

*Report
on
Environmental Audit*

OF
BARASAT GOVT. COLLEGE
10 KNC ROAD, BARASAT, NORTH 24 PARGANAS,
KOLKATA 700124

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Environmental Audit Committee
Vidyasagar University
Midnapore, Paschim Medinipur 721102

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10 KNC Road, Barasat, North 24 Parganas,
Kolkata 700124
(2022-23)

Environmental Audit Committee,
Vidyasagar University,
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1. Prologue

Environment is under tremendous stress due to inefficient use of resources, pollution, ecosystem degradation, insufficient expertise and awareness to waste management, climate change and bio-diversity loss. In this perspective environmental regulations and laws are becoming more stringent and compulsory, where it is expected the every organisation and institute shall adopt a systematic approach of environment management with equal importance to environment, societal needs and economy, the three pillars of sustainability. Environment audit is performed to review how efficiently one organisation performs to minimise its environmental impacts and protects environment both within and outside the campus. Organisation must identify its significant environmental aspects and impacts on environment and must put sincere efforts to minimise those impacts in a way to contribute in sustainable development. Environmental Auditing is the process of assessment of institution's practices to examine whether those are ecofriendly and sustainable. Higher Education Institutes (HEIs) should perform to make environmentally sensible citizens through its activities and practices designed in a systematic manner in the line of its strategies, aims and objectives.

2. Objective

In the context of unprecedented human impacts on environment and consequent environmental degradation, it is expected that every organisation /institute will display their commitment and accountability towards sustainability in a transparent manner. From this perspective, the main objective to carry out environmental audit is to check whether an organisation or institute designs an Environment Management System (EMS) of its own to address its significant environmental aspects, minimise its impact on environment by systematic planning and planned execution of targets, timely review of performance and continual improvement of existing EMS.

3. Barasat Government College - Institutional context :

Barasat Government College was established in 1950 to cater the need of formal education of large mass of displaced people after partition of India. Through several successive stages of development, the college has reached to the present status, where it accommodates and offers Honours courses in thirteen humanities and science

subjects, two General courses and Post-graduate courses in four subjects viz. Botany, Zoology, Physics and Bengali. A Post-graduate course in Chemistry has been sanctioned recently from the university and preparations are on to open it in the coming session. The college also has a unit of Netaji Subhas Open University which offers twenty one UG and PG course programmes. Presently the college is affiliated to the West Bengal State University. The campus of Barasat Government College is situated in the heart of Barasat city covering an area of 9259.09 m² of which, 4047 m² is under vegetation. The college has been accredited with Grade “A grade by NAAC with Institutional Score CGPA 3 .1 in 2016. In 2022-23 session, total student strength was 3112 including 1293 male and 1819 female students offered education by a teacher strength of 99, with a teacher-student ratio of 1 : 31. College has the administrative and supporting staff strength of 10 and 12 respectively.

College is located in the heart of Barasat Municipality at 22.717° N latitude and 88.481° E longitude.

4. Scope of the Present Environment Audit:

Environmental Audit of the Barasat Government College was done within the following scopes.

Whether the college has a sound environmental policy integrated into the priorities and strategic directions of the institute.

Whether a systematic plan is formulated to achieve measurable environmental objectives aiming to prevention and mitigation of adverse environmental impacts and enhancing beneficial environmental impacts in tune with environmental policy.

Whether commitments from all levels and functions of the organisation including top management are reflected and documented in their activities to execute the plans for enhancing environmental performances.

Whether mechanism is set for periodical review of environmental performance and what measures are taken for continual improvement.

Whether effective communications are made about the environmental information to interested parties and stakeholders.

Whether documented information on varied aspects of environmental impacts,

monitoring and measurement, corrective actions are maintained.

5. Environmental Setup of the Institute

5.1 Land Use

The College covers an area of 9259 m², of which 22% are under green cover, 41% are under built-up area, 14% open bare land and 22% is grass covered area (Figure-1 and 2).

