

# **ENERGY AUDIT REPORT**

**Of**

**Pt. DEVI PRASAD CHOUBEY  
GOVERNMENT COLLEGE SAJA**

**District – Bemetara, Chhattisgarh**



**2019-20**

**Surveyed**

**By**

**Department of Physics**

**Energy Audit Report**

**Submitted to**

**Pt. Devi Prasad Choubey Govt. College Saja District – Bemetara, Chhattisgarh**



**Submitted by**

**Prof. Dr. Vijyalaxmi Dewangan**

**Prof. Amit Dubey**

**Department of Physics**

## **PREFACE**

In the contemporary scenario, Energy has been identified as a crucial and balancing factor in the indices for sustainable development. The heavy and unbalanced energy consumption adversely affects energy price and economic growth.

The Energy Conservation Act, 2001, defines Energy auditing as “the verification, monitoring and analysis of use of energy including submission of technical report containing recommendations for improving energy efficiency with cost benefit analysis .It facilitates a systematic approach to the energy management in a system, trying to balance the total energy input with its use. It identifies all the energy streams in a system and quantifies the use of energy according to its discrete functions. It is a study to determine how and where energy is used, and to identify methods for energy savings. The Energy Auditing for a day is the index of the consumption which normalizes the situation of Energy crisis by providing the schemes for conservation of energy. The opportunities lie in the use of existing renewable energy technologies, greater efforts at energy efficiency and the dissemination of latest technologies.

This report is our mite in contributing to the larger picture of effective energy management and conservation. As is known, energy auditing is an on-going process, a part of a larger procedure to ensure long- term sustainable development.

We have enlisted credible solutions based on the outcome of our analysis of data, and our recommendations, which can be implemented totally in the campus in order to ensure minimizing energy waste and maximizing energy potential. We hope in all earnest that these will be given its due and that the audit will be fruitful in terms of energy conservation. Any suggestions to further enhance the quality of this work are always welcome. Kindly email your comments and suggestions to email: [govtcollegesaja@gmail.com](mailto:govtcollegesaja@gmail.com).

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## **Introduction**

**Pt.Devi Prasad Choubey Govt. College Saja** is the only college notified to providing quality education to the students of the region hailing mostly from remote rural, educationally and economically backward area. The Institute came into existence on 16<sup>th</sup> August 1989 with the under graduate course B.A., B.SC., and B.Com. In subsequent years Post Graduate courses were added i.e. M.A. in Sociology, Political Science, Economics, Hindi and M.com. The college is a co-ed college with majority of students belonging to SC/ST/OBC category. The institution is fully aware of its prime responsibility of mentoring these students by providing quality education to empower these students and motivate them by maintaining balance between tradition and modernity. Institute academic objectives include attaining depth of knowledge of subjects, developing design making capability in students together with developing society and nation by putting efforts towards letting students have perfection through co-education, cultural activities and sports competition..

Under the various schemes of the University Grants Commission, the college has received financial grants to for the construction of class-rooms, Building Laboratory, Multipurpose Hall, Library Building, Multi-Gym, Sports Equipment etc. Recently under UGC/NRC scheme UGC Network Resources Centre has been established in the college with an internet, intercom and Wi-fi system to keep the students updated in all aspects of learning. Research projects sponsored by UGC are being carried out at Doctorate and post Doctorate level.

## **Objectives**

The Energy Audit Manual of the Energy Management Centre, Government of Chhattisgarh, defines the primary objective of any energy audit as determining “ways to reduce energy consumption per unit of product output or to lower operating costs”. The recommendations of the study will become a basis for future schemes of better energy consumption and preservation throughout the organization. Specific objectives of the study are:

- ✓ Verify the steps adopted for energy management in the campus
- ✓ Spot the inefficient or inadequate practices, if any
- ✓ Improve the energy preserving measures and methods

- ✓ Identify potential energy saving opportunities
- ✓ Formulate Possible steps and measures to be adopted in the campus

### **Methodology**

An energy audit is an inspection, survey and analysis of energy flows, for energy conservation in a building, process system to reduce the amount of energy input into the system without negatively affecting the output. Method use for Energy audit is a Preliminary Audit. Preliminary audit uses existing data to look extensively at the existing energy consumption patterns and identifies the areas for improvement.

### **Data collection**

For the purpose of this audit, audit groups for specific areas were formed. Data was collected through

- ✓ Inspection and observation
- ✓ Identification of energy consumption
- ✓ Calculations, analysis
- ✓ Validation

### **Data analysis**

The gathered data was then quantified and separated according to the following criteria:

- ✓ Energy consumption by end use
- ✓ Average energy use block-wise
- ✓ Consumption equipment-wise
- ✓ Rate of consumption month-wise
- ✓ Rate of consumption time-wise

The quantified data are presented below as figures and tables for easy reference.

Figure 1. Shows the energy consumption by end use.

