GREEN AND ENVIRONMENTAL AUDIT REPORT

(2022-2023)

JHARGRAM RAJ COLLEGE (GIRLS' WINGS)

JHARGRAM, WEST BENGAL

CONSULTRAIN MANAGEMENT SERVICES,
LAKE ROAD, KOLKATA

TROPICAL INSTITUTE OF EARTH AND ENVIRONMENTRAL 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 (Girls' Wing), 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.

(Dr. Binoy Kr. Chanda)	(Dr. Pranab Sahoo)	(Mrs. Sanchita Bhattachariya)	(Dr. Sudipta Kr. Maiti)
President, TIEER	Asst. Professor & Secretary, TIEER	ISO-Auditor & CEO, CMS	Expert & Member, TIEER

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ACKNOWLEDGEMENT

We, The Environment Audit Team thank the management of Jhargram Raj College (Girls' Wing), Jhargram, West Bengal 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/OIC 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	Assistant Professor in Zoology, Panskura Banomali 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

CONTENTS

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(Girls' Wing) premises

1.1 Goals & Objectives:

It aims to analyses 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
- E-WASTE MANAGEMENT
- ENERGY MANAGEMENT
- BIODIVERSITY

Hon'ble Officer in Charge

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(Girls' Wing) 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 (Girls' Wing) 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 5 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. Jhargram Raj College (Girls' Wing) is situated in the town of Jhargram, the District Head Quarters of Jhargram. It takes about 15 minutes from Jhargram Rail Station. Government and private buses are also available from the nearby towns like Kharagpur and Midnapore. It is about 22 Km by road from Mumbai Kolkata national highway.Jhargram Raj College (Girls' Wing) started its journey in 2014 in the backyard of Jhargram Raj College and for the first 3-4 years it was recognized as nothing more than an annexed part of Jhargram Raj College. Some of it was justified because administrative operations were carried out mostly from Jhargram Raj College. The institution, however, started getting recognized and lauded for some of the infrastructural facilities that were being developed and the various activities that were being conducted in the premises. An auditorium with a seating capacity of over 150, housing state-of-the-art screening facilities and CCTV surveillance got JRC Girls' Wing on the map. Prestigious establishments like the Archaeological Survey of India, along with others, preferred and chose this particular venue to host their regional programmes with the aid of the faculty members of the college. This gave greater exposure to the students from remote margins of the Jungle Mahal area enabling them to be a part of such activities and interactions. In the following years, the college attained incremental independence and, finally, is a completely self-sufficient institution on its own credit with the resources to offer complete support to its staff and students at present. With time, an increasing number of seminars, talks, workshops, film screenings, legal interactive sessions were organized for the students. The infrastructure has kept on getting more advanced adding lifts, labs, games rooms along with a steady improvement of the academic quotient and cultural activities of the college. More Honours departments were added to both the Science and the Arts faculties along with and overhaul of the intake capacity of the students. More facilities like a cycle stand, rainwater harvesting systems, women's hostels are underway. Afforestation programmes are religiously carried out every few months or as and when required. As part of its community care projects, the college has also adopted a remote lodha-sabar village, taken its tiny tots under the wing of the faculty members who have vowed to take care of their educational

needs. Students are encouraged to actively participate in all of the above so that they can inculcate the spirit of social consciousness, environmental awareness along with a holistic evolution of their personalities. The institution has tried to uplift and will continue to strive to care for its ecological and social ecosystem as long as it exists and develop sustainably for a better and brighter future.

Vision & Mission of the College :

We, as citizens of this country, are all concerned about development and to be more specific human development. Each one of us wants all kinds of opportunities and freedoms to live a kind of life that we value. The process of development should at least create an environment for us to develop our full potential and to have a reasonable chance of leading productive and creative lives. This college by providing the girls of the area with an opportunity of education opens the door to this possibility. The vision is to boost their capabilities so that they can take control of their own lives. This is essential to enable them to make proper use of the opportunities they get. The college with all its infrastructure along with scholarships provided by the government creates the opportunity while the faculty members hailing from myriad backgrounds tend to take extra care in encouraging the students to make good use of these to become empowered individuals. We all know that women have achieved their right to education after a long struggle and our mission is to preserve and develop the fruits of that struggle. We also know that women empowerment, both psychological and financial, is the only way to prevent a large number of crimes against women. Our mission therefore is not just to impart formal education but also to raise consciousness among the girls about their position in society and how to change it for the better. Societal change is incremental. Our vision, therefore since the inception, has been to create a new generation of women in the area who are progressive, confident, empowered, who believe in gender equality and know how to claim their rights amidst adversities.

General Information :

Total area of the college campus – 5 acres,
Building area: 2.3 acres,
Green & Vegetated area: 1.7 acres.
Play Ground & Vacant land area: 0.99 acre
Water Bodies area: .01 acre
Departments: 10 (Under Graduate)
Laboratories: 3
Students: 1227
Teaching & Non-teaching staff: 31
Others stakeholder: 5
Total Stake holders: 1263
Auditorium /Seminar hall: 01
Hostels: Nil
Hostel students: Nil
Staff Quarters- Nil

Meeting with Principal and IQAC Team

Audit Team

Drone Survey of the College premises

Table 1 Area Coverage of the College Campus

Area Coverage of College Premises:	Percentage of the area	Area in acres
Building and Construction	46	2.3
Green & Vegetation Cover	34	1.7
Playground and Fallow land	19.8	0.99
Water Bodies	0.2	0.01

