

**GREEN AUDIT REPORT OF BHAIRAB GANGULY COLLEGE**



BELGHARIA, KOLKATA – 700 056.

**2017-2018**

**PREPARED BY**

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## Executive Summary

Rapid urbanization and economic development at local, regional and global level has led to several environmental and ecological crises. On this background it becomes essential to adopt the system of the green campus for the institute which will lead for sustainable development. Bhairab Ganguly College is deeply concerned and unconditionally believes that there is an urgent need to address these fundamental problems and reverse the trends. Being a premier institution of higher studies, the college has initiated 'The Green Campus' programme few years back that actively promote various projects for environment protection and sustainability.

Purpose of this audit is to ensure that the practices followed in the campuses are in accordance with the green policy adopted by the institution, it works on several facets of Green Campus including water conservation, electricity conservation, tree plantation, waste management, paperless work, mapping of biodiversity etc. With this in mind, specific objectives of the audit is to evaluate adequacy of the management control framework of environment sustainability as well as the degree to which the departments are in compliance with the applicable regulations, policies and standards. It can make a tremendous impact on students' health and learning, college operational costs and the environment. The criteria methods and recommendations used in the audit were based on the identified risks.

Sonar Bharat Environment & Ecology Pvt. Ltd.  
*Parimal Sarkar*  
Director

**CHAPTER – 1**  
**INTRODUCTION**

**1.1 Green Audit**

Environmental or Green Audit is a systematic, documented, periodic and objective review by regulated entities of facility operations and practices adopted to meet the environmental requirements (EPA, 2003). In other words, it is a management tool, comprising of systematic, documented, periodic and objective evaluation of how well environmental organization, management and equipment are performing with the aim of helping to safeguard the environment by facilitating management control of practices and assessing compliance with Institutional policies, which would include regulatory requirements and standards applicable.

Environmental auditing is essentially an environmental management tool for measuring the effects of certain activities on the environment against set criteria or standards. Depending on the types of standards and the focus of the audit, there are different types of environmental audit. Organizations of all kinds now recognize the importance of environmental matters and accept that their environmental performance will be scrutinized by a wide range of interested parties.

Considering the present environmental problems of pollution and excessive use of natural resources, Honorable Prime Minister, Shri. Narendra Modi has declared the Mission of Swachh Bharat Abhiyan. Also, University Grants Commission has mentioned the "Green Campus, Clean Campus" mission mandatory for all higher educational institutes. 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.

### **1.2 Why Green Audit**

- To ensure that the performance of the institution with respect to environmental activities is in compliance with existing laws and regulations.
- To check the functionality and their operating success including water supply, energy related matters and other similar matters that are related to green operations in the campus
- To formulate or update the institution's environmental policy, if warranted.
- To measure the environmental impact of operational process related to green activities in the campus.
- To measure the performance of each green related operations and actions in the campus.
- To generate a database of green activities for continuous monitoring to assess the success of each of them.
- To identify future potential liabilities.
- To align the institution's developmental and day to day activities with the stated vision, mission, strategies.
- To identify possible ways to reduce expenditure and running costs on equipments, appliances, etc. or try enhance revenue income.
- To improve process and materials efficiency, and in response to stakeholder requests for increased disclosure.

### **1.3 Goals of Green Audit**

#### **University has conducted a green audit with specific goals as:**

- Assess facility of different types of waste management.
- Increase environmental awareness throughout campus.
- Identification and documentation of green practices followed by university.
- Identify strengths and weaknesses in green practices.
- Conduct a survey to know the ground reality about green practices.
- Analyze and suggest solutions for problems identified from the survey.
- Identify and assess environmental risk.
  
- The long-term goal of the environmental audit program is to collect baseline data of environmental parameters and resolve environmental issues.
  
- To motivate staff for optimized sustainable use of available resources.

#### ***1.4 Objective of Green Audit***

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

- To prepare a checklist of flora and fauna diversity in and around the college campus.
- To suggest measures to improve biodiversity within the college campus.
- To monitor the energy consumption pattern of the college.
- To assess the quantity of water usage within the college campus.
- To suggest sustainable energy usage and water conservation practices.
- To find out various sources of organic and solid waste generation and mitigation possibilities.
- To inculcate values of sustainable development practices through green audit mechanism.

#### ***1.5 About Criteria 7 of NAAC***

National Assessment and Accreditation Council (NAAC) is a self-governing organization that rated the institutions according to the scores assigned at the time of accreditation of the institution. Green Audit has become a mandatory procedure for educational institutes under Criterion VII of NAAC. The intention of the green audits is to upgrade the environmental condition inside and around the institution. It is performed by considering environmental parameters like water and wastewater accounting, energy conservation, waste management, air, noise monitoring, etc. for making the institution eco-friendly.

Students are the major strength of any academic institution. Practicing green action in any educational institution will inculcate the good habit of caring for natural resources in students. Many environmental activities like plantation and nurturing saplings and trees, Cleanliness drives, no vehicle day, Rainwater harvesting, etc. will make the students good citizens of the country. Through Green Audit, higher educational institutions can ensure that they contribute towards the reduction of global warming through Carbon Footprint reduction measures.

### ***1.6 Benefit of Green Audit to an Educational Institute***

There are many advantages of green audit to an Educational Institute.

- It would help to protect the environment in and around the campus.
- Recognize the cost-saving methods through waste minimization and energy conservation.
- Empower the organization to frame a better environmental performance.
- It portrays a good image of the institution through its clean and green campus.
- More efficient resource management.
- To create a green campus.
- To enable waste management through reduction of waste generation, solid and waste.
- To create plastic-free campus and evolve health consciousness among the stakeholder & students.
- Recognize the cost-saving methods through waste minimizing and managing.
- Authenticate conformity with the implemented laws.
- Empower the organizations to frame a better environmental performance.
- Enhance the alertness for environmental guidelines and duties.
- Impart environmental education through systematic environmental management approach and Improving environmental standards.
- Benchmarking for environmental protection initiatives.
- Financial savings through a reduction in resource use.
- Development of ownership, personal and social responsibility for the University and its environment.
- Developing an environmental ethic and value systems in youngsters.
- Green auditing should become a valuable tool in the management and monitoring of environmental and sustainable development programs of the college.
- Finally, it will help to build a positive impression through green initiatives for the upcoming NAAC visit.



### ***1.7 Introduction of Auditing Firm***

Name of Firm	M/s. Sonar Bharat Environment & Ecology (P) Ltd.
Address	35, C. R. Avenue, 3 <sup>rd</sup> floor, Kolkata - 700012
Contact details	033-40031179

### **Details of team Member**

Sr. No.	Name	Designation/ Technical	Technical Experience /Qualification
1	Shri Parimal Sarkar	Legal Expert	<ul style="list-style-type: none"><li>➤ M.Sc. in Disaster Management</li><li>➤ Post Graduate Diploma in Environmental Law from National Law School, Bangalore</li><li>➤ Lead Auditor in ISO 14000 (Environmental Management)</li></ul>
2	Shri Subrata De Sarkar	General Manager	<ul style="list-style-type: none"><li>➤ General Manager in Central Public Sector undertaking.</li><li>➤ 12 years experience in Environmental Auditing</li><li>➤ Lead Auditor in ISO 50001:2011</li></ul>
3	Shri Suman Chchattaraj	Environmental Specialist	<ul style="list-style-type: none"><li>➤ M.Tech in Environmental Science</li><li>➤ 20 years experience in Environmental Impact Studies and Auditing</li></ul>

### Energy audit team

SN	Name	Designation/ Qualification	Experience
1	Shri Suvra Majumdar	<ul style="list-style-type: none"> <li>➤ Post Graduate Diploma in Energy Management (MBA)</li> <li>➤ B.Tech (Electrical Engineering)</li> </ul>	<ul style="list-style-type: none"> <li>➤ 15 years experience of Energy audit</li> </ul>
2	Shri Gautam Ghosh	<ul style="list-style-type: none"> <li>➤ Diploma in Mechanical &amp; Electrical Engineering from Calcutta Technical School</li> </ul>	<ul style="list-style-type: none"> <li>➤ 27 Years experience of working in electrical engineering department in different industries.</li> <li>➤ 12 years experience in independent electrical auditing</li> </ul>

### 1.8 List of Instruments

Following are the instrument used at the time of the Energy Audit.