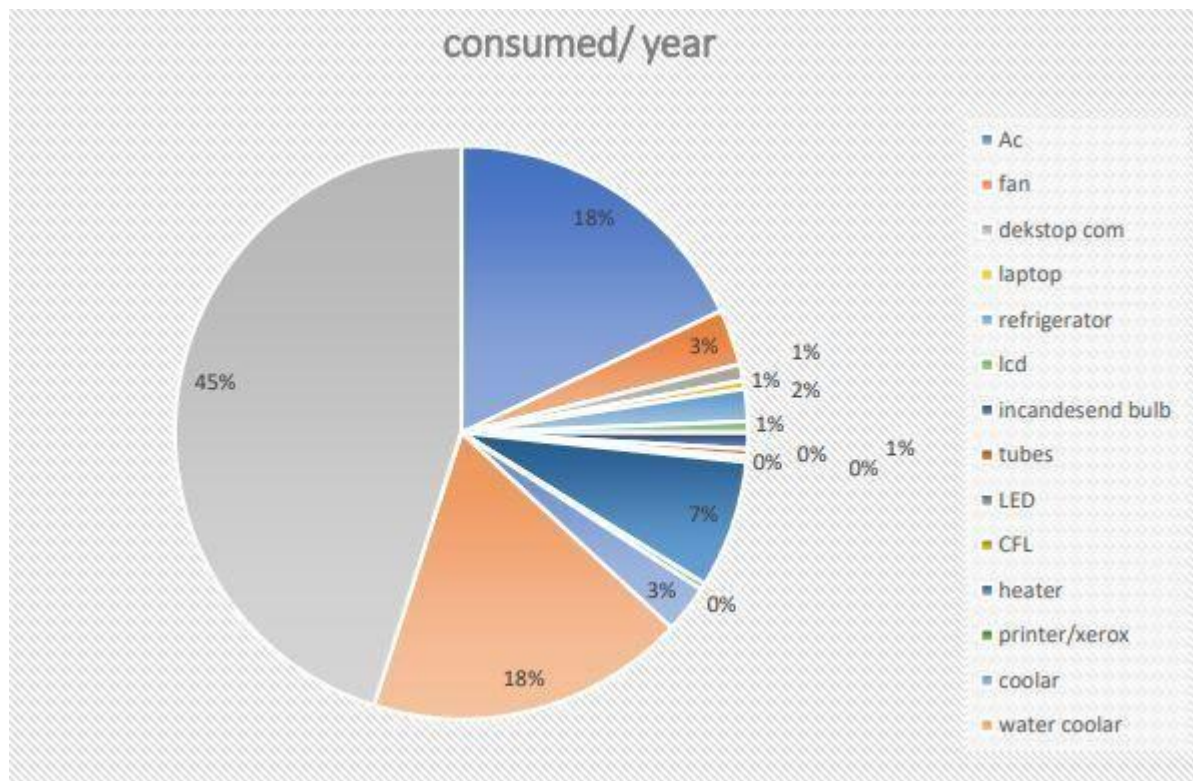


Figure -1

**Table 1**

**The consumption of energy block-wise.**

<b>Sno.</b>	<b>Block</b>	<b>Energy Consume Per Year Block Wise (kwh)</b>
01	Physics	2197
02	Chemistry	2201
03	Zoology	2098
04	Botany	2100
05	Mathematics	1100
06	Political Science	500
07	Sports	400
08	Canteen	400
09	Commerce	450
10	Library	1850
11	Principal Chamber	1100
12	Office	1005
13	Staff Room	825
14	English	725
15	Geography	1000
16	Economics	374
17	Common Room	425
18	Class Rooms	8004
19	IQAC	400

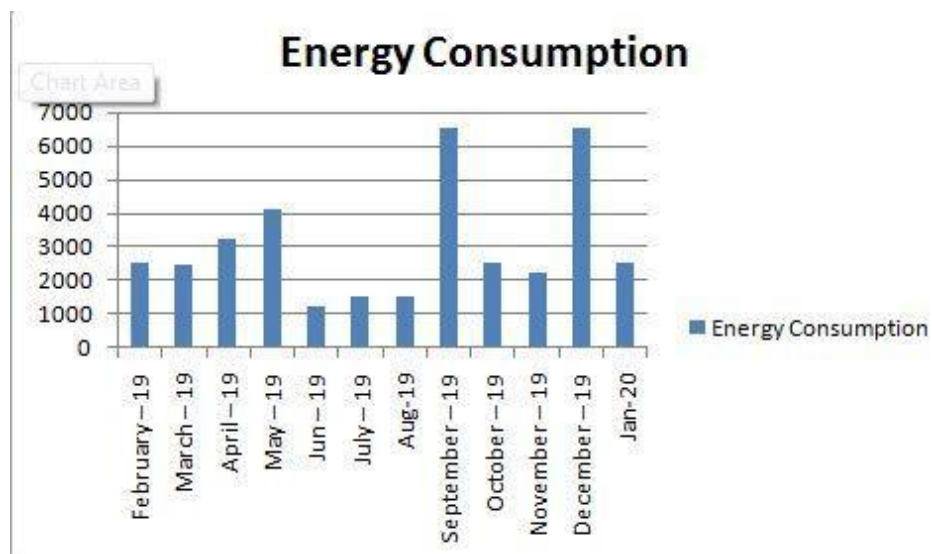


**Table -2**

**Month-wise consumption rate of energy for the year 2019-20**

Month	Energy Consumption
February – 19	2545
March – 19	2458
April – 19	3245
May – 19	4102
Jun – 19	1254
July – 19	1500
August - 19	1521
September – 19	6545
October – 19	2544
November – 19	2254
December – 19	6542
January - 20	2542

