

GREEN AND ENVIRONMENTAL AUDIT REPORT

(2022-2023)



JHARGRAM RAJ COLLEGE
JHARGRAM, WEST BENGAL

**CONSULTRAIN MANAGEMENT SERVICES,
LAKE ROAD, KOLKATA**

**TROPICAL INSTITUTE OF EARTH AND
ENVIRONMENTAL RESEARCH (TIEER),
MEDINIPUR**

CONSULTRAIN MANAGEMENT SERVICE
Lake Road, Kolkata, West Bengal, India



TROPICAL INSTITUTE OF EARTH AND
ENVIRONMENTAL RESEARCH (TIEER)

Reg. No. S/1L/42578 of 2006-07

Office address: M-10, Bidhannagar, Medinipur-721101, W.B., India

GREEN AUDIT CERTIFICATE

Academic Year: 2022-2023

This is to certify that Jhargram Raj College, Jhargram, West Bengal has good and healthy eco-friendly environment created for saving Earth and Nature. Tropical Institute of Earth and Environmental Research associated with Consultrain Management Service are satisfied after Green Audit with moral support of Honorable Principal, IQAC Team, Staff and Students for academic year 2022-2023. This efforts taken by Faculties and Students towards environment and sustainable are highly appreciable and commendable.

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President, TIEER

(Dr. Pranab Sahoo)
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(Mrs. Sanchita Bhattachariya)
ISO-Auditor & CEO, CMS

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ACKNOWLEDGEMENT

We, The Environment Audit Team thank the management of Jhargram Raj College for assigning us such an important work on Green & Environmental audit. We appreciate the cooperation to our team for the assigned study, giving us necessary inputs to carry out audit activities.

Our special thanks to:

- ❖ Principal of the College
- ❖ IQAC Members
- ❖ Teaching & supporting staff

AUDIT EXPERT MEMBERS

The Committee members are listed below:

SL. No.	NAME	DESIGNATION	AREA IN INTEREST
1.	Dr. Binoy Kr. Chanda	President, TIEER & Former IC, VU	Environment Science & Climatology
2.	Dr. Pranab Sahoo	Secretary, TIEER & Assistant Professor and HOD, Dept of Geography, S.B. Mahavidyalaya, Kapgari	Climate Change and Environment Management and Biogeography
3.	Mrs. Sanchita Bhattachariya	Consultant, Consultrain Management services, Kolkata, & Member, TIEER, ISO-9001,14001&50001Cerfied Auditor.	Environment Management
4.	Dr. Sudipta Maiti	Faulty, Dept. of Botany, Raja N.L. Khan Womens' College, Midnapore	Plants Diversity & Carbon stocking, Green Management
5.	Dr. Chandan Karan	Faculty, Dept. of Geography, S.B. Mahavidyalaya, Kapgari	Land use Survey, Ecology and Map Designer
6.	Dr. Mrinmoy Ghorai	Assistane Professor in Zoology, PanskuraBanomali college.	Fauna & Aqua animals and Biodiversity conservation
7.	Sri Ananda Das	Asst. Teacher & expert	Electro physics
8.	Sri Sarat Chatterjee	Surveyor	Water and Air Quality Measurement
9.	Sri Sanjib Mahata	Surveyor & Expert in RS &GIS	Map Designer
10.	Sri Soumitra Patra	M.Tech in Agriculture and surveyor	Micro irrigation technology and water management
11.	Mrs Sumita Swar	Surveyor and Expert ENVS	Waste and Environment Management

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1.0 INTRODUCTION :

The word “Green” means ecofriendly and produce better environment. Green and environmental Audit is a process of systematic, documented, periodic and objective evaluation of components of environmental diversity with the aim of ensuring readiness in eco-friendly environment and conservation of natural resources in its operations. The process starts with systematic identification, quantification, recording, reporting and analysis of components of environmental diversity of the college. Green auditing is a means of assessing environmental performance. 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 healthy consciousness and promotes environmental awareness, values and ethics.



Entrance of Jhargram Raj College premises

1.1 Goals & Objectives:

It aims to analyse environments within and outside of the concerned area, which will have an impact on the eco-friendly atmosphere. It provides staff and students better understanding of Resource management on their area of work.

The Main Objectives of Carrying of Green Environmental Audit:

- To ensure the performance of the Institution with respect to environmental activities they are involved in, in compliance with existing laws and regulations
- To locate the Green area and the Geographical location of the College – aerial view
- To document the floral and faunal diversity of the College
- To develop and follow the waste management system
- To reduce the energy consumption of the Institution
- To report the expenditure on green initiatives, carbon foot print
- To record the air, water quality of the Institution
- To conserve the natural resources

Areas of Concern:

- WATER MANAGEMENT
- WASTE MANAGEMENT
- AIR QUALITY AND CARBON FOOTPRINT
- ENERGY MANAGEMENT
- BIODIVERSITY



Meeting with Hon'ble Principal

This Audit has been conducted by a Committee constituted by the Experts & Scientists from different reputed Institutes. The Committee developed a questionnaire for audit based on the regulatory and statutory requirements of Centre as well State. The basic data was gathered and compiled, which the committee analyzed. By and large, the audit reveals a healthy environment inside the Jhargram Raj College campus. The committee has suggested short term as well as long-term suggestions for improved environmental conditions to a higher levels and authorities and all stakeholders of the College conforms that they will give due attention and utilize opportunities for identified improvements.

1.2 About the College :

Jhargram Raj College is situated at the town of Jhargram, the District Head Quarters of the newly created District of Jhargram. The area is a place of natural beauty. The college is set in a campus of 57.76 acres of land amid the serene and verdant forests of primordial trees such as Mahua, Sal, Piasal etc. It has registered a spectacular growth over the years since its inception.

Before the partition of 1947, the only agricultural college of the then undivided Bengal was in Dhaka which after partition became the capital of the then East Pakistan. The need for an agricultural college in West Bengal was felt and discussed in academic as well as administrative spheres of the state. In 1949, the young Raja of Jhargram, Raja Sir Narasingha Malla Ugal Sanda Deb, OBE, KBE, at the request of Pramathanath Banerjee, the then Vice Chancellor of Calcutta University, made a request of Rupees One Lakh in cash and 317 acres of land for the first agricultural college of West Bengal at Jhargram. The Raja was once a pupil of Professor Pramathanath Banerjee at Presidency College. Thus, a teacher-student endeavor resulted in the establishment of the college in Jhargram with a view to spread education in a backward and predominantly tribal area. The Khaira Professor of Agriculture Dr Pabitra Kumar Sen who was the first principal of the college, helped with the Khaira Endowment Fund.

The building was started to be raised in 1951 and Jhargram Agricultural College was promoted to the degree standard with a two-years' B.Sc. course. However, Calcutta University could not meet the financial requirements for long and in 1953 the college was handed over to the Government of West Bengal with the teaching of Agriculture retained only up to the I.Sc. standard and teaching of B.Sc. in Agriculture was taken over by the Government Agricultural College at Tollygunge, Calcutta. The land donated by the Raja of Jhargram became government land and much of it was put to use for various government purposes. The college retained about 57.76 acres of land.

Since its inception, as a premier college of the Jungle Mahal, the mission of the college has been the empowerment of the under-privileged. Founded on the 1st of July in 1949 as Jhargram Agricultural College, Jhargram Raj College grew into a hallowed centre of higher learning, offering to the undergraduate students a whole array of subjects from three disciplines of Arts, Commerce and Science. Initially affiliated to the University of Calcutta, the college came under affiliation of Vidyasagar University in 1985. In 1999, the college

celebrated the completion of 50 years of its glorious existence. In 2005, the college introduced its first Postgraduate course in Chemistry. Gradually, Postgraduate courses in Zoology and Bengali also came into being from 2006 and 2008, respectively. Different minor and major research projects funded by different government agencies are carried out by the faculty members of various departments of the college. The faculties regularly participate in seminars, workshops etc. and their research papers are regularly published in reputed journals and periodicals. These activities lead to involve and motivate the students, especially those who are pursuing postgraduate courses in this college, to a research career. In its sixty-eight years of existence, the college has witnessed the changes with time and it has been prepared accordingly to cope with the changes and offer better education to its students. Many of the alumni of the college are at the top positions of various government and non-government organisations. Many are reputed academicians. Many have made names in the field of art, music, literature etc. While the college takes pride in them, it busies itself with the duty of grooming the present students and looks forward to a brighter future for the coming generations.



Conversation between Audit Team & Principal, Jhargram Raj College

Vision & Mission of the College :

Since its inception, the mission of Jhargram Raj College has been the empowerment of the under-privileged. The college has been serving the districts of undivided Medinipur and the greater portions of Manbhum (comprising of the districts of Purulia and Bankura). Trees, shrubs and bushes and, hills and hillocks amidst a red earth and, the tribes living here are what distinguish this area from other parts of the state. Jhargram Raj College pays homage to Henry Vivian Louis Derozio as well as to Pandit Raghunath Murmu. Both strived for quest of knowledge and both inspired students to ask questions and look for the truth. Jhargram Raj College welcomes ideas, inventions and, innovations.

Jhargram Raj College being a government college offering quality education programmes at UG as well as a few PG levels takes a special place in the area. Many students of this college come from extremely poor families and under-privileged sections of the society and, are often the first-generation learners. Their requirements are quite different from that of the students belonging to middle class and comparatively well-to-do families. To achieve what is required of it, Jhargram Raj College functions accordingly to impart good and quality education in particular and contribute towards social welfare in general.

General Information :

Total area of the college campus – 20 acres,(Fenced)

Building area: 1.45 acres,

Green & Vegetated area: 15.95 acres.

Play Ground & Vacant land area: 2.40 acre

Water Bodies area: 0.02 acre

Departments: 15 (Post Graduate & Under Graduate)

Laboratories: 24

Students: 2906

Teaching & Non-teaching staff: 102

Others stakeholder: 25

Total Stake holders: 3033

Auditorium /Seminar hall:01

Hostels: 03. Studens-142

Staff Quarter : 12

Gymnasium Hall: 01

Table 1 Area Coverage of the College Campus

Area Coverage of College Premises:	Area in Percentage
Building and Construction	7.25
Vegetation Cover	79.75
Playground and Fallow land	12.00
Water Bodies	1.00