Sr.	Instrument	Make/Sr.No.
1	Digital LUX Meter	HTC/2222600
2	Digital Micro OHM Meter	Innova/I-259
3	Digital Multi Meter	Kusam Mecco/162180630
4	Digital Clampmeter	Waco/1910149152
5	Meger	Waco/307421
6	Load analyser	Waco/2954563

### 1.9 List of Laboratory Instruments for Environmental Monitoring

Sl. No.	Name of Equipment	Make	Model
1	GAS CHROMATOGRAPH WITH FID, TSD.	VARIAN	CP3800
2	GAS CHROMATOGRAPH MASS SPECTROMETER WITH ECD	VARIAN	CP 3800 SATURN 2200
3	GAS CHROMA TOGRAPH WITH FID for Air	DANI	Master GC
4	ION CHROMATOGRAPH	Thermo Fisher Scientific	DIONEXICS 1100
5	H.P.L.C.	VARIAN	SERIES 200
6	FTIR	Thermo Fisher Scientific	Nicolet IS10
7	ATOMIC ABSORPTION SPECTRROPHOTOMETER	VARIAN	AA 2406TA 120
8	MERCURY ANALYSER	EC	MAS 5840
9	FLAME PHOTOMETER	LOWERENCE & MAYO	381
10	SPECTRO PHOTOMETER	VARIAN	CARY 50
11	BOD INCUBATOR	MULTISPAN	DIGITAL
12	ELECTRONIC MICRO BALANCE	Citizen	CMSF

### ***1.10 List of Field Equipments in Environment Department***

Sl. No.	Name of Equipment	Make	Model
1	Field Dust Sampler	Envirotech/Lata Envirotech	APM – 550, PM 2.5 & 10
2	Respirable Dust Sampler	Envirotech/Lata Envirotech	APM-460BL
3	Stack Kit Sampler	Envirotech/Lata Envirotech	APM-620, PM-602
4	Sound Level Meter (AUTOMEDTIC)	Envirotech	SLM-101
5	Sound Level Meter	Lutron	SLM-4001
6	Local Air Quality Sampler	Vayubodhan	APM-414
7	Auto Metric Whather Monitor	Spectrum Technology	WM-272
8	Depth Sampler	NA	NA

### ***1.11 General steps involved in Green Audit***

1. Systematic and exhaustive data collection.
2. Evidence based documentation of activities.
3. Regular monitoring.
4. Provide standards and methods for improvement by establishing cost effective green action plan.

## **CHAPTER – 2**

### **BHAIRAV GANGULY COLLEGE**

#### ***2.1 Brief History***

Bhairab Ganguly College, Kolkata is a premier institute of higher education in the academic map of West Bengal. Situated at the northern fringe of the Kolkata metropolis, the College has started its journey on 3rd September 1968 with a vision to open a gateway of higher studies for the youth of the locality. In 1955 Sri Jibandhan Ganguly, a renowned social worker, philanthropist and educationist, along with some local educationists, approached the then Government of West Bengal to establish a Degree College on eleven bighas of land, to be donated from his ancestral property. Accepting the proposal the Government of West Bengal acquired the land along with fourteen bighas of vested adjacent lands and proceeded with the construction of the college. The College was named after Sri Bhairab Ganguly, the great grandfather of Sri Jibandhan Ganguly. It became a Government sponsored college and was recognized under section 2(f) and 12 (b) of the UGC Act. It was formerly affiliated to the University of Calcutta. It is currently affiliated with the West Bengal State University

#### ***2.2 Vision & Mission***

##### **Vision:**

**'Arise, awake and stop not till the goal is reached' - Swami Vivekananda**

Quest for knowledge, freedom of expression and respect for cultural pluralism is the hallmark of this institution. Our vision is to produce generations of optimistic, resourceful, committed, and passionate future leaders who will continue transforming the society and the nation.

Transcending knowledge beyond books and academics, the College is committed to providing experiential knowledge that not only heightens the intellectual capacity but also builds the character of students.

The College intends to develop a mutually beneficial relationship between the institution and society at large by providing the students with an environment conducive to the long-term development of their intellectual, aesthetic, spiritual and social abilities. The prime objective is to instill self-confidence, integrity, honesty, social responsibility and a spirit of adaptability to global changes among the students to help them to learn, grow and evolve to realize their aspirations. The college tries to foster a spirit of belongingness, camaraderie and warmth with very congenial relationship between the faculty and students.

## **Mission**

The goal of Bhairab Ganguly College is to impart value-based quality education which will enable our students to enhance their academic competence and fine-tune their aesthetic sensibility towards building a holistic culture.

In the field of higher education Bhairab Ganguly college is committed to academic excellence, high standards in extracurricular practices, relevant courses leading to employment and entrepreneurship, and continuous progress of the institution.

Bhairab Ganguly college is relentlessly working towards making our college one of the most sought-after educational institutions at the state and national levels, providing efficient training according to the changing demands of society, ensuring an open, secular and democratic intellectual environment in which students from all cross-sections and strata of the society can freely exchange their views and build themselves up to function not only as responsible individuals but also efficient and conscientious members of society.

To this end, the mission of the college is:

- To foster a stimulating academic environment that encourages a spirit of enquiry, innovation and experimentation.
- To nurture an ecosystem that promotes democratic values, inclusiveness of diverse peoples and cultures, and freedom of expression and creativity.
- To instill a culture of sensitivity to gender issues and identities; to challenges pertinent to differently abled people and economically-weaker sections.
- To promote civic ecology practices on campus and beyond for a sustainable relationship between human community and nature.
- To encourage a dynamic engagement between curricular and extra-curricular learning and positive social implications.
- To inculcate critical thinking and find new grounds of learning.

### 2.3 Location of the College

Bhairab Ganguly College is a higher educational college situated at Belgharia of district Kolkata in the West Bengal. The nearest railway station is Belgharia, which is about 1.5 km

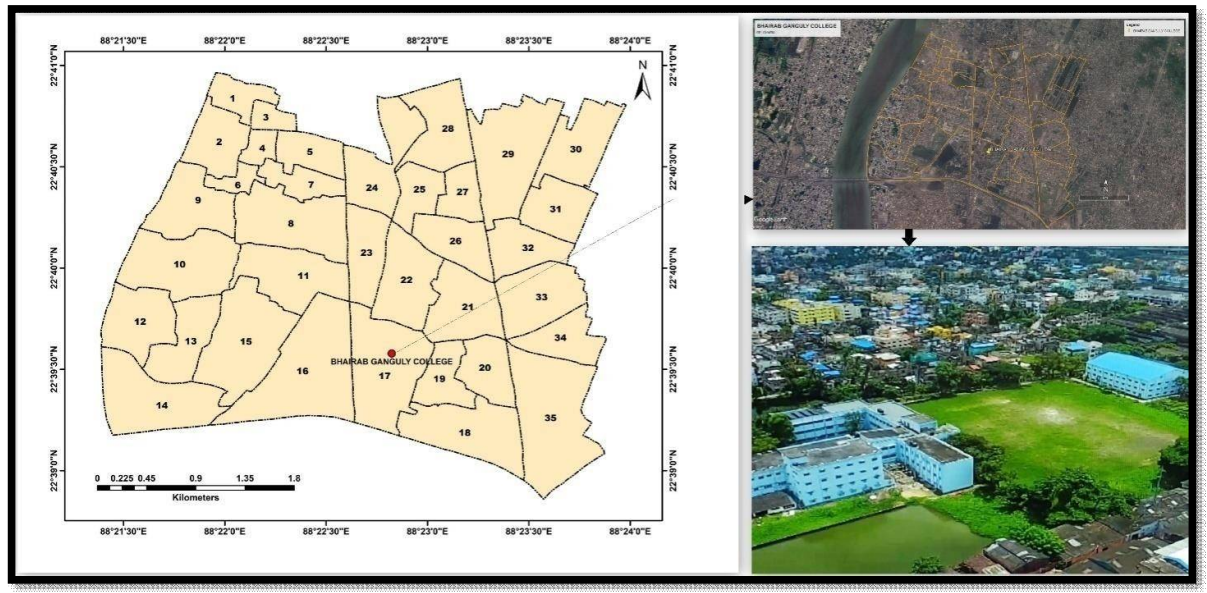


Figure 1: LOCATION MAP OF THE COLLEGE

## ***2.4 Communication and Transportation***

This college is well connected with different parts of North 24 Parganas district and Kolkata by bus and local trains. Lot of bus & metro are available here. The nearest railway station is Belgharia. The nearest international and domestic airport is Netaji Subhas Chandra Bose International Airport of Kolkata.

Bhairab Ganguly college have also adopted the 'Green Campus' system for environmental conservation and sustainability. The college also works on several activities for 'Green Campus' including tree Plantation, waste Management, paperless work & solar power etc.

## ***2.5 Campus Infrastructure***

Bhairab Ganguly College is ragging free Green Campus with free internet facility. It has a very good and systematic building infrastructure. All the classrooms are spacious, well ventilated and comfortable. Total area of college over 8538.86 sq metre. The college following facilities are:

- Cricket ground
- Football ground
- Cycle stand
- Well equipped Library with e library resources
- APC Lab
- Computer lab
- Language lab
- Sports complex

Bhairab Ganguly College campus is itself a combination of all standards and amenities required as far as great educational infrastructure is concerned. The existing facilities are continuously upgrading and improving.

A dedicated and well equipped IQAC cell controls the activities that enables the campus to run effectively. Systematic documentation of activities and academics is a characteristic feature of the college. The IQAC cell enables the campus to get accreditations from different accrediting agencies.

## **CHAPTER – 3**

### **GREEN AUDIT METHODOLOGY**

#### ***3.1 Pre Audit stage***

A pre-audit meeting provided an opportunity to reinforce the scope and objectives of the audit and pre-audit discussions were held on the basis of green initiatives taken and the current scenario of the University campus. The audit protocol and audit plan were handed over at this meeting and discussed in advance of the audit itself.