**Figure – 02 Energy Consumption Month Wise Graph.**

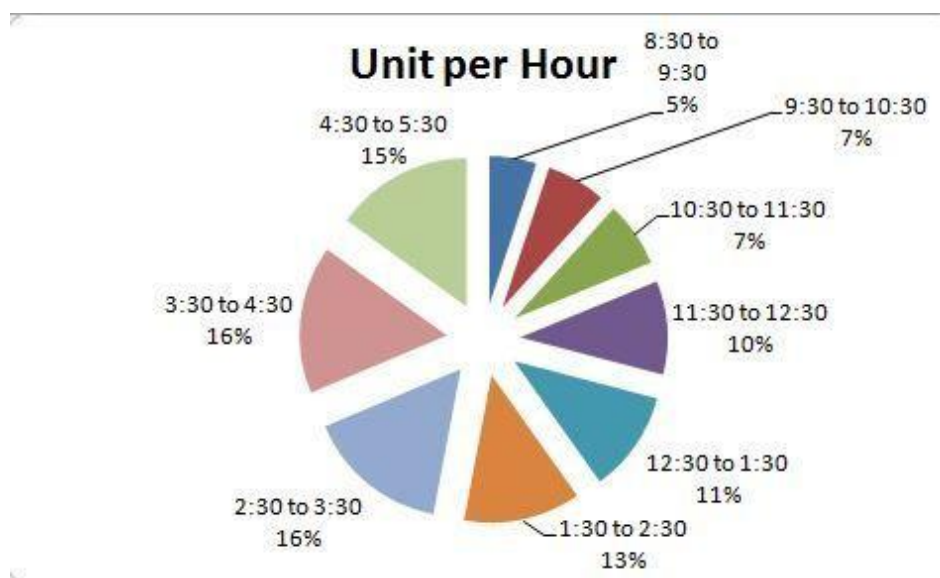


**Table -03**

**Time Wise split up of energy consumption on a normal working day.**

Time	Unit per Hour
8:30 to 9:30	1.8
9:30 to 10:30	2.3
10:30 to 11:30	2.5
11:30 to 12:30	3.6
12:30 to 1:30	3.9
1:30 to 2:30	4.5
2:30 to 3:30	5.5
3:30 to 4:30	5.7
4:30 to 5:30	5.3

**Figure – 03 Time Wise split up of energy consumption on a normal working day.**



**Table – 4**  
**Equipment Table.**

<b>Sno.</b>	<b>Equipments</b>	<b>No of</b>
01	Tube Lights	22
02	C.F.L. (6 W)	0
03	C.F.L. (20 W)	0
04	L.E.D Bulbs	89
05	Printer Equipments	0
06	Photocopy Machines	3
07	Computers	5
08	Fan	87
09	Geyser	0
10	Fac Machines	0
11	Note Counting Machine	0
12	Scanner	1
13	Mic Systems	2
14	Lab Equipments_ 1	3 zoology
15	Lab Equipments_ 1	2 Botany
16	Lab Equipments_ 1	5 Microscop zoology
17	Lab Equipments_ 1	15 physics
18	Lab Equipments_ 1	8 Chemistry
19	Water Pump (bore wells)	2
20	RO Machines	2
21	Projectors	1
22	Air purifier	0
23	Exhaust Fan	4
24	Air Conditioner	0
25	Cooler	5
26	Water Cooler	3

## **Major Findings**

Since this was a Preliminary Audit, the findings are formulated as per the norms for this stipulated by the Energy Audit Manual. Establish energy consumption in the organization from the quantitative analysis of the gathered data, the following findings have been reached.

1. The laboratories record the highest consumption based on end use
2. Classrooms records the highest rate of consumption
3. The month of September shows the peak in consumption.
4. The time slots in the Afternoon record the highest consumption on a normal working day

## **Identify easiest areas of attention**

Based on the physical observation and the analysis of data collected, certain areas have been identified as areas of attention.

1. Old wiring cables in many parts of the campus leading to loss of energy.
2. Old water pipelines in several parts of the campus leading to waste of energy.
3. Use of incandescent bulbs and tubes in certain rooms.
4. There is less use of solar panels.
5. Use of old equipment in laboratories.

## **Estimate the Scope for Saving**

The study could identify a large scope for saving energy in the campus, including -

1. Updating of technologies in laboratory equipment.
2. Replacing old electrical cables and pipelines.
3. Replacing incandescent bulbs and tubes with LEDs.
4. Ensuring even lighting facilities in rooms.
5. Use of Solar panels as a main source of lighting, especially common areas.

### Identify immediate areas of improvement

Based on the study, certain areas were identified as requiring immediate improvement. These are

1. Replacing incandescent bulbs and tubes with LEDs
2. Repairing and updating laboratory equipment
3. Encouraging students and staff to switch off electrical instrument.

**Table -4**  
**Finding and recommendation of the Audit**

Findings	Recommendations
The electrical wiring of many buildings was found to be old and inefficient.	Replace old electrical cables with new ones.
There seem to be a lack of judicious use of power among students and staff. During the study, it was found that lights, fans and computers were kept on working mode in many rooms, without a single person present.	Students and staff should be exhorted constantly to use energy judiciously. Posters and pamphlets should be distributed and notices about saving energy should be posted at major points of use.
Many Departments still use incandescent bulbs causing heavy power loss.	Incandescent bulbs should be replaced with LEDs.
Refrigerators and freezers used in many departments use obsolete technology and hence cause power loss.	Gadgets and equipment's should be repaired and/or replaced with latest ones to save energy.