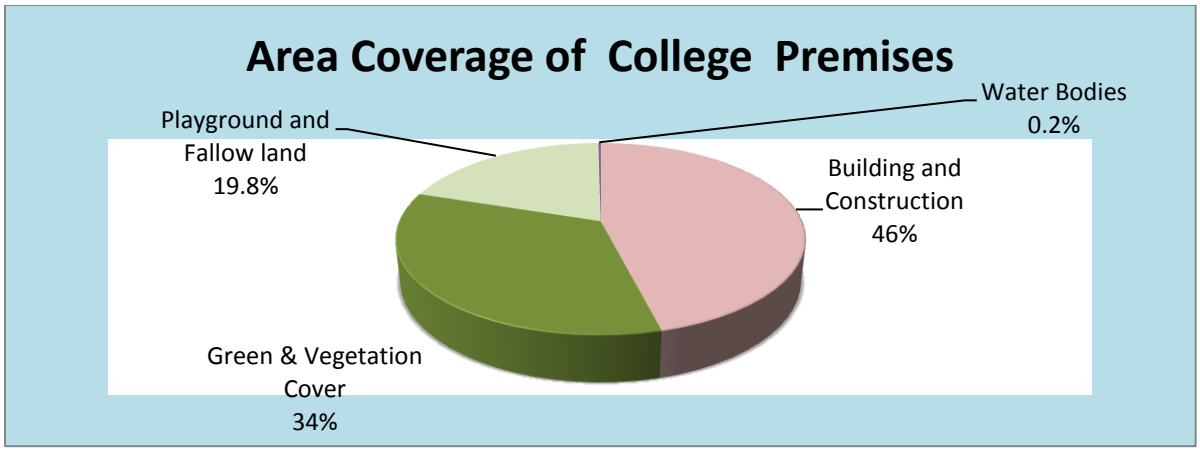


Fig. 1 Area Coverage of College Premises

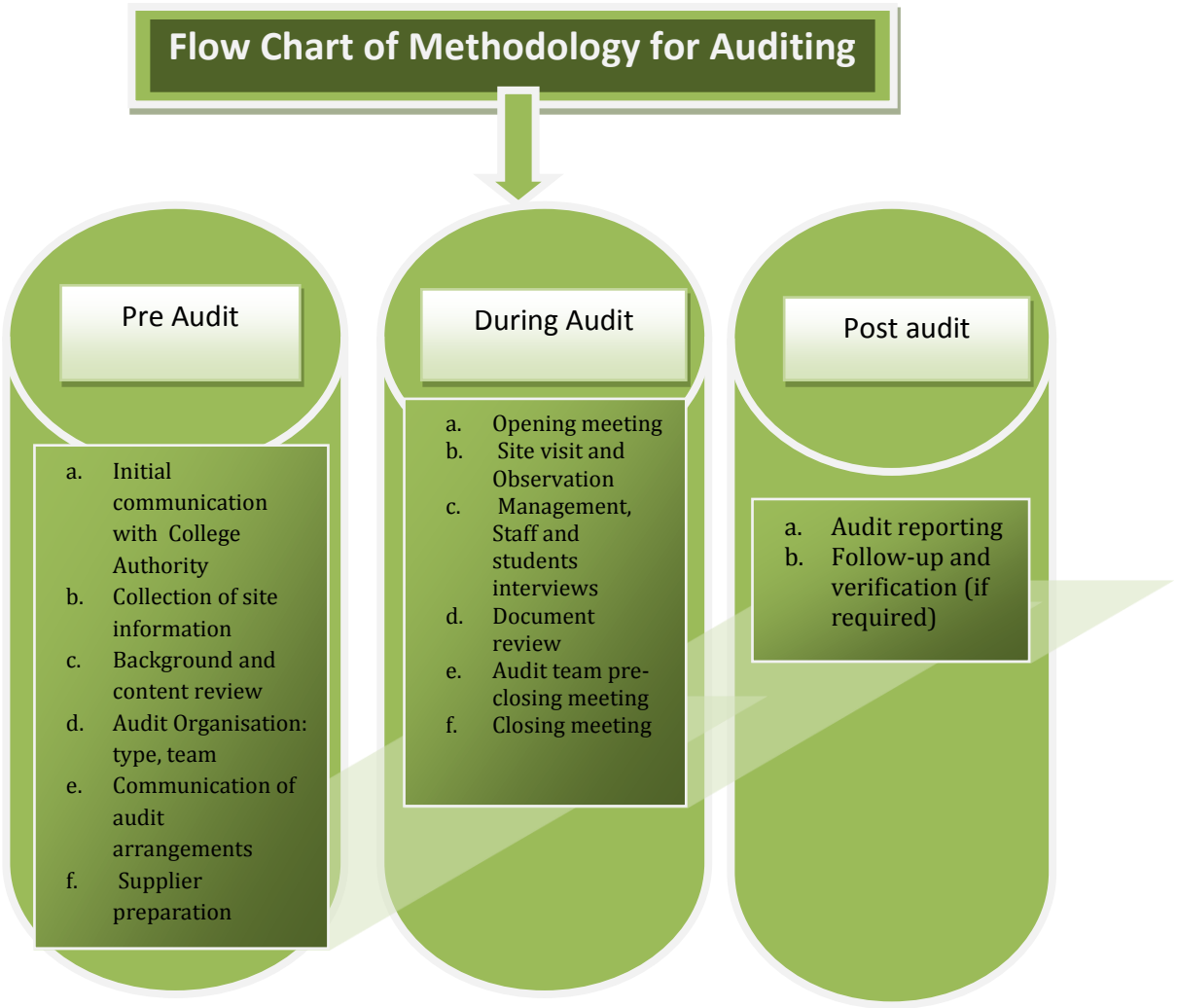
1.3 Purpose of Green and Environmental Auditing:

- 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.