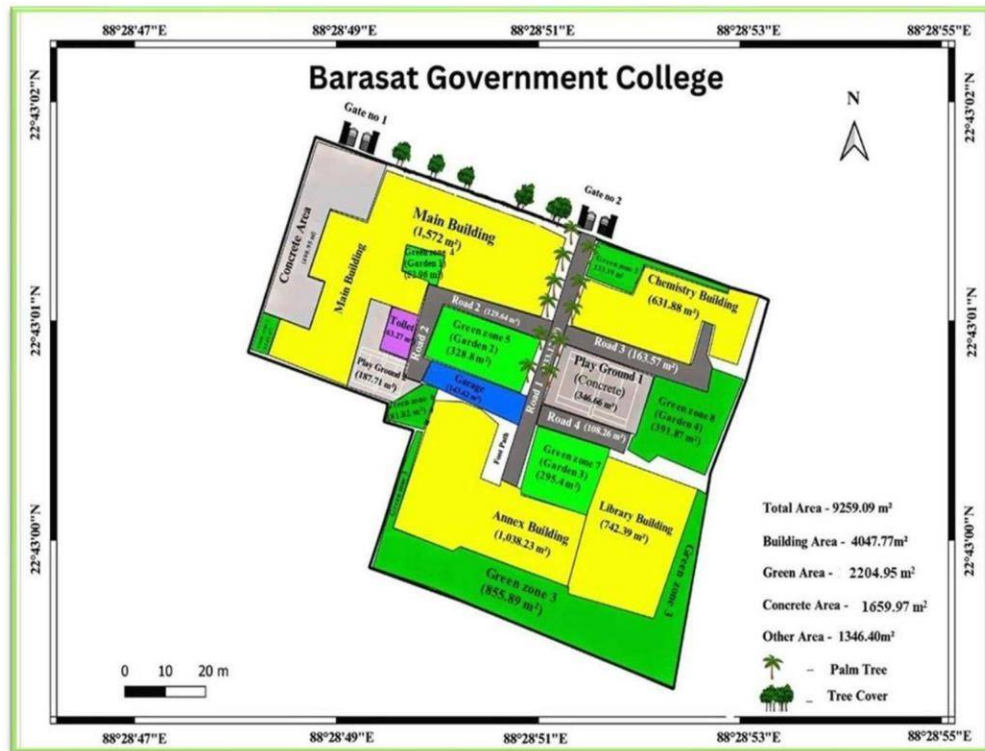


Figure 1: College Campus showing landuse (Source: Barasat Govt. College)

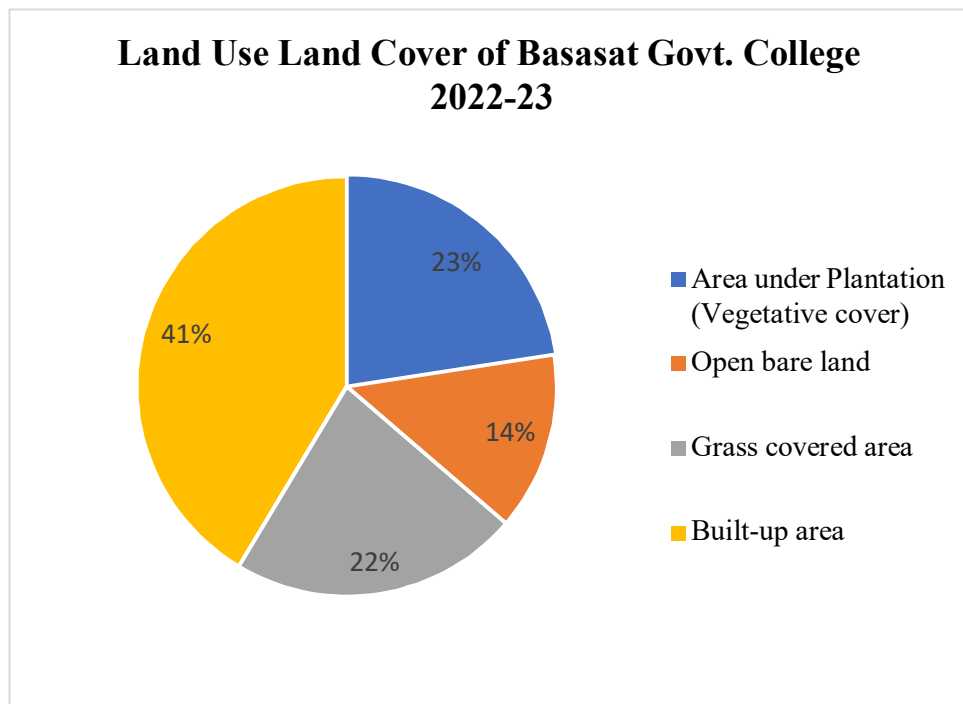


Figure 2: Comparison among the land uses (Source: Based on the data supplied by the college)

5.2 Flora and Fauna

The college has provided information on the total area of campus covered by green vegetation, after survey performed in 5 discrete zones. Those consisted of mainly trees, perennial grasses, palm species, epiphytes, herbs and shrubs.

Table 1: Plant Diversity and Abundance (Data Source: Supplied by the College)

(Species richness)	Types of trees	Epiphytes & climbers	Herbs and shrubs
Zone A (Green zone 1)	9		
Zone B (Green zone 2):	13		
Zone C (Green zone 3):	5		
Zone D (Green zone 4):	25		Vegetable and Ornamental Plants = 15 Medicinal Plant Garden = 20
Zone E: (common playground)			
Total	42	2	45

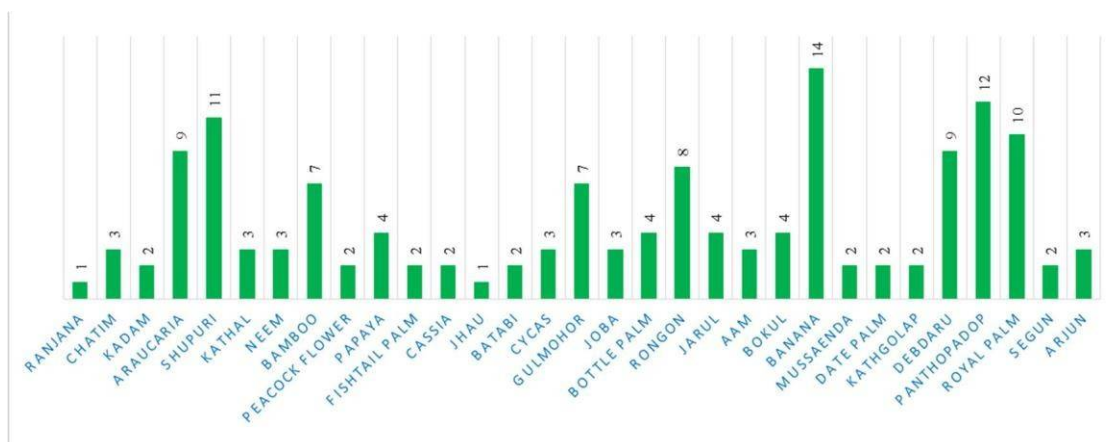


Figure 3: Plant types and their Abundance (Source: Based on the data supplied by the college)