#### ***3.2 Objectives of Green audit***

The basic objective of green audit is to promote environment management and conservation in the college campus. Purpose of the audit is to identify, quantify, describe and prioritize the framework of environmental sustainability in compliance with the applicable regulations, policies and standards. Major objectives of carrying out green audit are:

- To introduce an awareness among the students regarding real concerns of environment and its sustainability
- To secure the environment and cut down the threats posed to human health by analyzing the pattern and extent of resource use on the campus.
- To establish a baseline data to assess future sustainability by avoiding the interruptions in environment that are more difficult to handle and their corrections requires high cost.
- To bring out a present status report on environmental compliance.
- To enhance the carbon foot print in the locality and reduce pollution for sustainable environment.

#### ***3.3 Audit stage***

Green Audit was done with the help of co-associates involving different student groups, teaching, and non-teaching staff. The green audit began with the teams walking through all the different facilities at Bhairab Ganguly College, determining the different types of appliances and utilities as well as measuring the usage per item (Watts indicated on the appliance or measuring water from a tap) and identifying the relevant consumption patterns (such as how often an appliance is used) and their impacts. The staff and learners were interviewed to get details of usage, frequency, or general characteristics of certain appliances. Data collection was done in the sectors such as Energy, Waste, Green Area, Carbon footprint, and Water use. Records and documents were verified several times to clarify the data received through surveys and discussions.



### ***3.4 Methodology***

In order to perform green audit, methodology included different techniques such as physical inspection of the campuses, observation and review of the documentation, interviewing key persons and data analysis, measurement of the present status of environment management in the campuses:

- Water quality assessment, consumption and management
- Air quality assessment and management
- Electricity consumption and management
- Sound pollution monitoring
- Waste management
- Bio diversity status of the campus
- Land use and land coverage
- Rain water Harvesting
- Use of alternate energy

### ***3.5 Survey by Questionnaire***

Baseline data for green audit report preparation was collected by questionnaire survey method. Questionnaires are prepared to conduct the green audit in the campus based on the guidelines, rules, acts, and formats prepared by the Department of Environment, Government of West Bengal and other statutory organizations. Therefore, using these guidelines and formats, combinations, modifications, and restructuring were done and sets of questionnaires were prepared for land use, energy, water, air, sound, and waste management.

### ***3.6 Onsite visit observations***

Personal observations were made during the onsite visit. All the amenities were clubbed in, as per their similarities and differences, which makes the survey and further analysis easier. After the collection of secondary data, the reviews related to each environmental factor were taken by the green audit team. The data were tabulated, analyzed and graphs were prepared. Depending upon the observations and data collected, interpretations were made. The lacunas and good practices were documented. Finally, all the information was compiled in the form of the Green Audit Report.

### ***3.7 Data analysis and final report preparation***

The filled questionnaires of the survey from each group were tabulated as per their modules, in Excel spreadsheets. The tabulated data is then used for further analysis. A graphical representation of these results was made to give a quick idea of the status. Interpretation of the overall outcomes was made which incorporates all the primary and secondary data, references, and interrelations within. Final report preparation was done using this interpretation.

## **CHAPTER - 4**

### **LAND USE ANALYSIS**

#### ***4.1 GENERAL OVERVIEW OF THE CONCEPT OF LAND USE:***

Land use refers to man's activities and the various uses which are carried on and derived from land. Viewing the earth from space, it is now very crucial in man's activities on natural resource. In situations of rapid changes in land use, observations of the Earth from space give the information of human activities and utilization of the landscape.

#### ***4.2 METHODOLOGY ADOPTED FOR LAND USE MAPPING.***

Three types of data that are GPS points, field survey data and Google earth data for Geo-referencing have been used in this study. Land use map of the study area have been prepared using field survey

#### ***4.3 CLASSIFICATION SCHEME FOR LAND USE ANALYSIS OF BUILT UP AREA***

<b>Level-I</b>	<b>Level-II</b>
1. Built- up land area	1.1 Dense 1.2 Moderate 1.3 Sparse

Therefore, attempt has been made in this study to map land use for Bhairab Ganguly College with a view to detect the land consumption in the built-up land area.

### **LAND USE DATA OF COLLEGE OF BHAIRAB GANGULY COLLEGE**

<b>CATEGORIES OF LAND USE</b>	<b>AREA IN SQ METRES</b>
OPEN SPACE AND PLANTATION	30789
Ground Coverage	4036
TOTAL AREA	34825

Ground coverage of 11.59% ( i.e 4036 sq metres) consists of the buildings.

#### **FINDINGS:**

Bhairab Ganguly College which was established in 3<sup>rd</sup> September 1968, has an eco-friendly environment. It has a long legacy of healthy environmental practices including periodic plantation, their preservation and maintenance. Its land use is such that about 88.41% of the total area is occupied by open land and plantation that generates a better and sustainable campus environment.

## CHAPTER – 5

### WATER QUALITY ASSESSMENT, CONSUMPTION & MANAGEMENT

#### 5.1 *Water Audit*

Water audit can be defined as a qualitative and quantitative analysis of water consumption to identify means of reducing, reusing, and recycling water. Water Audit is nothing but an effective measure for minimizing losses, optimizing various uses, and thus enabling considerable conservation of water in the irrigation sector, domestic, power, and industrial sectors. Water usage can be defined as water used for all activities which are carried out on campus from different water sources. This includes usage in all residential halls, academic buildings, on-campus, and on-grounds.

#### 5.2 *Importance of water Audit*

- Systematic process
- May yield some surprising results
- Easier to work on solutions when the problems are identified.
- Attracting mechanism can be put into place.

#### 5.3 *Water Resources*

The major resource for the water in the university is a self-reliant water boring system installed on the college campus & supply of municipal water is available.

#### **Provision of Water Storage Facility:**

Proper facility of storage of water reduces wastage of water. Out of 20 departments, 45% of the departments surveyed have proper water storage facility while the rest 55% of the departments surveyed depend upon the central water storage system facility (CWSF).

<u>TOTAL DEPARTMENTS</u>	<u>PARAMETER</u>	<u>YES (%)</u>	<u>CWSF (%)</u>
20	Provision of water storage facility	45	55

#### **Cleaning of Water Tanks:**

Cleaning of water tanks at regular intervals keeps the water stored in it clean and ideal for consumption as well as for utilization in different purposes. Cleaning of tanks is done by entrusted persons at regular intervals to ensure supply of clean and safe water to the teachers and the students.

### **Water Management Practices:**

Water management involves judicious use of water resources. All the departments of the college encourage proper water management practices. Students are instructed by the teachers to turn off the taps if they see them open. All the staffs also keep a vigilant watch in this purpose.

#### ***5.4 Water Quality Analysis Report***

Water quality analysis was conducted by Qualissure Laboratory Services (NABL approved laboratory)

Water quality analysis was conducted by Qualissure Laboratory Services

## TEST REPORT

DOC NO : QLS/SAMP/08-D/00

<b>Name &amp; Address Of the Customer :</b>  <b>Bhairab Ganguly College</b> Belgharia, Kolkata.	Report No.	: QLS/W/18-19/C/701
	Date	: 20.12.2018
	Sample No.	: QLS/W/18-19/701
	Sample Description	: Drinking Water
	Sample Mark	: Tap Water
	Sample Drawn On	: 06.12.2018
	Date of Performance	: 08.12.2018-15.12.2018

### Analysis Result

#### (A) Microbiological Analysis

Sl. No.	Characteristic	Limit as per Drinking Water Standard : IS:10500, 2012 Amd. 2	Test Method	Result
1.	Total Coliform Bacteria/100ml	Not Detectable	IS 15185-2016	Not Detected
2.	E.coli /100ml	Not Detectable	IS 15185: 2016	Not Detected

#### (B) Chemical Analysis

Sl. No.	Test Parameter	Test Method	As per Drinking Water Standard : IS:10500, 2012 Amd. 1 & 2		Result
			Acceptable Limit	Permissible Limit	
1.	pH Value at 25°C	IS 3025 (Part 11)- 1984 RA: 2012	6.5-8.5	No Relaxation	7.12
2.	Turbidity in NTU	IS 3025 (Part 10)- 1984 RA: 2012	1	5	<1.0
3.	Total Dissolved Solids (TDS) in mg/l	IS 3025(Part 16)- 1984 RA: 2012	500	2000	464
4.	Calcium(as Ca) in mg/l	IS 3025 (Part 40): 1991(RA 2014)	75	200	62.3
5.	Chloride(as Cl) in mg/l	IS 3025 (Part 32): 1988 (RA 2014)	250	1000	167.7
6.	Iron (as Fe) in mg/l	IS 3025(Part 53)-1988 RA: 2014	1.0	No Relaxation	0.61
7.	Magnesium(as Mg) in mg/l	IS 3025 (Part 46)-1994 RA: 2014	30	100	32.1
8.	Nitrate (as NO <sub>3</sub> ) in mg/l	IS 3025 (Part 34)-1986 RA: 2014	45	No Relaxation	<0.5
9.	Free Residual Chlorine in mg/l	IS 3025 (Part 26): 1986(RA 2014)	0.2	1.0	<0.1
10.	Sulphate (as SO <sub>4</sub> ) in mg/l	IS 3025 (Part 24)-1986, RA: 2014	200	400	19.1
11.	Alkalinity (as CaCO <sub>3</sub> ) in mg/l	IS 3025 (Part 23)- 1986, RA: 2014	200	600	302.4
12.	Total Arsenic(as As) in mg/l	IS 3025 (Part 37):1988,RA 2014	0.01	No Relaxation	<0.01
13.	Total Hardness (as CaCO <sub>3</sub> ) in mg/l	IS 3025 (Part 21)-1983, RA: 2014	200	600	290.4