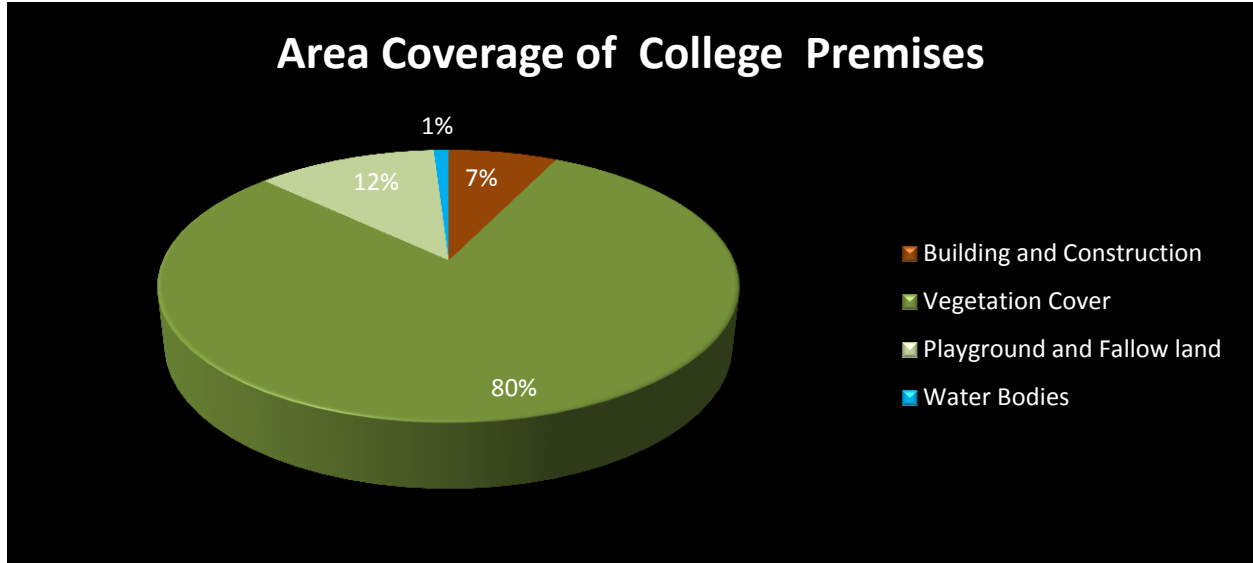


Fig. 1 Area Coverage of College Premises

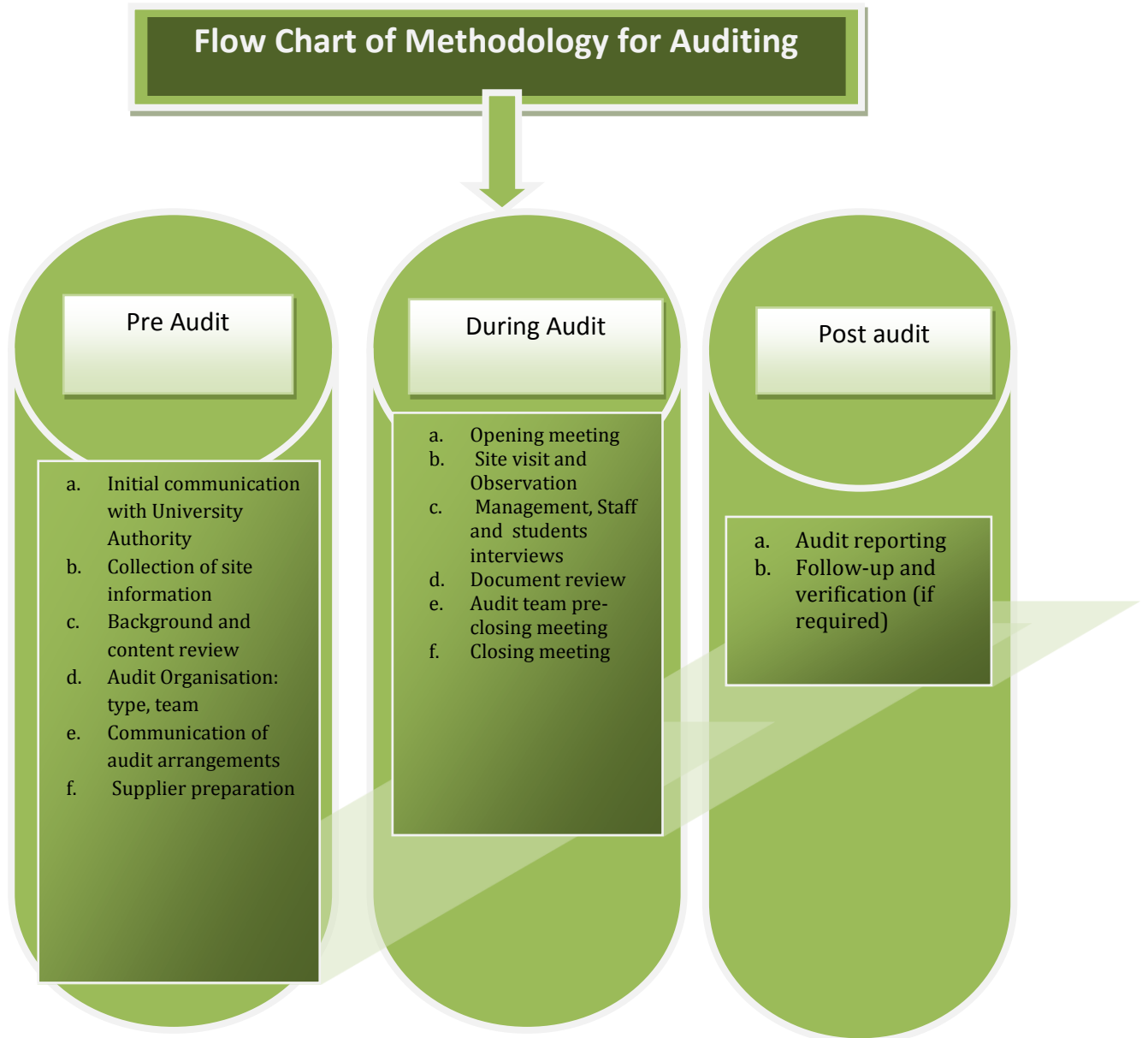
1.3 Purpose of Green and Environmental Auditing:

- To provide basis for improved sustainability
- To create a green campus
- To enable waste management through reduction of waste generation, solid- waste and water recycling
- To promote plastic free campus and evolve health consciousness among the stakeholders
- To recognize the cost saving methods through waste minimizing and managing
- To empower the organizations to frame a better environmental performance
- To develop an environmental ethics and values systems in youngsters.
- To establish valuable tools and methods for managing-and monitoring of environmental and sustainable development programs.

2.0 PRE-AUDIT STAGE:

2.1 Methodology and Survey Schedules:

The methodology is adopted for this assessment by collecting the information by onsite visit, group discussion, campus survey, enquiry, observation. Perception study and opinion survey are also included in the Auditing Report.



2.2 Site Visit:

1. College and its premises were visited and analyzed by the audit-teams several times to gather information.
2. Campus trees were counted and identified.
3. Medicinal garden, play grounds, canteen, library, All Department, office rooms, Hostels, Canteen and parking grounds were also visited to collect data.
4. Number and type of vehicles used by the stakeholders were counted and fuel consumption for each vehicle was verified with the user.
5. Number of LPG cylinders used in labs, canteen and hostel kitchen were also counted.
6. Water taps were checked. Leakage of a few water taps and over-flow tanks were noticed during the site inspection.

Following steps were taken for data collection:

- Survey to each Department, Laboratories, Library, Canteen etc.
- Data collected by observation and interview.
- Assessment of the environmental condition through measurement



2.3 Survey & Data Collection:

- A Questionnaire was developed covering all aspects of Green and Environment aspects for collection of data.
- Arrangement of Drone survey was made available to cover every corner of the college and its neighborhood areas.
- Data Analysis - Calculation of energy consumption, analysis of water reused, waste generation & disposal arrangements.
- Recommendation - On the basis of results of data analysis and observations, some steps for reducing power consumption, water consumption, waste management etc. were recommended.

We have discussed and interacted with different groups like teachers, students and staff to identify the attitudes and awareness towards environmental issues at the institutional, district, national and global level. Data and information were also collected from utility bills, reuse of water, waste management, use of energy-saving devices and e-waste. This information was added to the carbon footprint data, generating a fairly clearer picture of the emissions and impact of the reduction measures undertaken.



Survey Team

3.0 AUDIT STAGE :

3.1 Campus Survey and Enquiry:

Green and Environmental audit forms part of a resource management process. Total area including neighborhoods was surveyed using Drone and the data derived from this survey was detailed in our report.

Eco-campus concept mainly focuses on the reduction of contribution to emissions, on the efficient use of energy and water; Minimize waste generation or pollution and also economic efficiency. All these indicators are assessed in process of "Green Auditing of educational institute". Covered areas included in this green auditing are water, energy, air quality & carbon footprint, waste, biodiversity campus.

The Audit covered the following major areas:

1. Water Efficiency and Water Management
2. Energy Efficiency and Energy Management
3. Air Quality and Carbon foot print and Management
4. Waste and Waste Management
5. Biodiversity and Green Zone and management



Class room and Laboratory visit

Table-2 Total Stakeholders of the College

Students -	2906 persons
Teaching, Non-teaching and Other Stakeholders	102 persons
Total	3008 persons
Approximate no of visitor (per day)-	25 persons

3.2 Water Efficiency and Water Management :

The concerned auditor investigates the relevant method that can be adopted and implemented to balance the demand and supply of water and also proper water management practices along with rooftop rain water harvesting system must be installed in whole campus for recharging ground water and meeting part of the water requirements. It is therefore essential that any environmentally responsible institution examine its water use and Re-use practices.

a	Usage of water	That water is use for Drinking, Washing, Cleaning, Cooking, Bathing and gardening purpose. The maximum water is use for Bathing and washroom in the college. About 27000 Litre water has been consumed for that purpose.
b.	Total Consumption of water	About 60000Litre water per day
c.	Water wastage	The leakage and misuse of water is about 500Litre in whole campus. Small drip from a leaky tap, sewage water from pan in toilets and over flow can waste significant amount of water per day.
d	Surface water Harvesting	The Micro surface water bodies are available in college campus..

Table-3 Use of water in Different Purpose of College Premises

Use of water in Different Purpose Per Day	Use in Percentage
Bathing and washroom	45.00
Cooking and Cleaning	17.00
Drinking	18.00
Grading	12.00
Others	8.00

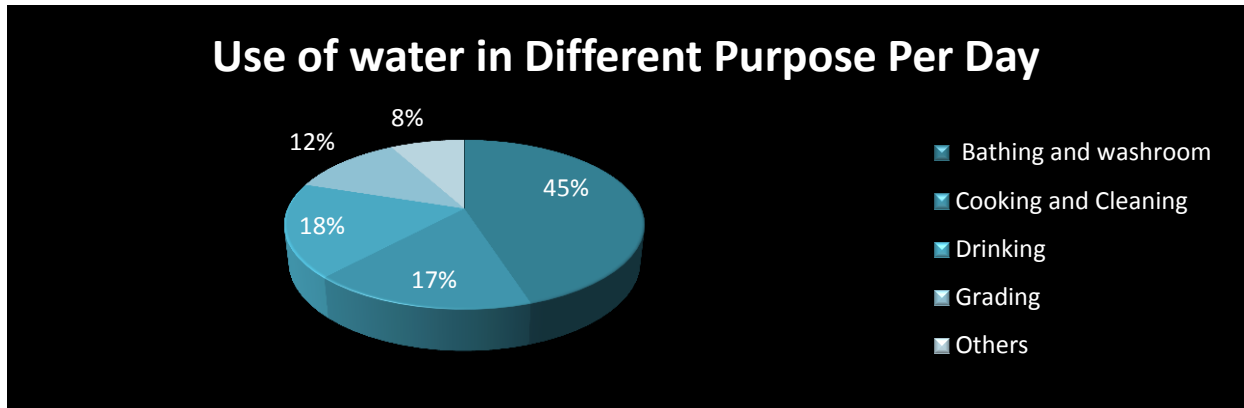


Fig.2 Use of water in Different Purpose Per Day

Sl. No.	Factors	Weightage
1	Quality of Water	H
2	Re-use of water	L
3	Water Harvesting & Recharge	M
4	Use of Surface Water	L

* H denote- Taken management policy level above 60%

** M denote- Taken management policy level 40%-60%

*** L denote-Taken management policy level below 40%

Recommendation

Water conservation faucets in washrooms were not seen. Installation of such faucets can save water and will help in minimising the water footprint of the institute. Sanitary wastewater generated from washrooms is connected to sewerage system.