### Conclusion

A master switch located at a prominent place which can be directly supervised by the HOD/supervising staff would help avoid power wastage in closed rooms. A well-prepared electrical wiring plan for the campus, which would help to identify unused points and re-wiring. A training /lecture for both students and staff to awareness for the need of energy conservation. If everyone ensures switching off lights, fans and electrical instrument that are not in use, roughly 10% of energy saving is possible. The scope for non-conventional energy should be utilized.

# **GREEN AUDIT REPORT**

**2019-20**

**Pandit Devi Prasad Coubey Government College Saja**

**District – Bemetara (Chhattisgarh)**



**Surveyed & Audited**

**By:**

- 1. Department of Botany**
- 2. Department of Zoology**
- 3. ECO Club of College**

**Principal Editor**  
**Dr. I.P. Dinakar**  
**Principal**

**Editor**  
**Dr. Vijay Laxmi Dewangan**  
**Head, Department of Political**  
**Science**

### GREEN AUDIT ASSESSMENT TEAM

Sno.	Member	Department
01	Dr. Vijay Laxmi Dewangan	Department of Political Science
02	Mr. Devendra Thakur	Department of Botany
03	Dr.Sarojani Bharsakale	Department of Commerce
04	Mr. Amit Kumar Dubey	Department of Physics

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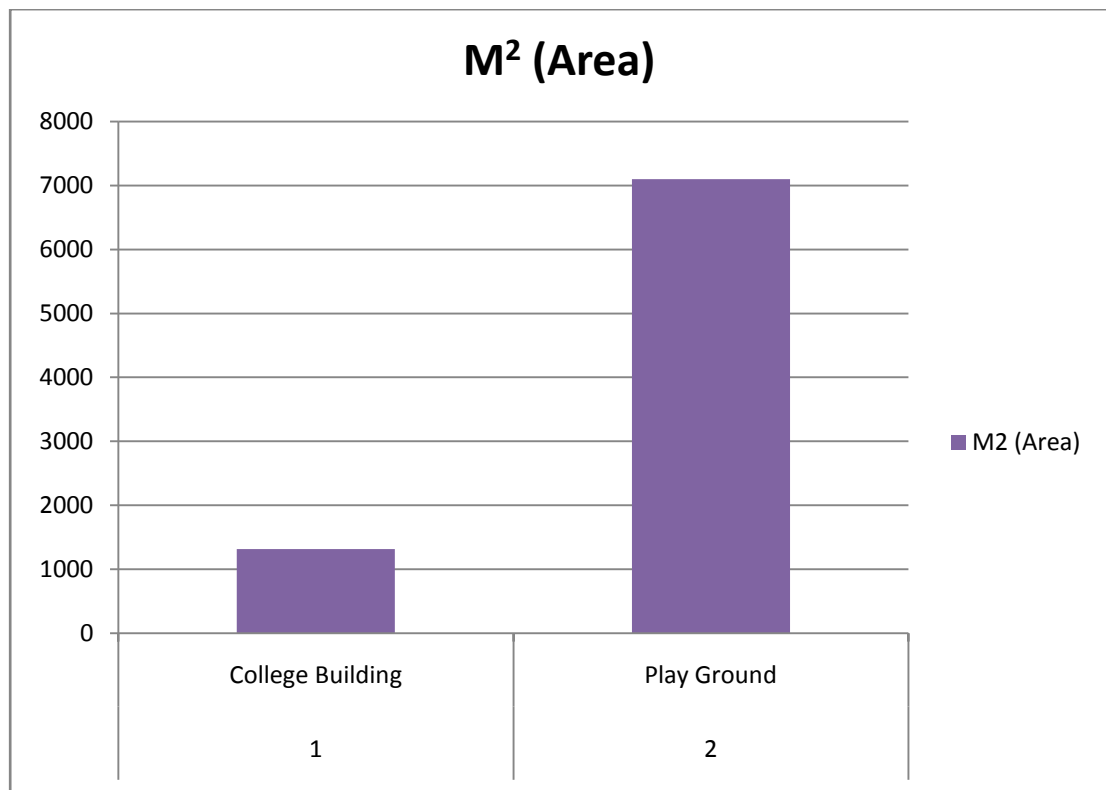
## Introduction -

**Pt.Devi Prasad Choubey Govt. College Saja** is the only college notified to providing quality education to the students of the region hailing mostly from remote rural, educationally and economically backward area. The Institute came into existence on 16<sup>th</sup> August 1989 with the under graduate course B.A., B.SC., and B.Com. In subsequent years Post Graduate courses were added i.e. M.A. in Sociology, Political Science, Economics, Hindi and M.com. The college is a co-ed college with majority of students belonging to SC/ST/OBC category. The institution is fully aware of its prime responsibility of mentoring these students by providing quality education to empower these students and motivate them by maintaining balance between tradition and modernity. Institute academic objectives include attaining depth of knowledge of subjects, developing design making capability in students together with developing society and nation by putting efforts towards letting students have perfection through co-education, cultural activities and sports competition.