Basic phytosociological parameters were also computed by students of NSS and Nature club. Summarising table reveals that most of the trees were more than 10 years old, some were even aged 50 years. 20 out of 31 trees were stated as natural while 11 were planted by the college community. In total 42 trees were counted to exist in campus. Some good practices like sapling plantation at college campus are being done

to celebrate World Environment Day and continued to generate general awareness about nature conservation.

Table 2: Animal Diversity and Abundance (Data Source: Supplied by the College)

Invertebrate diversity:	Butterfly = 16	
Vertebrate diversity:	Mammals = 5	
	Birds= 6	
	Amphibians= 2	
	Reptiles=2	

The vermicompost unit in the campus is a good endeavour to make environment sustainable and produce significant amount of compost utilisable for maintenance of the garden plants, through which 28-30 kg of vermicompost is produced annually. The unit is taken care of by the Zoology Department and Nature club students.

Further, Mushroom cultivation is being practiced by Students trained from value added course, organized by Department of Botany.



Plate 1: Mushroom Cultivation in the Dept. of Botany

The college also tried to generate awareness against vector borne diseases and general cleanliness and sanitization methods in slum area at Saradapally. International Biological Diversity Day was celebrated beyond campus through documentation and

study of plant Species. Students made a trip to Darjeeling's Lloyd Botanical Garden to document a list of plants including an endemic one, 16 epiphytes and some lichens.

Overall, this college takes various efforts to save the green environment amidst being in heart of the town.

5.3 Electricity Use and Alternative Energy Initiatives

College has prepared energy audit for the academic year 2021-22 and 2022-23. College premises accommodates various academic departments like Physics, Chemistry, Mathematics, Zoology, Botany, Geography, Economics, Bengali, English, Sanskrit, Philosophy, History, Political Science, Office rooms, Principal's room, Cashier's room, Staff room, Seminar room, Library, Language room, NSS room, Cheap store, Student's common room, PWD room, Canteen, Lawn and corridors. To run the required functions of all the segments and components electricity is required. Demand of energy increases with progress. However, for the sustainable growth, judicious use of energy and generation of alternate energy is essential. College has installed two solar power units (10kWp and 20kWp by WBREDA) at the rooftop of the main administrative building directly connected to the grid. The generation of clean energy fed to the grid is a good step towards sustainability. The energy consumption could be reduced appreciably with the modification of old electrical lines and appliances, like use of LED based lamps and low wattage fans. Awareness among all the stakeholder must be raised on the necessity of energy saving by putting off the switches while there is no need of light and fans. Maximum use of natural light and circulation of air ensures energy conservation and good health. Energy audit conducted by the college revealed that Botany department consumes more energy than others due to installation of heavy instruments. Electricity consumption is reduced by replacing filament bulb with LED bulbs and tubes. Solar power generation helps in reducing the electricity bill. Most of the plug point uses low wattage devices.