Micro Surface water body

3.3 Energy Efficiency and Energy Management:

a	Energy sources	Sources of Energy: Conventional Electricity, LPG Gases, Diesel, Petrol and Non –conventional Solar energy
b.	Energy consumption	The useable energy is Conventional and Non-Conventional energy. The used Electricity energy is 97016 units which costing is Rs.509334/-. About 5% energy is Non-conventional energy which is contributed from Solar Power. The Maximum energy is consumed for Light & Fan and Computer Section amounting to 68% of total consumption.
c.	Usage of LPG	It has been observed that LPG gas cylinders are used in Hostel, Canteen & Laboratories (310PC/year) for cooking and other purpose. There are Green generators used in the premises.

Table-4 Source of Energy in Percentage

Source of Energy	In Percentage
Conventional	95
Non -Conventional	5

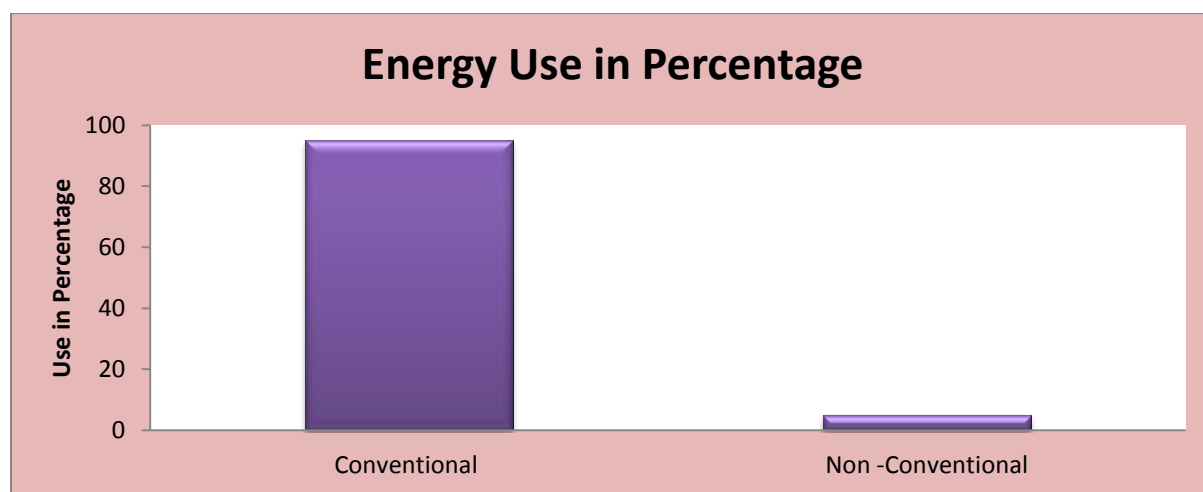


Fig. 3 Use of Energy in Percentage



Source of Convective Energy



Source of Non Convective Energy

Table-5 Energy Consumption in different Purpose in Percentage

Energy Consumption in different Purpose	In Percentage
Light and Fans	48
Computer and Laptop	20
AC	16
Pump	7
Others	9

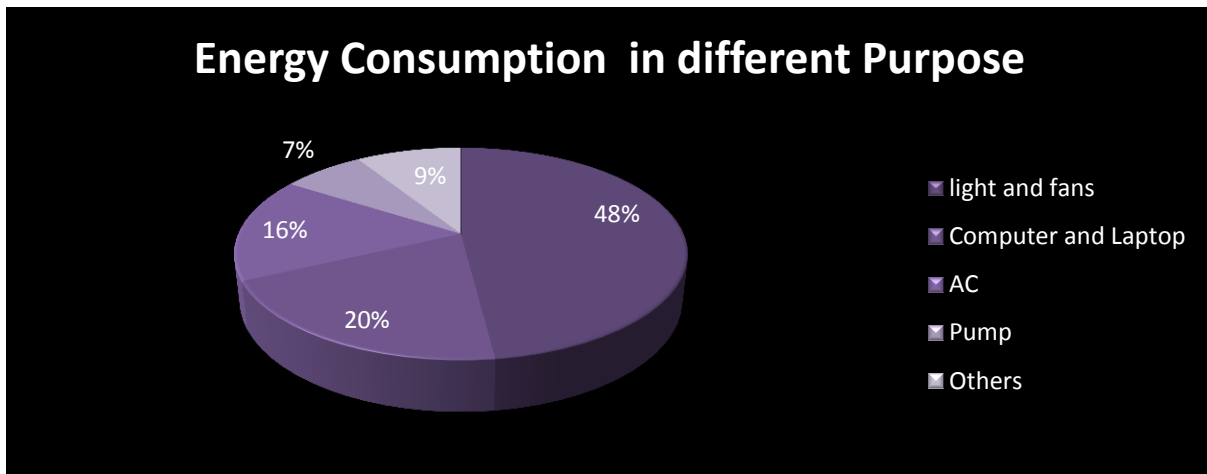


Fig. 4 Percentage of Energy Consumption in different Purpose

3.4 Air Quality and Carbon Footprints :

Commutation of stakeholders has an impact on the environment through the emission of greenhouse gases into the atmosphere consequent to burning of fossil fuels (such as petrol, Diesel, LPG Gas). The most common greenhouse gases are Carbon Dioxide, CFC, water vapor, methane, nitrous oxide and ozone. Of all the greenhouse gases, carbon dioxide is the most leading greenhouse gas, comprising about 214ppm (2022) to the Earth’s atmosphere. It undertakes the measure of bulk of carbon dioxide equivalents exhaled by the organization through which the carbon accounting is done. It is observed that the Outdoor air quality is Fresh and comfortable for breathing to human life.

Table-6 Amount of CO₂ (ppm) in different location of the College Campus

Different location of the College Premises	Amount of CO ₂ (ppm)
Principal Office	490
Administrative Office	480
Head Clark office	470
Girls Hostel	400
Canteen	425
Chemistry Lab	440
Computer Lab	470
Play Ground	400
Outdoor	400

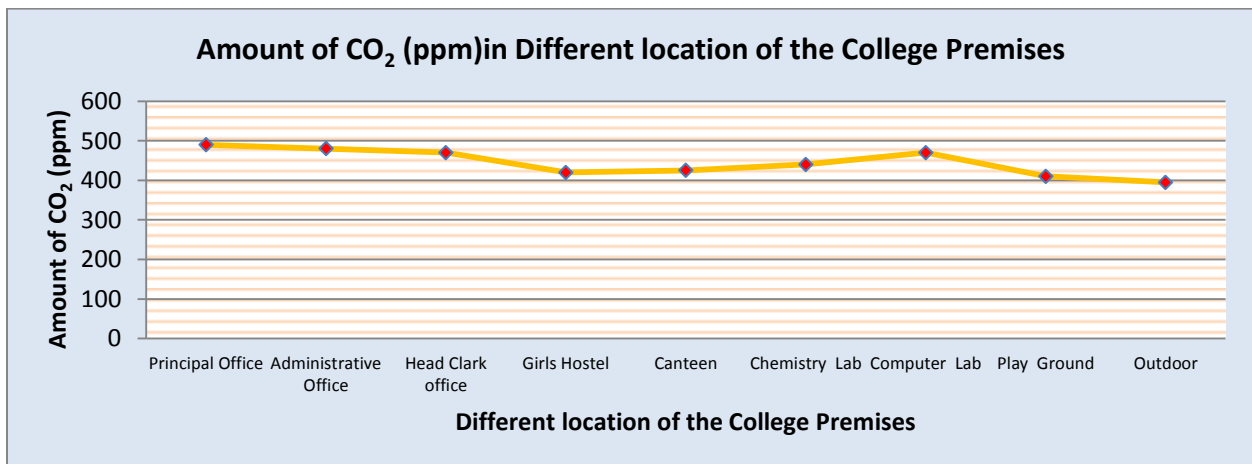


Fig. 5 Amount of CO₂ (ppm) in Different Location of the College Premises

Table-7 Amount of CO₂ (ppm) in the air in different location(College Campus) session 2022-2023

Amount of CO ₂ (ppm) in the Air in Different places of the College Premises	Amount of CO ₂ (ppm)
Outdoor	400
Indoor (Class room)	420
Indoor (Laboratories)	440

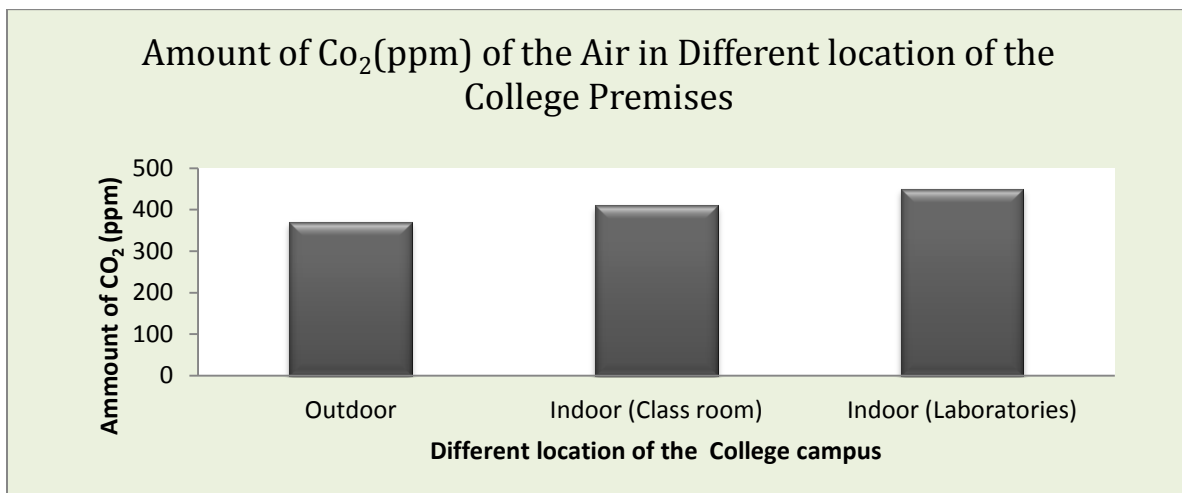


Fig. 6 Amount of CO₂(ppm) of the Air in Different location of the College Premises

Recommendation:

- a) Ventilation is achieved by fans in the institute and air conditioners in Official and Lab. places.
- b) Heating Ventilation and Air Conditioning (HVAC) system is not installed.
- c) No indoor plants were observed in the entire institute. Indoor plants can be plotted not only for the aesthetic appearance but also for health benefits.



Indoor Air Quality Assessment

3.5 Generation of Waste and Waste Management:

Waste (or wastes) is useless or unusable materials or components which are discarded after principal use. Sometimes, it is a defective article and of no use. In modern outlook waste may be a valuable substance subject to an appropriate operation or action on the waste. With the context of waste management RRR (Reduce, Reuse and Recycle) model may be followed in appropriate fashion.

The auditor diagnoses the prevailing waste disposal policies and suggests the best way to combat the problems. It is therefore essential that any environmentally responsible institution examine its waste processing practices. Keeping the objective of the audit the following study will be limited to the waste generated in an academic campus and surroundings.