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*(Signature)*

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**TEST REPORT**

<b>Name &amp; Address Of the Customer :</b>  <b>Bhairab Ganguly College</b> Belgharia, Kolkata.	Report No.	: QLS/W/18-19/C/702
	Date	: 20.12.2018
	Sample No.	: QLS/W/18-19/702
	Sample Description	: Waste Water
	Sample Mark	: Drainage Water
	Sample Drawn On	: 06.12.2018
	Date of Performance	: 08.12.2018-15.12.2018

**Analysis Result**

Sl. No.	Parameter	TEST METHOD	Result	Limit as per CPCB for discharge of effluents	
				Inland Surface Water	Public Sewers
1.	pH at 25°C	APHA 23 <sup>rd</sup> Edition-2017, 4500H <sup>+</sup> B	7.28	5.5 to 9.0	5.5 to 9.0
2.	Total Suspended Solidin mg/l	APHA 23 <sup>rd</sup> Edition-2017, 2540D	21	100	600
3.	Chemical Oxygen Demand (as COD) mg/l	APHA 23 <sup>rd</sup> Edition-2017, 5220B	60	250	---
4.	Biochemical Oxygen Demand (as BOD) mg/l	IS 3025 (Part 44)-1993, RA:2014	18	30	350
5.	Oil & Grease in mg/l	APHA 23 <sup>rd</sup> Edition-2017, 5520A	2.1	10	20

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### 5.5 Rain water Harvesting System

Rainwater harvesting is considered to be a very environmental friendly technique by which rain water can be easily stored and used for various purposes. The rainwater harvesting project is located by the side of the main building in the garden. The project is constructed in close proximity to the walls of the building so that the rainwater easily comes down through the pipes and get stored. There are 4 tanks. Tank 1 and 2 cover an area of about 2476.9 square feet while tank 3 and 4 cover 2420 square feet. Four tanks have storage capacity of 4000 litres which means each tank has the capacity of 1000 litres. The water is used for the maintenance of the greenery & toilets.



**Figure 2: Rainwater Harvesting facility of the College**

## CHAPTER - 6

### AMBIENT AIR QUALITY MONITORING

#### 6.1 Ambient Air Quality Monitoring

DOC NO : QLS/SAMP/08-A/00

### TEST REPORT

<b>Name &amp; Address Of the Customer :</b>  Bhairab Ganguly College Belgharia, Kolkata.	Report No.	: QLS/A/18-19/C/1151
	Date	:20.12.2018
	Sample No.	: QLS/A/18-19/1151
	Sample Description	: Ambient Air
	Sample Mark	: Near Mukto Mancha
	Ref No. Date	: SBEEPL/BGC/2018-2019/08; Dated: 08.12.2018

### Analysis Result

Location: Near Mukto Mancha		Date of sampling : 06.12.2018-07.12.2018		
Sampling Done by: B.Mondal		Sampling done as per : CPCB Guidelines (Volume-1)		
Environmental Condition: Clear & Sunny		Average Temperature : 25°C		
Barometric Pressure : 758 mm of Hg		Average Humidity : 51%		
Sl. No.	Pollutants	Result	Limit as per CPCB	Method of Test Reference
1	Particulate matter (<10µm) in µg/m <sup>3</sup>	74	100	IS: 5182 (Part-23), RA-2017
2	Particulate matter (<2.5µm) in µg/m <sup>3</sup>	38	60	USEPA CFR-40,Part-50, Appendix-L
3	Sulphur dioxide (SO <sub>2</sub> ) in µg/m <sup>3</sup>	7.1	80	IS: 5182 (Part-2)-2001, RA-2017
4	Nitrogen dioxide (NO <sub>2</sub> ) in µg/m <sup>3</sup>	33.9	80	IS: 5182 (Part- 6)-2006, RA-2017
5	Carbon Monoxide (CO) in µg/m <sup>3</sup>	837	2000	IS: 5182 (Part-10):1999,RA-2014
<b>NOTE:</b> Limit as per CPCB notification, New Delhi, 18 <sup>th</sup> November 2009, for Ambient air quality.				

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## AMBIENT AIR QUALITY MONITORING

### TEST REPORT

<b>Name &amp; Address Of the Customer :</b>  Bhairab Ganguly College Belgharia, Kolkata.	Report No. : QLS/A/18-19/C/1152 Date : 20.12.2018 Sample No. : QLS/A/18-19/1152 Sample Description : Ambient Air Sample Mark : Near Main Gate Ref No. Date : SBEEPL/BGC/2018-2019/08; Dated: 08.12.2018
---	--

### Analysis Result

Location: Near Main Gate		Date of sampling : 06.12.2018-07.12.2018		
Sampling Done by: B.Mondal		Sampling done as per : CPCB Guidelines (Volume-1)		
Environmental Condition: Clear & Sunny		Average Temperature : 25°C		
Barometric Pressure : 758 mm of Hg		Average Humidity : 51%		
Sl. No.	Pollutants	Result	Limit as per CPCB	Method of Test Reference
1	Particulate matter (<10µm) in µg/m <sup>3</sup>	80	100	IS: 5182 (Part-23), RA-2017
2	Particulate matter (<2.5µm) in µg/m <sup>3</sup>	45	60	USEPA CFR-40,Part-50, Appendix-L
3	Sulphur dioxide (SO <sub>2</sub> ) in µg/m <sup>3</sup>	7.7	80	IS: 5182 (Part-2)-2001, RA-2017
4	Nitrogen dioxide (NO <sub>2</sub> ) in µg/m <sup>3</sup>	34.5	80	IS: 5182 (Part- 6)-2006, RA-2017
5	Carbon Monoxide (CO) in µg/m <sup>3</sup>	917	2000	IS: 5182 (Part-10):1999,RA-2014
<b>NOTE:</b> Limit as per CPCB notification, New Delhi, 18 <sup>th</sup> November 2009, for Ambient air quality.				

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#### **6.2 Findings :**

Central Pollution Control Board, New Delhi has set guidelines to monitor and analyze the air pollution quality parameters. The trees covers on the campus are the leading sources to absorb CO<sub>2</sub> and release enough fresh O<sub>2</sub> across the Campus. The result shows that Bhairab Ganguly College Campus's air quality status is very good as compared to other locations. It is identified that Bhairab Ganguly College campus is a green campus with observed minimum air pollution as compared to other Ambient Air Pollution Centers located in different parts of the city.

## CHAPTER – 7

### **NOISE MONITORING**

#### **7.1 Ambient Noise Monitoring status**

Ambient noise monitoring was carried out in Bhairab Ganguly College campus. The sampling was carried out using calibrated Sound Level Meter by logarithmic scale in decibels (dB). The noise readings were collected at day and night time.

#### Sound Pollution Monitoring

DOC NO : QLS/SAMP/08-C/00

### TEST REPORT

<b>Name &amp; Address Of the Customer :</b> M/s. BhairabGanguly College Belgharia, Kolkata.	Report No. : QLS/A/18-19/C/1212 Date : 20.12.2018 Sample No. : QLS/A/18-19/1212 Sample Description : Ambient Noise Date of Performance : 06.12.2018-07.12.2018 Ref No. Date : SBEEPL/BGC/2018-2019/08; Dated: 08.12.2018
---	--

### Monitoring Result of Noise

Sampling Done By: B.Mondal				
Sampling Guideline : As per IS: 9876: 1981 (RA-2001)				
Sample No	Date of Monitoring	Location	Leq dB (A) Day Time	Leq dB (A) Night Time
1212	06.12.2018-07.12.2018	Near Garden	50.5	39.6

Code/ Category	Leq dB Day Time(A)	Leq dB Night Time(A)	<i>NOTE:</i> Day Time : 06.00 Hr. – 22.00 Hr. Night Time : 22.00 Hr. – 06.00 Hr.
A/Industrial	75	70	
B/Commercial	65	55	
C/Residential	55	45	
D/Ecological Sensitive	50	40	

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## **CHAPTER – 8**

### **ENERGY AUDIT**

#### ***8.1 Objective Primary***

- The first objective is to acquire and analyze data and find the necessary consumption pattern of these facilities.
- The second objective will be to calculate the wastage pattern based on the results of the first objective.
- The final objective is to find and implement solutions that are acceptable and feasible.

