apiaceae)	Man dhonia
58	*Aerva sanguinolenta* L. (Amaranthaceae)	Bisalya karani
59	*Alocasia odora* (Roxb.) Koc. (Araceae)	Shyam Kochu
60	*Xanthosoma atrovirens* Schott (Araceae)	Nil Kochu
61	*Zygocactus truncates* (Ham.) K. Sch (Cactaceae)	Golpota
62	*Clerodendrum glandulosum* Cobb. ex Wall (Verbenaceae)	Nephaphu
63	*Citrus limon* (L.) Burm. (Rutaceae)	Kaji Nemu
64	*Impatiens balsamina* L. (Balsaminaceae)	Dam deuka
65	*Ocimum sanctum* L. (Lamiaceae)	Tulsi
66	*Ocimum basilicum* L. (Lamiaceae)	Bon Tulsi
67	*Rauvoffia serpentine* (L.) Benth (Apocynaceae)	Sorpogondha
68	*Aristolochia indica* L. (Aristolochiaceae)	Iswar mul
69	*Menthe arvensis* L. (Lamiaceae)	Podina
70	*Pistia stratiotes* L. (Araceae)	Borpuni
71	*Xanthosoma robustum* Schott. (Araceae)	Seujia dudh Kochu
72	*Tinospora cordifolia* (Wild.) Hook. (Menispermaceae)	Soguni Lota

It is recommendations to review periodically the list of trees planted in the garden, allot numbers to the tree and keep records. Assign scientific name to trees. Promote environmental awareness as a part of course work in various curricular area, independent research projects and community service. Create awareness of environmental sustainability and take actions to ensure environmental sustainability. Establish a college environmental committee that will hold responsibility for that enactment, enforcement and review of the environmental policy. The Environmental Committee shall be the source of advice and guidance to staff and students on how to implement this policy. Ensure that an audit is conducted annually and action is taken on the basis of audit report, recommendation and findings. Green library should be established. Indoor plantation to inculcate interest in students, bonsai can plant in corridor to bond a relation with nature. Celebrate every year 5th June as "Environment day" and plant tree on this day to make the campus Greener.

Figure 21 Ten Commandants of Sustainability

14. Green Campus Site Photograph