Table-8 Types of wastes

Type of Wastage in Per Day	Amount in Kg
Degradable	90
Non degradable	10

The following categories of wastes are generated in the College campus:

a) Solid waste - Waste generated through paper, plastic packaging causes nuisance. Some wastes are generated after various experiments, primarily, chemistry laboratory; broken test tube, glassware are the example.

b) Liquid waste - There are bio-chemical wastes generated through various chemical reactions and biological processes. Generally, these are being drained to nearby Surface water bodies contaminating water and soil. Appropriate means is suggested to adopt scientific liquid waste management practices. These are neutralization, bacterial control, and natural control through plantation.

Table-9 Source of Wastage in Different Sector (per day in Kg)

Source of Wastage in Different Sector(per day in Kg)	Degradable wastage Amount in Kg.	Non Degradable wastage Amount in Kg.
Hostels	60	1
Canteen	10	0.5
Office	5	0.5
Laboratories	3	0.5
Forest and Garden	12	0.2
Others	4	.5

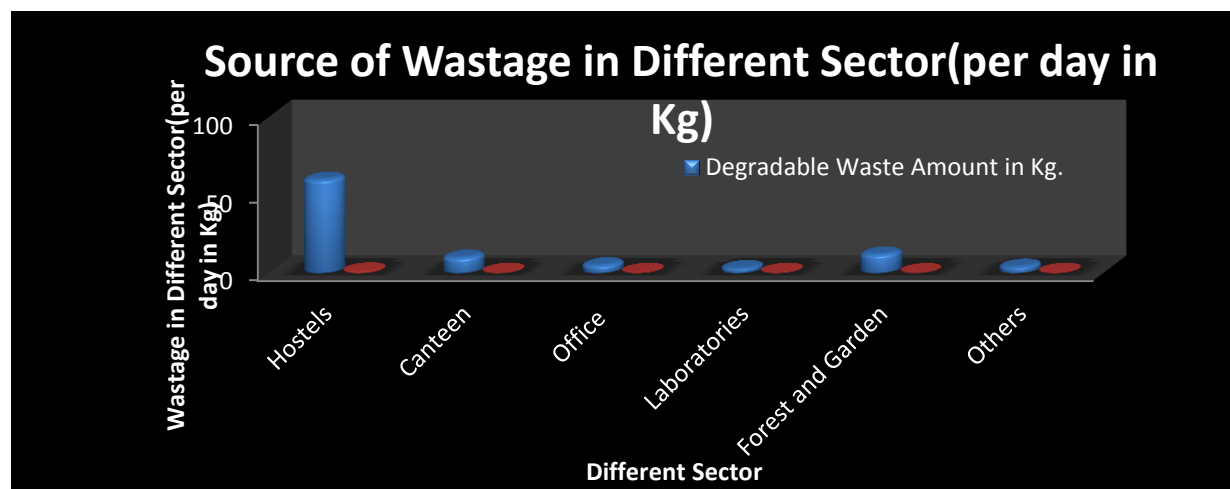


Fig. 9 Source and Amount of Wastage in Different Sector (per day in Kg)



Audit of Wastage management status in Different Sector

The following are being emphasized during audit of waste management:

- a) Name of the waste
- b) Category of waste
- c) Quantity of waste
- d) Hazardous effect of the waste
- e) Institutional action and mechanism for waste management

Compliance audit of waste issues:

At the present stage the institute is capable in managing their waste. They are complying with the essential requirements of waste management although suggestions are given for future improvements.

Performance Audit of Waste Issues:

No critical audit issue is there with respect to the waste management.

Implemented wastes management		
Sl.no	Factors/Indicators	Weightage
1	Plastic and Polythene free	M
2	Re-use of papers	H
3	Hazardous effect waste management	M
4	Removal of E-Wastes	M
5	Organic & food waste	H
6	Others solid wastes	M

* H denote- Taken management policy level above 60%

** M denote- Taken management policy level 40%-60%

*** L denote-Taken management policy level below 40%



Awareness Slogan in college premises

3.6 Auditing for Biodiversity & Green Campus Management:

Unfortunately, biodiversity is facing serious threats from habitat loss, pollution, over consumption and invasive species. Species are disappearing at an alarming rate and each loss affects nature’s delicate balance and our quality of life. In one year, a single mature tree will absorb up to pounds of Carbon dioxide from the atmosphere, and release it as Oxygen. The amount of oxygen that a single tree produces is enough to provide one day’s supply of oxygen for people. So while you are busy studying and working on earning those good grades, all the trees on campus are also working hard to make the air cleaner for us. Trees on our campus impact our mental health as well; studies have shown that trees greatly reduce stress, which a huge deal is considering many students are under some amount of stress.

About 13% area is under greenery and biodiversity zone and 14% area is water bodies’ also wet land. Biodiversity includes the genetic variability and diversity of life forms such as plants, animals, microbes etc. living in a wide range of ecosystems. Flora and fauna of College campus in Bajkul Milani Mahavidyalaya premises is rich.

Table 10 Area Coverage of the College Campus

Area Coverage of College Premises:	Area in Percentage
Building and Construction	7.25
Vegetation Cover	79.75
Playground and Fallow land	12.00
Water Bodies	1.00

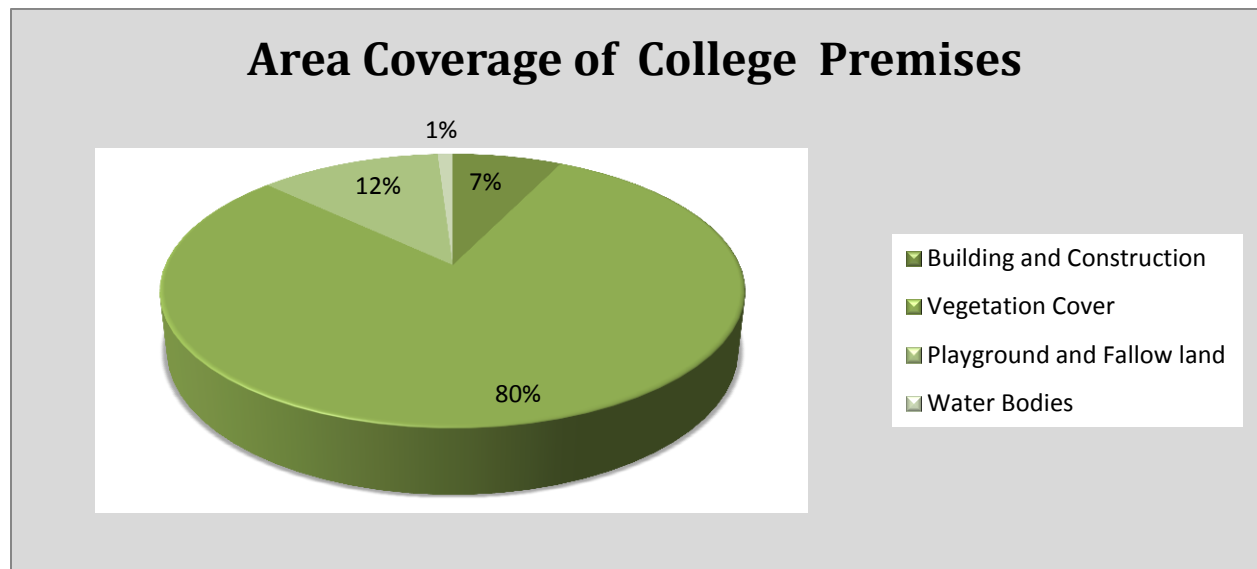


Fig. 10 Area coverage of the College Premises

Biodiversity Study:

Plant diversity – The campus of Jhargram Raj College is lush green and surrounded by large **Sal** (*Shorea robusta*) trees. There are three different types of buildings like Academic buildings, Ladies Hostel and Boys hostel building. Rest of the lands are covered by sal trees and other large trees like Mango, Mohua etc. (*Mangifera indica*, *Bassia latifolia* etc.). Cuban royal palm (*Roystonea regia*) trees are found in front side of the academic buildings, which are making a nice scenic beauty. Large mango trees (GBH – 335cm, 450cm etc.) are found here and there on east and south side of the academic building and within the campus of ladies hostel. One medicinal plant garden entitled Sibkali Bhattacharya Herbal Garden is situated between two academic buildings, which needed restoration (Table -2). Small patches of plantation of different fruit yielding trees are found in front of ladies hostel (Table – 3). There was a kitchen garden also found in front of Boy's hostel (Table-4). The north side of the academic building is surrounded by large Sal, Neem (*Azadirachta indica*), Gulmohor (*Delonix regia*), Debdaru (*Polyalthia longifolia*), Simul (*Bombax ceiba*), Haritaki (*Terminalia chebula*), etc. trees.

According to Champion and Seth, 1983, The forest surrounded by the Jhargram town is Dry Deciduous Sal Forest. The campus is representing such forest type. For quick ecological and vegetation study, Transact and quadrat methods are taken. Here length of transact was 30m. The plant diversity study has been done through quadrat method. One set of quadrats has been laid in the main campus. For this purpose a standard method has been followed i.e. 10m x 10m for trees, 5m x 5m for shrubs and 1m x 1m for herbs. Data of quadrat is given below (Quadrat – 1).

It has been found from the study that there are approximately 37 tree species, 44 shrubs, 57 herbs and three species of gymnosperm (Table-1a, 1b, 1c, 1d and Fig.-1). The dominant species is Sal here. Sal associates are *Croton oblongifolia*, *Combretum roxburghii* are available here like a natural forest.

There is one medicinal plant garden entitled Sibkali Bhattacharya Herbal Garden within the college campus (Table-2). Beside this there are 23 plants with medicinal value. The garden is very resourceful and planted in proper way. Plants like *Hemidesmus indicus*, *Adhatoda vasica*, *Aloe vera*, *Aristolochia indica*, *Asparagus racemosus*, *Cissus quadrangularis*, *Curcuma caesia* etc. are planted.

A fruit yielding plantation area found surrounding the ladies hostel (Table-3). There are 20 different species of fruit plants. Species like *Aegle marmelos*, *Annona squamosa*, *Artocarpus heterophylla*, *Averrhoa carambola*, *Carica papaya*, *Dillenia indica*, *Grewia asiatica* etc. are planted.

Within the area of Boy's hostel a small kitchen garden is seen. Different seasonal varieties of vegetable plants are found. Plants like *Alocasia esculanta*, *Basella rubra*, *Capsicum annum*, *Solanum melongena* etc. are planted.

There are small surrounded areas for plantation of ornamental or flowering plants (Table-5). Seasonal flowering plants are planted here. Plants like *Tectona grandis*, *Canna indica*, *Duranta repens*, *Euphorbia milii*, *Tagetes spatula* etc. are available now.

From Quadrat study two girth classes of trees are calculated (Table-6). From this data Carbon sequestration potential of trees have been calculated. It is found that from above ground biomass of trees stocked **4135.5kg.** of carbon within a quadrat, which is a large amount.

One Haritaki (*Terminalia chebula*) tree is growing here is huge large (GBH – 135cm and Height – 10.5 m) in size. This is very rare in this region. *Rowvolfia serpentina* is another rare shrub with medicinal value (Reserpin alkaloid) is growing here naturally.