#### ***Secondary***

- This would be our first exposure to this field hence experience gain would be vital.
- This project will precede many follow up projects and hence helps to gain technical and management exposure required for future energy projects.
- It is sure to help create a repertoire of vital contacts hence will develop interaction with alumni, faculty and students.

#### ***8.2 Source of Energy***

##### **Bhairab Ganguly College withdraws Energy from Followings:**

- Electricity from CESC
- Solar Energy

##### **The Following are the Major consumers of Electricity in the facility**

- Lightning
- Air Conditioner
- Fans
- Computers
- Other Lab Equipment

#### ***Indirect Benefits of Energy Audit***

Every time the Energy Audit is carried out it rekindles the interest in Energy Conservation as an important function. Energy Auditors sharing their experience and knowledge with the Plant Personnel helps in fueling the innovative ideas for further action of reduction in Specific Power consumption (SPC).

### 8.3 General Details

S.No.	PARTICULARS	DETAILS	
1	Name & Address of Collage	Bhairab Ganguly College Belgharia, Kolkata – 700 056.	
	Web Site	www.bhairabgangulycollege.ac.in	
2	Name of Contact Officer	Dr. Sanjit Kr. Das	
	Designation	Vice-Principal	
	Name of Alternative Officer	Dr. Prabir Karar	
	Designation	IQAC Co-ordinator	
3	Telephone No.	033-25532280	
	Mobile No.	9433352546	
	Fax No.		
	e-mail ID	bhairab1968@gmail.com	
	No. of shift	01 shift 10.00AM to 06.00 PM	
	No. of Employees (Approx)	88	
4	Electricity Consumption	Imported (Purchased) 88031	
5	Specific Energy Consumption	Fuel	Electricity
		645/- (per month)	Rs. 55,667/- (Per month)
6	LPD	1,494/- per month	
7	EPI	1.81	

#### 8.4 *Electrical Details*

##### **TRANSFORMERS**

	<b>No. 1</b>
Voltage Ratio	N/A
KVA	N/A
% Impedence	N/A

##### **ELECTRICITY CONSUMPTION**

	<b>Particulars</b>	<b>Demand</b>
A	Contract demand KVA	62.4
B	Maximum demand	62.4
C	Total Energy units consumed / year	88031
D	Avg. Power Factor (P.F.)	0.91
E	Avg. Energy bills (Rs/month)	Rs.55,667/-

#### 8.5 *Detailed list of the Electric Motors operating in the Institute*

<b>S.NO.</b>	<b>NAME OF THE PLANT</b>	<b>RATING OF MOTOR (KW)</b>	<b>NO. OF MOTORS</b>
1	Bhairab Ganguly College, Belgharia, Kolkata.	3.72	4 nos.

## CONNECTED LOAD

	<b>EQUIPMENT</b>	<b>TOTAL NUMBERS</b>	<b>LOAD IN KW (TOTAL)</b>
A)	Motors : Greater than 10 kW	NIL	NIL
	: Less than 10 kW	4 Nos.	3.72 KW
B)	AC & Ventilation with TR capacity		
a)	Others (Package ACs/ Split ACs / Windows ACs) with TR	<b>Room AC of Split/Window type –</b> 77 Nos. 516.97 KW	
C)	Total Process Load (in kW)		520.69 KW
D)	Total Lighting Load (in kW) & Luminaries details	<b>No's of lighting luminaries</b> (LED+T/L+ (including fan )  Tube Light - 3.60 KW LED Light - 13.87 KW Electric Fan - 27.36 KW	
	Total Load (in kW)		565.52 KW

### A. Lux Measurements :

Sl.no.	Room	LUX level	Remarks
1.	<b>Main Building</b>		
	Ground Floor	203,205,199,193,193,188,205,199	
	1 <sup>st</sup> floor	206,199,200,208,194,197,193,201	
	2 <sup>nd</sup> floor	203,200,199,198,204,197,194,199	
2.	<b>Office Building</b>	<b>LUX level</b>	
	Ground Floor	191,203,204,199,206,200,196,197	
	1 <sup>st</sup> floor	198,195,191,208 203,204,187,190	
	2 <sup>nd</sup> floor	208,199,188,189,190,195,193,199	
3.	<b>New PG Building</b>	<b>LUX level</b>	
	Ground Floor	203,209,197,198,196,198,202,191,200	
	1 <sup>st</sup> floor	205,195,191,196,195,203,195,200,193	
	2 <sup>nd</sup> floor	200,194,189,191,190,196,201,196,189	
4	<b>Canteen Building</b>	LUX level	
	Ground Floor	200,188,197,199,203,188,193,194,197	
	1 <sup>st</sup> floor	195,204,209,199,193,192,198,181,195	
5	<b>Indoor Sports Complex</b>	LUX level	
	Ground Floor	203,197,191,196,200,198,196,204,207	
6	<b>Staff Quarter</b>		
	Ground Floor	201,205,200,199,202,196,189,197,201	

### Illumination Level Comparison

Area	Average Lighting Level (LUX)	NBC Recommended
<b>Main Building</b>	184	300-500
<b>Office Building</b>	197	300-500
<b>New PG Building</b>	205	300-500
<b>Canteen Building</b>	195	300-500
<b>Indoor Sports Complex</b>	224	300-500
<b>Staff Quarter</b>	223	300-500

**Remarks: Lights needs cleaning at an interval of one month and old light to be replaced by new to get desired LUX value**

## **8.6 Use of alternate Energy**

The institute has taken an important step for reduction in pollution level by installation of solar panel and photo voltaic cell for generating electricity. Combined generation capacity is 96 KW.

For reducing carbon emission, and dependence on fossil fuel, the institution has resorted to using green energy by harnessing solar power. In order to increase generation of solar energy, installation of solar panels in the open space around the building may be considered.

Generated power is transferred to the grid.

This helps in reducing carbon emission.



**Figure 3: Solar power system for Green Energy**



## CHAPTER - 9

### WASTE MANAGEMENT

#### *9.1 Solid Waste*

Solid waste is the unwanted or useless solid material generated from human activities in a residential, industrial, or commercial area. Solid waste management reduces or eliminates the adverse impact on the environment and human health.

The present Prime Minister of India Sri Narendra Modi launched 'Swachh Bharat Abhiyan' (Clean India Mission) on 2nd October, 2014. In this mission, the proper use of dust/waste bins is one of the major priorities. To implement this mission, collective mass effort is necessary. For proper segregation and management proper use of waste bins is the only solution for waste management purpose in the college campuses.

#### *9.2 Solid Waste Management*

Solid waste collection bin has been placed at strategic points. Solid waste data is collected from all the Building areas and the same is directly handed over to the municipal collection system for further segregation and recycling purpose.



Figure 4 : Solid Waste Management

### Management of organic waste:

The data collected from the 20 departments reveal that 10% carries out high management of organic waste, 5% carries out medium and low management respectively, and 80% organic waste is not a matter of concern as it is produced in insignificant quantity. Organic wastes are mainly used for gardening and the issue of its management and storage is not an issue here.

TOTAL DEPARTMENT	PARAMETER	PERCENTAGE OF HIGH	PERCENTAGE OF MEDIUM	PERCENTAGE OF LOW	PERCENTAGE OF NIL
20	Management of Organic Waste	10	5	5	80

### Generation of Food and organic waste per day:

The data collected from the 20 departments reveal that 10% of the departments generate high amount food and organic waste per day, 15% of the departments generate medium amount food and organic waste per day, 40% of the departments generate low amount food and organic waste per day and 35% of the departments generate negligible amount of food and organic waste per day. This implies that wastage of food is not a serious problem for the college.

TOTAL DEPARTMENT	PARAMETER	PERCENTAGE OF HIGH	PERCENTAGE OF MEDIUM	PERCENTAGE OF LOW	PERCENTAGE OF NEGLIGIBLE
20	Food/Organic waste/day	10	15	40	35

### **Management of other waste:**

As per data collected from the 20 departments it has been found that 10% have high management of other waste, 5% have medium and low management of other waste respectively, whereas 80% have no management of other wastes. Steps are taken to keep the campus clean and tidy and so amount of waste generation within the campus is low.

TOTAL DEPARTMENT	PARAMETER	PERCENTAGE OF HIGH	PERCENTAGE OF MEDIUM	PERCENTAGE OF LOW	PERCENTAGE OF NIL
20	Management of Other Waste?	10	5	5	80

### **9.3 E-Waste**

Substantial quantity of e-waste is generated due to extensive use of computer.

All members particularly students have been advised not to throw used pen drive etc. any where, but to keep in designated bins. Waste thus collected is stored in secured place. Waste is to be discharge through authorised agencies and certificates are to be obtained. Presently, these are stored in open enclosure.

A covered area is to earmarked for storage of e waste.

## CHAPTER - 10

### **BIODIVERSITY STATUS**

#### ***10.1 Introduction***

Bhairab Ganguly College campus is very rich in the term of biodiversity. To conserve this biodiversity, our first need is to learn about the existing diversity of the place. Unless we know whom to conserve, we will not be able to plan proper conservation initiatives. Also, it is important to have an understanding of the biodiversity of an area so that the local people can be aware of the richness of biodiversity of the place they are living in and their responsibility to maintain that richness.

