GREEN & ENVIRONMENTAL AUDIT REPORT (2022-23)

THE BHAWANIPORE EDUCATION SOCIETY COLLEGE, KOLKATA, WEST BENGAL

CONSULTRAIN MANAGEMENT SERVICES, LAKE ROAD, KOLKATA

TROPICAL INSTITUTE OF EARTH, & ENVIRONMENTAL RESEARCH (TIEER), MIDNAPORE

GREEN AUDIT : 2022-23

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

LIST OF EXPERTS AND SCIENTISTS

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 Bhattacharya	ISO 14001 auditor, Consultrain Management services, Kolkata	Environment Management
4.	Dr. Bhaskar Bhowmik	Assistant Professor, Dept. of Green Entrepreneurship, IIT, Kharagpur	Green Technology & Marketing
5	Dr. Somnath Ghosal	Assistant Prof, G-1, Rural Development IIT, KHARAGPUR	Biodiversity, Environment and Green Urban Planning
8	Dr. SK MafizulHaque	Assistant Professor in Geography, CU	Climate Change and Environment Management and RS-GIS Techniques
6.	Dr. BodruddzaArefin	Assistant Professor, Dept of Botany, Jhargram Raj College	Botany & Indigenous Flora
`9	Dr. MrinmoyGhorai	Assistant Professor in Zoology, PanskuraBanomaliCollege	Fauna & Aqua animals
10	Sri Indrajit Dasgupta	Consultrain Management Services	Auditing & Management
15	Sri Amal Sasmal	Consultant, EIA and EMS	Environmental Management
12	Dr. Chandan Karan	Faculty, Dept. of Geography, S.B. Mahavidyalaya, Kapgari	Land use Survey, Technician for Lab test. and Map Designer
13	Dr. Suvendu Ghosh	Assistant Teacher	Soil Management and Environment Management
14	Dr. Kathakali Bandopadhyay	Assistant Professor-SRMV	Environmental Science & Green Technology

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CHAPTER-1

1.0 INTRODUCTION

Environmental auditing is a systematic, documented, periodic and objective evaluation to assess an organization's activities and services in relation to:

- Facilitating management control of environmental practices
- Promoting good environmental management
- Raising staff awareness and enforcing commitment to the departmental environmental policy
- Exploring improvement opportunities
- Establishing the performance baseline for developing an Environmental Management System (EMS)

1.1 Goals and Our Mission

Environment auditing is the process of identification and determination of the Institution's practices in creating awareness and practicing the environment friendly measures. Over the period of time, excessive exploitation of resources like energy, water, etc. have resulted in environmental degradation. It is necessary to check whether our way of living and exhausting the resources is going to cause detrimental effects in our surroundings. Environmental audit report aims at summarizing the College's contribution and its activeness in creating awareness and consciousness in practically applying the environmental friendly measures towards an institute.

The main objectives of carrying out the Environmental Audit are:

- To estimate the Energy requirements of the Institution
- To report the expenditure on green initiatives, carbon footprint
- To record the air and water quality
- To conserve the natural resources
- To record the waste disposal system

1.2 Advantages of Green & Environmental Audit

- To develop more efficient resource management
- 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 create plastic free campus and evolve health consciousness among the stakeholders
- To develop environmental ethics and value system in youngsters.
- Green and Environmental auditing should become a valuable tool in the management and monitoring of environmental and sustainable development programs.

CHAPTER-2 COLLEGE PROFILE

2.1 About the College

The Bhawanipur Education Society College was founded in 1966 with the motto "Education for Excellence" through the Bhawanipur Gujarati Education Society. Accredited by NAAC and affiliated to the University of Calcutta, BESC was created under Article 30 (1) of the Indian Constitution, which guarantees linguistic minorities, such as the Gujarati-speaking community in Kolkata, the right to establish and administer educational institutions of their choice. We started in 1966 with less than a hundred students, but in the decades since, BESC has strived to extend its motto to a truly diverse body of students, admitting eligible pupils regardless of linguistic, religious or regional backgrounds.
Established and administered by The Bhawanipur Gujarati Education Society. A minority-run institution. Affiliated to the University of Calcutta. Recognised under section 2(f) & 12(B) of the UGC Act, 1956.

Umang is the annual cultural fest and the college also conducts Model United Nation Conference which was started in 2016.

Previous NAAC Grading:
The National Assessment and Accreditation Council (NAAC) awarded The Bhawanipore Education Society College with a 3-star status.

2.2 Campus Area and Infrastructure

Total area of the College – 3946.84 Sqm
Main College Building –3460.22 Sqm
Annex building –486.62 Sqm
Unit 2 -739.59 Sqm

Facilities available area wise:

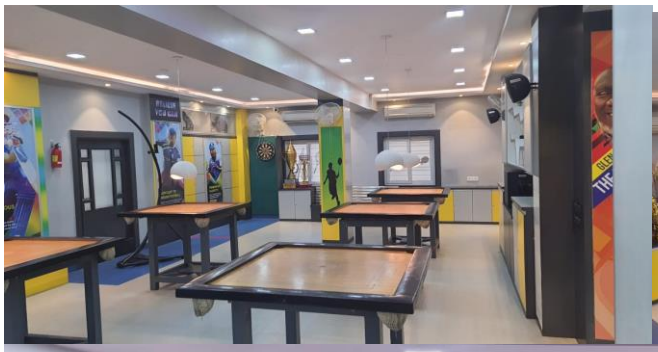
MAIN CAMPUS	ANNEX BUILDING	UNIT 2
Administrative building	Science Laboratories	Roof water harvesting
Society Office rooms	Pump House	Garden
Central Library	Electrical	
Class rooms		
Conferences		
Theatres		
Lifts		
Sports complex		
Auditorium		