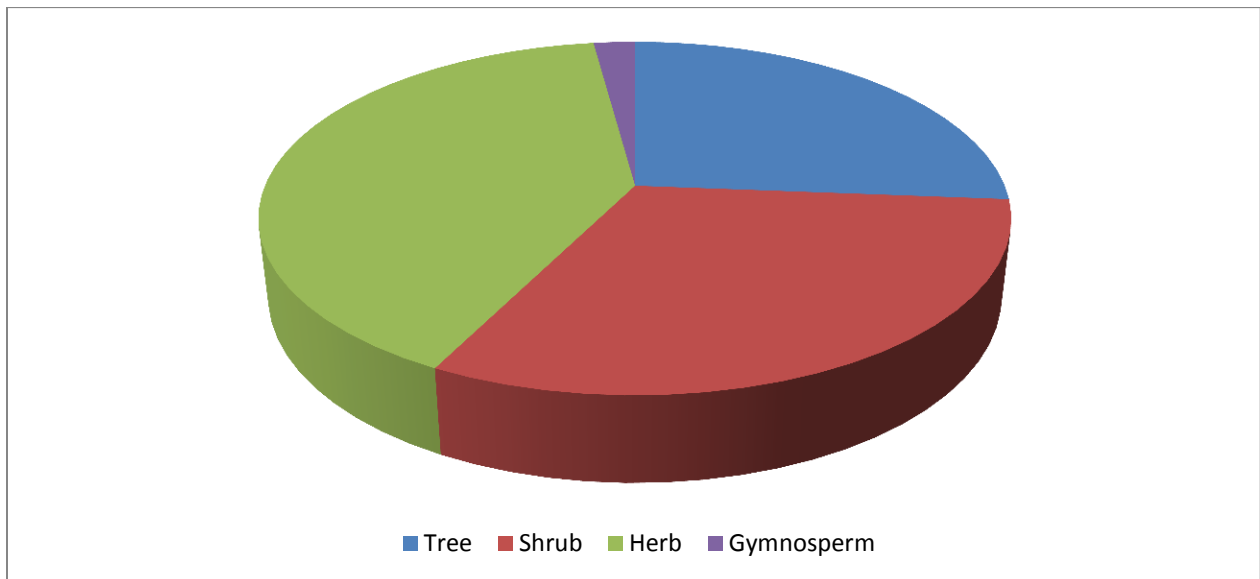


Fig. – 1: Plant composition of Jhargram Raj College



Biodiversity observation in College Premises

Table -1a: Available Tree species within the college campus

Sl. No.	Scientific name	Family
1	<i>Albizia lebbek</i> (L.) Benth.	Fabaceae
2	<i>Alstonia scholaris</i> (L.) R. Br.	Apocynaceae
3	<i>Araucaria araucana</i> (Molina) K.Koch	Araucariaceae
4	<i>Artocarpus heterophyllus</i> Lam.	Moraceae
5	<i>Azadirachta indica</i> A.Juss.	Meliaceae
6	<i>Bombax ceiba</i> L.	Malvaceae
7	<i>Callistemon viminalis</i> (Sol. Ex Gaertn.) G.Don	Myrtaceae
8	<i>Carissa carandas</i> L.	Apocynaceae
9	<i>Casuarina equisetifolia</i> L.	Casuarinaceae
10	<i>Dalbergia sisso</i> DC.	Fabaceae
11	<i>Diospyros melanoxylon</i> Roxb.	Ebenaceae
12	<i>Eucalyptus globules</i> Labill.	Myrtaceae
13	<i>Gmelina arborea</i> Roxb.	Lamiaceae
14	<i>Lagerstroemia speciosa</i> (L.) Pers.	Lythraceae
15	<i>Magnolia champaca</i> L.	Magnoliaceae
16	<i>Malvastrum</i> sp	Malvaceae
17	<i>Mangifera indica</i> L.	Anacardaceae
18	<i>Mimusops elengi</i> L	Sapotaceae
19	<i>Murraya paniculata</i> (L.) Jack	Rutaceae
20	<i>Nerium indicum</i> Mill.	Apocynaceae
21	<i>Peltophorum pterocarpum</i> (DC.) K.Heyne	Fabaceae

22	<i>Phoenix dactylifera</i> L.	Aracaceae
23	<i>Phoenix roebelenii</i> O'Brien	Aracaceae
24	<i>Psidium guajava</i> L.	Myrtaceae
25	<i>Pterocarpus marsupium</i> Roxb.	Fabaceae
26	<i>Roystonea regia</i>	Arecaceae
27	<i>Santalum album</i> L.	Santalaceae
28	<i>Shorea robusta</i> Gaertn. f.	Dipterocarpaceae
29	<i>Swietenia mahagoni</i> (L.) Jacq.	Meliaceae
30	<i>Tecoma gaudichaudii</i> DC	Bignoniaceae
31	<i>Tectona grandis</i> L.f.	Lamiaceae
32	<i>Terminalia bellirica</i> (Gaertn.) Roxb.	Combretaceae
33	<i>Terminalia arjuna</i> (Roxb. ex DC.) Wight & Arn.	Combretaceae
34	<i>Terminalia chebula</i>	Combretaceae
35	<i>Thevetia peruviana</i> (pers.) Merrill	Apocynaceae
36	<i>Thuja orientalis</i> L.	Cupressaceae
37	<i>Ziziphus mauritiana</i> Lam.	Rhamnaceae

Table -1b: Available Shrub species within the college campus

Sl. No.	Scientific name	Family
1	<i>Agave angustifolia</i> Haw.	Asparagaceae
2	<i>Agave sisalana</i> Perrine	Asparagaceae
3	<i>Aristolochia indica</i> L.	Aristolochiaceae
4	<i>Asparagus racemosus</i> Willd.	Asparagaceae
5	<i>Asparagus setaceus</i> (Kunth) Jessop	Asparagaceae
6	<i>Bougainvillea glabra</i> Comm. Ex Juss	Nyctaginaceae
7	<i>Caladium bicolor</i> (Aiton) Vent.	Aracaceae
8	<i>Calotropis procera</i> (Aiton) Dryand.	Asclepiadaceae
9	<i>Calotropis gigantea</i> (L.) Dryand.	Apocynaceae
10	<i>Canna indica</i> L.	Cannaceae
11	<i>Cissus quadrangularis</i> L.	Vitaceae
12	<i>Citrus limetta</i> Risso	Rutaceae
13	<i>Clerodendrum indicum</i> (L.) Kuntze	Lamiaceae
14	<i>Croton oblongifolia</i>	Euphorbiaceae
15	<i>Datura stramonium</i> L.	Solanaceae
16	<i>Datura suaveolens</i> f. <i>albidoflava</i> (Lem.) Voss	Solanaceae
17	<i>Dracaena reflexa</i> Lam.	Asparagaceae
18	<i>Duranta erecta</i> L.	Verbenaceae
19	<i>Eupatorium odoratum</i> L.	Asteraceae
20	<i>Euphorbia milii</i> Des Moul.	Euphorbiaceae
21	<i>Holarrhena antidysenterica</i> (L.) Wall.	Apocynaceae
22	<i>Hydrocotyle sibthorpioides</i> Lam.	Araliaceae
23	<i>Ixora coccinea</i> L.	Rubiaceae
24	<i>Jatropha gossypifolia</i> L.	Euphorbiaceae
25	<i>Kalanchoe pinnata</i> (Lam.) Pers.	Crassulaceae

26	<i>Lantana camara</i> L.	Verbenaceae
27	<i>Mentha spicata</i> L.	Lamiaceae
28	<i>Mikania scandens</i> (L.) Wild.	Asteraceae
29	<i>Mimosa pudica</i> L.	Fabaceae
30	<i>Mirabilis jalapa</i> L.	Nyctaginaceae
31	<i>Mussaenda erythrophylla</i> Schumach. & Thonn.	Rubiaceae
32	<i>Ocimum canum</i> Sims.	Lamiaceae
33	<i>Ocimum sanctum</i> L.	Lamiaceae
34	<i>Opuntia dillenii</i> (Ker Gawl.) Haw.	Cactaceae
35	<i>Pedilanthus tithymaloides</i> (L.) Poit.	Euphorbiaceae
36	<i>Pteris vittata</i> L.	Pteridaceae
37	<i>Rauwolfia serpentina</i> (L.) Benth. ex Kurz	Apocynaceae
38	<i>Sansevieria cylindrica</i> Bojer ex Hook.	Asparagaceae
39	<i>Sansevieria roxburghiana</i> Schult. & Schult.f.	Asparagaceae
40	<i>Tephrosia purpurea</i> (L.) Pers.	Fabaceae
41	<i>Thunbergia mysorensis</i> (Wight) T.Anderson	Acanthaceae
42	<i>Tradescantia pallida</i> (Rose) D.R. Hunt	Commelinaceae
43	<i>Tylophora indica</i> (Burm. f.) Merr.	Apocynaceae
44	<i>Vanda roxburghii</i> R.Br.	Orchidaceae

Table -1c: Available Herb species within the college campus

Sl. No.	Scientific name	Family
1	<i>Acalypha indica</i> L.	Euphorbiaceae
2	<i>Aerva lanata</i> (L.) Juss.	Amaranthaceae
3	<i>Aerva sanguinolenta</i> (L.) Blume	Amaranthaceae
4	<i>Ageratum conyzoides</i> L.	convolvulaceae
5	<i>Aloe vera</i> (L.) Burm.f.	Asphodelaceae
6	<i>Alternanthera sessilis</i> (L.)R.Br.ex DC.	Amaranthaceae
7	<i>Bambusa spinosa</i> Roxb.	Poaceae
8	<i>Barleria lupulina</i> Lindl.	Acanthaceae
9	<i>Begonia rex</i> Putz.	Begoniaceae
10	<i>Belamcanda chinensis</i> (L.) DC.	Iridaceae
11	<i>Boerhavia diffusa</i> L.	Nyctaginaceae
12	<i>Chrysopogon zizanioides</i> (L.) Roberty	Poaceae
13	<i>Codiaeum variegatum</i> (L.) Rumph. ex A.Juss.	Euphorbiaceae
14	<i>Coleus blumei</i> Benth.	Lamiaceae
15	<i>Coleus forskohlii</i> (Willd.) Briq.	Lamiaceae
16	<i>Cordyline fruticosa</i> (L.) A.Chev.	Asparagaceae
17	<i>Cordyline terminalis</i> (L.) Kunth	Asparagaceae
18	<i>Crinum latifolium</i> L.	Amaryllidaceae
19	<i>Cymbopogon citratus</i> (DC.) Stapf	Poaceae
20	<i>Cymbopogon nardus</i> (L.) Rendle	Poaceae
21	<i>Cynodon dactylon</i> (L.) Pers.	Poaceae
22	<i>Desmodium gangeticum</i> DC.	Fabaceae