#### ***10.2 Objective***

The main objective of this study is to get a baseline data of bio-diversity of the area which will include:

1. Documentation of the floral diversity of the area: its trees, herbs, shrubs, climbers and aquatic vegetations.
2. Documentation of the major faunal groups like mammals, reptiles, amphibians, birds and among the insects, butterflies and dragonflies.
3. Documentation of the specific interdependence of floral and faunal life.

#### ***10.3 Method of Study***

**Brief methodology for the floral and faunal survey is given below:**

01. Sampling was done mostly in random manner.
02. Surveys were conducted for the maximum possible hours in day time.
03. Tree species were documented through physical verification on foot and photographed each species as much as possible.
04. The total area was surveyed by walking at day time.
05. For faunal species we emphasized mainly on the direct sighting. Also call of various birds and amphibians and nesting of some faunal species were considered as direct evidences.

06. Observing mammals depend critically on the size of the species and its natural history. Diurnal species are common and highly visible. Nocturnal species, however, are rare and difficult to detect. Small mammals like the field rats were found near their burrows, particularly during their entry or exit times in or out from their burrows respectively. In some cases, deposits and footprints were also observed that served as a potential clue for the presence and absence of the concerned species. These secondary evidences were all noted with time and space co-ordinates.
07. Birds are often brightly coloured, highly vocal at certain times of the year and relatively easy to see. Sampling was done on the basis of direct sighting, call determination and from the nests of some bird species.
08. Reptiles were found mostly by looking in potential shelter sites like crevices of building, logs, tree hollows and leaf litter and also among and underneath the hedges. Sometimes some species, particularly the garden lizards were also observed in open spaces (on twigs and branches and even on brick constructions) while they were basking under direct and bright sunlight.
09. Amphibians act as potential ecological indicators. However, most of them are highly secretive in their habits and may spend the greater part of their lives underground or otherwise inaccessible to biologists. These animals do venture out but typically only at night. They were searched near pond, road beside wetland and in other possible areas. Diurnal search operations are also successful.
10. Active invertebrates like the insects require more active search. For larger winged insects like butterflies, dragonflies and damselflies, random samplings were carried and point sampling was also done.
11. The easiest way to observe many of the invertebrates is simply looking for them in the suitable habitat or microhabitat. Searching was carried out under stones, logs, bark, in crevices in the walls and rocks and also in leaf litter, dung etc. slugs and snails are more conspicuous during wet weather and especially at night when they were found using torch.

#### 10.4 Plant diversity of the College

Bhairab Ganguly College premises having about 10 acres of land have unique plant diversities. These include flowering plants, leafy trees, medicinal herbs and innumerable wild bushes. There are valuable trees like Mahogany, Ashok, Arjun, Jarul, Siris, Akashmoni Neem, Karabi, Bokul, Radhachura, Deodar, Basant bahar and decorative plants like Royal Palm, Christmas tree, Bottle brush etc. There are 45 types of trees and the highest number of the types of trees (37) are found within the species range of up to 10 i.e. within the lowest class range and only 1 type of tree has species number above 40 i.e. within the highest class range. There are 3 types of trees within the range of 10 to 20 trees, 2 types are within 20 to 30 species range and another 2 tree types are within 30 to 40 range. There are about 82% of the trees which have lower number of plant species (upto 10) i.e. 18% of the trees belong to the remaining species ranges. Besides, the campus is very green with a standard football ground surrounded by trees of different sizes and the roadside is also beautified by the plantations of a variety of decorative and indigenous species of trees.

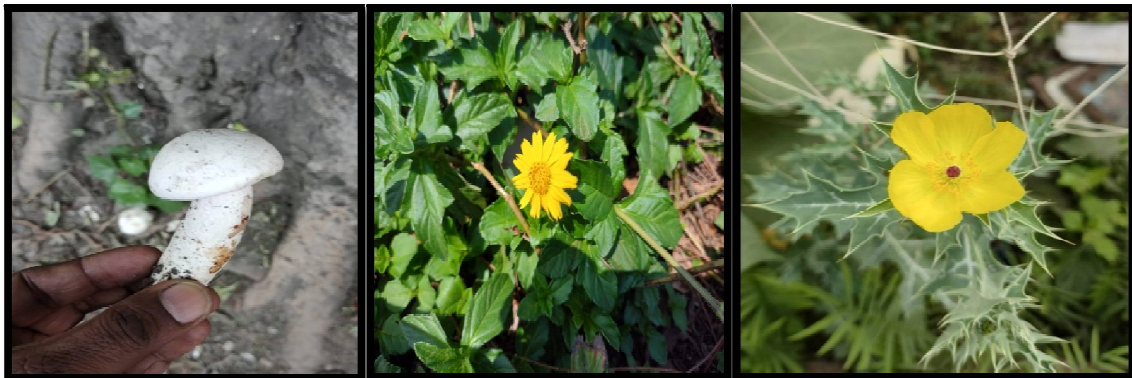


Figure 5 : Plant diversity of college

## List of the Major Plants of the Garden

SL. NO.	COMMON NAME	SCIENTIFIC NAME	FAMILY
1	Patharkuchi	<i>Kalanchoe pinnata</i>	Crassulaceae
2	Ghrita Kumari	<i>Aloe vera</i>	Liliaceae
3	Sarpagandha	<i>Rauwolfia serpentine</i>	Apocynaceae
4	Currypatta	<i>Murraya Koeinigii</i>	Rutaceae
5	Basak	<i>Adhatoda vasica</i>	Acnathaceae
6	Nayantara	<i>Vinca rosea</i>	Apocynaceae
7	Henna	<i>Lowsenia inermis</i>	Lythraceae
8	Arjuna	<i>Terminalia arjuna</i>	Combretaceae
9	Amada	<i>Curcuma amada</i>	Zingiberaceae
10	Tulsi	<i>Ocimum sanctum</i>	Lamiaceae
11	Lemongrass	<i>Cymbopogon citrates</i>	Poaceae
12	Fennel	<i>Foeniculum vulgare</i>	Umbelliferae
13	Onion	<i>Allium sepa</i>	Liliaceae
14	Ekangi	<i>Kaempferia galanga</i>	Zingiberaceae
16	Kulekhara	<i>Hygrophila auriculata</i>	Acanthaceae
17	Brahmi	<i>Bacopa moniera</i>	Scrophulariaceae
18	Datura	<i>Datura stramonium</i>	Solanaceae
19	Kalmegh	<i>Andrographis paniculata</i>	Acanthaceaea
20	Bahera	<i>Terminalia bellerica</i>	Combretaceae
21	Olotkambal	<i>Abroma augusta</i>	Malvaceae
22	Amla	<i>Emblica officinalis</i>	Euphorbiaceae
23	Kulekhara	<i>Hygrophila auriculata</i>	Acanthaceae
24	Eucalyptus	<i>Eucalyptus globulus</i>	Myrtaceae
25	Chalim	<i>Alstonia scholaris</i>	Apocynaceae
26	Segun	<i>Tectona grandis</i>	Lamiaceae
27	Stevia	<i>Stevia rebaudiana</i>	Asteraceae
28	Asoka	<i>Saraca asoca</i>	Fabaceae
29	Haritaki	<i>Terminalia chebula</i>	Combretaceae
30	Bael	<i>Aegle marmelos</i>	Rutaceae

SL. NO.	COMMON NAME	SCIENTIFIC NAME	FAMILY
31	Areca Palm	<i>Dypsis lutescens</i>	Areaceae
32	Neem	<i>Azadirachta indica</i>	Meliaceae
33	Jamun	<i>Syzygium cumini</i>	Myrtaceae
34	Mango	<i>Magnifera Indica</i>	Anacardiaceae
35	Sankarjata	<i>Uraria picta</i>	Fabaceae
36	Papaya	<i>Carica papaya</i>	Caricaceae
37	Nisindi	<i>Vitex negundo</i>	Lamiaceae
38	Ayapan	<i>Ayapana triplinervis</i>	Asteraceae
39	Ramtulsi	<i>Ocimum tenuiflorum</i>	Lamiaceae
40	Bakuchi	<i>Psoralea coryifolia</i>	Fabaceae
41	Ajwan	<i>Trachyspermum amm</i>	Apiaceae
42	Gurmer	<i>Gymnema sylvestre</i>	Asclepiadaceae
43	Akanda	<i>Calotropis procera</i>	Apocynaceae
44	Gandal	<i>Paederia foetida</i>	Rubiaceae
45	Henna	<i>Lawsonia inermis</i>	Lythraceae



Figure 6 : Plant diversity of college



## Medicinal Plants in the Campus:

A number of plants with medicinal properties are growing in the campus, specially in the medicinal plant garden.