Playground
Over Head Water Reservoir
Centralized Air conditioning
Garden

No. of Departments:	23	Main campus/Annex building/Unit 2
Science	07	
Humanities	12	
Commerce	03	
Other	01	
No of Class rooms :	82	Main Campus
No. of Laboratories :	33	Main Campus – 10 nos, Annex building – 23 Nos
Science Labs:	23	Annex Building
Computer Labs:	07	Main Campus – 06 Nos, Unit 2 – 01 Nos
Film studies labs:	01	Main campus
Conferences:	03	Main campus – 03
College Auditorium:	02	Main campus
Central Library:	01	Main campus
Kitchen:	02	Main Campus
Cafeteria:	01	Main Campus
No of Elevators:	05	Main Campus – 04 Nos, Annex Building – 01 Nos
Office rooms :	41	Main Campus – 38, Annex building – 03 nos
Toilets :	55	Main Campus – 48 Nos, Annex Building – 07 nos
Play Ground (own)	01	Main Campus
Garden area:	01	Main Campus
Butterfly Garden	0	
Medicinal plant garden	0	
Garbage area / Heap	01	Main Campus
Open Drainage	0	
Water Supply Service:	Bulk Water Supply by KMC	
Green Generator:	02	Main Campus
Roof water harvesting & Ground water recharge unit:	01	Unit - 2
Reuse of water unit	01	Unit - 2
Total Strength of the College (students, teachers and non teaching staff) :	12,256	
No of Students :	11800	
No of Teachers:	116	
No of non teaching staff	326	
Others	14	
Bus/Railway Station :	Within 500 meters	
Guard Outpost:	2	Main Gate & Annex building

2.3 Academic Department and Growth Centre

Academic Departments
GRADUATION :
Humanities (BA)
English
Bengali
Hindi
Education
Sociology
Geography
History
Political Science
Psychology
Journalism & Mass Com
Film Studies
Commerce (B Com Morning; Evening & Afternoon)
Science (B Sc)
Maths
Physics
Chemistry
Economics
Computer Science
Electronics
Statistics
Business Administration (BBA)
POST GRADUATION
English
Commerce



CHAPTER – 3 : Green & Environmental Auditing

3.1 Affirmation and commitment of the College:

The Management of the IQAC Cell& Infrastructure Department of the College has shown dedication and commitment towards the green auditing during the pre-audit meeting. They encouraged and supported all green activities. It was decided to promote all activities that are environment friendly such as awareness programs on the environment, campus farming, planting more trees, biodiversity management on the campus etc., after the green auditing. The Management of the College was willing to formulate policies based on the Green auditing report.

3.2 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 also included in the Auditing Report.

SL.NO	PURPOSE	DATE	REMARKS
1.	Communication with the College authority	09-12-2022	Discussion about terms and conditions
2.	Opening Meeting	17-01-2023	Submitted the survey schedule
3.	Collection of information about the College	17-01-2023	Introduced to Departmental Heads / Officers /staff
4.	Campus visit and observation	18-01-2023	Physically enquiring with expert
5.	Departmental visit and enquiry	18-01-2023	Enquiry conducted in Departments and Laboratories
6.	Interviewing faculty and students	18-01-2023	Gathered facts and data
7.	Review data and Assessment	06-02-2023	Meeting with auditors
8.	Pre Closing meeting	06-02-2023	Deciding on the finelines
9.	Closing Meeting	06-02-2023	Meeting with Green Audit team, Dept HODs and TIC
10.	Submission of Audit report	01-03-2023	Vote of thanks exchanged

Site Visit :

The campus and its premises were visited and analyzed by the audit-teams several times to gather information. Campus trees were counted and identified. Medicinal garden, Ground, canteen, library, classrooms, office rooms, were visited to collect data. Energy usage was calculated by identifying the total electricity consumption. Details of water taps and water usage were determined. The sources of wastes were identified and categorized into biodegradable and non-biodegradable wastes.