23	<i>Desmodium triflorum</i> (L.) DC.	Fabaceae
24	<i>Dyopsis lutescens</i> (H.Wendl.) Beentje & J.Dransf.	Aracaceae
25	<i>Ecbolium ligustrinum</i> (Vahl) Vollesen	Acanthaceae
26	<i>Eleutheranthera ruderalis</i> (Sw.) Sch.Bip.	Asteraceae
27	<i>Eragrostis tenella</i> (L.) Roem. & Schult.	Poaceae
28	<i>Euphorbia hirta</i> L.	Euphorbiaceae
29	<i>Euphorbia heterophylla</i> L.	Euphorbiaceae
30	<i>Grevillea robusta</i> A.Cunn. ex R.Br.	Proteaceae
31	<i>Hedychium coronarium</i> J.Koenig	Zingiberaceae
32	<i>Hippeastrum reginae</i> (L.) Herb.	Amaryllidaceae
33	<i>Kopsia fruticosa</i> (Roxb.) A.DC.	Apocynaceae
34	<i>Kyllinga brevifolia</i> Rottb.	Cyperaceae
35	<i>Oldenlandia corymbosa</i> L.	Rubiaceae
36	<i>Oplismenus hirtellus</i> (L.) P.Beauv	Poaceae
37	<i>Phyllanthus niruri</i>	Euphorbiaceae
38	<i>Piper betle</i> L.	Piperaceae
39	<i>Piper retrofractum</i> Vahl	Piperaceae
40	<i>Plumeria pudica</i> Jacq.	Apocynaceae
41	<i>Polyalthia longifolia</i> Sonn	Annonaceae
42	<i>Polyscias balfouriana</i> (André) L.H.Bailey	Araliaceae
43	<i>Portulaca grandiflora</i> Hook.	Portulacaceae
44	<i>Premna mollissima</i> Roth	Lamiaceae
45	<i>Rhinacanthus nasutus</i> (L.) Kurz	Acanthaceae
46	<i>Rhoeo discolor</i> (L'Hér.) Hance	Commelinaceae
47	<i>Scoparia dulcis</i> (L.) Kuntze.	Scrophulariaceae
48	<i>Sida cordifolia</i> L.	Malvaceae
49	<i>Solanum nigrum</i> L.	Solanaceae
50	<i>Solanum sisymbriifolium</i> Lam.	Solanaceae
51	<i>Spermacoce hispida</i> L.	Rubiaceae
52	<i>Stevia rebaudiana</i> (Bertoni) Bertoni	Asteraceae
53	<i>Syngonium podophyllum</i> Schott	Aracaceae
54	<i>Talinum portulacifolium</i> (Forssk.) Asch. ex Schweinf.	Talinaceae
55	<i>Tridax procumbens</i> (L.) L.	Asteraceae
56	<i>Urtica sp</i>	Asteraceae
57	<i>Vernonia cinerea</i>	Lamiaceae

Table -1d: Available Gymnosperm species within the college campus

Sl. No.	Scientific name	Family
1	<i>Cycas revoluta</i> Thub.	Cycadaceae
2	<i>Zamia furfuracea</i> L.f.	Zamiaceae
3	<i>Thuja orientalis</i>	Cupressaceae

Table – 2: List of Medicinal plants of Sibkali Bhattacharaya Herbal Garden

Sl. No.	Local Name	Scientific Name	Family
1	Basak	<i>Adhatoda vasica</i> (Nees.)	Acanthaceae
2	Apang	<i>Aerva sanguinolenta</i> (L.) Blume	Amaranthaceae
3	Ghritakumari	<i>Aloe vera</i> (L.) Burm.f.	Asphodelaceae
4	Iswarmul	<i>Aristolochia indica</i> L.	Aristolochiaceae
5	Satamul	<i>Asparagus racemosus</i> Willd.	Asperagaceae
6	Bisalyakarani	<i>Barleria lupulina</i> Lindl.	Acantahaceae
7	Lily	<i>Belamcanda chinensis</i> (L.) DC.	Iridaceae
8	Harjora	<i>Cissus quadrangularis</i> L.	Vitaceae
9	Ghentu	<i>Clerodendrum indicum</i> (L.) Kuntze	Verbenaceae
10		<i>Coleus blumei</i> Benth.	Lamiaceae
11	Kalo Halud	<i>Curcuma caesia</i> Roxb.	Zingiberaceae
12	Lemon grass	<i>Cymbopogon citratus</i> (DC.) Stapf	Poaceae
13	Citronella	<i>Cymbopogon nardus</i> (L.) Rendle	Poaceae
14	White Zinger	<i>Hedychium coronarium</i> J. Koenig.	Zingiberaceae
15	Anantamul	<i>Hemidesmus indicus</i> (L.) R.Br.	Asclepiadaceae
16	Patharkuchi	<i>Kalanchoe pinnata</i> (Lam.) Pers.	Crassulaceae
17	Pan	<i>Piper betle</i> L.	Piperaceae
18	Choi jhal	<i>Piper chaba</i> Trel. &Yunck.	Piperaceae
19	Golmorich	<i>Piper longum</i> L.	Piperaceae
20	Sarpagandha	<i>Rauvolfia serpentina</i> (L.) Benth. Ex. Kurz	Apocynaceae
21	Star goosberry	<i>Sauropus androgynus</i> (L.) Merr.	Phyllanthaceae
22	Arjun	<i>Terminalia arjuna</i> (Roxb. ex DC.) Wight &Arn.	Combretaceae
23	Antamul	<i>Tylophora indica</i> (Burm. f.)	Asclepiadaceae

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Table – 3: List of fruit plants present in the campus

Sl. No.	Scientific name	Common name	Family
1	<i>Aegle marmelos</i>	Bel	Rutaceae
2	<i>Annona squamosa</i>	Ata	Annonaceae
3	<i>Artocarpus heterophylla</i>	Jack Fruit	Moraceae
4	<i>Averrhoa carambola</i>	Kamranga	Oxalidaceae
5	<i>Bassia latifolia</i>	Mahua	Sapotaceae
6	<i>Carica papaya</i>	Pepe	Caricaceae
7	<i>Citrus decumana.</i>	Batabilabu	Rutaceae
8	<i>Dillenia indica</i>	Chalta	Dilleniaceae
9	<i>Eugenia jambolana</i>	Kaloram	Myrtaceae
10	<i>Grewia asiatica</i>	Falsa	Tiliaceae
11	<i>Mangifera indica</i>	Aam	Anacardiaceae
12	<i>Mimusops elengii</i>	Bakul	Sapotaceae
13	<i>Moringa Oleifera</i>	Sajne	Moraginaceae
14	<i>Morus nigra</i>	Tunt	Moraceae
15	<i>Psidium guava</i>	Piara	Myrtaceae
16	<i>Schleichera oleosa</i>	Kusum	Sapindaceae
17	<i>Spondias dulcis</i>	Bilati Amra	Anacardiaceae
18	<i>Syzygium samarangense</i>	Jamrul	Myrtaceae
19	<i>Tamaridus indica</i>	Tetul	Casalpiniaceae
20	<i>Zizyphus mauritiana</i>	Kul	Rhamnaceae

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Table - 4: List of Plants of kitchen garden

Sl. No.	Scientific name	Local name	Family
1	<i>Alocasia esculanta</i>	Cochu	Araceae
2	<i>Basella rubra</i>	Pui	Basellaceae
3	<i>Capsicum annuum</i>	Lanka	Solanaceae
4	<i>Carica papaya</i>	Papaya	Caricaceae
5	<i>Cinamomum tamala</i>	Tejpata	Lauraceae
6	<i>Lycopersicum esculantum</i>	Tomato	Solanaceae
7	<i>Piper chaba</i>	Choi jhal	Piperaceae
8	<i>Solanum melongena</i>	Begun	Solanaceae

Table-5: Ornamental Plants found in the college campus

Sl. No.	Scientific Name	Family
1	<i>Aurocaria heterophylla</i>	Araucariaceae
2	<i>Cycas revolute</i>	Cycadaceae
3	<i>Murraya paniculata</i>	Rutaceae
4	<i>Roystonea regia</i>	Arecaceae
5	<i>Tabernemontana coronaria</i>	Apocynaceae
6	<i>Tectona grandis</i> L.f.	Lamiaceae
7	<i>Thuja orientalis</i>	Cupressaceae
8	<i>Zamia furfuracea</i> L.f.	Zamiaceae
9	<i>Adenium sp.</i>	Apocynaceae
10	<i>Agave Americana</i>	Asparagaceae
11	<i>Canna indica</i>	Cannaceae
12	<i>Duranta repens</i>	Verbenaceae
13	<i>Euphorbia milii</i>	Euphorbiaceae
14	<i>Hibiscus rosasinensis</i>	Malvaceae
15	<i>Rosa sp.</i>	Rosaceae
16	<i>Tagetes sp.</i>	Asteraceae

Quadrat - 1

Tree Quadrat (10m x 10m)

Sl. No.	Scientific name	GBH (in cm)	Height (in m)
1.	<i>Shorea robusta</i>	88	15
2.	<i>Shorea robusta</i>	95	14
3.	<i>Delonix regia</i>	220	17
4.	<i>Polyalthia longifolia</i>	70	11
5	<i>Shorea robusta</i>	85	19
6	<i>Shorea robusta</i>	75	17

Shrub quadrat (5m x 5m)

Sl. No.	Scientific name	Number of individuals
1.	<i>Polyalthia longifolia</i>	6
2.	<i>Croton oblongifolia</i>	4
3.	<i>Clreodendron infortunatum</i>	2
4.	<i>Streblus asper</i>	3

Herb quadrat (1m x 1m)

Sl. No.	Scientific name	Number of individuals
1.	<i>Hemidesmus indicus</i>	4
2.	<i>Desmodium triflorum</i>	2
3.	<i>Andropogon aciculatus</i>	9
4.	<i>Digitaria sanguinalis</i>	1

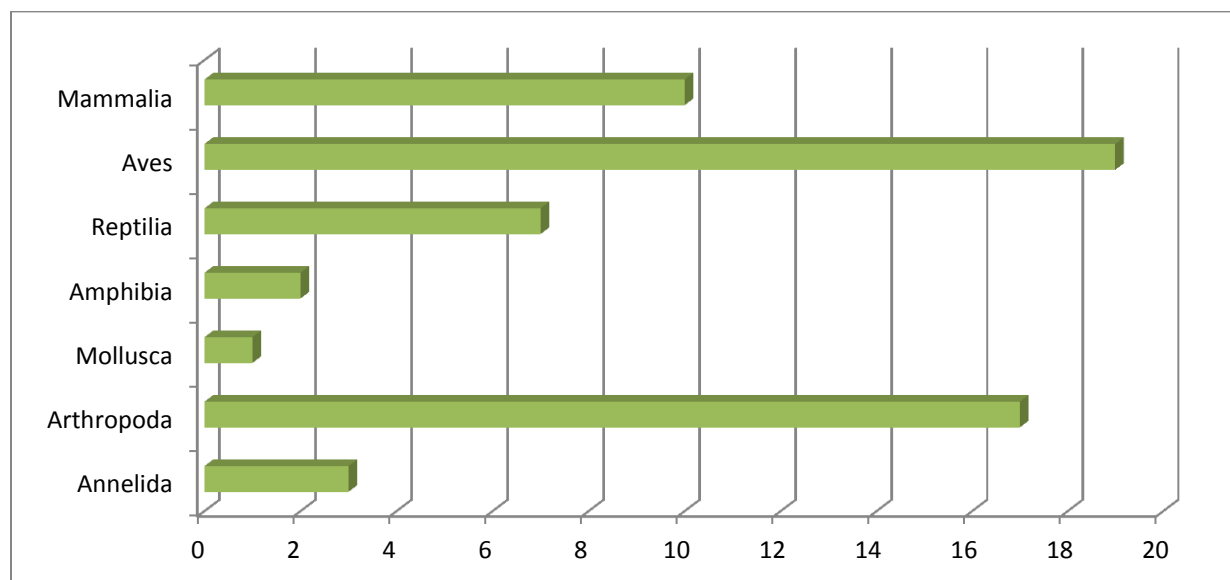
Table - 6: Carbon sequestration potential of trees of college campus

Sl. No.	GBH Class (in cm)	No. of Trees	Biomass (in Kg.)	Carbon stock (in Kg.)
1	50 – 100	5	630	315
2	225-250	1	7641	3820.5
			Total	4135.5

Faunal Diversity:

Jhargram Raj College campus is a habitat of a number of wide varieties of fauna. Different types of insects including moths, butterfly, wasp, bees, amphibian, reptilian, birds and mammals are found here. The large abandoned area of the college is creating a great habitat of different mammals also. This area is safe for animals. Members of different phylum are given in figure (Fig.-3).