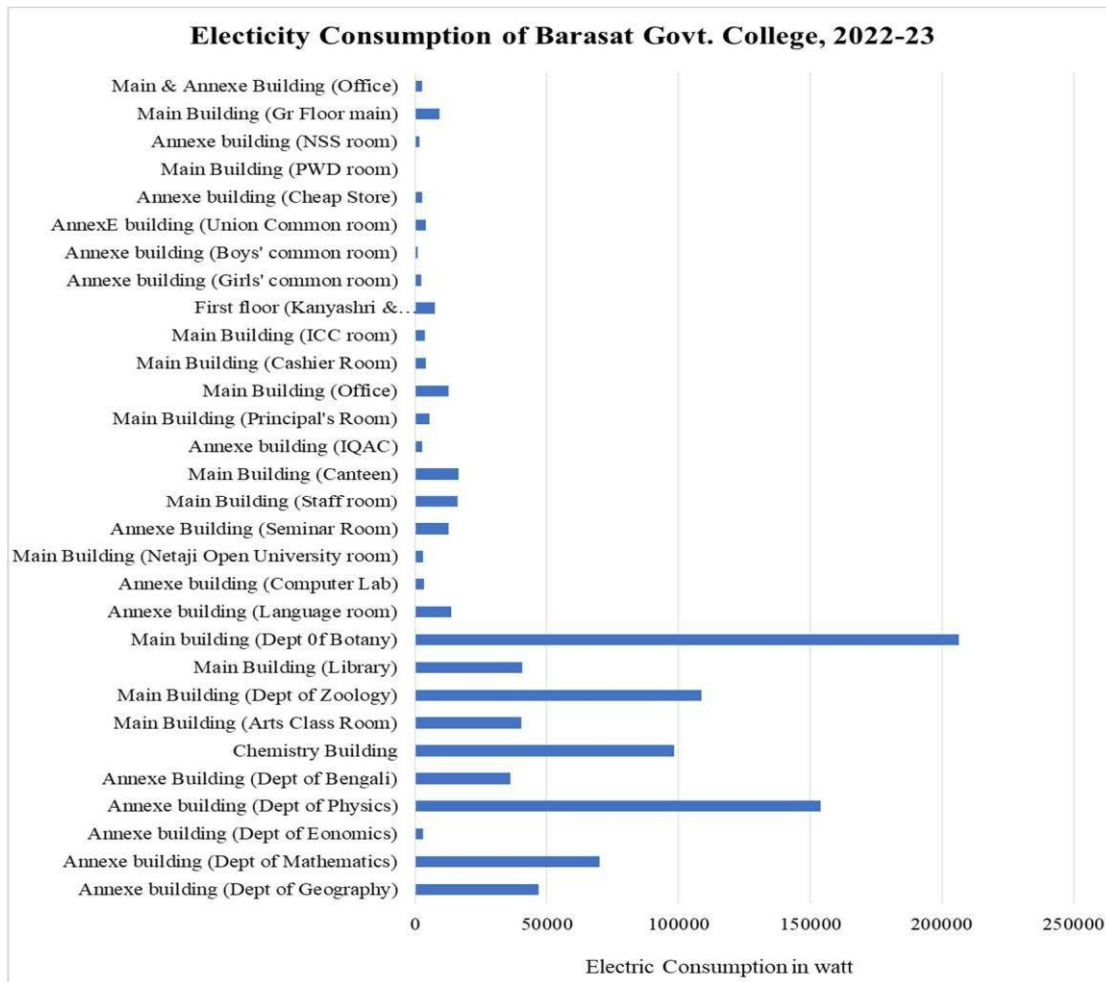


Figure 4: Department-wise Electricity Consumption

Table 3: Electricity Use in 2022-23 (Data Source: Supplied by the College)

Total wattage	448228 KW
Sum of Individual maximum demand in KW	448.228 KW
Simultaneous Maximum demand (50% of total Demand	224.114 KW
Maximum Energy consumption one hour per day(kwh)	224 BOT unit
Maximum Energy consumption five hour per day (kwh)	1121 BOT unit
Maximum Energy consumption for one year (Taking 240 working days)	268937 BOT unit
Maximum Energy consumption for rest 125 days (Taking 5% of normal consumption)	7004 BOT unit
Maximum Energy Consumption for one year	275940 BOT unit
Maximum Energy Consumption (Average) for month	22995 BOT unit

5.4 Water Use and Management

Barasat Government College has four water storage tanks each with 10000 L capacity each and two smaller tank with 5000 L capacity underground. Water Resource distribution, consumption and qualitative analysis of tap water and drinking water has been represented graphically. This water resource is used from 193 taps, 17 water coolers and purifiers, 104 wash basins, 45 toilets and 78 urinals among almost 3443 users. Total daily water use is estimated about 34,430L considering a demand of 10L/day/per person.

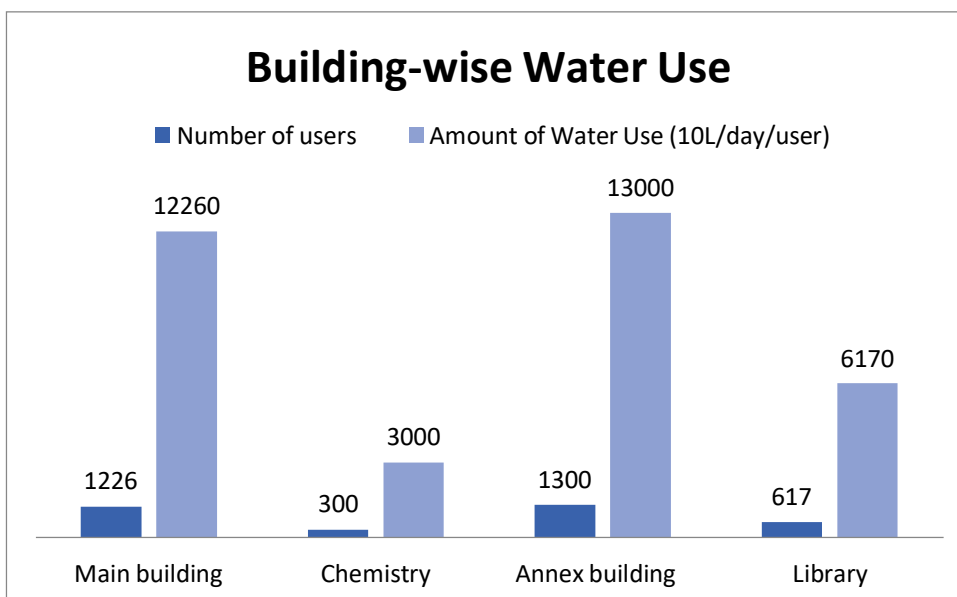


Figure 5: Building-wise distribution of users and water use (Data source: College Authority)

Table 4: Water Resource Facilities and Water Use (Data source: College Authority)