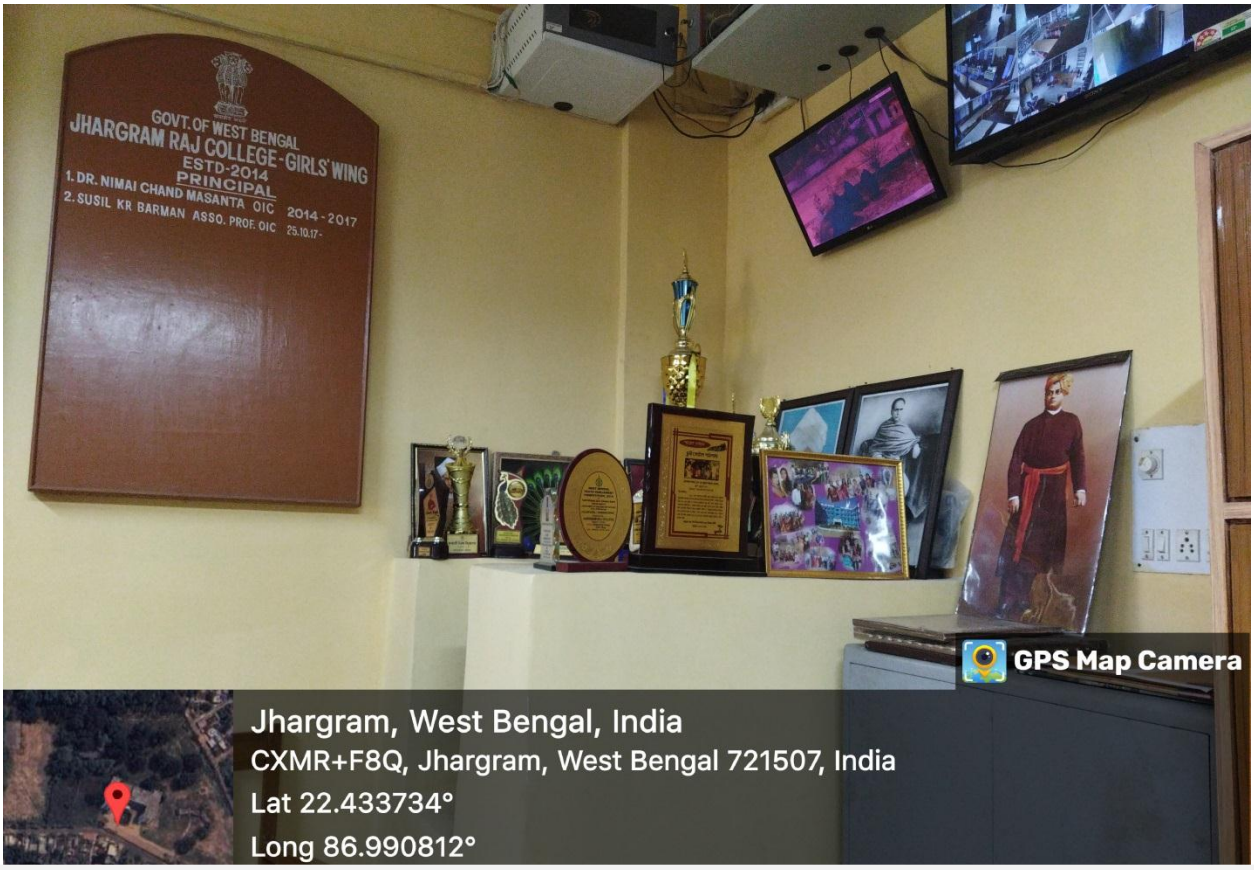


2.2 Site Visit:

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



Use of Energy in Principal chamber

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 form 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.

Administrative Buildings

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

Visiting the Zoology Department

Table-2 Total Stakeholders of the College

Students -	1227 persons
Teaching, Non-teaching and Other Stakeholders	36 persons
Total	1263 persons
Approximate no of visitor (per day)-	16 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 and gardening purpose. The maximum water is use for washing purpose in the college. About 6300 Litre water has been consumed for that purpose.
b.	Total Consumption of water	About 14000 Litre water per day
c.	Water wastage	The leakage and misuse of water is about 70Litre 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	Water Reservoir	The water reservoir are available in college campus. About 0.01 acre area has covered with three site.

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

Use of water in Different Purpose Per Day	Use in Percentage	Use in Liter
Washroom purpose	45.00	6300
Grading	25.00	3500
Drinking	22.00	3080
Cleaning	6.50	910
leakage	0.5	70

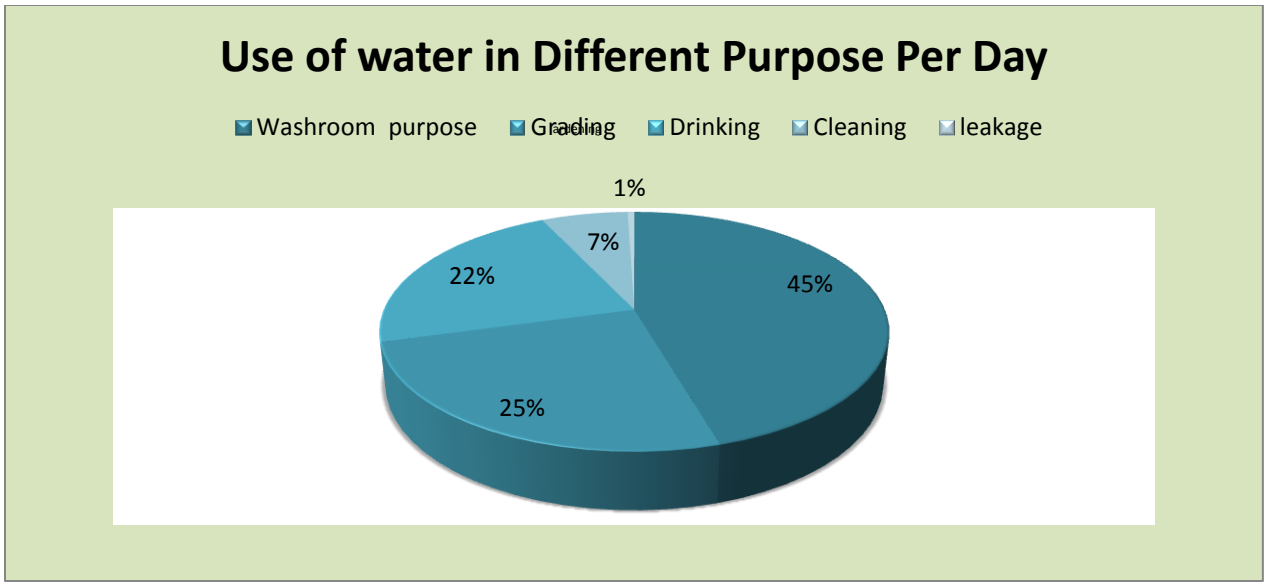


Fig.2 Use of water in Different Purpose Per Day

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

Water Pump(Source of Underground water)

Drinking Water Facility

Drainage outlet

Water **leakage point**

3.3 Energy Efficiency and Energy Management:

a	Energy sources	Sources of Energy: Conventional Electricity & Diesel
b.	Energy consumption	The useable energy is Conventional. The used Electricity energy is 30661 units which costing is Rs.2. 44Lakh/-, The Maximum energy is consumed for Light & Fan and Computer Section amounting to 64% of total consumption.