SL. NO.	COMMON NAME	SCIENTIFIC NAME	USES
1	Arshagandha	Wythianiasomnifera	Root, Leaf, Fruits and Seed
2	Akanda	Calotropisagigantea	Bark, Root, Leaf, Latex, Flower
3	Ayapan	Eupatorium triplinerve	Whole Plants
4	Tulsi	Ocimum sanctum	Leaf
5	Kari pata	Murrayakoenigii	Root, Leaf, Fruit
6	Bisallakaroni	Barlerialupulina	Leaf
7	Kulephara	Hygrophilaschulli	Whole plant
8	Gurmar	Gymnemasylvestre	Root, Leaf, Fruit
9	Grikumari	Aloe vera	Leaf
10	Thankuni	Cantellaasiatica	Leaf
11	Nayantara	Catharanthusroseus	Whole Plants
12	Neem	Azadirachtaindica	Bark, Leaf, Yound Stem, Unripped fuit, Seed Oil
13	Basak	Adhatodavasika	Leafd, Flower, Bark, Root
14	Bisllakarani	Gendarussa Vulgaris	Leaf
15	Bel	Aeglemarmelos	Root, Young Leaf, Flower, Ripe and Unripped Fruit
16	Sarpagan Jha	Raunolfiaserpentina	Leaf
17	Sughni	Marsileaminuta	Whole Plant
18	Karabi	Neriumodorum	Root, Leaf, Bardk, Stem
19	Black Tulsi	Ocimumtenuiflorum	Whole Plant, Leaf, Seed
20	Muthagrass	Cyperusrotundus	Root
21	Tulsi	<i>Ocimum sanctum</i>	Leaf
22	Thankuni	<i>Cantellaasiatica</i>	Leaf
23	Blue porterweed	<i>Stachytarpheta jamaicensis</i> ( <i>Verbenaceae</i> )	Root, leaves
24	Costus	<i>Costus sp (Zingiberaceae)</i>	Rhizome
25	Guava	<i>Psidium guajava</i>	Leaves
26	Atasi	<i>Crotalaria retusa L.</i>	Leaves
27	Lemon grass	<i>Cymbopogon microthecus</i>	Leaves
28	Adlay millet	<i>Coix lacryma-jobi</i>	Fruit
29	Nayantara	<i>Catharanthus roseus</i>	Leaves

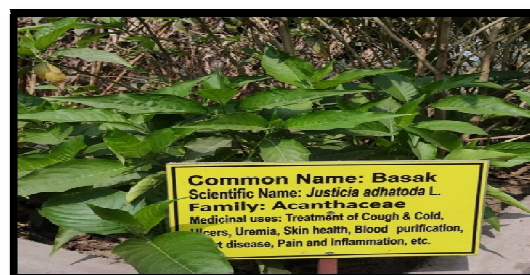


Figure 7 : Medicinal Plant of the college

### 10.5 Checklist of Reptiles

Sl. No.	Common name	Scientific Name	Bengali Name
1.	Checkered Keelback	Xenochrophis piscator	Joldhora
2	Buff Striped Keelback	Amphiesma stolatum	Hele
3	Rat Snake	Zamenis longissimus	Darash
4	Russel's Vipar	Daboia russelii	Chandrabora
5	Skink	Lampropholis sp.	Anjani
6	Oriental Garden Lizard	Colotes versicolor	Girgiti
7	Bengal Monitor Lizard	Varanus bengalensis	Gosap
8	Common House Grcko	Hemidactylus frenotus	Tiktiki



Figure 8 : Reptiles

## 10.6 Checklist of Birds

A total of 20 types of bird species were found in the campus, which is quite a good number, in spite of the industrialized surrounding around it.

### **BIRD Species**

SL. NO.	Scientific Name	COMMON NAME
1.	<i>Columba livia</i>	Rock dove
2.	<i>Dendrocitta Sp.</i>	Rufous Treepie
3.	<i>Copsychus Sp.</i>	Oriental Magpie Robin
4.	<i>Centropus sinensis</i>	Crow Peasant
5.	<i>Chrysocolaptes Sp.</i>	Greater Flameback
6.	<i>Corvus macrorhynchos</i>	Jungle Crow
7.	<i>Amaurornis phoenicurus</i>	White-breasted Waterhen
8.	<i>Ardeola grayii</i>	Indian Pond heron
9.	<i>Lonchura punctulata</i>	Scaly Breasted Munia
10.	<i>Molpastes cafer</i>	Shipoy bulbul
11.	<i>Megalaima haemacephala</i>	Coppersmith Barbet
12.	<i>Megalaima Sp.</i>	Blue Throated Barbet
13.	<i>Hierococcyx varius</i>	Common Hawk Cuckoo
14.	<i>Dicrurus Sp.</i>	Black Drongo
15.	<i>Treron phoenicoptera</i>	Yellow Footed Green Pigeon
16.	<i>Passer domesticus</i>	House sparrow
17.	<i>Turdoides striatus</i>	Jungle babbler
18.	<i>Merops orientalis</i>	Green Bee-eater
19.	<i>Upupa epops</i>	Hoopoe
20.	<i>Milvus Sp.</i>	Black kite



Figure 9 : Local Birds

### 10.7 Checklist of Grasses

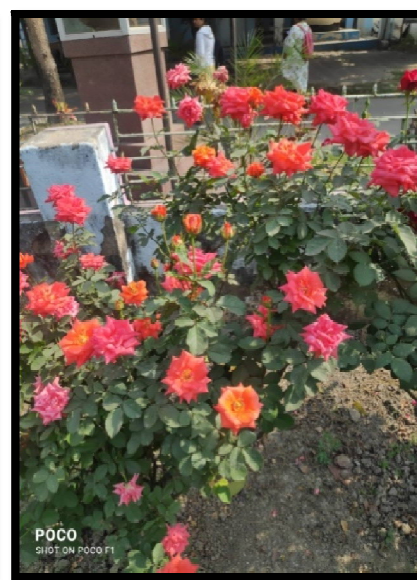
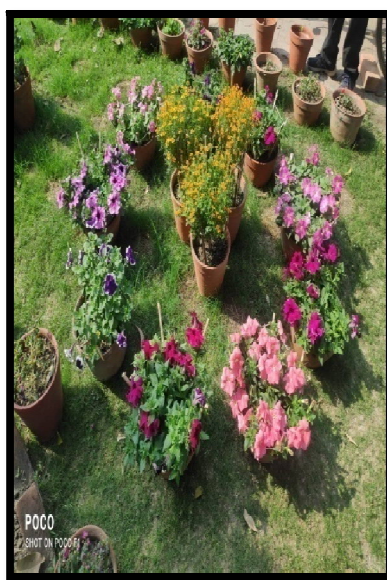
Sl. No.	Local Name	Common Name	Scientific Name
1.	Chepri Ghas	Common Carpetgrass	Axonopus sp.
2.	Durba Ghash	Durba	Cynodon dactylon

### 10.8 Mamals

Sl. No.	Common Name	Scientific Name	Bengali Name
1	Indian palm squirrel	<i>Funumbulus sp.</i>	Kathberali
2	Frugivorous bat	Suborder Megachiroptera	Badur
3	Insectivorous bat	Suborder Microchiroptera	Chamchike
4	House mouse	<i>Mus musculus</i>	Indur
5	Rat	<i>Rattus norvegicus</i>	Dhere indur

### 10.9 Checklist of Ferns and Seasonal Flowers

Sl. No.	Local Name	Common Name	Scientific Name
1.	Bird-nest-Fern	Bird-nest Fern	Asplenium sp.
2.	Fern sp.		
3.	Fishtail Fern	Fishtail Fern	Microsorium punctatum
4.	Oakleaf Fern	Oakleat Fern	Drynaria quercifolia
5.	Dog flower, Snadragon	Dog flower, Snapdragon	Antirrhinum majus
6.	Garden stock, Common stock	Garden stock, Common stock	Matthiola incana
7.	Gazania	Gazania	Gazania sp.
8.	Gladiolus	Gladiolus	Gladiolus sp.
9.	Himsagar	Flaming katy, Florist kalanchoe	Kalanchoe blossfeldiana
10.	Maiden Pink	Maiden Pink	Dianthus deltoids
11.	Mike Ful	Amaryllis	Hippeastrum sp.
12.	Pansy, Garden Pansy	Pansy, Garden Pansy	Viola tricolor var.
13.	Petunia	Petunia	Petunia hybrid
14.	Verbena	Verbena	Verbena sp.