Group Discussion

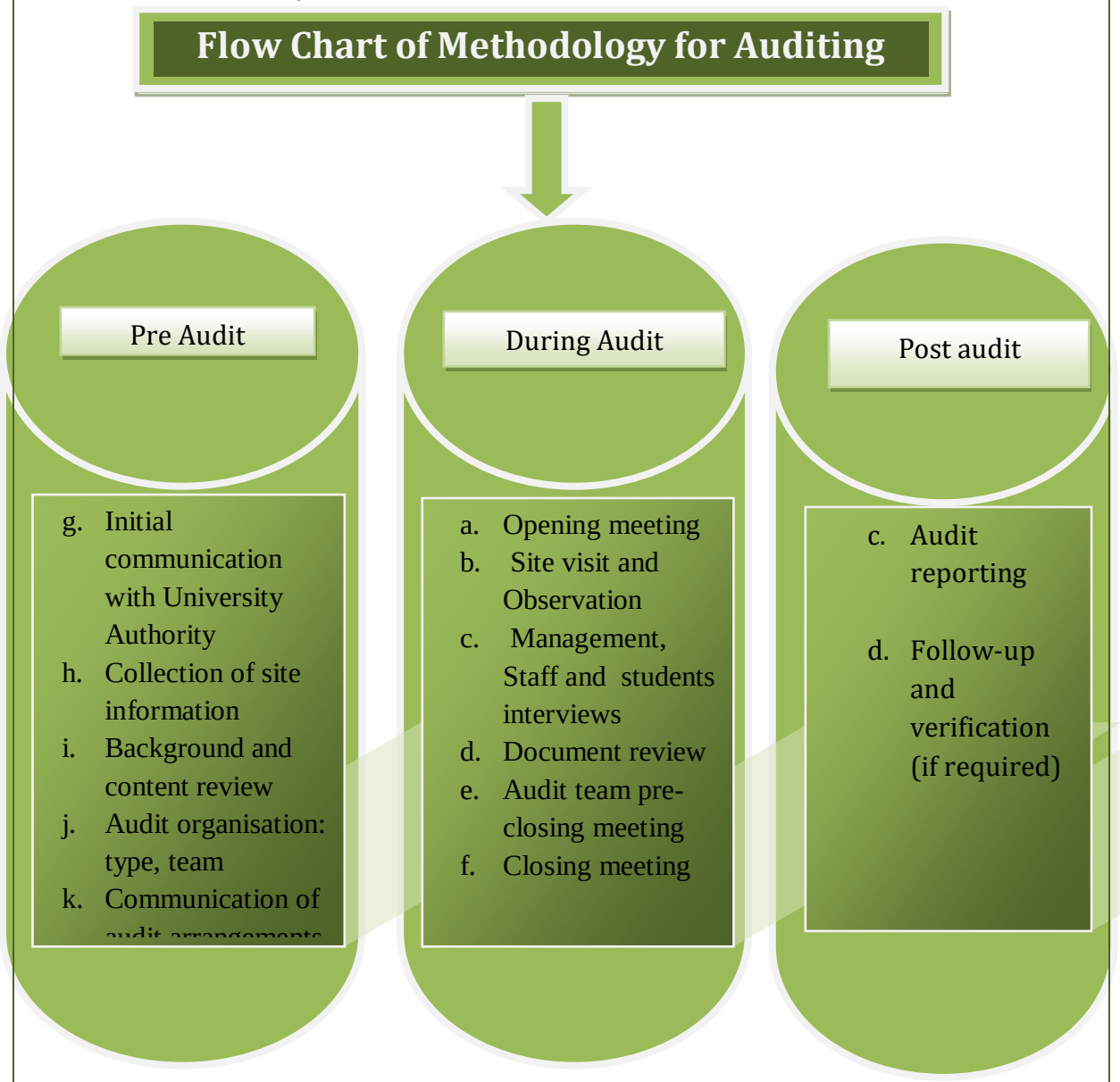
The discussion was focused on identifying the attitudes and awareness towards environmental issues at the institutional, district, national and global level. From the Group Discussion we gathered information about office-based environmental impacts like built-up area, utility bills, reuse of water, waste management energy-saving devices and IT equipment/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.

Purpose of Green and Environmental Auditing

The Green Audit Report is of extreme importance for NAAC purpose. It is necessary to conduct a Green Audit in College &University campus to ensure student awareness about the Green audit advantages to save the planet & become good citizens of our country. The Green Audit practically involves use of renewable sources, conservation of energy, rainwater harvesting program, effects of carbon neutrality, plantation of trees, E-waste management and hazardous waste management. Environment being a compulsory subject for all students, the national & local governments are putting in a lot of effort for maintaining a green planet and also arrange various programs so that studentsbecome aware for saving the planet, keep it green & also save energy.

Methodology and Survey Schedules

The methodology adopted for this assessment is collection of information by onsite visit, group discussion, campus survey, enquiry, observation, perception study and opinion. These methods are evidenced in the Audit Report.




GPS Map Camera
Kolkata, West Bengal, India
2/1A, Sreepally, Bhowanipore, Kolkata, West Bengal 700020, India
Lat 22.538501°
Long 88.353325°
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Chapter 4.0 : AUDITING

4.1 Campus Survey and Enquiry

Green audit forms part of the resource management process. Although they are individual events, the real value of green audit is the fact that they are carried out at defined intervals, and their results can illustrate improvement or change over time. Eco-campus concept mainly focuses on the efficient use of energy and water; minimizes waste generation or pollution and also ensures economic efficiency. All these indicators are assessed in the process of "Green Auditing of Educational Institute". Eco-campus focuses on the reduction of contribution to emissions, procure a cost effective and secure supply of energy, encourage and enhance energy use conservation, promotes personal action, reduce the institute's energy and water consumption, reduce wastes to landfill, and integrate environmental considerations into all contracts and services considered to have significant environmental impacts. Covered areas included in this green auditing are water, energy, air quality & carbon footprint, waste and biodiversity campus.