Table-4 Source of Energy in Percentage

Source of Energy	In Percentage
Conventional	100
Non -Conventional	0

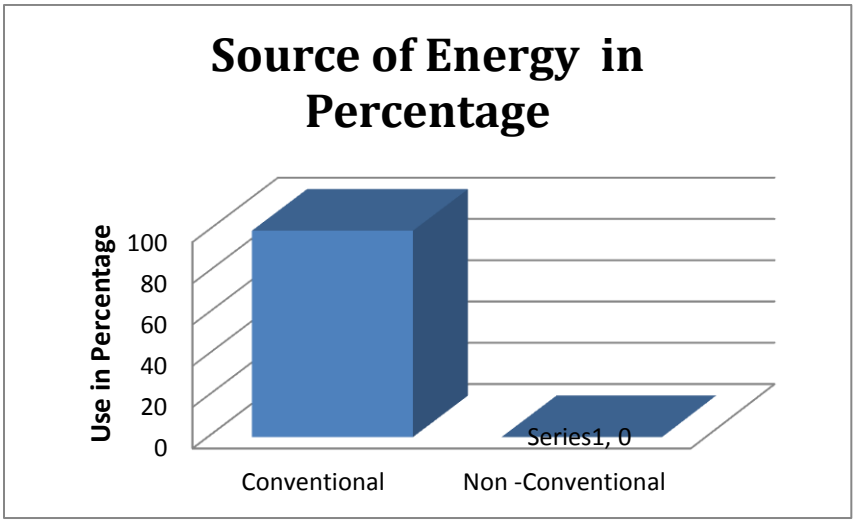
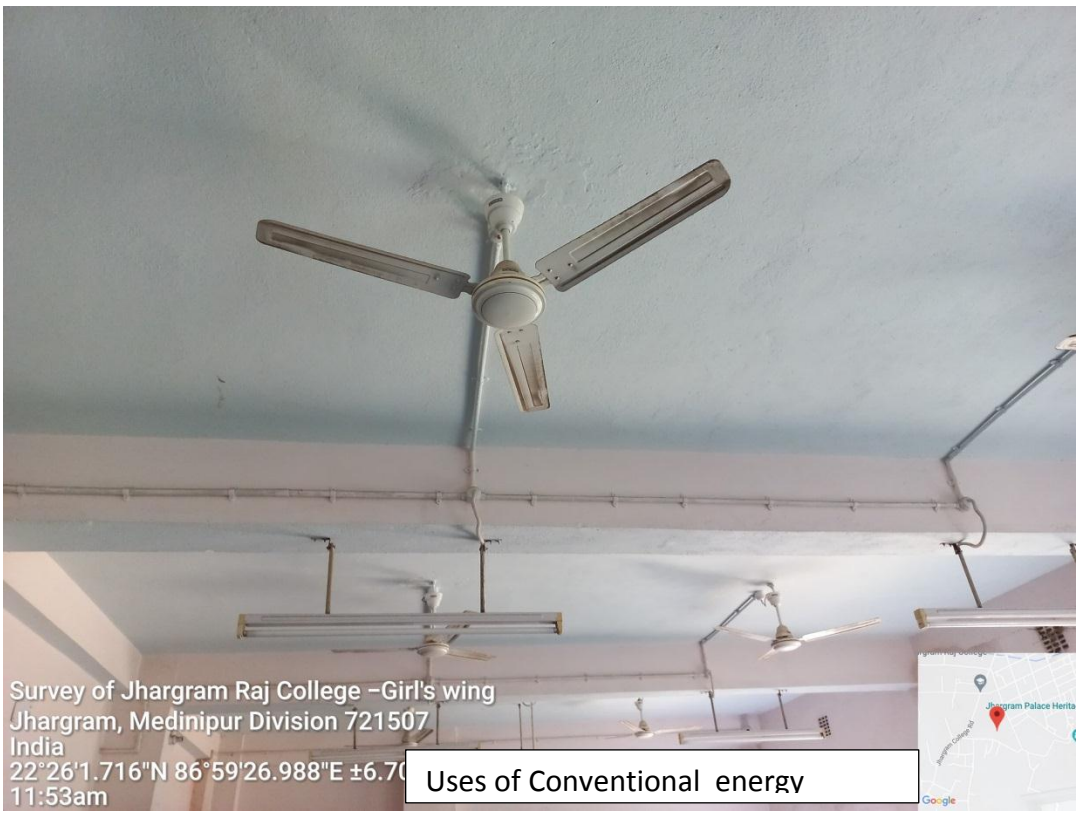


Fig. 3 Use of Energy in Percentage

Source of Conventional energy

Measurement of Indoor air quality



Uses of Conventional energy

Table-5 Energy Consumption in different Purpose in Percentage

Energy Consumption in different Purpose	In Percentage
Light and Fans	42
Computer and Laptop	22
Street light	14
AC	11
Pump	7
Others	4