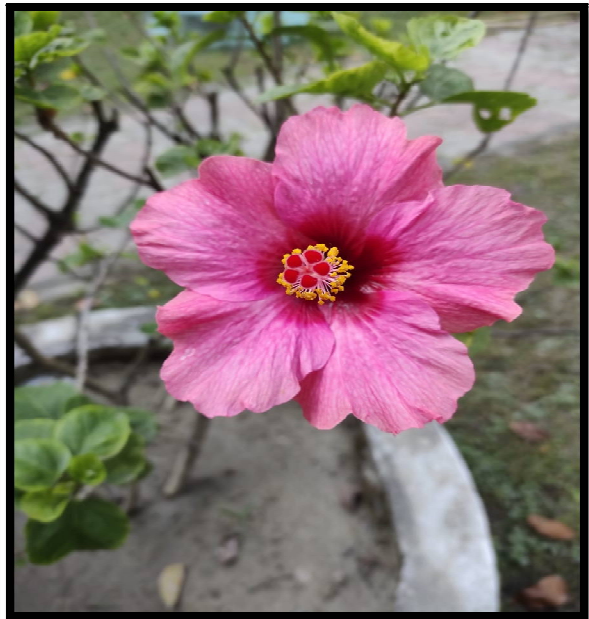


Figure 10 : Blooming Flowers throughout the year in the College campus

## Checklist of Butterfly in Bhairab Ganguly College

Bhairab Ganguly College campus possesses large scale butterfly diversity. The greenery of the college attracts a large number of species of butterflies. The survey identified 25 species of butterflies. Out of 25 species identified, 5 are abundant accounting for about 20% of the total, 11 are common accounting for about 44% of total, 6 belong to the uncommon category accounting for about 24% of total and 3 are rare accounting for about 12% of total.

SL. NO	SCIENTIFIC NAME	COMMON NAME
1.	<i>Tirumala limniace</i>	Blue Tiger
2.	<i>Mycalesis gotama</i>	Chinese Bushbrown
3.	<i>Neptis hylas</i>	Common Sailor
4.	<i>Moduza procris</i>	Commander
5.	<i>Euthalia aconthea</i>	Common Baron
6.	<i>Mycalesis perseus</i>	Common Bushbrown
7.	<i>Ariadne merione</i>	Common Castor
8.	<i>Euploea core</i>	Common Crow
9.	<i>Melanitis leda</i>	Common Evening Brown
10.	<i>Ypthima baldus</i>	Common Five-ring
11.	<i>Ypthima huebneri</i>	Common Four-ring
12.	<i>Eurema hecabe</i>	Common Grass Yellow
13.	<i>Delias eucharis</i>	Common Jezebel
14.	<i>Elymnias hypermnestra</i>	Common Palmfly
15.	<i>Castalius rosimon</i>	Common Pierrot
16.	<i>Mahathala ameria</i>	Falcate Oakblue
17.	<i>Junonia atlites</i>	Grey Pansy
18.	<i>Papilo demoleus</i>	Lime Butterfly
19.	<i>Danaus chrysippus</i>	Plain Tiger
20.	<i>Danaus genutia</i>	Striped Tiger





Figure 11 : Butterfly in the college campus area

## **CHAPTER - 11**

### **GREEN INITIATIVES**

Bhairab Ganguly College aims to protect and conserve its biodiversity, fresh and clean ambiance through the following green initiatives to protect and conserve nature.

#### ***11.1 Plantation and Nurturing Programme***

Many plantation drives are taken by Eco club of Bhairab Ganguly College on its campus. The trees are watered by students of UG and PG Departments. They nurture these trees through out the year.

Plantation programme of Bhairab Ganguly College promotes environment management and conservation in the college campus with the following objectives:

1. To motivate the students to keep their surroundings green and clean by undertaking plantation of trees.
2. Promote ethos of conservation of water by minimizing the use of water.
3. Motivate students to imbibe habits and life style for minimum waste generation, source separation of waste and disposing the waste to the nearest storage points.
4. To create awareness amongst public and sanitary workers, so as to stop the indiscriminate burning of waste which causes respiratory diseases.
5. To minimize the use of plastic bags, not to throw them in public places as they choke drains and sewers, cause water logging and provide breeding ground for mosquitoes.
6. Organize tree plantation programmes, awareness programmes such as Quiz, essay, painting competitions, rallies, nukkad natak etc. regarding various environmental issues and educate children about re-use of waste material & preparation of products out of waste
7. Organize Nature Trail in Wild Life Sanctuaries/Parks/Forest areas to know about the Bio-diversity



Figure 12 : Plantation Programme

### ***11.2 Green computing practice***

Being an academic institution, papers are used for various purposes like exam answer sheets, circulars, notices, office work, document printing, and Xeroxing. Since the trees are cut for paper manufacturing, the sequestration of carbon is reduced increasing carbon footprint. To cut down the carbon footprint, the university administration and various departments follow paperless methods of communication by using emails, online forms submission, etc. The paperless work was helpful in reducing tons of CO<sub>2</sub>. The tons of biomass are saved by this green computing practice.

## CHAPTER - 12

### CONSOLIDATION OF AUDIT FINDINGS

Green Audit will create a greater appreciation and understanding of the impact of college activities on the environment. Bhairab Ganguly College has successfully been able to identify the impacts on the environment through the various auditing exercises. The green auditing exercise has brainstormed and provided insights on practical ways to reduce negative impact on the environment. Participating in this green auditing procedure has increased knowledge about the need of maintaining sustainability of the college campus. It will create awareness around the use of the Earth's resources in your home, college, local community and beyond. Bhairab Ganguly College should adopt an Environmentally Responsible Purchasing Policy, and work towards creating and implementing a strategy to reduce the environmental impact of its purchasing decisions. While good producing companies are rapidly developing in the area of energy efficiency. Many computer hardware and electrical supply companies now cooperate with customers to reclaim old or damaged parts. Bhairab Ganguly College has a tie with a Company (the entrepreneur is an alumnus of our College) which reclaims old or damaged computers and repair or replace them if possible. Although over twice as expensive up front, LCD monitors are estimated to use 40-60% less energy overall than CRTs. All computers purchased by the college have an Energy Star rating, which is beginning to be a standard requirement for computers.

#### *12.1 Preparation of action plan*

Management's policies referring to College and approach towards the use of resources need to be considered in purview of green audit report. An environmental policy should be formulated by the management of the college. The college should have a policy on green awareness raising or training programmes for students and staff, seminars on Environment Awareness are often organized by different departments of the institution, green awareness policy right from kitchen staff to procurement policy by the management. Based on the policies, college should have an action plan. The green auditing report will be a base line for the action plan to be evolved.

#### *12.2 Follow up action and plans*

Green Audit is an exercise which generates considerable quantities of valuable environment and resource management information. The time and effort and cost involved in this exercise is often considerable and in order to be able to justify this expenditure, it is important to ensure that the findings and recommendations of the audit are considered at the correct level within the organization and action plans and implementation programmes will be conducted on the basis of the audit findings.

### ***12.3 Environmental education***

The following environmental education programmes may be implemented in the college before the next green auditing:-

Training programmes in solid waste management, liquid waste management setting up of biodiversity garden, tree management, medicinal plant nursery, vegetable cultivation, water management, energy management, landscape management, pollution mitigation methods, and water filtration methods.

- Give priority to environmental clubs and its programmes
- Set up model rainwater harvesting system, vegetable garden, medicinal plant garden, butterfly garden etc.
- Conduct exhibition on throw away plastic danger, recyclable products etc.
- Display various slogans and pictures to protect environment.
- Implement chemical treatment system for waste water from the laboratories and incinerators.

## CHAPTER - 13

### **CONCLUSION AND RECOMMENDATIONS**

Green Audit is the most efficient way to identify the strength and weakness of environmental sustainable practices and to find a way to solve problem. Green Audit is one kind of professional approach towards a responsible way in utilizing economic, financial, social and environmental resources. Green audits can “add value” to the management approaches being taken by the college and is a way of identifying, evaluating and managing environmental risks (known and unknown). There is scope for further improvement, particularly in relation to waste, energy and water management. The college in recent years consider the environmental impacts of most of its actions and makes a concerted effort to act in an environmentally responsible manner. Even though the college does perform fairly well, the recommendations in this report highlight many ways in which the college can work to improve its activities and become a more sustainable institution.

#### ***13.1 Suggestions***

- a) Adopt the proposed Environmentally Responsible Purchasing Policy, and work towards creating and implementing a strategy to reduce the environmental impact of its purchasing decisions.
- b) Increase recycling education on campus.
- c) Increase awareness of Environmentally Sustainable Development – Use every opportunity to raise public, government, industry, foundation, and college awareness by openly addressing the urgent need to move toward an environmentally sustainable future.
- d) Collaborate for Interdisciplinary Approaches – Convene college faculty and administrators with environmental practitioners to develop interdisciplinary approaches to curricula research initiatives, operations, and outreach activities that support an environmentally sustainable future.
- e) Adopt the proposed Environmentally Responsible Purchasing Policy, and work towards creating and implementing strategy to reduce the environmental impact of its purchasing decisions.
- f) Increase reduce, reuse, and recycle education on campus.

### 13.2 Recommendations

- a) Declare the campus plastic free and implement it thoroughly.
- b) Replace incandescent and CFL lamps with LED light
- c) Replace LCD computer monitors with LED monitors
- d) A separate enclosure needs to be made for storage of scrap and waste materials.
- e) Exhaust Gas shall be monitored, analysed and check regularly
- f) Noise Level Monitoring shall be done as per the guideline of "Noise Pollution (Regulation and Control) Rules 2000
- g) Total 33% area is to be reserved for plantation
- h) The Biodiversity is to be maintained while considering the plantation in future

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Director

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Sonar Bharat Environment & Ecology Pvt. Ltd.  
*Parimal Sarker*  
Director



**THE END**