Fig.-3: Comparison between different animal members of different phylum found in the campus



Phylum: Annelida

Sl. No.	Scientific name	Local name
1.	<i>Hirudinaria</i> sp	Joke
2.	<i>Pheretima</i> sp.	Kecho

Phylum: Arthropoda

Sl. No.	Scientific name	Local name
1	<i>Anopheles</i> sp	Anopilis masa
2	<i>Apis</i> sp	Moumachi
3	<i>Buthus</i> sp	Kakrabicha
4	<i>Copris lunaris</i>	Gubrepoka
5	<i>Galleria</i> sp	Moth
6	<i>Julus</i> sp	Kenno
7	<i>Lampyri noctiluca</i>	Jonaki
8	<i>Muska domestica</i>	Machi

9	<i>Nephila</i> sp	Makarsa
10	<i>Odontotermes</i> sp	Wepoka
11	<i>Oecophyllas maragdina</i>	Lalpipra
12	<i>Orthetrum</i> sp	Pharing
13	<i>Papilio</i> sp	Prajapati
14	<i>Periplaneta americana</i>	Arsola
15	<i>Schistocera gregaria</i>	Pangapal
16	<i>Scolopendra</i> sp	Tetulbicha
17	<i>Vespa orientalis</i>	Vimrul

Phylum: Mollusca

Sl. No.	Scientific name	Local name
1	<i>Acatina fulica</i>	Sthal samuk

Class : Amphibia

Sl. No.	Scientific name	Local name
1	<i>Duttaphrynusmelano stictus</i>	Kuno bang
2	<i>Rana tigrina</i>	Sona bang

Class: Reptilia

Sl. No.	Scientific name	Local name
1	<i>Ahaetullana sutas</i>	Loudaga sap
2	<i>Calottes versicolor</i>	Girgiti
3	<i>Daboia russelii</i>	Chandrabora sap
4	<i>Elachistodon westermanni</i>	Matiali sap
5	<i>Hemidactylus flaviviridis</i>	Tiktiki
6	<i>Ptyas mucosus</i>	Jamna sap
7	<i>Varanus</i> sp	Godi sap

Class : Aves

Sl. No.	Scientific name	Local name
1	<i>Acridotheres tristis</i>	Shalik
2	<i>Alcedo atthis</i>	Chotomachranga
3	<i>Amaurornis phoeniurus</i>	Dahuk
4	<i>Ardeola grayii</i>	Bak
5	<i>Athene brama</i>	Kuturepancha
6	<i>Columba livia</i>	Paia
7	<i>Copsychus aularis</i>	Doyel
8	<i>Corvus splendens</i>	Kak
9	<i>Dicrurous adsimilis</i>	Phinge
10	<i>Dinopium bengalensis</i>	Kat thokra
11	<i>Eudynamis scolopacea</i>	Kokil
12	<i>Merops orientalis</i>	Baspati
13	<i>Orthotomus</i>	Tuntuni
14	<i>Passer domesticus</i>	Charaipakhi
15	<i>Pittacus</i>	Tia
16	<i>Pycnonotus</i>	Bulbul
17	<i>Streptopelia chinensis</i>	Gughu
18	<i>Turdoides</i>	Satbhaya
19	<i>Tyto alba</i>	Lakshmiapancha

Class : Mammalia

Sl. No.	Scientific name	Local name
1	<i>Bandicota bengalensis</i>	Indur
2	<i>Felis chaus</i>	Katas
3	<i>Funambulus pennantii</i>	Katbirali
4	<i>Herpestes edwardsii</i>	Neul
5	<i>Mus musculus</i>	Nenhtiindur

6	<i>Pipistrellus tenuis</i>	Chamchika
7	<i>Prionailurus viverrinus</i>	Mechobiral
8	<i>Pteropus sp</i>	Badhur
9	<i>Suncus murinus</i>	Chucha
10	<i>Vulpes bengalensis</i>	Khaksial

Few suggestions for biodiversity management – The College has a lush green area with different ecological habitat for biotic components. Following suggestions are given for its better management.

- Name plates should be given to trees for their easy identification to students
- A board should be given in front of medicinal plant garden where use of every plant will be written there.
- A board should be given in front the pond where indigenous fish conservation is going on. The board will display about the type of fish conserved.
- If possible a bird watching area may be demarcated in front of hostel (North east corner of the campus)
- Rose garden may be converted to butterfly garden.

Table-17 Green Coverage of the College Premises

Green Coverage of the College Premises	Area in Percentage
Native and Natural Vegetation	65
Agro-Plants	13
Medicinal Plants	11
Plantation	7
Kitchen Garden	3

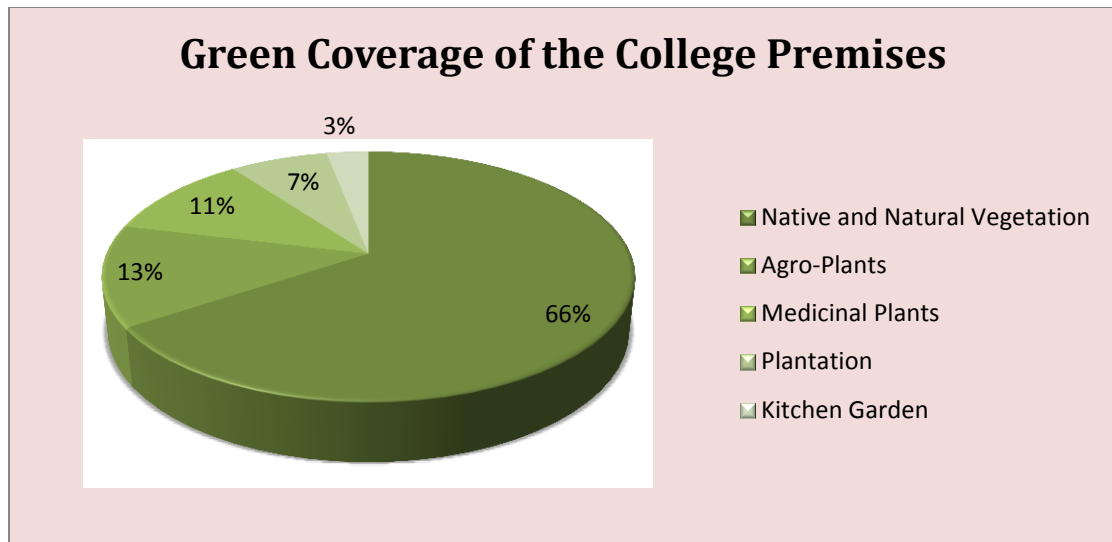


Fig. 11 Green Coverage of the College Premises





Campus visit & Biodiversity observation

Implemented Biodiversity & Green Management		
Sl. No	Factors/ Indicators	Weightage
1	Plants Diversity	H
2	Birds and Insects	H
3	Mammals	M
4	Fishes and Amphibian	L
5	Fungus & Organisms	M

- * H denote- Taken management policy level above 60%
- ** M denote- Taken management policy level 40%-60%
- *** L denote-Taken management policy level below 40%

3.7 Reviews of Documents and Records:

Documents such as admission registers, registers of Engineering and water charge remittance, furniture register, laboratory equipment registers, purchase register, audited statements, and office registers were examined and data were collected. College calendars, college magazines, annual report of the college and NAAC self-assessment reports, UGC report etc. were also verified as part of data collection.

3.8 Review of Policies:

Discussions were made with the College management regarding their policies on environmental management. Future plans of the College were also discussed. The management would formulate a revised environment/green policy for the college in the light of green auditing. The purpose of the green audit was to ensure that the practices followed in the campus are to be in accordance with the Green Policy adopted by the institution.

3.9 Interviews:

In order to college information for green auditing different audit groups which are IQAC Cell, Dept. HOD, Teaching and non-teaching staff, students, Students Union, parents and other stakeholders of the College. Discussions were also made with the PTA office bearers to clarify doubts regarding certain points.

4.0 POST AUDIT STAGE :

4.1. Data Analysis and Assessment :

The base of any Green audit and Environmental audit is that its findings are supported by documents and verifiable information. The audit process seeks, on a sampled basis, to track past actions, activities, events, and procedures to ensure that they are carried out according to systems requirements and in the correct manner.

Although Green & Environmental audits are carried out using policies, procedures, documented systems and objectives as a test, there is always an element of subjectivity in an audit. Each of the three components are crucial in ensuring that the organization's environmental performance meets the goals set in its green policy. The individual functioning and the success of integration will all play a role in the degree of success or failure of the organization's environmental performance.

4.2 Results and Findings:

a) Water -

Water Audit and Assessment:

Sl. No.	Object and Parameter	Observation and Finding
1	Source of water	<ul style="list-style-type: none"> ➤ Underground(60000) ➤ Surface water(120litre) ➤ Surface water bodies(0.02 acre)
2	Capacity of water storage (Daily)	<ul style="list-style-type: none"> ➤ Reservoir and Overhead tanks- 106000liter ➤ Total amount of used -60000ltr ➤ Total misuse of water- 500 ltr
3	Amount of used water per day	60000 liter
4	Misuse of water in daily	Leakage, overflow and Misuse- 500 liter
5	Maximum used of water per day – Bathing and Washroom purpose	45% (27000liter)
6	Amount of water for used per day- Drinking Purpose	18% (10800 liter)
9	pH level of drinking water	7.1
10	TDS level of drinking water	70 ppm - 80ppm
11	Use of surface water	120litre

b. Energy-

- a) ❖ Electricity Consumption – 97016 Unit (Conventional). Rs. 734854/- Per Year
- b) Conventional energy- 97016 Unit
- c) Nonconventional energy-480 unit (Production Capacity)

d) Payable cost of electricity – 734854/- Per Year

❖ Fossil fuel consumption per Year:

- a. Number of Gas cylinders used for cooking purpose(Hostels& Canteen) – 294PC
- b. Number of Gas cylinders used in Chemistry Laboratory - 16PC
- c. Diesel used for green Generator- 100 liter

❖ Number of Green Generators - 2 Unit

❖ Cost of fuel for Generator – Rs. 9000/-year

Energy Audit and Assessment

Sl. No.	Object and Parameter	Observation and Finding
1	Source of energy (conventional)	95%
2	Source of energy (Non-conventional)	Solar- 5%(480Unit)
3	Total consumption of Electric Power	97016 Unit
4	The maximum use of Electric Power	Conventional - 95%
5	Maximum energy consumption in the purpose	Light & Fan- 47768 unit
6	Energy Consumption in Computer & Lab.	19403.2 unit
7	No. of LPG Gas cylinder for coking purpose	294
8	No. of LPG Gas cylinder used in Laboratories	16
9	Amount of diesel used for green generator	100 liter
10	No. of Computers and use of energy	101 (151.5 Unit/Day)
11	No. of AC and use of energy	30(225 Unit/Day)

Energy consumption in different purpose, 2022-23

1.	Lights & Fans	47768 unit
2.	Air Condition	27000 unit
3.	Lifting of water(HP pump)	6791.12 unit
4.	Computer & Dept. Lab	19403.2 unit
5.	Others(CCTV,TV, water cooler & others)	8731.44 unit

C. Wastes-

- Total Students – 2906 persons
- College staff- 102 Persons
- Other Stakeholders – 25 persons
- Total Stakeholders - 3033 persons
- Departments – 15
- Student Hostels - 03
- Canteen- 01
- Type of Wastes & Management: Biological Wastes Disposal by local authority & Bio-fertilizer Unit.
- E-wastes- computers, electrical and electronic parts – Disposal by selling
- Plastic waste- disposal by selling
- Solid wastes – Damaged furniture, Iron & Metal scraps- Disposal by Selling
- Food wastes – Waste Rice, Vegetable, Paper plates- Disposal to by local authority
- Chemical wastes – Laboratory waste treatment –Inadequate -No treatment
- Waste water – washing, urinals, and bathrooms in soak pits
- Glass waste – Broken glass wares from the labs to local authority
- Napkin & Clothes incinerators- Disposal to local authority

Waste Audit and Assessment

Sl. No.	Object and Parameter	Observation and Finding
1	Degradable waste	90(Kg/Day)
2	Non degradable	10(Kg/Day)
3	Source of waste (Organic)	Hostels, Canteen and Garden
4	Source of waste (Chemical Waste)	Zoology Lab., Chemistry Lab., Botany Lab. and Physiology lab
5	Plastic waste management	Use of separate dustbin and Established of different waste unit & Shock pit

e) Green Campus-

Green cover of the campus- 79.75% area

Free space including Playground-12% area

Crops cultivated in the campus:

Chilly, Cabbage, Tomato, Spinach, Brinjal, Cauliflower, Ladies finger, Pea and different seasons flowers are produced during different seasons in Hostels Kitchen garden and College premises area.