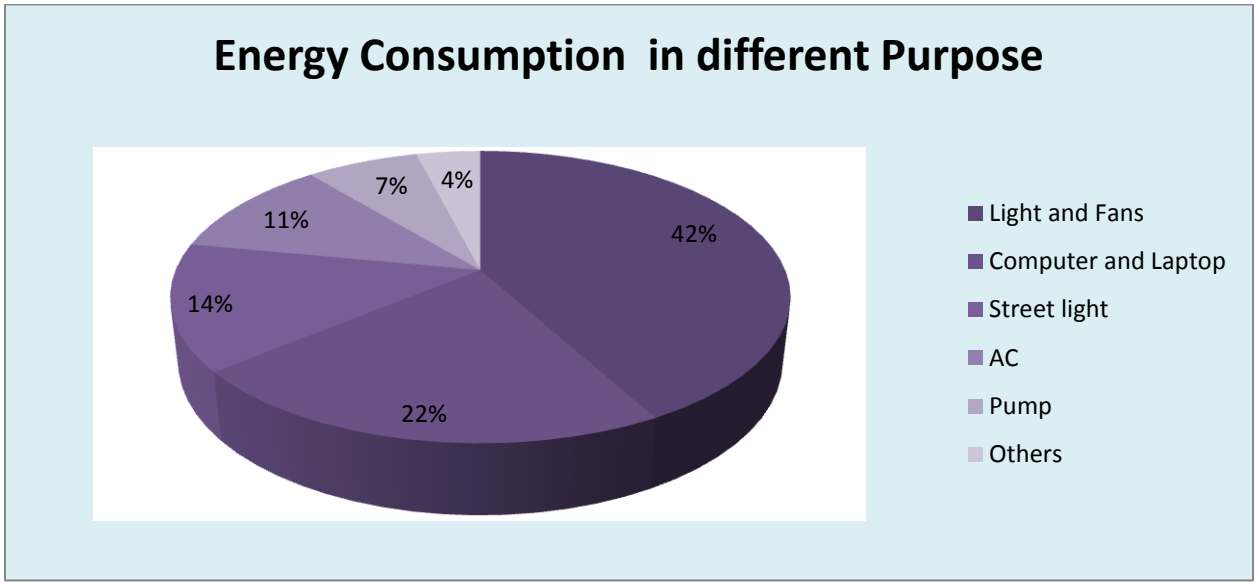


Fig. 4 Percentage of Energy Consumption in different Purpose

Recommendations:

a) Standard Operation Procedures (SOPs) should be prepared and followed for green purchasing wherein equipment's with star rating; those using eco-friendly materials; those with safe disposal policy or return to supplier after unused, can be considered.

b)For purchasing new electronic appliances, star rating provided by Bureau of Energy Efficiency (BEE) should be considered. The equipment which has maximum star ratings could be purchased, which will consume less energy, ensure environmental sustainability and also operate at low cost.

c) 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.

d) Installation of automatic lights with sensors can be considered.

e) Usage of light reflectors is recommended as the reflectors can spread light to relatively large areas.

f) 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.

g) Use of large percentage renewable energy should be considered.

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 CO_2 (ppm) in different location of the College Campus

Different location of the College Premises	Amount of CO_2 (ppm)
Principal Office	460
Administrative Office	440
Physiology Lab	430
Zoology Lab	440
Gymnasium Hall	425
Digital Classroom/Smart Classroom	460
Computer Lab	460
Play Ground	410
Outdoor	400

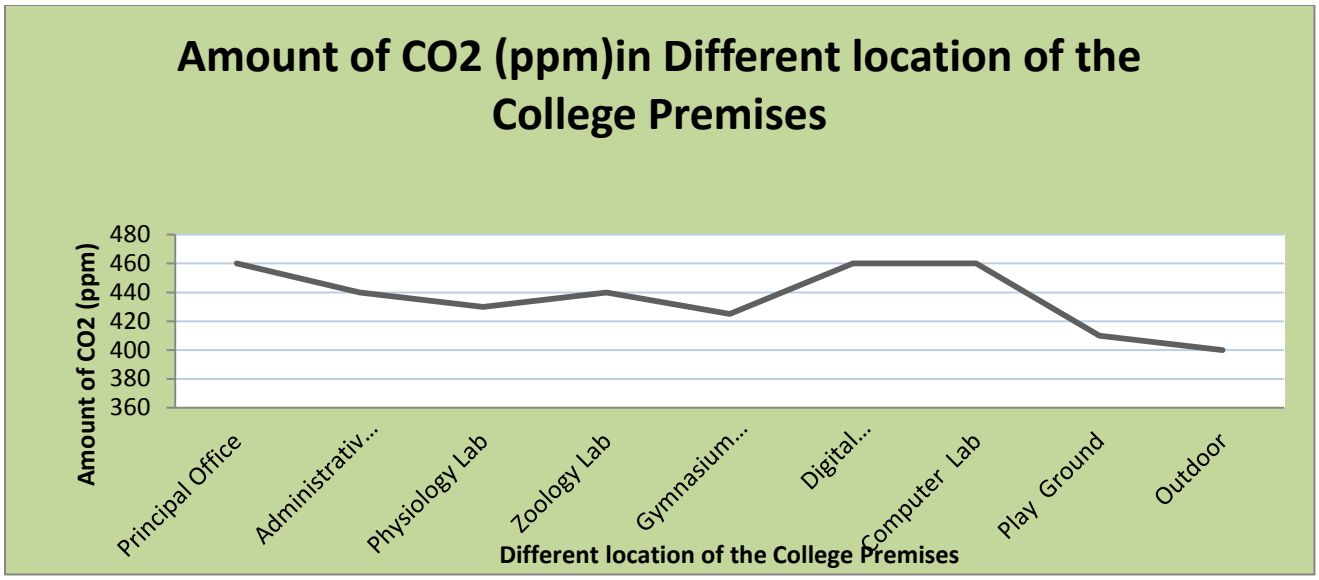


Fig. 5 Amount of CO_2 (ppm) in Different Location of the College Premises

Table-7 Amount of CO_2 (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)	460

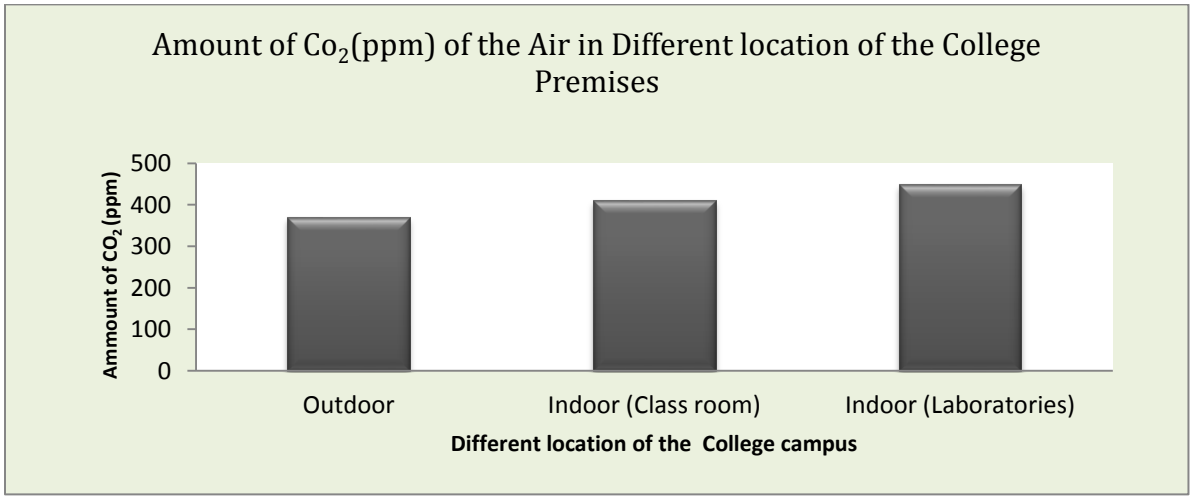


Fig. 6 Amount of CO_2(ppm) of the Air in Different location of the College Premises

Greenery part 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.