The Audit covered the following major areas:

1. Water Efficiency and Water Management
2. Energy Efficiency and Energy Management
3. Air Quality &Carbon footprint Management
4. Types of Waste and Waste Management
5. Biodiversity &Green Zone management

Audit Stages

Pre Audit	During Audit	Post Audit
a. Initial communication with College Authority	a. Opening meeting	a. Audit reporting
a. Collection of site information	b. Site visit and Observation	b. Follow-up and verification (if required)
a. Background and content review	c. Management, Staff and students' interviews	
b. Audit organisation: type, team	d. Document review	
c. Communication of audit arrangements	e. Audit team pre-closing meeting	
d. Supplier preparation	f. Closing meeting	

4.2 Water Efficiency and Water Management

The assessment of water requirement comprises of sanitation, laboratory, kitchen, drinking, washing, etc. The water is used for drinking, washing, cleaning, cooking and gardening purposes. Main water resource is bulk supply by Kolkata Municipal Corporation (KMC). Its

Water storage Capacity of overhead tank is 42,800 litres

Qty of water used per day : 35000 – 40000 litres

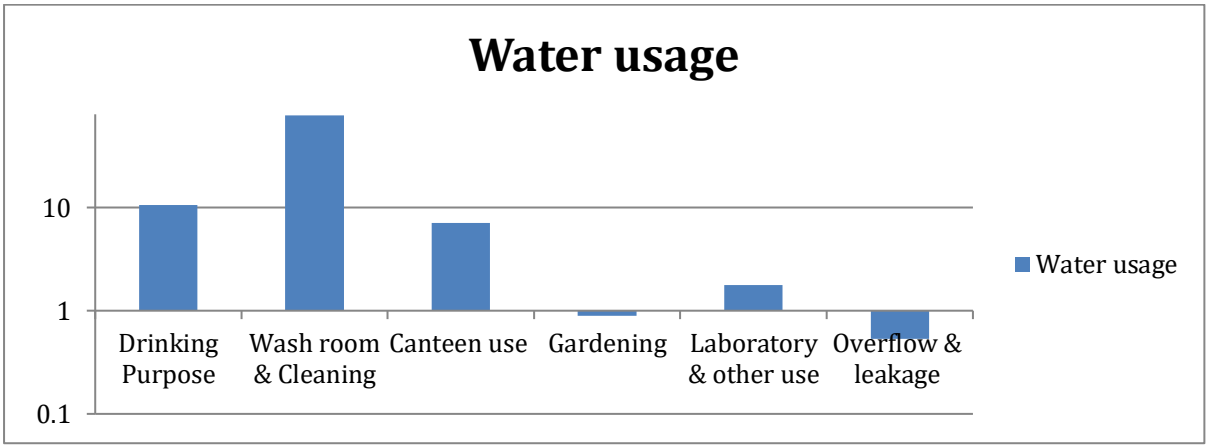
Water harvesting unit is installed and the recycled water is used mainly for ground water recharge and partly for gardening purpose.

Water consumption :

S.No.	Question	Status	
		Nos	Amount in ltrs
1.	No. of water coolers/Gasser. Amount of water used per day?(in litres)	19	500 – 700
2.	No. of drinking watertaps.Amount of water used per day?	150	6000 – 7000
3.	No. of water taps in laboratories. Amount of water used per day in each lab?	60	200 - 250
4.	No. of toilet,urinals. Amount of water used per day?	34	12000 – 15000
5.	No. of taps in canteen. Amount of water used per day?	10	1500 – 2000
6.	Amount of water used per day for garden use.	--	200 – 250

Water Consumption (2022-23)

Sl no.	Purpose	Use of %
1	Drinking Purpose	10.64
2	Washroom & Cleaning	78.01
3	Canteen use	7.09
4	Gardening	0.89
5	Laboratory & other use	1.77
6	Overflow & leakage	0.53



By the investigation with the help of Water P^Hmeter and TDS meter, we have assessed that the water quality of drinking water is highly healthy for human health. As result, Quality of Water weightage is high (H). Other hand, we have observed that only one Rechargeable unit is active, so the medium category of Water Harvesting and water recharge methods are applied in the campus. By the observation, reuse of water and use of surface water in the campus is not properly managed. So, weightage of taken water management policy level is Low (L).

Water management policy

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%

4.3 Energy Efficiency and Energy Management:

This indicator addresses energy consumption, energy sources, energy monitoring, lighting appliances and vehicles. Energy use is clearly an important aspect of campus sustainability and thus requires no explanation for its inclusion in the assessment. All tubes and lights are converted to an energy efficient light emitting diode (LED) uses only less than 10 W. By the enquiry, we have observed that the College is planning for Non-Conventional energy source. The uses energy is 393406 units which Rs. Amount is Rs.45,33,617/ in the year 2022.

Energy auditing deals with the conservation and methods to reduce its consumption related to environmental degradation. It is therefore essential that any environmentally responsible institution examine its energy use practices. Energy cannot be seen, but we know it is there because we can see its effects in the forms of heat, light and power. The details for Energy consumption is given below:

Sl.No	Items	Qty	Usage
1	Air conditioning machine	867.03 Ton	5500 unit/day
2	Elevators	05 Nos	200 unit/day
3	Computers	297 Nos	297 unit/day
4	Lights	2074 Nos	650 unit/day
5	Fans	766 Nos	383 unit/day

Good Daylight Design and Ventilation:

a) All the corridors receive good daylight due to the large windows.
b) Corridors are wide with good ceiling height.
c) Classrooms also have high ceilings with wide doors and large windows. Windows are kept open to receive sunlight.
d) Curtains are provided on some of the windows to avoid glare. Due to the location some classrooms do not receive ample natural light and fresh air. Hence these rooms are provided with tube lights even during daytime.

