GREEN AUDIT REPORT 2021-2022

Submitted To

The Principal

CKB College , Teok

Submitted By

JKM Consultancy Service
Solution For Green Audit

CONTENTS

ACKNOWLEDGEMENT

At first, we would like to thank Chandra Kamal Bezbaruah College,Teok management for their cooperation that was extended to us during the entire process.

Our special thanks goes to Dr. Bijoy Krishna Pachani , Principal, CKB College, Teok for giving us necessary inputs to carry out this vital exercise of Green Audit. We are also thankful to other staff members who were actively involved while collecting the data and conducting field measurements.

GREEN AUDIT ASSESMENT TEAM

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Dr. Bijoy Krishna Pachani, Principal, CKB College,Teok

Dr. Gautom Das, Assistant Coordinator,IQAC,CKB College, Teok

(EXTERNAL)

Chairperson : Dr. Dulen Saikia, Principal, JKM, M.Sc., M.Phill, PhD. 25/06/2022

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Mrs. Ely Phukan, Academic Vice Principal, Science Stream 25/06/2022

Dr. Dandeswar Dutta,RFRI 26/06/22

GREEN AUDIT CERTIFICATE

This is to certify that a Green Audit for Chandra Kamal Bezbaruah College, Teok, Jorhat , Assam has been conducted from March -21 to February -22 to assess Environment cost and Environment Impact Assessment and Carbon credit with a view to take sustainable steps to reduce the carbon footprint left by the college and to make environment friendly model of administration.

25/06/2022

Dr. Dulen Saikia

Chairperson

Dr. Dulen Saikia
Chairperson, G Audit
JKM Consultancy Service

G Audit

JKM Consultancy Service

25/06/2022

Mrs. Pinaki Hazarika

Coordinator

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INTRODUCTION:

Green audit is also widely known as Environmental Audit. Green Audit can be better understood as: Compliance of Environmental Laws, Audit of Environment Cost and Environment Impact Assessment, and Carbon Credit. We believe that saving 'Mother Earth' is an integral part of education and that the carbon footprint left by the college is to be reduced by sustainable steps and an environment friendly model of administration. Green audit is a valuable means for a college to determine how and where they are using the most energy or water or other resources; the college can then consider how to implement changes and make savings. It can create health consciousness and promote environmental awareness, values and ethics. It provides staff and students better understanding of Green impact on campus. Institutional self-enquiry is a natural and necessary outgrowth of a quality educational institution. As environmental sustainability is becoming an increasingly important issue for the nation, the role of higher educational institutions in relation toenvironmental sustainability is more prevalent.

In recent time, the Green audit of an institution has been becoming important for self assessment of the institution which reflects the role of the institution in mitigating the present environmental problems. Many institutions undertake lots of good measures to resolve these problems but are not documented due to lack of green documentation awareness. All this non-scholastic efforts of the administrations play an important role in ensuring the green quotient of the campus is intact. Therefore, the purpose of the present green audit is to identify, quantify,describe and prioritize framework of Environment Sustainability in compliance with the applicable regulations, policies and standards.

OBJECTIVES:

The main objectives of carrying out Green Audit are:

- To map the Geographical Location of the college.
- To document the floral and faunal diversity of the college
- To record the meteorological parameter of Jogduar, Teok Jorhat where college issituated
- To document the ambient environmental condition of weather, air, water and noiseof the college
- To document the waste disposal system
- To estimate the Energy requirements of the college
- To report the expenditure on green initiatives during the last five years.

METHODOLOGY:

The purpose of the green audit of CKB College, Teok is to ensure that the practices followed in the campus are in accordance with the Green Policy of the country. The methodology includes:

- Collection of data.
- Physical inspection of the campus
- Observation and review of the documentation and data analysis.

ABOUT THE COLLEGE:

It is a general degree college in Jorhat, Assam. This college is affiliated with the Dibrugarh University. It is a promising Co-educational premier institution in North-East India that offers courses in both Arts and Commerce Stream . The College is located in Jogduar, 25 kilometres east of Jorhat town, and is well connected by NH-37 . The institute is serving a great number of students and the public belonging to a large hinterland of Jorhat, Sibasagar and Majuli districts ranging the area from the foothills of Naga Hills to Jhanjimukh and from Jhanji to Kakojan by disseminating the light of knowledge among them.The college was founded in 1959 with the noble goal of meeting the higher education needs of a large locality, many of whom come from rural and economically disadvantaged backgrounds. Formerly the institute was named as "Teok Purbanchal College". Later, in 1961, the college was renamed as "Chrandra Kamal Bezbaruah College". Chandra Kamal Bezbaruah was a very courageous pioneer tea planter of Assam and a protagonist of education. His benevolent sons Late Dr. N. K Bezbaruah and Late R. K Bezbaruah donated about 100 bighas of land and a substantial amount to construct the college in initial years. The arts stream of the college was brought under deficit system in the year 1972 and the commerce stream in 1996. At present the college community consists of 1500 students, 34 permanent Associate / Assistant Professors. The college at present has 8 departments.

VISION AND MISSION STATEMENT:

Our vision: The transformation, including engaging in the continuous learning necessary in a rapidly advancing world, identifying and addressing critical issues related to the education of all people, and using technology to broaden and support learning opportunities.

Our Mission: The mission of the College is to build a better future for all. This includes individuals, our state, our nation, and our world. We fulfill our mission by preparing competent, committed, and reflective professionals as we engage in outstanding teaching, innovative and impactful research, and meaningful outreach.

OBSERVATIONS:

TREE DIVERSITY OF CKB COLLEGE TEOK, JORHAT:

Chandra Kamal Bezbaruah College, Teok is located by the side of the National Highway No. 37 at about 25 Kms. east of Jorhat town. C.K.B College, Teok is almost at an equidistance from Jorhat and Sivasagar. It is well connected by bus from both the town. The college has about 100 bighas (approximately 33.33 acres) of land out of which about 35% land is covered by valuable trees.The college possesses a plantation area of about 11 bighas which has a great diversity of tree species performing a variety of functions. Most of these tree species are planted in different periods of time through various plantation programmes organised by the college authority and have become an integral part of the college. The trees of the college are prominent features that are planted to maintain the greenery and aesthetic values, store carbon and stabilize the soil. Many species of birds are dependent on these trees mainly for food and shelter. Nectar of flowers and plants is a favourite of birds and many insects. Leaf – covered branches keep many animals, such as birds and squirrels, out of reach of predators. Different species display a seemingly endless variety of shapes, forms, texture and vibrant colours. Even individual trees vary their appearance throughout the course of the year as the seasons change. They also remind us the glorious history of our institution in particular. We often make an emotional connection with these trees and sometime become personally attached to the ones that we see every day. A thick belt of large shady trees in the periphery of the college have found to be bringing down noise and cut down dust and storms. Thus, the college has been playing a significant role in maintaining the environment of the entire surrounding areas. The following are the tree species with whom we are being attached-

A. List of plants from College Campus.

Sl. no	Common name	Scientific name	Family	Nos.
1.	Aam	*Magnifera indica L*	Anacardiaceae	02
2.	Ahot	*Ficus religiosa L*	Moraceae	04
3.	Amlokhi	*Emblica officinalis*	Phyllanthaceae	17
4.	Arjun	*Terminalia arjuna*	Combretaceae	02
5.	Bhomora	*Terminalia bellerica*	Combretaceae	01
6.	Bot –Goch	*Ficus benghalensis* L	Moraceae	01
7.	Golap Jamu	*Syzygium jambos*	Myrtaceae	01
8.	Gol- Nemu	*Citrus aurantifolia*	Rutaceae	01
9.	Kala Jamu	*Syzygium cumini L*	Myrtaceae	01
10.	Kodom	*Anthocephalus chinensis*	Rubiaceae	22
11.	Koros	*Derris indica*	Fabaceae	01
12.	Madhuri Aam	*Psidium guajava*	Myrtaceae	04
13.	Moha neem	*Azadirachta indica*	Meliaceae	04
14.	Nahor	*Mesua ferrea L*	Calophyllaceae	26
15.	Narikol	*Cocos nucifera*	Arecaceae	05
16.	Narji Phul	*Tagetes erecta L*	Asteraceae	08
17.	Narasingha	*Murraya koenigii*(L) Sprenge	Rutaceae	01
18.	Sewali Phul	*Nyctanthes arbor-tristis* L	Oleaceae	02
19.	Silikha	*Terminalia chebula*	Combretaceae	04
20.	Bokul	*Mimusops elengi L*	Sapotaceae	17
21.	Bogori	*Zizyphus jujube*	Rhamnaceae	02
22.	Tamol	*Areca catechu*	Arecaceae	03
23.	Kaji Nemu	*Citrus limon*	Rutaceae	109
24.	Sasi	*Aquilaria melaccensis*	Thymelaeaceae	500
25.	Debodaru	*Polyalthia longifolia*	Annonaceae	75
26.	Palash	*Butea monosperma*	Fabaceae	02
27.	Pochotia	*Vitex negundo*	Lamiaceae	01
28.	Barial	*Bauhinia purpurea*	Fabaceae	02
29.	Koroi	*Albizia lebbeck*	Fabaceae	02
30.	Acacia	*Acacia*	Fabaceae	35
31.	Chandan	*Santalum album*	Santalaceae	06
32.	Krishnachura	*Delonix regia*	Fabaceae	04
	TOTAL			872