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	15
Non degradable	2

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; 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.
Office	2.0	0.5
Department & Laboratories	1.5	0.8
Forest and Garden	11	0.2
Others	0.5	0.5

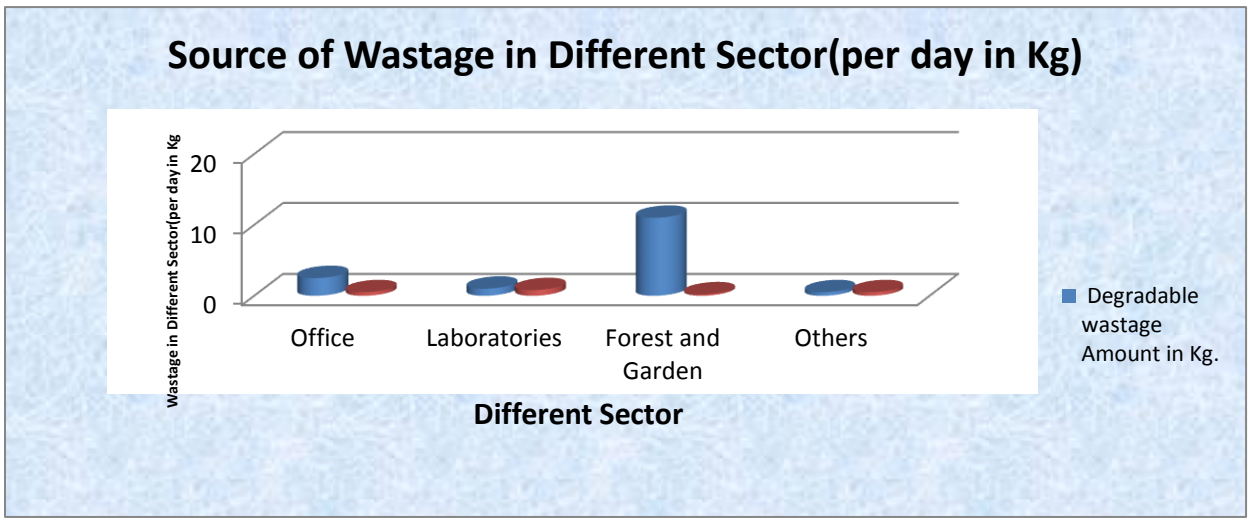


Fig. 7 Source and Amount of Wastage in Different Sector (per day in Kg)

Use of separate Dustbin for Wastage management

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	M
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%

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 34% area is under greenery and biodiversity zone and 0.2% 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..

Table 10 Area Coverage of the College Campus

Area Coverage of College Premises:	Area in acres
Building and Construction	2.3
Green & Vegetation Cover	1.7
Playground and Fallow land	0.99
Water Bodies	0.01

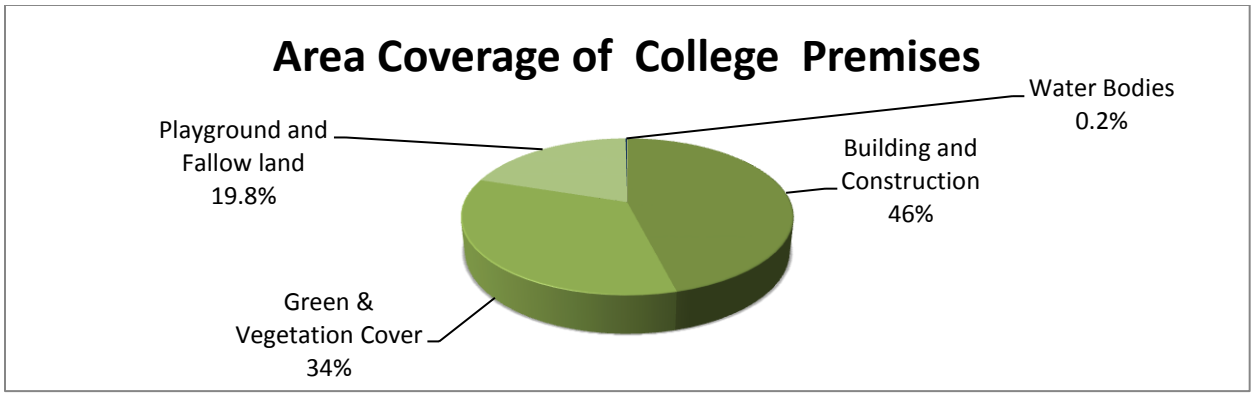


Fig. 8 Area coverage of the College Premises

Biodiversity Study:

Plant diversity – The campus of Jhargram Raj College(Girls' Wing) is lashing green and surrounded by large **Sal** (*Shorea robusta*) trees. There is a one main buildings Academic cum Administrative buildings and rest huge lands are covered by sal trees and other large trees like Mango, Mohua etc. (*Mangifera indica, Bassia latifolia* etc.). Large mango trees (GBH – 335cm, 450cm etc.) are found here and there on east and north side of the academic building and within the campus. One medicinal plant garden with Herbal Garden and different fruit yielding trees are found behind the Administrative buildings, which needed restoration. The north side of the Academic cum Administrative buildings is surrounded by large Sal, Neem (*Azadirachta indica*), Debdaru (*Polyalthia lingifolia*), etc. trees. 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 17 tree species, 14 shrubs, 12 herbs. The dominant species is Sal here. Sal associates are *Croton oblongifolia, Combretum roxburghii* are available here like a natural forest.

There are small surrounded areas for plantation of ornamental or flowering plants in front in main Administrative building. 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. From this data Carbon sequestration potential of trees have been calculated. It is found that from above ground biomass of trees stocked **1135.5**kg. of carbon within a quadrat, which is a large amount.