It was observed that reflectors are not provided for tube lights which can reduce electricity consumption. Computers are always kept on standby mode with power saving screensavers. There are signages encouraging users to switch off light and fans to save electricity. Providing signage through screensavers & posters near electrical switches help in making students responsible for conservation of electricity.

Our Observations :

a) Every classroom and lab with central switch board have a diagram linking place of tube light, fan etc. with corresponding switch. This ensures that correct fitting is switched on/ off and can save time & unnecessary operation.

b) Installation of automatic lights are already placed in toilets, they can also be used in corridorswith sensors.

c) 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 defunctioning, can be considered.

d) 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.

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 electrical gadgets of all Departments & Sectors when not in use.

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

4.4 Air Quality and Carbon Footprint:

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 vapour, methane, nitrous oxide and ozone. Of all the greenhouse gases, carbon dioxide is the most leading greenhouse gas, comprising 407.4 ppm of the Earth's atmosphere. The release of carbon dioxide gas into the Earth's atmosphere through human activities is commonly known as carbon emissions. An important aspect of doing an audit is to be able to measure your impact so that we can determine better ways to manage the impact. In addition to the water, waste, energy and biodiversity audits we can also determine what our carbon footprint is based on the amount of carbon emissions created. One aspect is to consider the distance and method traveled between home and College every day. It undertakes the measure of bulk of carbon dioxide equivalents exhaled by the organization through which the carbon accounting is done. It is necessary to know how much the organization is contributing towards sustainable development. It is therefore essential that any environmentally responsible institution examine its carbon footprint.

It was observed that the Outdoor air quality is Fresh and comfortable for breathing.

The enquiry revealed that more than 23% Oxygen is available in the air. While, Indoor air quality especially Computer and Departmental Laboratories is usually uncomfortable, level of Oxygen being less than 21.80%. On the other hand, the amount of CO2 is very high in the departmental and Computer laboratories amounting to more than 450ppm.

Amount of CO_2 (in ppm) of the air in different locations

Location	**Density of CO_2(ppm)**
Out Door	390
Indoor(Classroom)	410
Laboratory	460

Indoor Air Quality (IAQ) refers to the air quality within and around buildings and structures, as it relates to the health and comfort of building occupants. Some common indoor pollutants are listed as below:

• Molds and other allergens – This may arise from water seeping into the building envelope or skin, plumbing leaks, condensation due to improper ventilation, or from ground moisture penetrating a building part.

• Carbon monoxide – Sources of carbon monoxide are incomplete combustion of fossil fuels.
• Volatile organic compounds – VOCs are emitted by paints and lacquers, paint strippers, pesticides, office equipment such as copiers and printers, correction fluids and carbonless copy paper, graphics and craft materials including glues and adhesives, permanent markers, and photographic solutions etc.
• Carbon dioxide – Outcome of human respiration

Amount of O_2 (in %) of the air in different location
• Particulate matter – Due to construction and maintenance activities

Air quality record in Different station CO_2 in ppm & Amount of Oxygen in %

Air quality record in Different station CO_2ppm	Density of CO_2 (ppm)	Amount of O_2 in %
Road Side	400	21.4
Corridors	425	21.9
Canteen	475	22
Playground	387	21.2
Conference Hall	416	21.6
Chemistry lab	450	21.8
Physics lab	429	20.75
Library	410	20.7
Offices	428	21.2

Major observations under indoor air quality are as below:
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 also installed.
c) Exhaust fans are only provided in washrooms and chemistry lab.
d) A lot of indoor plants were observed in the entire institute which not only enhances aesthetic appearance but also ensures health benefits.

4.5 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 context 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.

Pollution from waste is aesthetically unpleasing and results in large amounts of litter in our communities which can cause health problems. Plastic bags and discarded ropes and strings can be very dangerous to birds and other animals. This indicator addresses waste production and disposal, plastic waste, paper waste, food waste, and recycling. Solid waste can be divided into two categories: general waste and hazardous waste. General waste includes what is usually thrown away in homes and schools such as garbage, paper, tins and glass bottles. Hazardous waste is waste that is likely to be a threat to health or the environment like cleaning chemicals and petrol. Unscientific landfills may contain harmful contaminants that gets mixed into soil and water supplies and produce greenhouse gases contributing to global climate change. Furthermore, solid waste often includes wasted material resources that could otherwise be channeled into better service through recycling, repair, and reuse. Thus the minimization of solid waste is essential to a sustainable college. 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.

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

a) Solid waste - In the Science department old instruments, plastic containers, Bottles and furniture cause dump. 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.

Waste Management

a) Solid waste

It was observed that:

a) Wet waste and dry waste segregation is not practiced in the premises. No separate bins are provided for wet biodegradable and dry recyclable waste.
b) Combined waste is directly handed over to the Municipality
c) Canteen is the main area where biodegradable and non-biodegradable waste is generated.
e) In other areas like classrooms, it is mostly paper waste and plastic wrappers

Old Instruments: The suggestion is that old instruments may be preserved in a central museum (may be developed if does not exist). The same may be used for demonstration to the new and passionate students and also for their project purpose.

Old Furniture:Old furniture may be reassembled to make stools, desks, chairs, tables, racks and bookshelves with appropriate renovation. Moreover, since cutting of trees is not suggested, whatever timber we have from the ancestors must be preserved and utilized properly.