PHOTO GALLERY

Ficus religiosa

Cocos nucifera

Terminalia chebula

Emblica officinalis

Zizyphus jujuba

Citrus aurantifolia

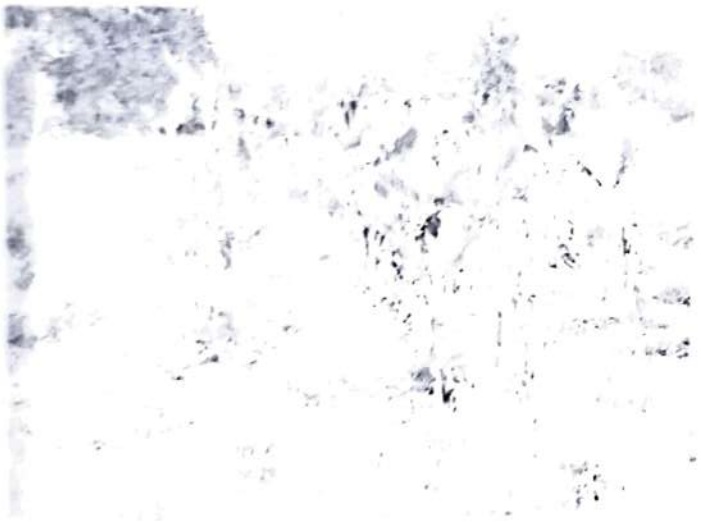
Polyalthia longifolia

Mangifera indica

Delonix regia

Syzygium jambos

Mimusops elengi



Musa species

Aquilaria melaccensis

FAUNAL DIVERSITY IN CKB COLLEGE, TEOK CAMPUS:

The Chandra Kamal Bezbaruah College, Teok is in the Jorhat District of Assam. The wet season in this area is hot, oppressive, and mostly cloudy, while the dry season is warm and clear. Throughout the year, the temperature typically ranges from 51°F to 89°F, with temperatures rarely falling below 47°F or rising above 95°F. The climatic conditions in the Jorhat district as a whole, and particularly in CKB College, Teok ,are ideal for a diverse range of flora and fauna to thrive and contribute to the district's rich biodiversity.

The college has established animal farms of Goat, Pig and Cattle. The main motive behind this is to help in the proper management of animals by providing food, shelter and protection against diseases and other animals. It also encourages the students as well as the local community regarding knowledge of animal husbandry and for their economic growth. Besides, the college also posseses two big fisheries covering an area of around 4 bighas. Various fishes like Rohu, Catla, Golden carp etc,. are reared in those fisheries .

The following faunal diversity has been studied and documented on the CKB College, Teok campus:

Table: Common and Scientific names of birds and animals

S.No	Common Name	Scientific Name
1.	Common Myna	*Acridotheres tristis*
2.	White breasted waterhen	*Amaurornis phoenicurus*
3.	House Sparrow	*Passer domesticus*
4.	Crow	*Corvus sp.*
5.	Cuckoo	*Cuculidae*
6.	Snake	*Naja naja*
7.	Cattle egret	*Bubulcus ibis*
8.	Butter Fly	Danaus Genutia
9.	Common pigeon	*Columba livia*
10.	Garden tiger moth	*Arctia caja*
13.	Bat	*Chiroptera*
14.	Indian owl	*Bubo benghalensis*
15.	Leech	*Hirudinea*
16.	Earthworm	*Eisenia fetida*
17	Goat	*Capra aegagrus hircus*
18	Pig	*Sus scrofa domesticus*
19	Cow	*Bos Taurus*
20	Rohu	*Labeo rohita*
21	Catla	*Catla catla*
22	Golden carp	*Carassius carassius*

NOISE LEVEL IN THE SURROUNDING OF CKB, TEOK:

Noise measurement, also known as sound level monitoring, is a process that determines the magnitude of noise in a specific area, such as an industrial or residential area. As noise pollution has increased exponentially in recent years, this process is part of environmental monitoring and testing. Sound or noise has two important properties:

- **Loudness** : The intensity of a person's perception of sound is defined as loudness. Decibels are used to quantify it. A whisper is about 20 dB, a library is about 30 dB, normal conversation is about 35-60 dB, heavy street traffic is about 60-0 dB, boiler factories are about 120 dB, jet planes during take-off are about 150 dB, and rocket engines are about 180 dB. The loudest sound a person can tolerate without feeling ill is around 80 decibels (dB). Sounds above 80 decibels (dB) can be considered Pollutants because they harm the hearing system. The WHO has established 45 decibels as the safe noise level for cities. Noise levels of up to 65 dB are considered tolerable by international standards. Sones are another way to express loudness. One sone is equal to 40 decibels of sound pressure at 1000 hertz. The number of vibrations per second is defined as frequency. Hertz is the abbreviation for it (Hz).
- **Frequency** : The frequency of sound is defined as the number of pressure variations per second that occur when sound travels through air and is measured in Hertz (Hz). The higher the frequency, the higher pitched the sound is perceived to be.

MATERIALS, STUDY AREA & METHODS

Noise level meter or noise measuring app(Sound meter), was used to measure the noise level. Noise test pro detect of any noise, music or sound in your surroundings. It will tell you maximum, minimum and average decibels.

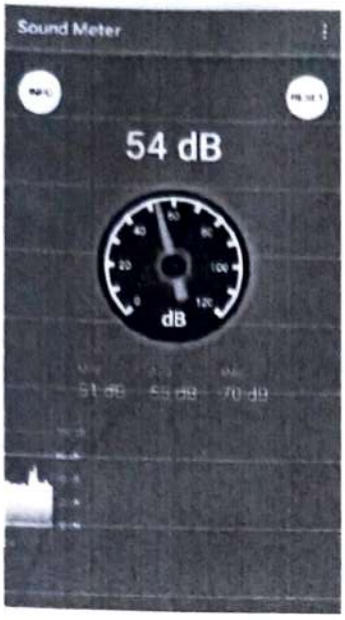


Figure: Noise Measurement by Sound Meter App

DESCRIPTION OF THE COLLEGE SITE:

The Chandra Kamal Bezbaruah College, Teok is located by the side of the National Highway No. 37 at about 25 Kms. east of Jorhat town. The campus of the college is bounded to the north by the 37 No National Highway, to the east by the Sewali path, and to the west and south by residential areas. The satellite image of the college site is shown below.

MEASUREMENT PROCEDURE:

The noise level was measured at various important locations of the college area..The measurements were taken for 60 seconds at each location during the day (9 a.m.-3 p.m.) and are recorded. Screen shots of noise measurements were taken on the app immediately at the 60th second of each measurement..