Aerial view of biodiversity zone & Biodiversity measurement

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

Sl. No.	Scientific name	Family
1	*Albizia lebbeck* (L.) Benth.	Fabaceae
2	*Alstonia scholaris* (L.) R. Br.	Apocynaceae
3	*Araucaria araucana* (Molina) K.Koch	Araucariaceae
4	*Artocarpus heterophyllus* Lam.	Moraceae
5	*Azadirachta indica* A.Juss.	Meliaceae
6	*Bombax ceiba* L.	Malvaceae
7	*Callistemon viminalis* (Sol. Ex Gaertn.) G.Don	Myrtaceae
8	*Carissa carandas* L.	Apocynaceae
9	*Casuarina equisetifolia* L.	Casuarinaceae
10	*Dalbergia ssisso* DC.	Fabaceae
11	*Diospyros melanoxylon* Roxb.	Ebenaceae
12	*Eucalyptus globules* Labill.	Myrtaceae
13	*Gmelina arborea* Roxb.	Lamiaceae
14	*Lagerstroemia speciosa* (L.) Pers.	Lythraceae
15	*Magnolia champaca* L.	Magnoliaceae

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

Sl. No.	Scientific name	Family
1	*Agave angustifolia* Haw.	Asparagaceae
2	*Agave sisalana* Perrine	Asparagaceae
3	*Aristolochia indica* L.	Aristolochiaceae
4	*Asparagus racemosus* Willd.	Asparagaceae
5	*Asparagus setaceus* (Kunth) Jessop	Asparagaceae
6	*Bougainvillea glabra* Comm. Ex Juss	Nyctaginaceae
7	*Caladium bicolor* (Aiton) Vent.	Aracaceae
8	*Calotropis procera* (Aiton) Dryand.	Asclepiadaceae
9	*Calotropis gigantea* (L.) Dryand.	Apocynaceae
10	*Canna indica* L.	Cannaceae
11	*Cissus quadrangularis* L.	Vitaceae
12	*Citrus limetta* Risso	Rutaceae
13	*Clerodendrum indicum* (L.) Kuntze	Lamiaceae
14	*Croton oblongifolia*	Euphorbiaceae
15	*Datura stramonium* L.	Solanaceae
16	*Datura suaveolens f. albidoflava* (Lem.) Voss	Solanaceae
17	*Dracaena reflexa* Lam.	Asparagaceae
18	*Duranta erecta* L.	Verbenaceae
19	*Eupatorium odoratum* L.	Asteraceae
20	*Euphorbia milii* Des Moul.	Euphorbiaceae

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

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

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

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

Table – 2: List of Medicinal plants in Herbal Garden

Sl. No.	Local Name	Scientific Name	Family
1	Basak	*Adhatoda vasica* (Nees.)	Acanthaceae
2	Satamul	*Asparagus racemosus* Willd.	Asperagaceae
3	Kalo Halud	*Curcuma caesia* Roxb.	Zingiberaceae
4	Citronella	*Cymbopogon nardus* (L.) Rendle	Poaceae
5	Anantamul	*Hemidesmus indicus* (L.) R.Br.	Asclepiadaceae
6	Patharkuchi	*Kalanchoe pinnata* (Lam.) Pers.	Crassulaceae

7	Golmorich	*Piper longum* L.	Piperaceae
8	Sarpagandha	*Rauvolfia serpentina* (L.) Benth. Ex. Kurz	Apocynaceae
9	Arjun	*Terminalia arjuna* (Roxb. ex DC.) Wight &Arn.	Combretaceae

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

Sl. No.	Scientific name	Common name	Family
1	*Aegle marmelos*	Bel	Rutaceae
2	*Annona squamosa*	Ata	Annonaceae
3	*Artocarpus heterophylla*	Jack Fruit	Moraceae
4	*Averrhoa carambola*	Kamranga	Oxalidaceae
5	*Bassia latifolia*	Mahua	Sapotaceae
6	*Carica papaya*	Pepe	Caricaceae
7	*Citrus decumana*.	Batabilabu	Rutaceae
11	*Mangifera indica*	Aam	Anarcardiaceae
12	*Mimusops elengii*	Bakul	Sa1potaceae
13	*Moringa Oleifera*	Sajne	Moraginaceae
15	*Psidium guava*	Piara	Myrtaceae
17	*Spondidas dulcis*	Bilati Amra	Anacardiaceae
18	*Syzygium samarangense*	Jamrul	Myrtaceae
19	*Tamaridus indica*	Tetul	Casaelpiniaceae
20	*Zizyphus mauritiana*	Kul	Rhamnaceae

Quadrat - 1

Tree Quadrat (10m x 10m)

Sl. No.	Scientific name	GBH (in cm)	Height (in m)
1.	*Shorea robusta*	88	20
2.	*Shorea robusta*	95	21
3.	*Delonix regia*	220	17
4.	*Polyalthia longifolia*	70	11
5	*Shorea robusta*	85	19
6	*Shorea robusta*	75	17

Shrub quadrat (5m x 5m)

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

Herb quadrat (1m x 1m)

Sl. No.	Scientific name	Number of individuals
1.	*Hemidesmus indicus*	4
2.	*Desmodium triflorum*	2
3.	*Andropogon aciculatus*	9
4.	*Digitaria sanguinales*	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	4	420	215
2	225-250	2	2641	920.5
			Total	**1135.5**

Observation of Medicinal plants Garden

Small patches of seasonal flower garden and water body also in front of College premises

Faunal Diversity:

Jhargram Raj College Girls' wing 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.