Plastic Waste:For plastic three-dimensional package-of-practices is suggested. First of all, awareness on plastics material (and its life cycle), its uses and disposal will be there regularly among students. In the second stage, practice of keeping plastic wrapping, packaging, and other plastic-made things should be kept in appropriate bins. For this purpose sufficient numbers of bins will be placed in appropriate locations like students' common room, canteen etc. A mechanism will be there for regular collection by dedicated manpower. At the end, the plastics will recycled by grinding/ chopping instrument and final material is to be dispatched to the market. The Institution has accepted the suggestion of using such innovative recycling machine and suggested to design the machine.

Paper Waste Management: Being an academic Institution, paper waste is the main solid waste generated in the premises. The Institution has taken steps to minimize and avoid paper usage. Faculty and administrative staff uses old papers and envelops for internal usages as rough work, file markers, page separators etc. Paper notices are displayed on the notice boards.The dissertation reports, journals, and answer papers are stored as per the College rules after that the waste paper is

supplied to the nearest paper mill.About 80% waste is Bio- Degradable. Farther, 60% degradable waste is mainly examination papers, which amounts to 10 to12 tons. After a couple of years, old submissions and answer papers will be archived and stored in a record room at the Examination control room. Old publications are still stored in the library. As per the memo, for the disposal of old newspaper scrap dealer is called by central purchase department.

E-Waste Management:Most of the storage of E- Wastes is in the computer laboratory, library, Geography, Remote Sensing & GIS, MBA Departments. The data on E-waste generation and its disposal is not available. There is no documented policy for collection, segregation of e-waste.

Hazardous waste:Wastes generated from chemical experiments are to be disposed safely maintaining chemical hazard disposal protocol.

b) Liquid waste: Liquid waste is generated from canteen,toilets and also from chemical experiments, washing of used glassware etc. Appropriate means is suggested to adopt scientific liquid waste management practices. These are neutralization, bacterial control, and natural control through plantation.

Waste prevention

Since waste demands a cost for recycling, it is better to design such product which takes less recycling cost. So, at the design phase proper need assessment is to be undertaken to reduce the target cost for disposal.

Major audit issues in management of waste :

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 Institution is capable of managing their waste. They are complying with the essential requirements of waste management although suggestions are given for future improvements.

- Total Students & other stakeholders inside the campus – 12256
- Departments – 23
- Office Building – 1
- Canteen- 1
- Type of Wastes & Management:
- 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
- Papers wastes – Disposal by Selling
- Food wastes – Waste Rice, Vegetable, Paper plates- Disposal to municipal waste Collection centers.
- Chemical wastes – Laboratory waste – No treatment
- Waste water – washing, urinals, and bathrooms in soak pits
- Glass waste – Broken glass wares from the labs to municipal waste
- Collection centers.
- Napkin & Clothes incinerators- Disposal to municipal waste Collection centers.

Quantity of waste generated:-

- Biodegradable – 15 kg/day (office), (except Exam. Evaluation sheet)
- Non-biodegradable – 2.5 kg/day (office)
- Biodegradable – 3kg/day (labs)
- Non-biodegradable – 3 kg/day (including glass bottles)
- Hazardous waste –250gm/day

Canteen waste

- Biodegradable College canteen – 60kg/day
- Non-biodegradable – 4 kg/day

d) Green Campus

- Total number of plant species identified – more than 200 species.
- Tree cover of the campus – 54 acres area
- Free space including Playground- 49 acres area

Performance audit of waste issues:

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

Implemented waste management		
Sl.no	Factors/Indicators	Weightage
1	Plastic and Polythene free	H
2	Re-use of papers	H
3	Hazardous effect waste management	L
4	Removal of E-Waste	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%

4.6 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. Without this variability in the living world, ecological systems and functions would break down, with detrimental consequences for all forms of life, including human beings. Newly planted and existing trees decrease the amount of carbondioxide in the atmosphere. Trees play an important ecological role within the urban environment, as well as support improved public health and provide aesthetic benefits to cities. In one year, a single matured tree will absorb up to 48 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.

As the college is placed in the heart of the city, scope of plantation is very less. Plantation is needed in the compound in the periphery of the campus to keep down severe heat and cold. The trees should be planted in such a way that they should not completely obstruct the view of the building from outside and hinder sunlight from reaching classrooms.

a) Indoor plants are potted along the corridors of departments, classrooms, laboratories and building entrance to maintain of air quality and purification. For enhancing the scenic beauty it is suggested to plant flowering trees, which bloom in different seasons, in front of the large trees along the periphery.

b)Vertical Gardening can be done on the compound wall of the institute.

4.7Review of Documents and Records

Documents such as admission registers, registers of students 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.

4.8 Review of Policies

Discussions were made with the College management regarding their policies on environmental management. Future plans of the College were also discussed. 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.

4.9 Interviews

In order to gather College information for green auditing, different audit groupsinterviewed different departments, Infrastructure, HR, Principal, Dept. HOD, Teaching and non-teaching staff, students, and other stakeholders of the College.

CHAPTER : 5.0POST AUDIT STAGE

5.1 Data analysis and Assessment

The basis of any green audit is that its findings are supported by documents and verifiable information. The audit process seeks, on a sampled basis, totrack past actions, activities, events and procedures to ensure that they are carried out according to systems' requirements and in a correct manner.Green audits form a part of a process. Although they are individual events, the real value of green audits is the fact that they are carried out at defined intervals and their results can illustrate improvement or change over time.