Study of Heritage Tree(Haritaki Tree behind the college)

Table 18 Biodiversity and Green Coverage

Sl. No.	Object and Parameter	Observation and Finding
1	Vegetation coverage area	79.75 % Area
2	Types of green coverage	<ul style="list-style-type: none"> ➤ Native and Natural Vegetation- 65 % ➤ Medicinal plants-11% ➤ Agro-plants-13% ➤ Plantation-7%
3	Different types of Animal	<ul style="list-style-type: none"> ➤ Mammals -Squirrel, Rat, Free ranging Cat, Free ranging Dog, Field Rat, Bengal Fox etc. ➤ Amphibian-Snake, Frogs ➤ Birds- Crow, Common Moyna, Pigeon, etc. ➤ Insects- Ants, Butterfly, Spider etc.
4	Biodiversity and Green Management Programme	<ul style="list-style-type: none"> ➤ Awareness program arrange by- Dept. of Zoology and Dept. of Botany among the students and Staff through the year ➤ Observation and celebration of environmental days ➤ Maintain the ponds ecosystem & fishes cultivation

Table 19 Green Coverage of the College Premises

Green Coverage of the College Premises	Area in Percentage
Native and Natural Vegetation	65
Plantation	7
Agro-Plants	13
Medicinal Plants	11
Kitchen Garden	4

f) Carbon Footprint-

- Number of Students & Staff using cycles – 80
- Number of persons using cars – 3
- Number of persons uses two wheelers – 22
- Number of students uses Buses - 750
- Number of visitors per day – 20
- Number of Students staying in the hostel – 142
- Number of Faculty and staff staying in the quarters – 02
- Average distance travelled by stake holders – 20 kms /day
- Expenditure for transportation per person per day – Rs. 40/-

4.3 SUMMARY:

- I. The installation of solar panels, Fire extinguishers training, organic vegetable cultivation, Vermi composting practices are inadequate.
- II. The College campus is plastic free and maintained the outdoor air quality.
- III. The environmental awareness initiatives are adequate..
- IV. Indoor air quality of the laboratories is very uncomfortable and inhospitable.
- V. Use of notice boards and signs are inadequate to reduce over exploitation of natural resources.
- VI. Fully carbon foot prints and wastes free zone actions should be taken to maintain this.
- VII. Rain water harvesting systems, solar power generation, Bio Gas, Re-use of water environmental education programs have to be fully explored.
- VIII. There is Nature club of the College towards its environmental performance for Community development.
- IX. Programs on green initiatives have to be increased. Campus is declared “Clean Campus”

Implemented Air Quality management		
Sl No	Indicator	Weightage
1	Carbon & Smoke free	H
2	Exhaust fans & Ventilation	M
3	Emission of GHGs	M
4	Indoor Plants	L

* H denote- Taken management policy level above 60%

** M denote- Taken management policy level 40%-60%

*** L denote-Taken management policy level below 40%

Major Audit Observations		
Sl. No	Sectors/Indicators	weightage
1	Water efficiency Audit	M
2	Energy efficiency Audit	L
3	Air Quality & Carbon foot print Audit	M
4	Wastes Audit	H
5	Green & Biodiversity Audit	H

* H denote- Taken management policy level above 60%

** M denote- Taken management policy level 40%-60%

*** L denote-Taken management policy level below 40%

4.4 Environmental Education:

The following environmental education program may be implemented in the College before the next green and environmental auditing:-

- ❖ Installation of different captions : No smoking, , switch OFF light and ON after use, plastic free campus etc.
- ❖ Training programs in solid waste management, liquid waste management, setting up of medicinal plant nursery, water management, vegetable cultivation, tree planting, energy management, landscape management, and rain water harvesting and water re-use methods.
- ❖ Conduct exhibition of recyclable waste products
- ❖ Activate the nature or green clubs

- ❖ Set up Organic vegetable garden, Indigenous fish farm etc. for providing proper training to the students.

4.5 Common Recommendations

- ✓ Adopt an environmental policy for the college
- ✓ Introduce UGC Environmental Science course to all students
- ✓ Renovation of cooking system in the canteen to save gas
- ✓ Establish water, waste and energy management systems
- ✓ Establish a purchase policy for environmental friendly materials
- ✓ Conduct more seminars and group discussions on environmental education
- ✓ Students and staff can be permitted to solve local environmental problems

4.6 Criteria Wise Recommendations

Water Audit

- Drip irrigation for gardens and micro irrigation technology can be initiated.
- Establish water treatment systems.
- Remove damaged taps and install sensitive taps is possible.
- Establish the more water reuse unit in the Hostel & staff quarter's area.
- Awareness programs on water conservation to be conducted.
- Drip irrigation for gardens and micro irrigation technology can be initiated.
- Establish the re-use water management methods.
- Establish rain water harvesting systems for each building and each campus.

Energy Audit

- ✓ Replace computers and TVs with LED monitors.
- ✓ More energy efficient fans, tubes and bulb should be replaced.
- ✓ Automatic power switch off systems may be introduced.
- ✓ Employment of more solar panels and other renewable energy sources.
- ✓ Conduct more save energy awareness programs for students and staff.
- ✓ Every classroom and lab with central switch board should have a diagram linking place of tube light, fan etc. with corresponding switch. This will ensure that correct fitting is switched on/ off and can save time & unnecessary operation.
- ✓ Installation of automatic lights with sensors can be considered.
- ✓ Usage of light reflectors is recommended as the reflectors can spread light to relatively large areas.
- ✓ Notices/ signage can be put up/ displayed near switches and on notice boards, informing students and staff to switch off all Departments & Sectors when not in use.
- ✓ Use of large percentage renewable energy should be considered.

Waste Audit

- ❖ Practice of waste segregation to be initiated.
- ❖ Establish of a unit for chemical liquid wastes and Hazardous waste management
- ❖ A model Vermi composting plant to be set up in the Hostels, canteen and Quarters of Establish a Regular functional bio gas plant.
- ❖ A model solid waste treatment system to be established.
- ❖ Practice of waste segregation to be initiated.
- ❖ Establish an e-waste management unit

Green Campus Audit

- ✓ All trees in the campus should be named scientifically.
- ✓ Develop the Herbal and medicinal plants garden for large area
- ✓ Establish a butterfly park.
- ✓ Not just celebrating environment day but making it a daily habit.
- ✓ Providing funds to nature club for making campus more green
- ✓ Establish an Orchid ex-situ zone .
- ✓ Develop the Fruits trees area for Birds conservation
- ✓ Grow potted indoor plants at verandah, class rooms and Laboratories.
- ✓ Create automatic drip irrigation system during summer holidays.
- ✓ Not just celebrating environment day but making it a daily habit.
- ✓ Providing funds to nature club for making campus more green.
- ✓ Conducting competitions among departments for making students more interested in making the campus green.
- ✓ Encouraging students not just through words, but through action for making the campus green.
- ✓ Conducting competitions among departments for making students more interested in making the campus green.

Carbon footprint Audit

- ❖ Establish a more efficient cooking system to save gas.
- ❖ Establish the indoor plants in office rooms ,computer lab and other laboratories to Co₂ management.
- ❖ Providing more college bus services to the students and staff.
- ❖ Establish a system of carpooling among the staff and visitors to reduce the number of four wheelers coming to the college.
- ❖ Encourage students and staff to use cycles.
- ❖ Establish the indoor plants in office rooms ,computer lab and other laboratories to Co₂ management.



Executive Summary: 2022-23

Environmental Audit is a process of systematic, documented, periodic and objective evaluation of components of environmental diversity with the aim of safeguarding the environment and natural resources. The process starts with the systematic identification, quantification, recording, reporting and analysis of components of environmental diversity and is a means of assessing environmental performance (Welford, 2002). It aims to analyze environments within and outside of the concerned area, which will have an impact on the eco-friendly atmosphere. Green and Environmental audit is a valuable means for an institution to determine how and where they are using the most resources; the institution can then consider how to implement changes and take necessary management measures. It can create health consciousness and promote environmental awareness, values and ethics. It provides staff and students better understanding of green impact on their area of work. Environmental auditing and the implementation of mitigation measures is a win-win situation for the institution, the learners and the planet. It can also create health consciousness and promote to holistic approaches to environmental management, awareness, values and ethics. Green and Environmental auditing promote financial savings through efficiency of resource usage. It gives an opportunity for the development of ownership, personal and social responsibility for the students and teachers. If self-enquiry is a natural and necessary outgrowth of a quality education, it could also be stated that institutional self-enquiry is a natural and necessary outgrowth of a quality educational institution. Thus it is imperative that the institute evaluate its own contributions toward a sustainable future. As environmental sustainability is becoming an increasingly important issue for the nation, the role of higher educational institutions in relation to environmental sustainability is more prevalent.

In Jhargram Raj College, Jhargram, W.B the audit process involved initial interviews with the teachers and staffs to clarify policies, activities, records and the cooperation in the implementation of mitigation measures. This was

followed by collection of data through the questionnaires, review of records, observation and enquiry of practices and observable outcomes. In addition, the approach ensured that the management and staff are active participants in the Green and Environmental auditing process. The baseline data prepared for the Jhargram Raj College, Jhargram, W.B. will be a useful tool for campus greening, resource management, planning of future projects, and a document for implementation of sustainable development. Existing data will allow the College to compare its programmes and operations with those of peer institutions, identify areas in the need of improvement, and prioritize the implementation of future projects.

The area of the College premises is 20 acre out of which about 15.95 acre areas is covered by trees, plants etc. and 0.02 acre areas is covered by surface water bodies . In the present audit report most of the aspects are covered such as tree plantation, awareness about environment programmes, rain water harvesting and plastic free premises. The College has already taken some steps to protect the environment with help of teachers, staff and students under the guidance of Dr. Debnarayan Roy Principal, Jhargram Raj College, Jhargram, W.B. We expect that the management will be committed to implement the green and environmental audit recommendations. We are happy to submit this green and environmental audit report to the Jhargram Raj College, Jhargram, West Bengal.