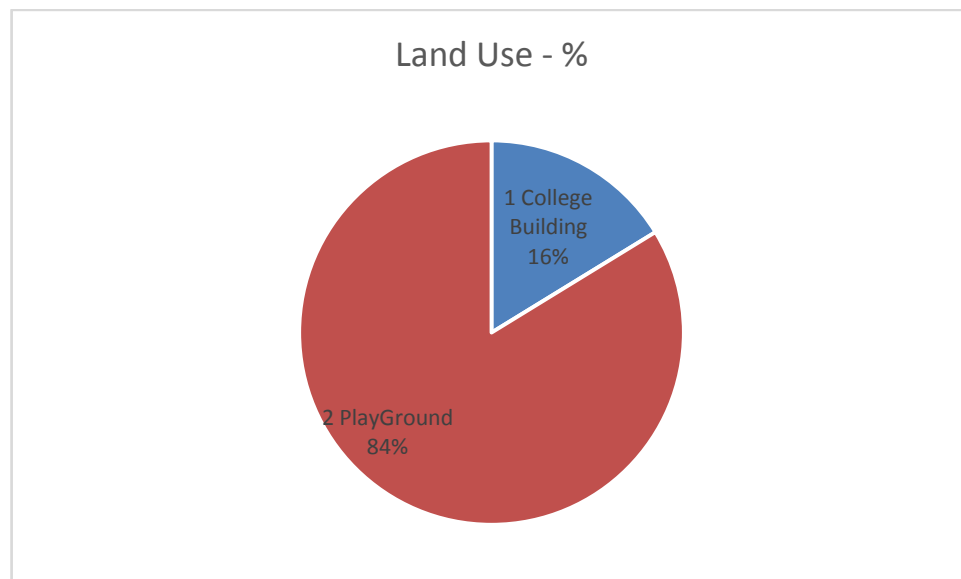
## Overview of Land Use Patterns:

Land use refers to man's activities and the various uses which are carried on and derived from land. Viewing the earth from space, it is now very crucial in man's activities on natural resource. In situations of rapid changes in land use, observations of the Earth from space give the information of human activities and utilization of the landscape (Howarth 1981). Remote sensing and GIS techniques are now providing new tools for advanced land use mapping and planning. The collection of remotely sensed data facilitates the synoptic analyses of earth system, functions, patterning, and change in the local, regional as well as at global scales over time. Satellite imagery particularly is a valuable tool for generating land use map. It is a graphical representation of land use –

Sno.	Area/Building	M <sup>2</sup> (Area)
01	College Building	1316.12
02	Play Ground	7100.52

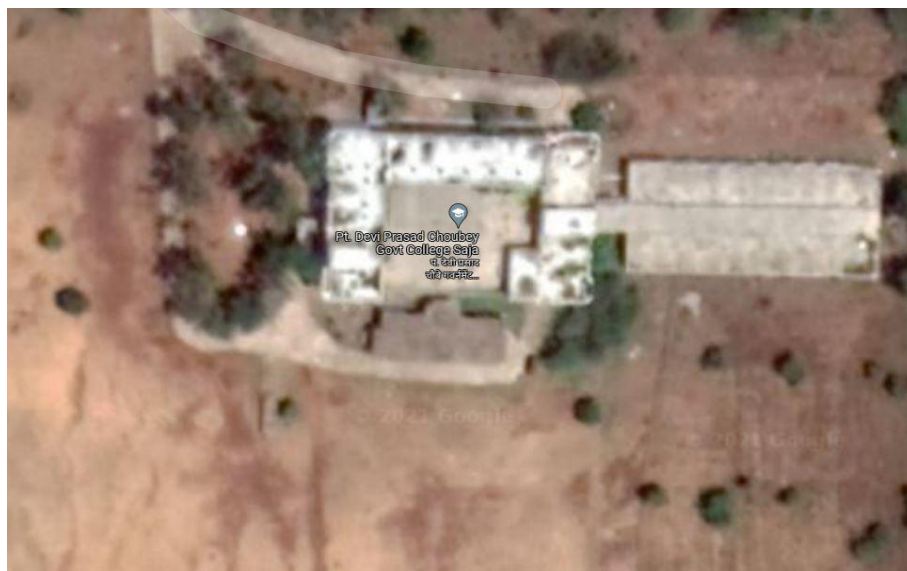


**Graph - 01**



**Graph - 02**

## Scope of Audit-



Green audit serve as a means to identify opportunities to sustainable development practices, enhance environmental quality, improve health, hygiene and safety, reduce liabilities and save money and achieve values of virtue. Environmental audits can be a highly valuable tool for college in a wide range of ways to improve their environmental and economic performance and reputation -- while reducing wastages and operating costs. Once a baseline data is prepared after the auditing process, the data can serve as a point of departure for further action in campus greening. It will also help the college to compare its programmes and activities with other peer institutions, identify areas for improvement and prioritize the implementation of future projects.

## Objective of Green Audit -

The general objective of green audit is to prepare a baseline report on biodiversity and other resources, measures to mitigate resource wastage and improve resource quality and sustainable practices. The specific objectives are:

- To prepare a checklist of flora and fauna diversity in and around the college campus.
- To suggest measures to improve biodiversity within the college campus.
- To assess the quantity of water usage within the college campus.
- To suggest sustainable energy usage and water conservation practices.

- To find out various sources of organic and solid waste generation and mitigation possibilities
- To inculcate values of sustainable development practices through green audit mechanism.