Although green audits are carried out using policies, procedures, documented systems and objectives as a test, there is always an element of subjectivity in an audit. The essence of any green audit is to find out how well the environmental organization, environmental management and environmental equipment are performing. Each of the three components are crucial in ensuring that the organisation'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.

5.2 Results and Findings

Routine Green Practices

World Water Day- 21st March; World Earth Day- April 22nd; World Biodiversity Day- May 22nd; and World Environment Day – June 5th,
Ozone Day – September 16th
Awareness seminars are organized on various environmental problems.
Distribution of fruit trees, poster exhibition etc. are some of the activities on thatday. Conducted poster competition, invited lectures etc and also College has been declared as 'Save water Save earth'
The Green campus drive is an initiative of the College to protect the Environment. The College has been declared as 'No Plastic' & No Smoking' zone. The campus protects age old trees in addition to several new trees and plants planted. The campus is lush green with gardens, lawns, flowers and plants wherever there is open space. Rain water is harvested and collected in the well in front of the College. There is a pond at the far end of the College ground to harvest water. Bio-degradable waste is collected and made into compost. Non-degradable and electronic waste and toxic materials are regularly disposed of. Important days like World Environment Day, Ozone Day, Hiroshima Day etc are observed and several programmes including processions with placards, competitions and street plays are conducted by various departments to create awareness in environment protection and conservation.

Carbon Footprint

- ✓ Number of Students & Staff using cycles –100
- ✓ Number of persons using cars – no car inside the campus
- ✓ Number of persons uses two wheelers – 10% (1200)
- ✓ Number of students uses other transportations - 70% (8400)
- ✓ Number of visitors per day – 10 nos
- ✓ Average distance travelled by stake holders – 5-6 kms /day
- ✓ Expenditure for transportation per person per day – Rs.80/-

5.3 Consolidation of Audit Findings

We hope that students and stakeholders will develop a greater appreciation and understanding of the impact of their actions on the environment. They have successfully been able to determine the impacts on the environment through the various auditing exercises. By participating in this green auditing procedure they have gained knowledge about the need of sustainability of the College campus. It will create awareness on the use of the Earth's resources in their home, College, local community and beyond.

5.4 Summary of Green Auditing and Environmental Auditing

- The environmental awareness initiatives are not substantial.
- The College campus is noticed plastic free and the outdoor air quality is maintained.
- No solar panels are installed
- Fire extinguishers training and awareness signages are inadequate.
- There is an Environmental committee to measure environmental performance for Community development.
- Gardens inside the College premises are initiated and maintained.
- No departmental gardens are noticed
- No medicinal plant garden was available
- Indoor air quality of the laboratories is not very uncomfortable and inhospitable.
- Use of notice boards and signages are adequate to reduce over exploitationof natural resources.
- Programs on green initiatives have to be increased.
- Fully carbon footprint and wastes free zone actions should be introduced to maintain this.
- Rainwater harvesting systems, solar power generation, Bio Gas, Re-use of water environmental education programs have to be properly applied.

Water Audit

- There is no water consumption monitoring system in the College campus.
- The College does not have wastewater treatment for waste watergenerated from laboratories, canteen, kitchen, toilets, bathroomsand office rooms.
- The wastewater from canteen and kitchens are not suitably controlled and are not re-used for gardening.
- The College should strengthen rainwater harvesting. Rainwater harvesting for separate buildings are lacking.
- Measurement of quantity of water obtained from the rainwater harvesting should be done.
- Automatic switching system is not installed for pump sets used for overhead tank filling.
- Per day use of water is very high and there is no control over wastage of water.
- Display boards against the misuse of water use are lacking.

Energy Audit

- The communication process for awareness in relation to energy conservation is found inadequate.
- Assessment of electrical load calculation is yet to be done by the College.
- Monthly use of electricity in the College is very high.
- Objectives for reducing energy, water and fuel consumption are meagre.
- All classrooms and departments have LED powersaving light system, air conditioners and fans.
- Regular monitoring of equipment and immediate rectification of any problems is a must here.

Waste Audit

- Solid waste management systems established should be more apt.
- The College has proper communication with the local body for regular collection of solid waste from the campus.
- Implementation of sustainable projects to attain set environmental goals is not in place.
- Waste bins in the classrooms, veranda, canteen and campus are mostly covered and adequate.
- Biogas plant is not found.
- Proper composting systems are lacking.
- Green chemistry labs are yet to be introduced.

Green Campus Audit

- Tree cover of the College with respect to the stakeholders' strength is enough.
- Regular planting of trees in the campus is inadequate.
- Vegetable cultivation is not done regularly.
- Plant identification boards are less.
- Water usage for gardens is high.
- No arboretum has been set up in the College campus.
- There are only very few fruit trees in the College to attract birds.
- Benefits and uses of herbs cultivated in the medicinal garden are not displayed.

Carbon Foot Print Audit

- College has not yet taken any initiative for carbon accounting.
- Adequate common transportation facilities should be provided by the College
- Students should be encouraged to use cycles.
- Fossil fuel is burned every day for the functioning of the College which has high carbon emission.
- Minimum energy is used from Non-conventional power.
- Usage of 130 gas cylinders per month is very high.