RESULTS

The results of the experiments at different places have been tabulated in the following table

Table 1: Measurements of Noise in and around CKB ,Teok:

PLACE	MEASUREMENTS (Duration in Sec.)	MINIMUM (dBA)	Maximum (dBA)	AVERAGE (dBA)
Canteen	60	38	80	56
Library	60	38	79.3	51.7
Girls hostel	60	41.9	71.2	47
Arts Building(site 1)	60	39.9	78.4	59.8
Arts building(site 2)	60	43.9	81.4	57.2
Arts building (site 3)	60	46.1	78.6	62.8
Administrative building	60	51	70	55
Auditorium	60	39.7	61.3	48.5
Visiting room	60	43	64	55
College Front Gate	60	40	75	51
IQAC office room	60	26	72	58
Playground	60	40.5	81	58

Source: The measurements were taken with the help of sound meter app. The measurements of noise have been recorded in and outside of college area:

Inside the campus: 26- 81.4

Outside the campus: 40.5-81

WEATHER DATA MONTH WISE JORHAT (Source: Google)

Location: 27.039° N, 95.079° E

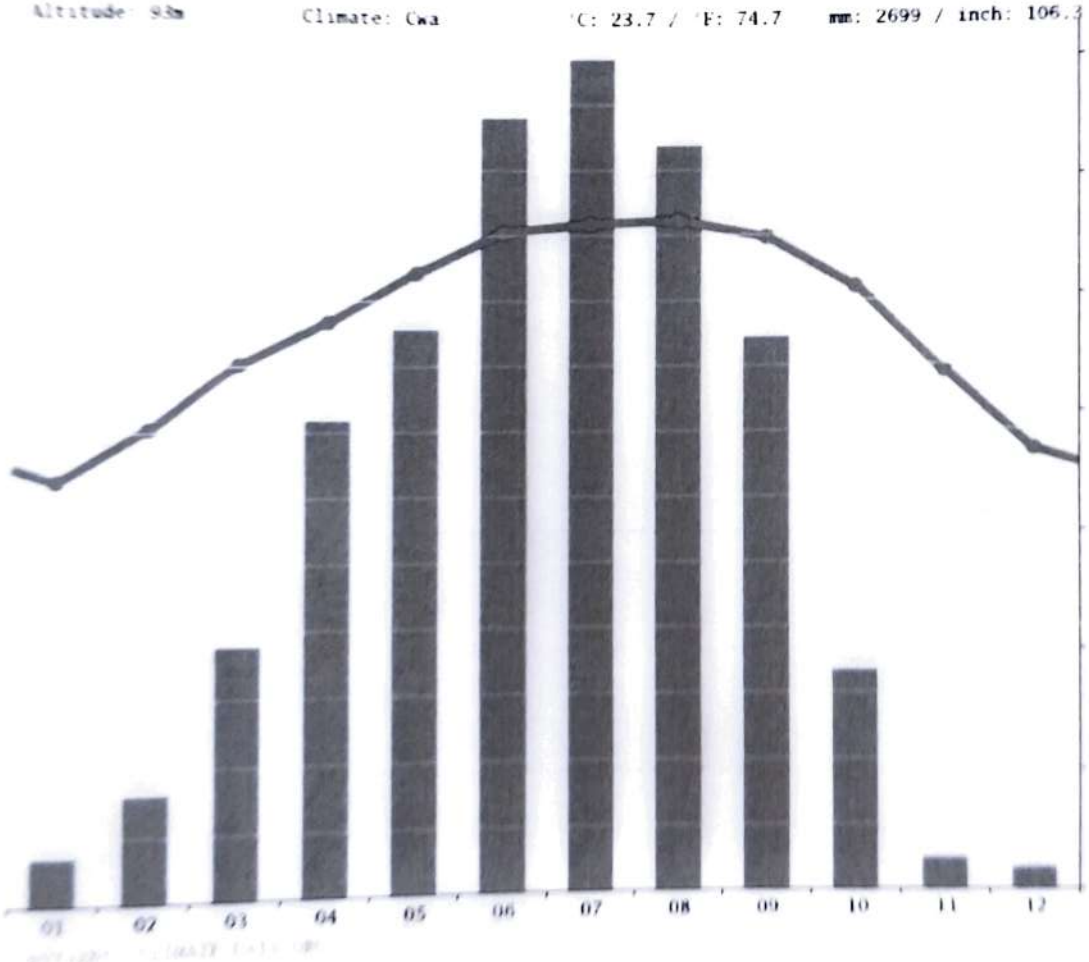
The climate in Jorhat is warm and temperate. Jorhat is in the northern hemisphere Here, the average temperature is about 23.8 °C (74.9 °F) and about 2699 mm i.e 106.3 inch of precipitation falls annually. The month with the highest relative humidity is July (85.22 %). The month with the lowest relative humidity is March (69.03 %).

The month of July has the highest number of rainy days i.e 21 days. The month with the lowest number of rainy days is December (2.17 days).

Summer starts here at the end of June and ends in September. There are the months of summer: June, July, August, September. The driest month is December, with 12 mm of rain and most of the precipitation falls in July, with 489 mm of rain.

Parameters	Jan	Feb	Mar	April	May	June	July	Aug	Sep	Oct	Nov	Dec
Avg. Temperature °C (°F)	17.2°C 63°F	19.3°C 66.8°F	22.1°C 71.7°F	23.8°C 74.9°F	25.9°C 78.6°F	27.6°C 81.7°F	28°C 82.4°F	28.1°C 82.6°F	27.4°C 81.3°F	25.3°C 77.6°F	21.7°C 71.1°F	18.4°C 65.1°F
Min. Temperature °C (°F)	12.3°C 54.1°F	14.4°C 57.9°F	17.5°C 63.5°F	20.2°C 68..4°F	22.8°C 73°F	25.1°C 77.2°F	25.6°C 78.1°F	25.6°C 78°F	24.7°C 76.5°F	21.9°C 71.5°F	17.5°C 63.4°F	13.7°C 56.7°F
Max Temperature°C (°F)	22.3°C 72.1°F	24.3°C 75.7°F	26.7°C 80.1°F	27.7°C 81.9°F	29.4°C 84.9°F	30.8°C 87.4°F	30.9°C 87.6°F	31.1°C 88°F	30.6°C 87.1°F	28.9°C 84°F	26.1°C 79°F	23.3°C 73.9°F
Precipitation /Rainfall Mm(in)	26 (1)	61 (2.4)	144 (5.7)	276 (10.9)	329 (13)	454 (17.9)	489 (19.3)	438 (17.2)	325 (12.8)	127 (5)	18 (0.7)	12 (0.5)
Humidity (%)	75%	71%	69.03%	78%	82%	85%	85.22%	85%	85%	82%	78%	78%
Rainy days (d)	4	6	10	14	17	20	21	21	18	9	2	2.17
Avg. Sun Hours	7.6	8.4	9.0	8.1	8.8	9.3	9.4	9.0	8.9	8.6	8.1	7.4

CLIMATE GRAPH MONTH WISE



WASTE DISPOSAL IN THE COLLEGE CAMPUS:

Generation of wastes from tree droppings and lawn management is a major solid waste generated in the campus.They are segregated at source by providing separate dustbins for Bio-degradable and Plastic Waste.

Reuse of single sided used papers for writing and printing in all the departments has been carried out to reduce paper wastes.. Both side printing is also practied as per requirement. Metal waste and wooden waste is stored and given to authorized scrap agents for further processing. The solid waste is collected by the municipal cooperation and disposed by their method.