All plant and animal species - including humans - are linked together in a complex web of life; we depend upon biodiversity for our survival. Biodiversity is the key to healthy ecosystems and ultimately a healthy planet. It keeps the air and water clean, regulates our climate and provides us food, shelter, clothing, medicine and other useful products. Each part within this complex web diminishes a little when one part weakens or disappears. The trees work hard to keep the air we breathe clean and healthy. Their leaves take in much of the poisonous unwanted carbon dioxide in the air, and replace it with the oxygen we need for healthy living. In this process, the plants with the help of sunlight, water, minerals and the green material called Chlorophyll within the leaves change the carbon-dioxide into food for themselves. When doing this they release oxygen into the air which is vital for all life on earth. The roots of trees dig deep into the earth and hold it together so that the rain and wind cannot wash or blow it away. This is very important as the earth has only a very thin layer (seldom more than one foot) of fertile soil covering it.

#### **Preparation –**

Green auditing was done by involving different student in Eco Club and Department of Botany supported by teaching and non-teaching staff of the college. The green audit began with the teams walking through all the different wings, seeking plant and their structure. They find the botanical name, local name and their number of presence in our campus.

### **Eco Club Team**

<b>Sno</b>	<b>Name of Member</b>	<b>Concerned Department</b>
01	Dr.Sarojani Bharsakale	Commerce
02	Pyare Lal Markande	Chemistry
03	Devendra Thakur	Botany
04	Chitra Kumar	Political Science
05	Ageshwar	Sociology
06	Bharti	Sociology
07	Sunil Kumar	Political Science

### **Department of Botany**

<b>Sno</b>	<b>Name of Member</b>	<b>Concerned Department</b>
01	Jai karan	Botany
02	Priya Gupta	Zoology
03	Devendra Thakur	Botany
04	Sandip singh Thakur	Geography
05	Gopal Maravi	Physics
06	Dharm kumar tiwari	Botany

### **Site Inspection-**

Site inspection was done by Faculty and students. The process of green audit was an enriching environmental awareness programme for the students who participated in the green auditing. The experience of green auditing was a first time experience for most of the students. They shared their expectations about a green campus and gave suggestions for the audit recommendations. It encompasses an area of about 6784.52m<sup>2</sup> acre. The area is immensely diverse with a variety of tree species performing a variety of functions. Most of these tree species are planted in different periods of time through various plantation programmes organized by the authority and have become an integral part of the college. The trees of the college have increased the quality of life, not only the college fraternity but also the people around of the college in terms of contributing to our environment by providing oxygen, improving air quality, climate amelioration, conservation of water, preserving soil, and supporting wildlife, controlling climate by moderating the effects of the sun, rain and wind. Leaves absorb and filter the sun's radiant energy, keeping things cool in summer. Many animals are dependent on these trees mainly for food and shelter. Flowers and fruits are eaten by monkeys, and nectar is a favorite 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 colors. Even individual trees vary their appearance throughout the course of the year as the seasons change. The strength, long lifespan and regal stature of trees give them a monument – like quality. They also remind us the glorious history of our institution. 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. The following are the tree species with whom we are being attached-

Sno.	Botanical Name	Local Name	Family	No. of Plants
1	Eucalyptus	Neel Giri	Myrtaceae	114
2	Delonix regia	Gul Mohar	Fabaceae	12
3	Millettia Pinnata	Karanj	Fabaceae	27
4	Phyllanthus Emblica	Aavla	Phyllanthaceae	43
5	Mangifera Indica	Aam	Anacardiaceae	3
6	Citrus Limon	Neebu	Rutaceae	6
7	Annona Squamosa	Sitafal	Annonaceae	3
8	Azadirachta Indica	Neem	Meliaceae	3
9	Pithecollobium dulce	Ganga Emali	Fabaceae	7
10	Saraca Asoca	Ashok	Fabaceae	5
11	Aegle Marmelos	Bel	Rutaceae	2
12	Rheea	Riya	Rheidae	243
13	Gmelina Arborea	Khamhara	Lamiaceae	2
14	Vachellia Nilotica	Babul	Fabaceae	7
15	Annona Reticulata	RamFal	Annonaceae	2
16	Citrus Limetta	Mosambi	Rutaceae	2
17	Psidium Guajava	Jam	Myrtaceae	2
18	Prunus Armeniaca	Ber	Rosaceae	41
19	Vermilion	Sindur	Bixaceae	4
20	Ribes Uva- Crispa	Karoda	Grossulariaceae	4
21	Curcuma Longa	Dhanbahar	Zingiberaceae	1
22	Ficus Benghalensis	Bargad	moraceae	3
23	Ficus Religiosa	Pipal	Moraceae	2

### Faunal Diversity –

Our College is located in Bemetara district of Chhattisgarh. The area having monsoon type of climate. The highest temperature is recorded just prior to the onset of monsoon (around May early June). The faunal Diversity of this College campus has been studied and documented as below-