S. No.	Building Name	Floor	Wash Basin Numbers	Toilet Number	Urinal Number	Number of Taps	Numbers of Water Purifier and Coolers	Numbers of Total Users
	Main Building	ground floor	4 porcelain/marble	Indian style 3	female 2+2	7	2	Approximately 1226 for mainbuilding
		1st floor	14 porcelain	7	female 3+male 2+2	26	3	
		2nd floor	22 porcelain	4 commodes	female 2+ male2	32	2	
		rooftop				2		
	Chemistry	ground floor	4	Indian style 2	female 3 male 2	10	1	Approximate ly300 for chemistry building
		1st floor	wash basin 3 lab basin 8	commode 2	male 1 female1	15	1	
		new building	wash basin 2	commode 2	male 1 female1	6	1	
	Annex Building	ground floor	wash basin 11 lab basin 2	commode 6	male 9 female 6	25	2	Approximate ly1300 for ANNEXE Building
		1st floor	wash basin 11 lab basin 2	commode 6	male 9 female 7	25	2	
		2nd floor	wash basin 11 lab basin 3	commode 7	male 9 female 8	25	2	
		roof top				2		
	Library	ground floor	wash basin 2	commode 2	male 1 female 1	6	1	Approximately 617 for Library Building
		1st floor	wash basin 2	commode 2	male 1 female 1	6		
		2nd floor	wash basin 2	commode 2	male 1 female1	6		

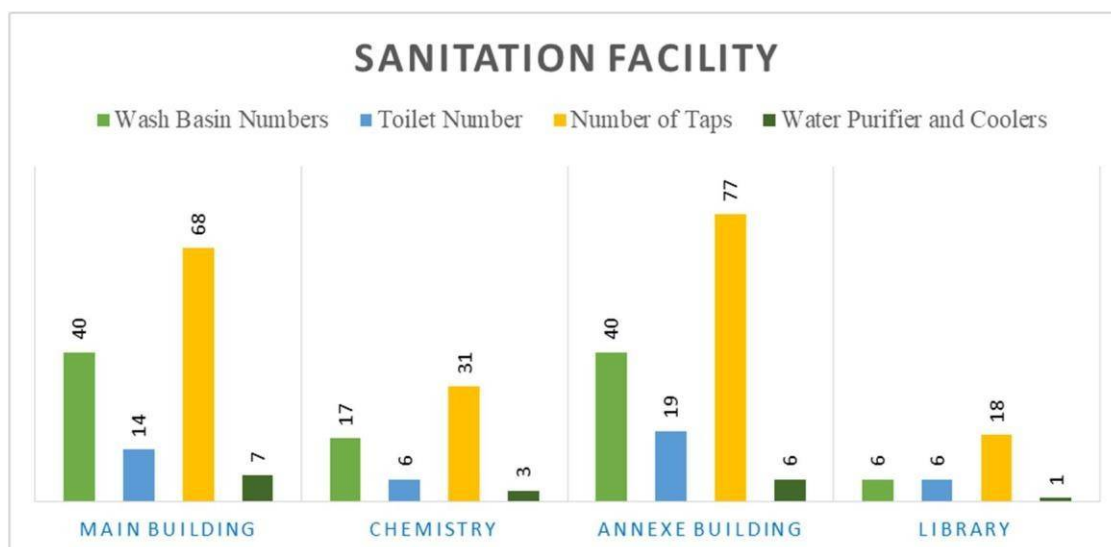


Figure 6: Building-wise sanitation facility available (Data source: College Authority)

5.5 Water Quality Analysis:

Water quality is very important due to its potential health risk. Water quality testing facility is available in the college. The main parameters that are tested are pH, dissolved oxygen, BOD, total dissolved solids (TDS), conductivity, hardness. Physico-chemical analysis of different parameters was done using water sample collected from different buildings of Barasat Government College (Table 5).

Table 5: Water Quality Parameters (Data source: College Authority)

District	Location	Parameters	Source		Standards for
North 24 Pgs	Barasat Government College		Drinking	Tap water	drinking water
			water		(Desirable)
					WHO (1998,2019) AND BIS (1993& 2012)
		pH	7.2	7.4	6.5-8.5
		Colour	colourless	colourless	—
		Odour	odourless	odourless	—
		DO (mg L ⁻¹)	6.12	5.09	4-6
		BOD (mg L ⁻¹)	2.97	4.37	6
		Conductivity (mS/cm)	0.81x10 ⁻³	0.81x10 ⁻³	0.05-0.5
		TDS (ppm)	55	108	500

		Total Hardness (ppm)	316.8	374.4	300
		Chloride (ppm)	27.87	49.47	250
		Nitrate (ppm)	5	5	50
		Nitrite (ppm)	nil	<<0.5	3
		Ammonium (ppm)	nil	nil	0.2
		Arsenic (ppm)	nil	nil	0.05
		Fecal Coliform (MPN/100 ml)	<1	<1	Shall not be detectable in any 100 ml sample

5.6 Waste Management

- **Electronic Waste Management**

The College comes under the purview of West Bengal state government and hence cannot independently dispose of e-waste without the permission and intervention of the government authorities. It has been resolved that the e-waste of the college will be disposed through Webel Technology Limited and departments have been asked to prepare a list of the e waste items lying in the respective departments. As per guidelines of Higher Education Department a committee of E-wastemanagement has been formed comprising of 5 associate professors and one assistant professor. The team has met with members of the DM office to finalizethe process of e waste disposal.

An E-waste repository room has been assigned within the college campus to deposit the E Waste and the solid metallic wastes. These are disposed of through Government undertaking Agency (WEBEL).