25/06/2022

Dr. Dulen Saikia
Chairperson, G-Audit
JKM Consultancy Service

25/06/2022

Mrs. Pinaki Hazarika
Co-ordinator, G-Audit
JKM Consultancy Service

Energy Audit Report

Submitted

To

The Principal

CKB College , Teok

Submitted By

JKM Consultancy Service
Solution For Energy Audit

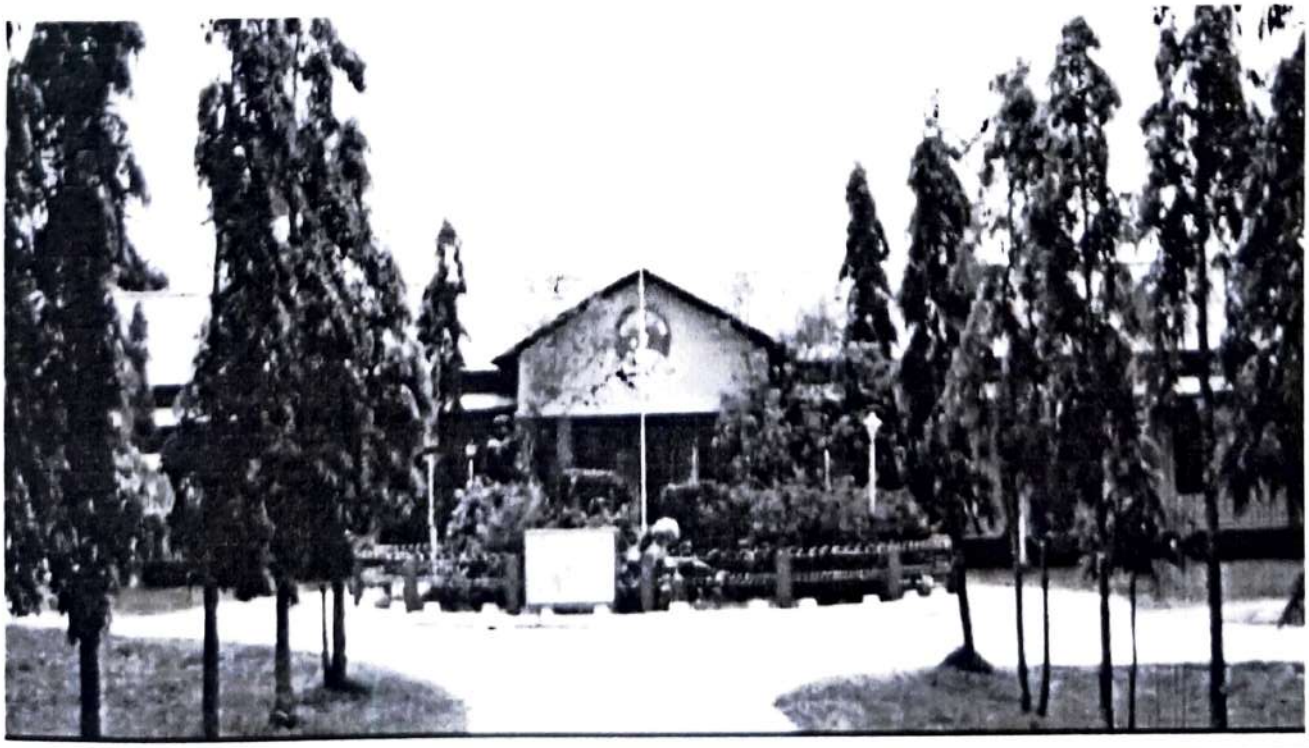
INDEX

Preface

Data collection for energy audit of the Chandra Kamal Bezbaruah College, Teok, Jorhat was conceded by team for the period of March 2021 to February2022

This audit was over sighted to inquire about convenience to progress the energy competence of the campus. All data collected from each classroom, laboratory, every room. The work is completed by considering how many tubes, fan, A.C, electronic instruments, etc. in each room. How much was participation of each component in total electricity consumption.

We really appreciate the effort put by college management for creating awareness of Energy Audit, use renewable energy such as solar energy and their significance use for efficient energy saving and our nature among the all of us. We really appreciate Hon. Management of the college for encouraging us by providing this wonderful opportunity to do the energy audit. Through this, we have been cleared the vision of Institution towards the Green campus and save our green nature. We really appreciate to develop good quality weather station in house of the college.



Acknowledgement

We are sincerely thankful to the Chandra Kamal Bezboruah College, Teok management for giving us the opportunity to conduct energy audit in Chandra Kamal Bezboruah College campus.

We are also grateful to Dr. Bijoy Krishna Pachani, principal, CKB College, Assam whose valuable comments/feedback, during various reviews have helped us to bring the report in the present format.

We express our sincere gratitude to all other concerned officials for their support and guidance during the conduct of this exercise.

Energy Audit Certificate

This is to certify that an Energy Audit for Chandra Kamal Bezbaruah College, Teok, Jorhat, Assam has been conducted from March-21 to February-22 to assess energy costs, availability and reliability of supply of energy, energy conservations technologies and ways to reduce energy consumption.

25/06/2022

Dr. Dulen Saikia

Chairperson

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Energy Audit Assessment Team
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- **Dr. Dulen saikia, Principal , M.Sc , M.Phil., Ph.d**
- **Mr. Rajib Bordoloi, Associate Prof. , M.Sc**
- **Mr. Arup saikia, Assistant Prof. M.sc, M.Phil**
- **Mr. Amrit Dutta, Assistant Prof. M.Sc**

(External)

- **Mr. Sabikur Rahman, Assistant Prof. JEC**
- **Dr. Dandeswar Dutta, Sr. Scientist RFRI**

Summary

The objective of the audit was to study the energy consumption pattern of the facility, identify the areas where potential for energy/cost saving exists and prepare proposals for energy/cost saving along with investment and pay back periods.

The salient observations and recommendations are given below.

1. Energy sources of Chandra Kamal Bezbaruah College are in the following forms:
   a. **From APDCL**
   b. **High Speed Diesel Generator (HSDG)**

   Electrical energy is used for various applications, like: Computers, Lighting, Air-Conditioning, Fans Other Laboratory Equipment, Printers, Xerox machines, CCTV, UPS, LCD Projector, Router system, Floodlight, Pumping motor etc.
2. The average cost of energy is around **Rs.25426.42/Month.**
3. After the measurement and analysis, we propose here with following Energy Efficiency Improvement measures.

Table: Energy Efficiency Improvement

Sl. No.	Recommendations	Annual Saving Potential (Rs.)	Estimated Investment (Rs.)	Pay Back period (Years)	Remarks (Feasibility)
1	Replacing Tube Lights (FTL)with LED Tube Lights	48,144	59,000	0.51	Mid/Short -term
2	Replacing Fan with 5-starenergysaving Fan or BLDC fan	83,300	857,500	4.6	Long-term
3	Providing Energy Saver Circuit to the Air Conditioners	2115	170,000	0.48	Mid/Short -term
	Total Amount	**Rs.133,559**	**Rs.1,086,500**	**1.86 Years**	

Note:
- **Total savings during the energy audit is estimated atRs.133,559/-**
- **The total energy cost with an overall payback period of 1.86 Years for technical and economic feasibility.**

Abbreviations

AHU	Air handling unit
APFC	Automatic Power Factor Controller
DG	Diesel generator
ECP	Energy Conservation Proposal
GCV	Gross Calorific Value
HVAC	Heating, Ventilation and Air Conditioning
HSDG	High speed diesel Generator
PF	Power Factor
SEC	Specific Energy Consumption
TR	Tons of Refrigeration
UOM	Unit of Measurement
APDCL	Assam Power Distribution Company Limited

Chapter:1

Introduction to Energy Audit

- **General:**

Chandra Kamal Bezboruah College, Teok, Jorhat

Assamentrustedtheworkofconductingadetailed Energy Auditofcampuswiththemainobjectivesareasbe llows:

- ✓ To study the present pattern of energy consumption
- ✓ To identify potential areas for energy optimization
- ✓ To recommend energy conservation proposals with cost benefit analysis.

- **Scope of Work, Methodology and Approach:**

Scope of work and methodology were as per the proposal While undertaking data collection, field trials and their analysis, due care was always taken to avoid abnormal situations so as to generate normal/ representative pattern of energy consumption at the facility

- **Approach to Energy Audit:**

We focused our attention on energy management and optimization of energy efficiency of the systems, sub systems and equipment. The key to such performance evaluation lies in the sound knowledge of performance of equipment and system as a whole.

- **Energy Audit:**

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.

Energy Audit Methodology: Energy Audit Study is divided into following steps

1. Historical Data Analysis:

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

2. 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.

3. 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.