Sno.	Faunal Group	Scientific Name
01	SPIDERS	Myrmachneorientalis(Family Salticidae); Nephila plipes(Family-Nephilidae); Heteropodasp (Family-Sparassidae);Phintellavitatta(Family Salticidae)
02	MOTHS & BUTTERFLIES	Antheriaaassmensis;Bombyxmori;Philosamiaricini; Junoniaatlitesatlites ; Commander (Moduzaprocrisprocris); pthimabaldus ; Acraea terpsicore ; Elymniashypermnestra undularis ; Mycalesisperseusblasius ; Tanaecialepidealepidae
03	AMPHIBIANS	Duttaphrynusmelanostictus(Assian common toad), Leptobrachiumsmithi; Fejervaryapierrei; Hoplobatrachustigerinus; Hylaranatyleri; Humeranahumeralis; Hylaranaleptoglossa; Polypedatesleucomystax.
04	BIRDS	Acridotheres tristis (Common myna) Athene noctua( little owl ); Pycnonotuscafer(Redvented Bulbul)

## Noise Levels –

The human ear is constantly being assailed by man-made sounds from all sides, and there remain few places in populous areas where relative quiet prevails. There are two basic properties of sound, (1) loudness and (2) frequency.

Loudness is the strength of sensation of sound perceived by the individual. It is measured in terms of Decibels. Just audible sound is about 10 dB, a whisper about 20 dB, library place 30 dB, normal conversation about 35-60 dB, heavy street traffic 60-80 dB, boiler factories 120 dB, jet planes during take-off is about 150 dB, rocket engine about 180 dB. The loudest sound a person can stand without much discomfort is about 80 dB. Sounds beyond 80 dB can be safely regarded as Pollutant as it harms hearing system. The WHO has fixed 45 dB as the safe noise level for a city. For international standards a noise level upto 65 dB is considered tolerate. Loudness is also expressed in Sones. One sone equals the loudness of 40 dB sound pressure at 1000 Hz. Frequency is defined as the number of vibration per second. It is denoted as Hertz (Hz). The objectives of the study were as the following:

- To assess the impact on human work efficiency due to road traffic parameters, different noise indices, and attitudinal response.
- To study the temporal pattern of road traffic the study area.
- To study the existing status of noise levels in the study area by recording the noise intensity at various locations.
- Identification and consideration of suitable mitigation and abatement measures.

Noise level meter or noise measuring app, NoiseTube(version: 2.0.2), was used to measure the noise level.



Place	Measurement (Duration)	Minimum dBA	Maximum dBA	Average
Office – Staff Room	60 Sec.	6.73	56.69	43.68
Botany Department	60 Sec.	6.90	58.98	41.57
Library	60 Sec.	3.14	30.34	20.93
Commerce Department	60 Sec.	28.82	65.33	52.82
Front Office Area	60 Sec.	50.73	78.08	71.02
Front Gate	60 Sec.	52.23	80.02	72.35
Department of Physics	60 Sec.	28.82	65.33	52.82