Table 5: E-wastes disposed from Barasat Government College (Data source: College Authority)

Sl. No.	Electical/Electronic scrap items	Number
1.	CRT Monitor	47
2.	Flat screen Monitor LCD	02
3.	Flat Mother Board	01
4.	CPU Fully intact	25
5.	CPU with missing components	07
6.	CPU Cabinet without any component	23
7.	Deskjet printer	06
8.	Laser Jet Printer with toner	01
9.	Scanner	04
10.	Key Board	43
11.	Mouse	23
12.	UPS with battery	22
13.	UPS without battery	06
14.	UPS Battery	07
15.	Server	01
16.	Autoclave	03
17.	Spectrophotometer	04
18.	Air conditioner	02
19.	Refrigerator	10

Sl. No.	Electical/Electronic scrap items	Number
20.	SNPS	08
21.	Flame Photometer	01
22.	Telecomm devices: Projector	02
23.	Gas generator	01
24.	CRT TV	02
25.	Weighing machine	02
26.	Water purifier/dispenser	05
27.	Xerox machine	05
28.	Inverter machine	11
29.	Inverter Battery	13
30.	Centrifuge	04
31.	Waterbath	01
32.	Stabilizer	05

- **Solid Waste Management**

The solid wastes generated in the college campus includes bio- degradable waste, non-biodegradable wastes, paper waste, plastic, glass, metallic sharp objects as waste, construction waste, electronic waste (e-waste) and other miscellaneous waste. College has signed MoU with Barasat Municipality and Madhyamgram Municipality for solid waste management.

Bio degradable waste, Non-biodegradable wastes and paper wastes are collected in the Vat for clearance by the Barasat Municipality and Madhyamgram Municipality at a regular interval of time.

The waste papers are mostly from office and are reused for other rough work or writing purpose. Other paper wastes generated like cardboards, packing boxes are disposed in a yellow-coloured bins separately.

The other organic wastes from garden area like leaf litters and different plant parts

are collected weekly and stored. The leaf litters are utilised for vermicompost preparation.

Per capita production per day: About 15 to 17 kilograms of waste product produced within the college per day

After every 10 days (Monthly thrice) the wastes are being disposed utilizing Barasat Municipality Logistics.

- **Chemical Waste Management**

Liquid chemical waste generated from the laboratories are collected through pipeline and are stores in two covered chambers. Solid Chemical wastes are disposed within black-coloured containers kept at Chemistry Department.

To reduce the volume of chemical waste generated in the laboratories the following initiatives have been taken:

- Purchase of minimum possible quantity of hazardous chemicals required for our laboratories.
- Sharing surplus chemicals with other laboratories of biological sciences.
- Practicing green chemistry i.e. substituting hazardous chemicals with non-hazardous chemicals whenever possible.

Table 6: Chemical wastes generated from the laboratories (Data source: College Authority)

Sl No	Dept	Name of the wastes			Method of Disposal	Agency involved
		Chemical (a)	Biological waste (b)	Microbial waste (c)		
1.	Botany	Cytological stains, Ethanol, Methanol, Acids	Plant materials	Bacillus sp. Rhizobium sp.	Plant materials are disposed in biodegradable waste bins	Barasat Municipality
2.	Zoology	Biological Stains, Ethanol, Methanol, Acids etc	Animal/fins/ insects/ fish bodies	Nil	Animal/insect/fish bodies are disposed in biodegradable vat	Barasat Municipality
3.	Chemistry	Ethanol, Methanol, Acids	Nil	Nil	Many hazardous chemicals Collected in a disposal chamber	Barasat Municipality

Observation on waste management system

1. MoUs are signed between Barasat Municipality and Madhyamgram Municipality for waste management.
2. The microbiological wastes or contaminated wastes are autoclaved prior to further use or disposal.
3. Scopes are there in developing a standard protocol for primary collection, segregation, processing and disposal of laboratory and other solid wastes.
4. Signage system mentioning biohazard symbol, nature of chemicals, reagents and waste management is lacking.
5. No instruction as poster highlighting waste handling or collection or disposal and hazards of different categories of waste was found in the relevant laboratories e.g. Botany, zoology, tissue culture, microbiology laboratories.
6. Chemical wastes from chemistry laboratory are directly disposed in to a big size sealed concrete structure without any precaution to reduce the probable hazards of reaction between numerous chemicals inside the concrete chamber.
7. Plastic bottles are used by the stakeholders for consuming drinking water.

5.7 Within Campus Green Initiatives and Sensitisation Programmes

Table 7: Green Initiatives and Sensitisation Programmes within Campus (2022-23) (Data Source: Supplied by the College)

Sl No.	Dates	Event	Nature of events	Outcome	Participants/weblink
1	23.08.2022	An interactive seminar was organized on the "World Zoonoses Day" by Aritri Dutta, Grant adviser, Welcome trust, DBT	Celebration of Zoonoses day Commemorative Event	Student awareness programme	Number of participants: 30 https://bgc.ac.in/news/admin/uploads/9ab0e_Zoonoses-Day-flyer-2022.pdf