Chapter:2

Energy Consumption Profile

Source of Energy:

a. **Electricity from Assam Power Distribution Company Limited**

b. **High Speed Diesel Generator (HSDG):**

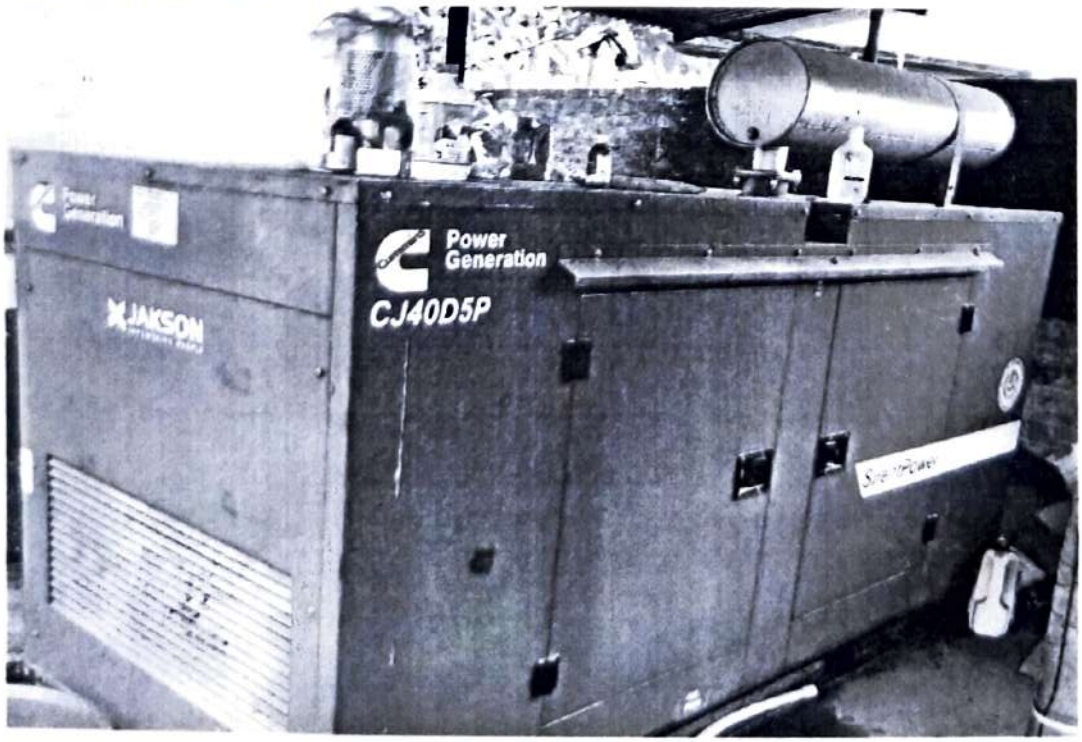
HSD is used as a fuel for Diesel Generator which is run whenever power supply from APDCL is not available.

There is one number of DG set which is dedicated to supply power to entire campus.

The salient technical specifications are as follows:

Company	Jakson
Model no	JSP-40X
Machine no	CJGS18061305
KVA	40
KW	50
Voltage	415v
Current	87amp
Power factor	0.8

JAKSON DIESEL GENERATOR



Following are the major consumers of electricity in the facility:

- Computers
- Lighting
- Air-Conditioning
- Fans
- Other Lab Equipment
- Printers
- Xerox machines
- CCTV
- UPS
- LCD Projector
- Router system
- Pumping motor

CONFERENCE HALL BUILDING

COMPUTER LAB

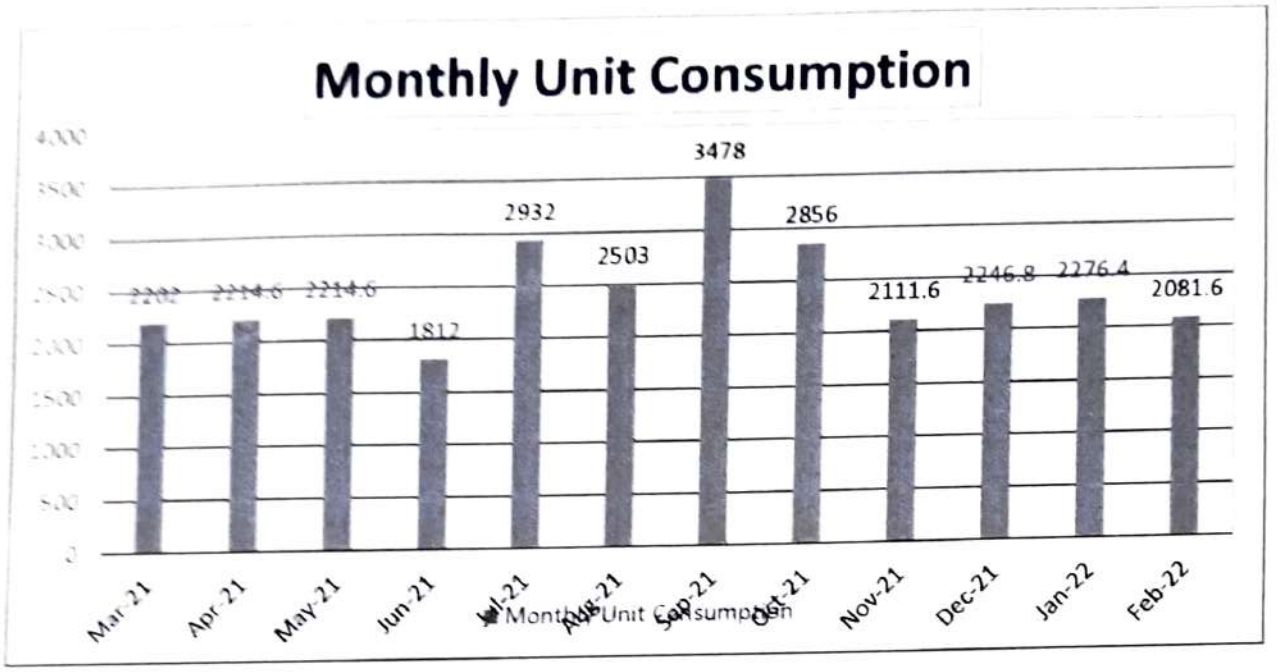
Chapter: 3 Historical Data Analysis

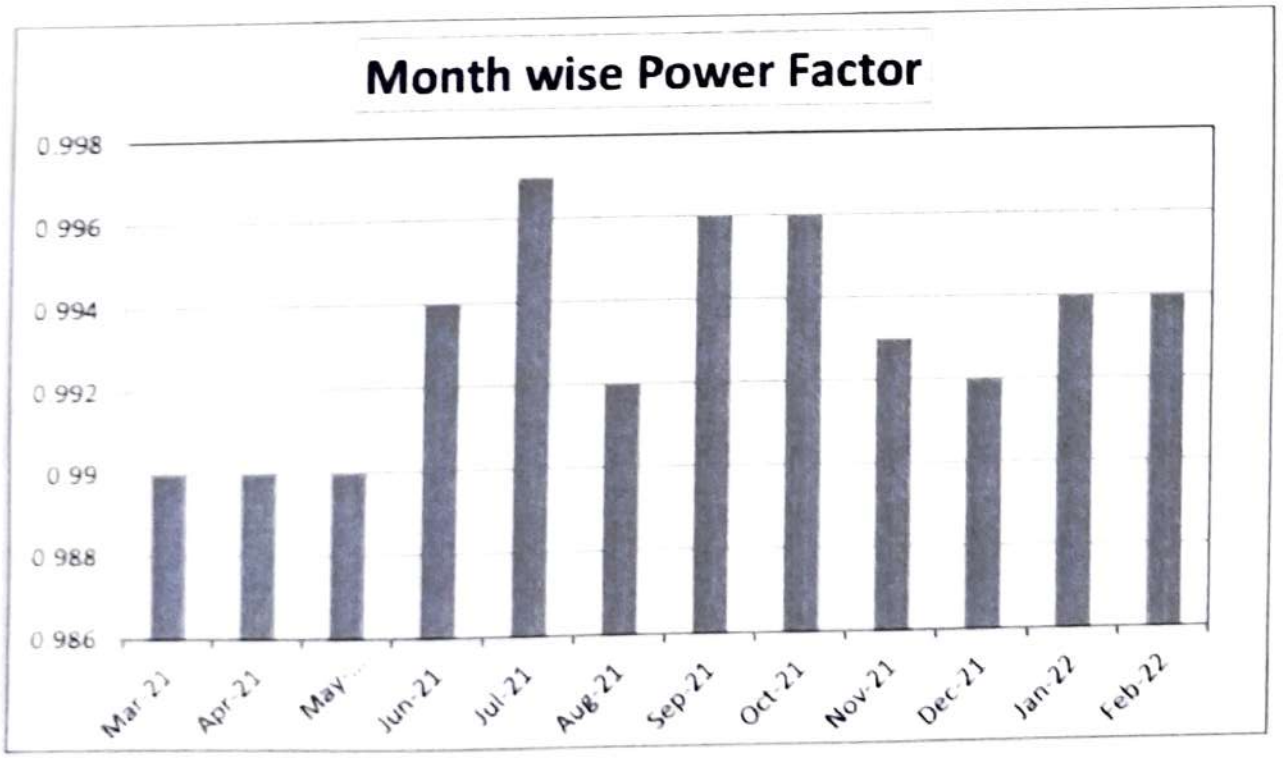
Study of Variation of Monthly Units consumption & Power Factor:

In this Chapter, we study the details of the 12 months Electricity Bills.