#### Photographs –



Pic -1 Front Phase of College



**Pic -2 Inner Premise – Right Side**



**Pic -3 Inner Premise-Left Side**



**Pic -4 Play Ground**



**Pic -5 Plantation**



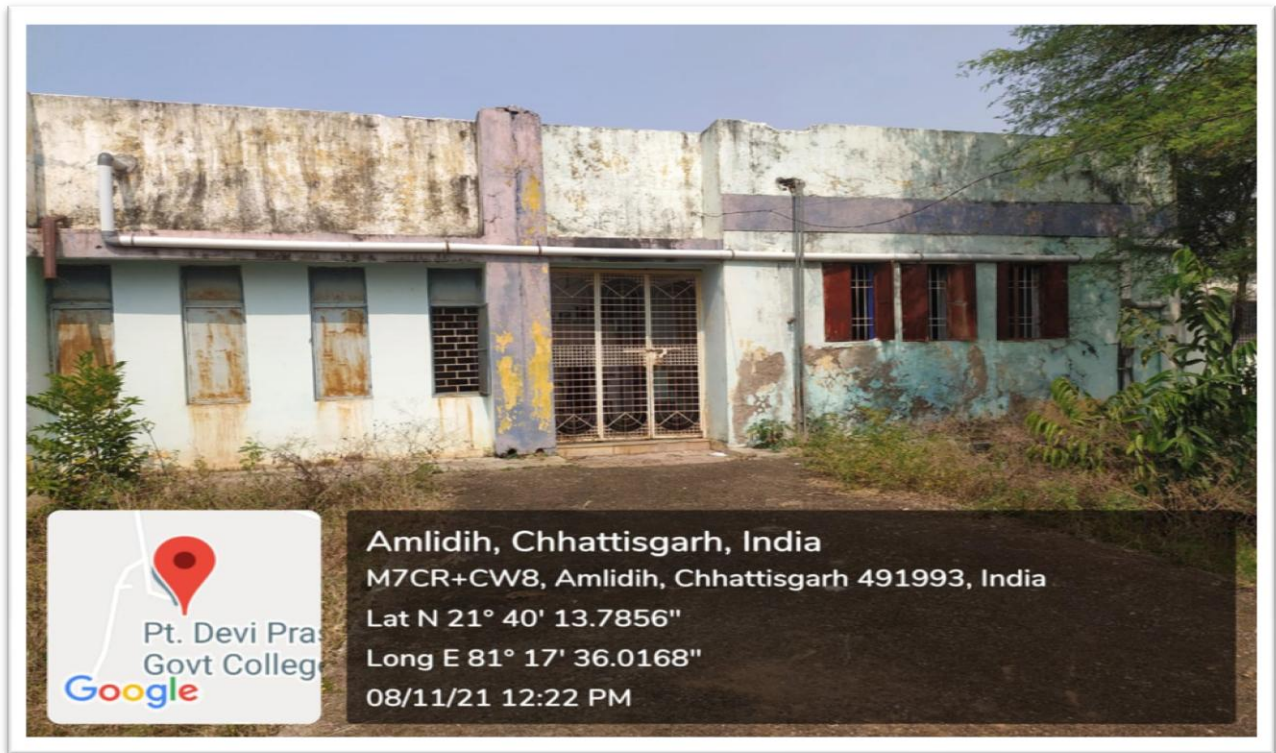




**Pic -6 Front Entrance**



**Pic -7 Inner Plant**



**Pic -8 Additional Block**



**ER. PRATEEK NISHAD**

Diploma (Geology)  
 B.E. (Chemical Engineering)  
 A Member of Indian Association of Hydrologist  
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Hydrological Resistivity Surveys, Execution of Rainwater Harvesting Systems, Green Audits, Soil Resistivity Tests, Blasting Boreholes, 3D Mapping, Drilling & Ringing

**RAIN WATER HARVESTING CERTIFICATE**

(True Copy)

It is certified that the plot belonging to Pandit Devi Prasad Choubey Government College Saja District Bemetara Chhattisgarh has been installed Rain-water harvesting system. The building has square shaped terrace with hollow centrally, the system has been installed in entire block. The details are given below-

A)	Name of Colony/Locality/Space	Pandit Devi Prasad Choubey Government College Saja, Amlidih, Chhattisgarh 491993
B)	Geo location	21.670763432109297, 81.29386635690314
C)	Ward (If Any)	Village -Amlidih
D)	Local Governing Body	Nagar Panchayat Saja, Gram Panchayat Amlidih
E)	Date of Survey	12-Aug-2021
F)	Date of Installment	17-Aug-2021
G)	Date of Work	17-Aug-2021
H)	Method used	Roof rain-water system , Recharge pits, with adjoining it by roof outlets.
I)	Pit Position	Outdoors are closed pit Indoors are open drained canal
J)	Number of Pit used	08 Pits
K)	Material used for Pit	Concrete (Up side and down side opened)
L)	Total plot area	Block A – 1708.7 m <sup>2</sup>
M)	Roof Area	Block A - 1200.00 m <sup>2</sup>
N)	Run Off	1100 Cubic mt. Approx.
O)	Recharge capacity of RWH	700 MMt

For being a member of this great process of "Save Water - Save Earth".  
 I am very grateful to you..

Prepared By : Prateek Nishad  
 Date : 17/08/2021  
 Audit Number : BMT03  
 Mode of Pymt :

**PRATEEK NISHAD**  
 Director  
 (Regd. Geologist Municipal Corporation)



## ER. PRATEEK NISHAD

Diploma (Geology)

B.E. (Chemical Engineering)

A Member of Indian Association of Hydrologist

Member of Chhattisgarh Bhujalvid Sangh

Registered Hydrologist By Municipal Corporation Raipur (C.G.)

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**GREEN ABACUS**

Contact No. 07999040708

03 Budha Talab Complex

Raipur Chhattisgarh

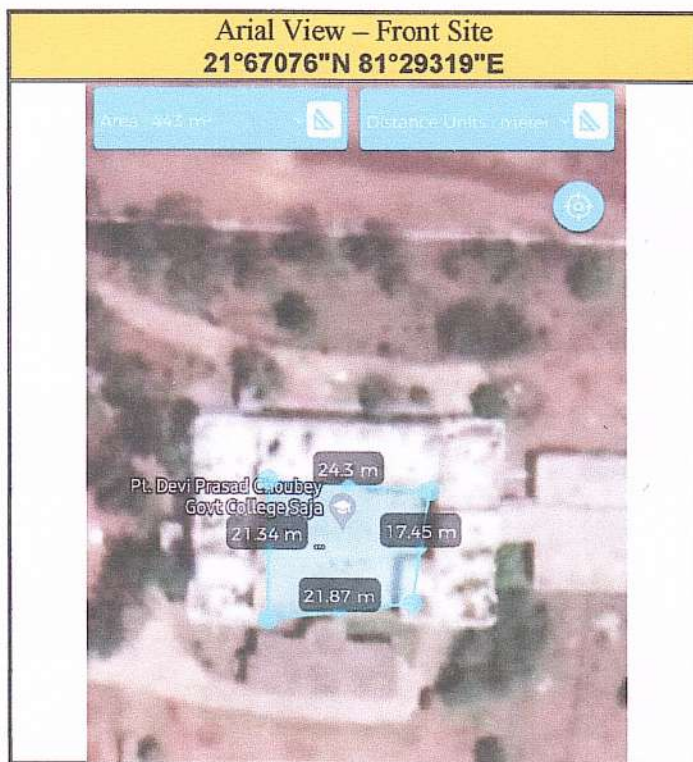
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Hydrological Resistivity Surveys, Execution of Rainwater Harvesting Systems, Green Audits, Soil Resistivity Tests, Blasting Boreholes, 3D Mapping, Drilling & Ringing



  
**PRATEEK NISHAD**  
PRATEEK NISHAD  
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 (Regd. Geologist Municipal Corporation)