2	16.09.2022	A student's seminar was organized on the theme of "Environmental Chemistry" by 3rd Semester students of Chemistry both from Pass and Hons. course.	Celebration of Ozone Day (Awareness programme)	Student awareness programme	Number of Participants: 67 https://bgc.ac.in/pdf/activities/chemistry/ozone%20day%2016.9.22.pdf
3	22.05.2023	Celebration of International Biological Diversity Day	Commemorative Day	Student awareness programme	Number of participants:82 https://bgc.ac.in/pdf/activities/botany/Seminars-by-Botany-department-academic-session-2021-22-23.pdf
4	05.06.2023	Geography Department organised a seminar on "Dhapa: The Human face of Solid Waste Management in Kolkata"	Celebration of World Environment Day	Student awareness programme	Number of participants: 87 https://bgc.ac.in/pdf/activities/geography/Report_05_06_2023.pdf
5	05.06.2023	Tree Plantation on World Environment Day in collaboration with west Bengal Forest Department Sapling plantation Distribution of plants to NSS volunteers	Celebration of World Environment Day	Student awareness programme	Number of participants: 18 https://bgc.ac.in/pdf/nss/2022-23%20Report_NSS,%20BGC,%20NAAC.pdf
6	16.06.2023	Academic seminar on the research methodology related to field and laboratory environmental research, environmental sustainability organized by Dept. of Zoology	World Environment Day Celebration	Student awareness programme	Number of Participants: 41 https://bgc.ac.in/pdf/activities/zoology/Zoology_Seminar_Report_2022-23.pdf
7	12.08.2022	Campus Cleaning Programme on International	Student build up programme	Awareness Programme within	Number of participants:27 https://bgc.ac.in/pdf/nss/2022-23%20Report_NSS,%20BGC,%20NAAC.pdf

		Youth Day		campus	23%20Report NSS,%20BGC,%20NAAC.pdf
8	24.09.2022	Campus Sanitization; Plantation	Capacity building programme	Awareness Programmes within campus	Number of participants:14 https://bgc.ac.in/pdf/nss/2022-23%20Report NSS,%20BGC,%20NAAC.pdf
9	10.11.2022	Plantation Programme within campus	Volunteer/ student capacity building programme	Awareness Programmes within campus	Number of participants:16 https://bgc.ac.in/pdf/nss/2022-23%20Report NSS,%20BGC,%20NAAC.pdf
10	17.03.2023	Campus Cleaning Programme NSS volunteers have actively participated in Campus cleaning.	capacity building programme for student volunteers	Awareness Programmes within campus	Number of Participants: 29 https://bgc.ac.in/pdf/nss/2022-23%20Report NSS,%20BGC,%20NAAC.pdf
11	14.06.2023	Introduction to Environmental Education and Sustainable Development by Dr. Ruksanara Begum, Associate Professor in Geography, BGC	Value Added Course on “Environmental Education and Sustainable Development” organized by Geography Department	Student awareness about Environmental education	Number of Participants:24 https://bgc.ac.in/pdf/add-on-course/Geography VAC June 2023.pdf
12	14.06.2023	Natural Resource and Sustainable Management by Dr. Chandan Surabhi Das, Associate Professor in Geography, BGC	Do	Student awareness about Environmental resources	Do
13	16.06.2023	Goals of Sustainable Development by Dr. Sourama Saha	Do	Student awareness about sustainable Development	Do
14.	21.06.23	Environmental Policy and Governance by Dr. Sourama Saha, Assistant Professor in Geography, BGC	Do	Student awareness about Environmental Policy Adaptations	Do

15.	22.06.2023	Medicinal Plants in Our Daily Life lecture by Dr. Dibyendu Sekhar Mahanty, Assistant Professor in Botany, BGC	Value Added Course on "Techniques on Biodiversity conservation and Plant Resource Utilization" organized by Department of Botany	Student awareness about Medicinal Plants	Number of participants: 97 https://bgc.ac.in/pdf/add-on-course/Botany_VAC_June_2023.pdf
16.	23.06.2023	Biodiversity and Conservation Present	Do	Student awareness about Plant Diversity	Do
17.	24.06.2023	Natural Colour from Plant parts	Do	Hands on training for extraction of natural colour from plant Sources	Do
18.	26.06.23	Mushroom Cultivation: Theory	Do	Hands on training on Mushroom	Do
19.	07.06.2023 to 13.06.2023	Water Pollution and Analysis	Value added course	Student Awareness	Number of Participants: 19 https://bgc.ac.in/pdf/add-on-course/Chemistry_VAC_June_2023.pdf
20.	12.06.2023	Measurement of BOD and COD of water by	Do	Student Awareness about COD and BOD	Do
21.	12.06.2023	Discussion and Measurement of	Do	Student Awareness about Arsenic	Do
22	Academic Session (2018-19, 2019-20, 2020-	Vermicompost preparation and training programme is a continuous training programme	Hands on training Programme on Vermi technology Number of	Hands on Training programme imparted to the students by Zoology	https://bgc.ac.in/pdf/activities/zoology/vermitechnology.pdf

	2021, 2021.22, 2022-23)	imparted by Department of Zoology to the students Total Number of participants: 51	participants: 2018- 19 -11 2019-20- 11 2020-21-12 2021-22- 12 2022-23- 5	Department	
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Numbers of academic courses are designed on environment-related issues, which are preferred by the students. Thus, environmental awareness and sensitisation are integrated into academic programmes and synthesised into strategic goal and vision of the college.