Few suggestions for biodiversity management – The College has a lash 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	69
Agro-Plants	13
Medicinal Plants	11
Plantation	7

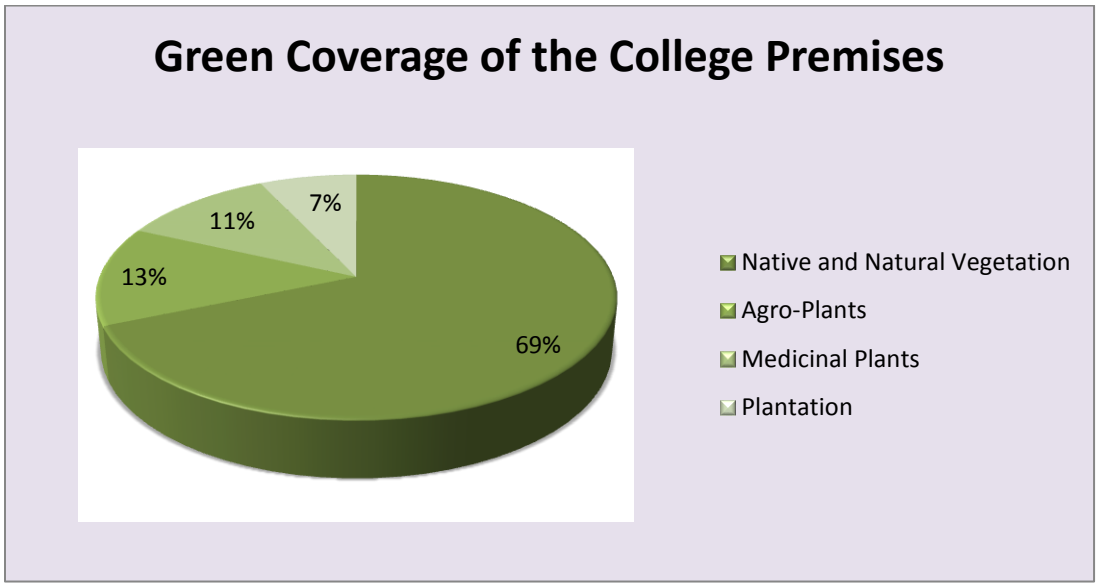


Fig. 11: Green Coverage of the College Premises

Native and Natural Vegetation space

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

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	➢ Underground(14000liter) ➢ Surface water bodies(0.05 acre)
2	Capacity of water storage (Daily)	➢ Reservoir and Overhead tanks-15000liter ➢ Total amount of used -13930 ltr ➢ Total misuse of water- 70 ltr
3	Amount of used water per day	14000 liter
4	Misuse of water in daily	Leakage, overflow and Misuse- 70 liter
5	Maximum used of water per day – Washroom purpose	45% (6300 liter)
6	Amount of water for used per day- Drinking Purpose	22% (3080 liter)
9	pH level of drinking water	7.1
10	TDS level of drinking water	70 ppm - 80ppm

b. Energy-

a) ❖Electricity Consumption – 30661 Unit (Conventional). Rs. 2.44 Lakh Per Year
b) Conventional energy- 30661 Unit
c) Payable cost of electricity – 2.44 Lakh Per Year
❖ Fossil fuel consumption per Year: 50 Liter
❖Number of Green Generators - 1 Unit
❖Cost of fuel for Generator – Rs. 4500/- Year

Energy Audit and Assessment

Sl. No.	Object and Parameter	Observation and Finding
1	Source of energy (Conventional)	100%
3	Total consumption of Electric Power	30661 Unit
4	The maximum use of Electric Power	Conventional - 100%
5	Maximum energy consumption in the purpose	Light & Fan- 47768 unit
6	Energy Consumption in Computer & Lab.	6745.42 unit
9	Amount of diesel used for green generator	50 liter
10	No. of Computers and use of energy	18 (26.91 Unit/Day)
11	No. of AC and use of energy	7(52.5 Unit/Day)

Energy consumption in different purpose, 2022-23		
1.	Lights & Fans	12877.62unit
2.	Air Condition	3372.71 unit
3.	Lifting of water(HP pump)	2146.27 unit
4.	Computer & Dept. Lab	6745.42 unit
5.	Street light	4292.54 unit
6.	Others(CCTV,TV, water cooler & others)	1226.44 unit

c. Wastes-

- Total Students – 1227 persons
- Other Stakeholders – 36 persons
- Total Stakeholders - 1263 persons
- Departments – 10
- 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
- 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	15(Kg/Day)
2	Non degradable	2(Kg/Day)
3	Source of waste (Organic)	Garden
4	Source of waste (Laboratories Waste)	Zoology Lab and Physiology Lab
5	Plastic waste management	Use of separate dustbin and Established of different waste unit

d) Green Campus-

Green cover of the campus- 34% area

Free space including Playground-19.8% area

Table 18 Biodiversity and Green Coverage

Sl. No.	**Object and Parameter**	**Observation and Finding**
1	Vegetation coverage area	34 % Area
2	Types of green coverage	➢ Native and Natural Vegetation- 69 % ➢ Medicinal plants-11% ➢ Agro-plants-13% ➢ Plantation-7%

3	Different types of Animal	➢ 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	➢ Awareness program arrange by- Dept. of Zoology and Dept. of Physiology 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	69
Plantation	7
Agro-Plants	13
Medicinal Plants	11

e) Carbon Footprint-

- Number of Students & Staff using cycles – 190
- Number of persons using cars – 3
- Number of persons uses two wheelers – 12
- Number of students uses Buses and other transport - 734
- Number of visitors per day – 12
- Number of Faculty and staff staying in the quarters – 00
- Average distance travelled by stake holders – 2- 10 kms /day
- Expenditure for transportation per person per day – Rs. 30/-

4.3 SUMMARY:

I. The installation of solar panels, , 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 NSS team 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	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%

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, medicinal plant garden, And 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
- ✓ 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 the re-use water management methods.
- ➢ Establish rain water harvesting systems for each building and each campus
- ➢ Establish water treatment systems.
- ➢ Remove damaged taps and install sensitive taps is possible.
- ➢ Awareness programs on water conservation to be conducted.
- ➢ .

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.
- ✓

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 college campus.
- ❖ Establish an e-waste management unit
- ❖ 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.

Green Campus Audit

- ✓ All trees in the campus should be named scientifically.
- ✓ Develop the Herbal and medicinal plants garden for large area
- ✓ Create more space for planting in vacant land.
- ✓ 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 CO_2 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 CO_2 management.
- ❖ Providing more college bus services to the students and staff.

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 (Girls' wing), 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(Girls' wing), 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 programmers 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 5 acre out of which about 1.7 acre areas is covered by trees, plants etc. and 0.01 acre areas is covered by micro water bodies In the present audit report most of the aspects are covered such as tree plantation, awareness about environment programmers, 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 Prof.. Sushil Kumar Barman, OIC, Jhargram Raj College (Girls' Wing), 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(Girls' wing),, Jhargram, West Bengal.