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	L
2	Energy efficiency Audit	M
3	Air Quality & Carbon footprint Audit	H
4	Wastes Audit	M
5	Green & Biodiversity Audit	H

* H denote- Taken management policy level above 25%
** M denote- Taken management policy level 15%-25%
*** L denote-Taken management policy level below 15%

5.5 Preparation of Action Plan

Policies referring to College's management and approach's towards the use of resources need to be considered. The College should have a Green policy/Environmental policy for its sustainable development. The environmental policy formulated by the management of the College should be implemented meticulously. The College should have a policy on awareness raising or training programs (for ground staff or kitchen staff for example) and College also should have a procurement policy (the College's policy for purchasing materials).

5.6 Follow up of Action Plan

Green Audits are exercises which generate considerable quantities of valuable management information. The time, effort and cost involved in this exercise is often considerable and to justify this expenditure, it is important to ensure that the findings and recommendations of the audit are

properly conducted within the organisation and that action plans and necessary programs which result from the findings are implemented. Audit follow up is part of the wider process of continuous improvement. Without follow-up, the audit becomes an isolated event which soon becomes forgotten in the pressures of organisational priorities and with passing time.

5.7 Environmental Education

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

- ❖ Training programs to be implemented on solid waste management, liquid waste management, setting up of medicinal plant nursery, water management,vegetable cultivation, paddy cultivation, tree planting, energy management, landscape management, pollution monitoring methods, and rain water harvesting and ware re-use methods.
- ❖ Number of display boards on environmental awareness to be increased such as – save water, save electricity, no wastage of food/water, no smoking, switch off light and fan after use, plastic free campus etc.
- ❖ Nature or green clubs to be activated.
- ❖ Model rainwater harvesting system, rainwater pits, Organic vegetable garden, medicinal plant garden, Honey farm, Mushrooms, Indigenous fish farm etc. to be made for providing proper training to the students.
- ❖ Exhibition of recyclable waste products to be conducted.
- ❖ Chemical treatment system for waste water from the Laboratories to be implemented.

Awareness on Carbon Consumption

- ✓ Students and Staff members may be made totally aware of pollution caused by use of vehicles.
- ✓ The carbon consumption awareness programs on carbon emission at Individual as well as social level will help to avoid air and noise pollution in the campus due to vehicles.

5.8 Recommendations Concluded

The green audit assists in the process of testing performance in the environmental arena and is fast becoming an indispensable aid to decision making in a College. The green audit reports assist in the process of attaining an ecofriendly approach to the sustainable development of the College. Hope that the results presented in the green auditing report will serve as a guide for educating the College community on the existing environment related practices and resource usage at the college as well as new activities and innovative practices. A few recommendations are added to curb the menace of waste management using eco-friendly and scientific techniques. This may lead to the prosperous future in context of Green Campus and thus sustainable environment and community development. It has been shown frequently that the practical suggestions, alternatives, and observations that have resulted from audits have added positive value to the audited organisation. An outside view, perspective and opinion often helps staff who have been too close to problems or methods to see the value of alternative approaches. A green audit report is a very powerful and valuable communications tool to use when working with various stakeholders who need to be convinced that things are running smoothly and systems and procedures are coping with natural changes and modifications that occur.

Common Recommendations

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

Criteria Wise Recommendations

Water

- Remove damaged taps and install sensor based hand free taps, if possible and same may be implemented for urinals.
- Drip irrigation for gardens and vegetable cultivation can be initiated.
- Establish water management methods.
- Establish rain water harvesting systems for each building.
- Establish water treatment systems.
- Awareness programs on water conservation to be conducted.
- Install display boards to control over exploitation of water.

Energy

- ✓ Employment of solar panels and other renewable energy sources.
- ✓ Conduct more save energy awareness programs for students and staff.
- ✓ Replace computers and TVs with LED monitors.
- ✓ More energy efficient fans, tubes and bulbs should be installed.
- ✓ Observe a power saving day every quarter.
- ✓ Automatic power switch off systems may be introduced.

Air Quality & Carbon footprint

- ❖ Establish a system of carpooling among the staff and visitors to reduce the number of four wheelers coming to the College.
- ❖ More College bus services to the students and staff to be provided.
- ❖ Encourage students and staff to use cycles.
- ❖ Establish a more efficient cooking system to save gas.
- ❖ Discourage the students using two wheelers for their commutation.
- ❖ More use of generators every day should be discouraged.

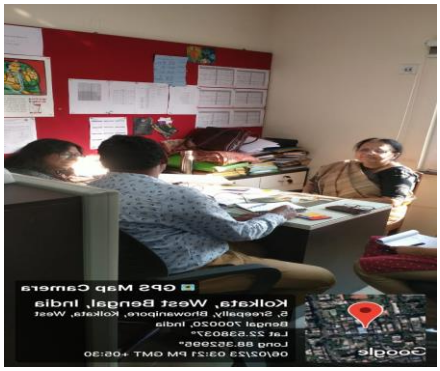
Waste

- ❖ Establish a functional biogas plant.
- ❖ A model solid waste treatment system to be established.
- ❖ Practice of waste segregation to be initiated.
- ❖ Establish a plastic free campus.
- ❖ Avoid paper plates and cups for all functions in the College.

Green Campus

- ✓ All trees in the campus should be named scientifically.
- ✓ Create more space for planting.
- ✓ Grow potted plants at corridors,classrooms and Laboratories.
- ✓ Create automatic drip irrigation system during summer holidays.
- ✓ Not just celebrating environment day but making it a daily habit.
- ✓ Beautify the College building with indoor plants
- ✓ Providing funds to nature club for making campus more 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.

PHOTOGRAPHS AND IMAGES



-: End of report :-