TableNo4.1VariationinUnitsConsumption& Power Factor (PF)

Sr. No.	Month	Power Consume	Power Factor
1.	March-21	2202	0.99
2.	April-21	2214.6	0.99
3.	May-21	2214.6	0.99
4.	June-21	1812	0.994
5.	July-21	2932	0.997
6.	August-21	2503	0.992
7.	September -21	3478	0.996
8.	October-21	2856	0.996
9.	November-21	2111.6	0.993
10.	December-21	2246.8	0.992
11.	January-22	2276.48	0.994
12.	February-22	2081.6	0.994
	Total Unit (average)	**2410.67**	**0.99**


Monthly Unit Consumption
3478
2932
2856
2503
2111.6
2246.8
2276.4
2081.6
1812
Mar-21
Apr-21
May-21
Jun-21
Jul-21
Aug-21
Sep-21
Oct-21
Nov-21
Dec-21
Jan-22
Feb-22


Month wise Power Factor
0.998
0.996
0.994
0.992
0.99
0.988
0.986
Mar-21
Apr-21
Jun-21
Jul-21
Aug-21
Sep-21
Oct-21
Nov-21
Dec-21
Jan-22
Feb-22

Conclusion: Variation of PF

The Power Factor to reduce the utility power bill. Most utility bills are influenced by KVAR usage. A good Power Factor provides a better voltage. Reducing the pressure on electrical distribution network. Reducing cable heating, cable over loading and cable losses. Reducing over loadings of control gears and switch-gears etc.

Whenever the average power factor over a billing cycle or a month, whichever is lower, of a higher tension consumer is below 90%, Penal charges shall be levied to the consumer at the rate of 2 % (two %) of the amount of monthly energy bill (excluding of Demand Charges, FOCA, Electricity Duty and Regulatory Liability Charge etc.)

For power factor of 0.99, the effective incentive will amount to 5% (five percent) reduction in the energy bill and for unity power factor; the effective incentive will amount to 7% (seven percent) reduction in the energy bill

Study of Month wise Electricity Bill Variation:

Table No 4.2Variationin Electricity Bill

Sl. No.	Month	Electricity Bill Amount (Rs.)
1	March 21	26389
2	April 21	25215.5
3	May 21	25215.5
4	June 21	23048
5	July 21	31333
6	August 21	28532
7	September 21	34306
8	October 21	30460
9	November 21	25515
10	December 21	26722
11	January 22	26534
12	February 22	24541
	Total Annual Bill =	**305117**
	Average Monthly Bill =	**25426.42**

Month wise Maximum Demand Variation

Study of Month wise Load Factor Variation

Electrical Load factor is a measure of the utilization rate, or efficiency of electrical energy usage. It is the ratio of total energy (KWH) used in the billing period divided by the possible total energy used within the period, if used at the peak demand (KW) during the entire period. Thus,

LoadFactor=KWH/(KW/hoursintheperiod/numberofdaysinthebillingcycle)

For example:

Let total kWh= 360000 kWh
Demand = 100 kW
No. of Days = 30 days Hours per day = 24hrs

Solution:

$$\text{Monthly load factor} = \frac{36000}{100 \times 30 \times 24} = 0.50$$

$$= 0.50 \times 100 = 50\%$$

Table No 4.3 Month wise Load Factor Variation

Sl. No.	Month	Load Factor
1	March-21	0.03
2	April-21	0.03
3	May-21	0.03
4	June-21	0.02
5	July -21	0.04
6	August-21	0.03
7	September-21	0.04
8	October-21	0.04
9	November-21	0.03
10	December-21	0.03
11	January-22	0.03
12	February-22	0.03
	Average	**0.03**

Month wise Load Factor Variation

Conclusion: Variation in monthly Load Factor

If your load factor ratio is above 0.75electrical usage is reasonably efficient. If the load factor is below 0.5, you have periods of very high usage (demand) and a low utilization rate. Low load factor customers would benefit from a peak demand control system or from a Battery Energy Storage System to distribute electrical usage out over longer intervals of time and smooth peaks.

Low load factors, such as below 0.4, contribute significantly to the overall monthly electric bill in the form of demand charges. These demand charges are listed on the bill as coincident demand, facilities demand, and summer time related demand.

SL. NO	Basic Building Data	Value
1	Connected Load	68kW
	Contract Demand	80KVA
2	Installed capacity of DG set	40KVA(1Nos)
3	Annual electricity consumption (March2021-February2022)	28928.6 KWh
4.1	Annual cost of electricity consumption @6.45/ unit	Rs. 327811/-
4.2	Annual cost of electricity consumption through DG set	Rs. 69004/-
4.3	Total cost of electricity	Rs. 396815/-
5	Working hours (Academic and administrative building)	8hrs (9am to 5pm)
6	Working hours (Hostel building)	24hrs X 7days
7	Working days/week	6 Days

Actual measurement and its analysis

List of Electrical and Electronic Equipment's used in C.K.B. College Teok

Room	Sl. No.	Name of the equipment	Power Rating (Watt)	Qty.	Power consumption In Watt	Used Per Day (hrs.)	Power Consumption Per day (watt)
Department of Assamese	1	LED	12	2	24	1hrs	24w
	2	Fan	80	2	160	6hrs	960w
	3	Desktop Set	170	1	170	2hrs	340w
Department of Economics	1	LED	12	2	24	1hrs	24w
	2	Fan	80	1	80	6hrs	320w
	3	T. Fan	55	1	55	4hrs	220w
	4	Desktop Set	170	1	170	2hrs	340w
Department of Education	1	LED	12	2	24	1hrs	24w
	2	Fan	80	2	160	6hrs	960w
	3	Desktop set	170	1	170	2hrs	340w
Department of English	1	LED	12	2	24	1hrs	24w
	2	Fan	80	2	160	6hrs	960w
	3	Desktop Set	170	1	170	2hrs	340w
Department of History	1	Tube light	40	2	80	1hrs	80w
	2	Fan	80	2	160	6hrs	960w
	3	Desktop set	170	1	170	2hrs	340w
	4	W/Fan	80	1	80	6hrs	480w
Department of Sociology	1	LED	12	1	12	1hrs	12w
	2	Fan	80	1	80	6hrs	320w
	3	Desktop set	170	1	170	2hrs	340w
Department of Political Science	1	LED	12	2	24	1hrs	24w
	2	Fan	80	2	160	6hrs	960w
	3	Desktop set	170	1	170	2hr	340w

Department of Commerce	1	LED	12	1	12	1hr	12w
	2	CFL	20	1	20	1hr	20w
	3	Fan	80	2	160	6hr	960w
	4	T. Fan	55	1	55	4hr	220w
	5	Desktop with printer	220	1	220	2hr	440w
Principal Chamber Office	1	Tube Light	40	9	360	1hrs	360w
	2	Fan	80	5	400	6hrs	2400w
	3	Inverter	900	1	900	1hrs	900w
	4	Desktop Set	170	2	340	2hrs	680w
	5	Laptop	50	3	150	2hrs	300w
	6	CFL	15	1	15	1hrs	15w
	7	W/Aqua	25	1	25	5hrs	125w
	8	Sound system(Mic)	40	1	40	1hrs	40w
	9	AC	1500	2	3000	4hrs	12000w
	10	Xerox	1370	1	1370	1hrs	1370w
	11	LED	12	1	12	1hrs	12w
Punaram Gogoi Museum	1	Halogen	300	3	90	3hrs	1800w
	2	Fan	80	3	240	6hrs	1440w
	3	Printer	50	1	50	1hrs	50w
	4	CFL	20	6	120	1hrs	120w
IQUAC	1	LED	12	20	264	1hrs	264w
	2	Fan	80	10	800	6hrs	3200w
	3	Desktop Set	170	11	1820	2hrs	2640w
	4	Xerox	1370	1	1370	1hrs	1370w
	5	AC	1500	1	1500	4hrs	6000w
	6	LCD (TV)	50	1	50	1hrs	50w
	7	Printer	50	1	50	1hrs	50w
	8	W. Pump	750	1	750	1hrs	750w
	9	Tube light	40	3	120	1hrs	120w
	10	CFL	20	2	40	1hrs	40w
	11	Halogen	50	2	100	1hrs	100w
Conference Room	1	CFL	20	6	120	1hr	120w
	2	Fan	80	6	480	2hr	960w
	3	AC	1500	4	6000	2hr	12000w
	4	Sound system	40	1	40	1hr	40w
	5	LCD	50	1	50	1hr	50w

Computer Lab	1	LED	12	6	72	1hr	72w
	2	Monitor set	35	6	210	2hr	420w
	3	Laptop	40	1	40	2hr	80w
	4	Desktop	170	1	170	2hr	340w
	5	Printer	50	2	100	1hr	100w
Golden Jubilee	1	LED	12	6	72	1hrs	72w
	2	Fan	80	5	400	4hrs	1600w
	3	Projector with Digital Board	100	1	100	1hrs	100w
	4	Television	50	1	50	2hrs	100w
	5	AC	1500	2	3000	4hrs	12000w
ID Stadium Room	1	Fan	80	1	80	2hrs	160w
	2	Halogen	50	8	400	2hrs	800w
Outdoor Stadium Room	1	LED	12	2	24	1hrs	24w
	2	Fan	80	1	80	3hrs	240w
	3	Water Pump	750	1	750	1hrs	750w
	4	Tube Light	40	9	360	1hrs	360w
Career Counselling **Cell**	1	Xerox	1370	1	1370	1hrs	1370w
	2	LED	12	2	24	1hrs	24W
	3	Fan	80	1	80	4hrs	320W
Sec/Room	1	Fan	80	1	80	6hrs	480w
	2	CFL	20	1	20	1hrs	20w
W/Cell	1	LED	12	2	24	1hrs	24w
	2	Fan	80	2	160	6hrs	960w
Boys Hostel	1	LED	12	3	36	5hrs	180w
	2	Halogen	50	2	100	5hrs	500w
	3	Tube Light	40	9	360	5hrs	1800w
	4	Fan	80	14	1120	12hrs	13440w
	5	Water purifier	25	1	25	1hrs	25w
	6	Refrigerator	100	1	100	24hrs	2400w
	7	Exhaust Fan	80	1	80	1hrs	80w
	8	Water Pump	750	1	750	1hrs	750w
	9	Inverter	900	1	900	12hrs	10800w

Rector Room	1	LED	12	4	528	2hr	1056w
	2	Fan	80	4	320	5hr	1600w
	3	LCD	80	1	80	1hrs	80w
	4	C.C.T.V	50	1	50	24hrs	1200w
Exam Room	1	LED	12	4	48	1hr	48w
	2	Fan	80	2	160	6hr	960w
	3	C.C.T.V	50	1	50	6hr	300w
Canteen New	1	LED	12	5	60	1hrs	60w
	2	Fan	80	5	400	6hrs	2400w
	3	Exhaust Fan	80	2	400	6hrs	2400w
	4	Refrigerator	100	1	100	24hrs	2400w
Library	1	LED	12	18	48	1hrs	48w
	2	Fan	80	28	240	6hrs	1440w
	3	Water purifier	25	1	25	1hrs	25w
	4	Inverter	1050	2	2100	2hrs	4200w
	5	Desktop	170	7	1190	2hrs	1380w
	6	Printer	50	2	100	1hrs	100w
	7	Xerox	1370	1	1370	1hrs	1370w
	8	LCD	80	1	80	1hrs	80w
	9	C.C.T.V	50	11	550	24hrs	13200w
	10	Tube light	40	2	80	1hrs	80w
	11	CFL	20	2	40	1hrs	40w
O.G.N.R	1	LED	12	11	132	1hrs	132w
	2	CFL	20	4	80	1hrs	80w
	3	Fan	80	4	320	6hrs	1920w
Common Room	1	LED	12	5	60	1hrs	60w
	2	Fan	80	4	320	6hrs	1920w
Office	1	CFL	20	6	180	1hrs	180w
	2	Fan	80	6	480	6hrs	2880w
	3	Desktop set with printer	220	1	220	2hrs	440w
	4	Inverter	900	1	900	2hrs	1800w

	1	LED	12	3	36	1hrs	36w
	2	Fan	80	4	320	6hrs	1920w
G.C. Room	3	W. Pump	750	1	750	1hrs	750w
	4	Water Purifier	25	1	25	1hrs	25w
	5	T.V.	50	1	50	1hrs	50w
	1	LED	12	70	840	12hrs	1008w
	2	Fan	80	30	2400	12hrs	28800w
	3	Refrigerator	100	1	100	24hrs	2400w
Girl's Hostel	4	Water pump	500	2	100	1hrs	100w
	5	Television	50	1	50	3hrs	150w
	6	Inverter	900	1	900	24hrs	21600w
	7	Halogen	50	1	50	4hrs	200w
Food	1	LED	12	2	24	1hrs	24w
Processing	2	Fan	80	1	80	4hrs	320w
Guest House	1	Tube	40	4	160	12hrs	1920w
	2	LED	12	4	48	12hrs	576w
	3	T V	50	1	50	1hrs	50w
	4	Refrigerator	100	1	100	24hrs	2400w
	5	W/M	500	1	500	1hrs	500w
	6	Chimney	150	1	150	1hrs	150w
	7	Geyser	2000	1	2000	1hrs	2000w
	8	Fan	80	4	320	6hrs	1920w
Karabi	1	Fan	80	4	320	6hrs	1920w
Baideu	2	LED	12	7	84	1hrs	84w
	1	Fan	80	2	160	6hrs	960w
Duck/Main	2	LED	12	3	36	4hrs	144w
Gate Section	3	W/Pump	750	1	750	1hrs	750w
	4	Halogen	50	2	100	4hrs	400w

Room No. 41	1	LED	12	1	12	1hrs	12w
	2	Fan	80	4	320	6hrs	1920w
	3	Projector	150	1	150	1hrs	150w
Room No. 17	1	LED	12	1	12	1hrs	12w
	2	Fan	80	2	160	6hrs	960w
Room No. 19	1	LED	12	1	12	1hrs	12w
	2	Fan	80	2	160	6hrs	960w
Room No. 27	1	Tube light	40	3	120	1hrs	120w
	2	Fan	80	2	160	6hrs	960w
	3	Projector	150	1	150	1hrs	150w
Room No. 15	1	Tubelight	40	2	80	1hrs	80w
	2	Fan	80	4	320	6hrs	1920w
Room No. 30	1	CFL	20	1	20	1hrs	20w
	2	Fan	80	5	400	6hrs	2400w
	3	Projector	150	1	150	1hrs	150w
Room No. 1	1	CFL	20	2	40	1hrs	40w
	2	Fan	80	1	80	6hrs	480w
Room No. 33	1	Tube light	40	2	80	1hrs	80w
	2	Fan	80	5	400	6hrs	2400w
	3	Projector	150	1	150	1hrs	150w
	4	Sound System	40	1	40	1hrs	40w
Room No. 36	1	Tube light	40	2	80	1hrs	80w
	2	Fan	80	5	400	6hrs	2400w
	3	Projector	150	1	150	1hrs	150w
Room No. 37	1	Tube light	40	2	80	1hrs	80w
	2	Fan	80	5	400	6hrs	2400w
	3	Projector	150	1	150	1hrs	150w

Room No. 25	**1**	**Tube light**	**40**	**2**	**80**	**1hrs**	**80w**
	2	LED	12	1	12	1hrs	12w
	3	Fan	80	9	720	6hrs	4320w
	4	Sound System	40	1	40	1hrs	40w
Room No. 6	1	LED	12	5	60	1hrs	60w
	2	CFL	20	2	40	1hrs	40w
	3	Fan	80	8	640	6hrs	3840w
	4	D. Board	200	1	200	1hrs	200w
	5	Projector	150	1	150	1hrs	150w
	6	Sound System	40	1	40	1hrs	40w
Room No. 18	1	LED	12	1	12	1hrs	12w
	2	Fan	80	2	160	6hrs	960w
Room No. 29	1	LED	12	4	48	1hrs	48w
	2	Fan	80	5	400	6hrs	2400w
L. Lib	1	LED	12	1	12	1hrs	12w
	2	Fan	80	1	80	80hrs	80w
Room No. 11	1	Fan	80	1	80	6hrs	480w
Room No. 10	1	Tube light	40	2	80	1hrs	80w
	2	Fan	80	4	320	6hrs	1920w
	3	Projector	150	1	150	1hrs	150w
Room No. 9	1	Tube light	40	2	80	1hrs	80w
	2	Fan	80	2	160	6hrs	960w

Room No. 8	1	Tube light	40	2	80	1hrs	80w
	2	Fan	80	7	560	6hrs	3360w
	3	Projector	150	1	150	1hrs	150w
Room No. 21	1	LED	12	7	84	1hrs	84w
	2	CFL	20	1	20	1hrs	20w
	3	Tube light	40	2	80	1hrs	80w
	4	Fan	80	28	2240	6hrs	13440w
	5	Projector	150	1	150	1hrs	150w
	6	Sound System	40	1	40	1hrs	40w
Room No. 28	1	LED	12	4	48	1hrs	48w
	2	Fan	80	6	480	6hrs	2880w
Room No. 26	1	Light Point		19			
	2	Fan Point		11			
	3	Projector	150	1	150	1hrs	150w
	4	6 Amp. Socket		2			
	5	16 Amp. Socket		3			
Piggery Farm	1	Halogen	50	3	150	3hrs	450w
	2	Tube light	40	4	160	3hrs	480w
	3	LED	12	4	48	3hrs	144w
College Balcony	1	LED	12	10	120	4hrs	480w
Total			**35598w**				**281453w**

Lighting System

Observations and suggestions:

- It is found that FTL, Bulbs, CFL is installed in the facility.
- It is recommended that some tube lights in this area be switched off when sufficient day light is available.
- Presently there are no reflectors installed for tube lights.
- Everylightorelectricgadgetleftonwhennotneedediswastingenergyandmoneyandis causing pollution that is totally unnecessary.

- **Stand-by power can use up to 8% of a household's total electricity.**

For most homes a 10% reduction in electricity consumption can save $200 a more a year off our electricity bill and nearly ¾ of a tone of CO2 pollution. A 20% reduction on average consumption will save over $400 and over 1.5 tons of CO2.

Don't forget to power down the settings when not in use:

- Lights
- Heaters and fans(or air-conditioning)
- Printers and scanners
- Battery and phone chargers
- Computers
- Gaming consoles
- TVs, DVD players
- Stereos
- Kitchen gadgets such as blenders, kettles etc

Chapter: 4
Study of Air Conditioners

In the facility for air conditioning there is no centralized system with AHU (air handling unit), but mostly spilt air conditioners are installed.

Load of ACs was as follows:

Item	Rated Power (kW)	Qty	Voltage	Current Amp	Actual Power (kW)
ACs	1.5	9	240	6.6	1.6

Observations and suggestions:

1. Normal air conditioning temperature should be kept as high as possible (i.e.,24 d cel.) By thumb rule, increase in 3 degrees in indoor air temperature scan save 1% of electricity.

2. The ventilation in area can be provided with installation of natural ventilation. Natural ventilation will also minimize the requirement to fix exhaust fans.

Chapter: 5 Carbon Di-Oxide Emission

In this Chapter we compute the CO_2 emissions. For consumption of 1Unit (1kWh) of Electricity, the CO_2 emitted is 0.8 Kg. OR the Emission is 0.8 Kg/kWh. In the following Table we present the total units consumed and CO_2 emitted as under:

Table 8.1:CO_2 Emission:

Sl. No.	Month	kWh	CO_2 Emitted in MT
1	March-21	2202	1.76
2	April-21	2214	1.77
3	May-21	2214	1.77
4	June-21	1812	1.45
5	July-21	2932	2.3
6	August-21	2503	2
7	Septembe-21	3478	2.78
8	October-21	2856	2.28
9	November-21	2111	1.68
10	December-21	2246	1.79
11	January-22	2276	1.8
12	February-22	2081	1.66
	Total		**Avg. Emission= 1.92**

Merits/ Existing Features for Energy Savings :

1. Staff vigilance
2. Computers are connected in LAN.
3. Printers are shared in LAN.
4. Screen savers facility implemented for every computer.
5. AC's used are of three STARS.
6. Refrigerator's are of three STARS.
7. Incandescent Bulbs are nowhere used.
8. They are replaced by CFL tubes with electronic choke.
9. Maximum use of natural light.
10. Cross Ventilation is provided in laboratory &

    class rooms, which reduced number off ans.
11. Most of the practical's are scheduled in noon time when Billing Rate in normal.
12. Walls are painted with off white colour to have sufficient brightness.
13. LED flash light is used in Seminar hall.

Chapter:6
Energy Conservation Proposals

Providing Energy Saver Circuit to the Air Conditioners:

The **energy saver circuits for the air conditioners, intelligently reduces the** operating hours of the compressors either by timing or temperature difference logic without affecting the human comfort. This can save around 15% to 30% of the electricity depending on the weather conditions and temperature settings.

Replacing Fluorescent Tube Lights (FTL) with LED Tube Lights:

The 295 W FTLs can be replaced with the LED tube lights 16 W. These changes can be made at the places where the life is higher. Usually minimum of 3 years warranty is given and approximate burning hours is 40,000 (15 years considering 8 hours per day running).

Followingcalculationsaredonefor8hoursworking:

- Power consumption by36 WFTL with conventional choke=40W/Tube Light
- Equivalent LED tube light= 16W/Tube Light
- Savings in power =24W/Tube Light
- Operating hours= 8h/dayx300=2400h/year
- Tube Light Yearly savings=2400x24W=57.6kWh/year/Tube Light
- Average Cost of electricity=Rs.6.80/kWh
- Saving=57.6kWhx6.80=Rs.391.68/year/Tube light
- Approximate investment on single LED Tube lights=Rs.200
- Number of Tube Lights to be replaced =295

Summary:

- ✓ **Total Yearly Saving =295x391.16=Rs.115392.2/year**
- ✓ **Total Investment=295 xRs.200 =Rs. 59000**

General Recommendations

- All Class Rooms and labs to have **Display Messages** regarding optimum use of electrical appliances in the room like, lights, fans, computers and projectors. Save electricity. Display **the stickers of save electricity**, save nature everywhere in the campus. So that all stake holders encouraged to save the electricity.
- Most of the time, all the tube lights in a class room are kept ON, even though, there is sufficient light level near the window opening. In such cases, the light row near the window may be kept OFF.
- All projectors to be kept OFF or in idle mode if there will be no presentation slides.
- All computers to have power saving settings to turn off monitors and hard discs, say after 10minutes/30minutes.
- The comfort/Default air conditioning temperature to be set between 24°Cto26°C.
- Lights in toilet area may be kept OFF during daytime
- Use AUTOMATIC POWER FACTOR CORRECTION (APFC) Panel FOR PF improvement.

- Need to focus on existing solar plant which is generating power below the rated power
- Need to use power saver circuits for AC.
- Need to replace FTL by smart LED Tube
- Need to replace ordinary bulb by LED bulb.
- Need to replace ordinary CRT monitor by LED.
- Need to replace ordinary refrigerator by BEE power saver refrigerator if possible.
- Out of total electricity bill paid, 53 percentage are actual energy utilized charges and remaining expense belongs to additional taxes on energy consumption

Executive Recommendations:

There has to be Institute level student community that keeps track of the energy consumption Parameters of the various departments, classrooms, halls, areas, meters, etc.

1. Energy **auditing inside the campus has to be done on a regular basis and report should** be made **public to generate awareness.**
2. Need to **Create energy efficiency/renewable energy awareness among the college campus** i.e. solar, **wind, Bio gas energy. College should take initiative to arrange seminars, lectures,** paper **presentation competition among students and staff for general awareness.**

29/6/2022

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29/06/2022

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