Academic courses offered on environmental issues:

- Department of Chemistry arranged a value-added course on assessment and analysis of quality of drinking water. The seminar also entails about the immediate necessity of conservation of ground water.
- Department of Botany arranged a value-added course imparting the knowledge on medicinal plants, documentation of biodiversity and different techniques related to conservation of biodiversity.
- Knowledge on mushroom cultivation is regularly disseminated by Department of Botany and students percolate the practice at their residence. A value-added course on Mushroom Cultivation and requirement of Biofertilizer was arranged by Department of Botany.
- College has an installation of a Vermi-Compost Unit beside medicinal Plant Garden which is being maintained by Zoology Department and Nature club students. The trained students help to produce Vermi-compost that keeps the vegetable garden and medicinal plant garden green and healthy. This practice will be continued for learning and greening purpose of the campus.
- Environmental science is being taught as a paper in every subject (Hons or General), which is part of University Curricula.

Similarly, numbers of outreach activities are also organised in the way to prevent environment outside college campus.

5.8 Green Initiatives and Sensitisation Programmes outside Campus

1. Azadi ka Amrit Mohotsav, CLEAN INDIA 2.0, 2022, on 5.10.2022, Swachh Kaal: Amrit Kaal during auspicious occasion of Durga Puja Festival, Observation of Swachh Kaal : Amrit Kaal
2. 'Lifestyle for the Environment Pledge' was taken and registered in October, 2022
3. Clean Environment & Sustainability Swachh Bharat Mission Campaign, was organised on 2.12.2022
4. Awareness Rally was organised on 17.12.2022 from Barasat Government College to Barasat Municipality where Local people have been made aware about dengue and its prevention.
5. Agricultural field visit was made for plant disease identification and farmers' interactions by M.Sc. Sem 2 and Sem 4 students, P.G. Department of Botany, BGC, at Sarpadihi, Amdanga Subdivision, North 24 Parganas., for consecutive three academic sessions 2021-22, 2022-23 and 2023-24.
6. Students were trained on Mushroom Cultivation through the value-added course, organized by Department of Botany during 22.06.2023 to 27.06.2023 (BGCBOTVAC001/2023). Student implemented knowledge and cultivated mushroom at their residences.

Table 8: Outreach Activities: Green Initiatives Outside Campus (2022-23) (Data Source: Supplied by the College)

Sl. No.	Date	Event/ Participants	Location of event	Nature of the event	Web link
1.	5.10.2022	1. Azadi ka Amrit Mohotsav, CLEAN INDIA 2.0, 2022, Swachh Kaal: Amrit Kaal during auspicious occasion of Durga Puja Festival Observation of Swachh Kaal: Amrit Kaal Prepared drawing on Awareness on Cleanliness Participants Narayan Biswas, NSS Volunteer, BGC Debnita Kundu, NSS Volunteer, BGC	Durga puja pandal at nearby locality	Outreach programme to spread awareness about cleanliness by cleaning the festivity refuse.	https://bgc.ac.in/pdf/ns/s/2022-23%20Report_NSS,%20BGC,%20NAAC.pdf
2.	20.10.2022	NSS Volunteers of Barasat Government College had participated in "Lifestyle for the Environment Pledge" and they received the certificates on it from Ministry of Environment Forest and Climate Change, Govt. of India on 20.10.2022 Participants 2	Online pledge taken to protect environment	Students took pledge to keep environment green and clean	https://bgc.ac.in/pdf/ns/s/2022-23%20Report_NSS,%20BGC,%20NAAC.pdf

3.	02.12.2022	Students participated in National Conference on Clean Environment & Sustainability Swachh Bharat Mission Campaign, organized by NSS Cell, WBSU Among four student Participants Puja Biswas received a prize by the NSS Cell of the University for her poster entitled "Stop Use Plastic".	NSS Cell, West Bengal state University	Outreach programme And spreading awareness against plastic use	https://bgc.ac.in/pdf/ns/s/2022-23%20Report_NSS,%20BGC,%20NAAC.pdf
4.	17.12.2022	Awareness Rally on Dengue from Barasat Government College to Barasat Municipality was arranged. Local people have been Made aware about dengue and its prevention. Participants No: 11	Barasat Govt. College Locality and surroundings up to Municipality	Outreach programme And spreading awareness against vector borne disease	https://bgc.ac.in/pdf/ns/s/2022-23%20Report_NSS,%20BGC,%20NAAC.pdf
5.	21.12.2022	Sanitization Programme was carried out by NSS volunteers Participants No: 16	Saradapally (Adopted slum)	Outreach programme for cleaning activity beyond campus	https://bgc.ac.in/pdf/ns/s/2022-23%20Report_NSS,%20BGC,%20NAAC.pdf
6.	04.03.2022 (2021-22) 28.02.2023 (2022-23) 15.03.2024	An agricultural field had been selected to visit for three consecutive academic years by students for continuous study and identification of plant diseases. Interactive sessions with farmers helped to enrich	Madhabpur, Nilganj Santoshpur adjoining area, Amdanga, North 24 Parganas	Farmer's field visit to learn about 1.Different diseases in Agricultural crops	https://bgc.ac.in/pdf/activities/botany/Outreach%20Picture%20by%20Botany%20Department%2021-22,%2022-23,%2023-24.pdf

6. Ambient Air Quality

Ambient air quality is monitored by the automatic monitoring station installed by West Bengal Pollution Control Board. Based on the data recorded, air quality index (AQI) was calculated (Figure 7). Except in the winter months (November-February), air quality is satisfactory in rest of the year.

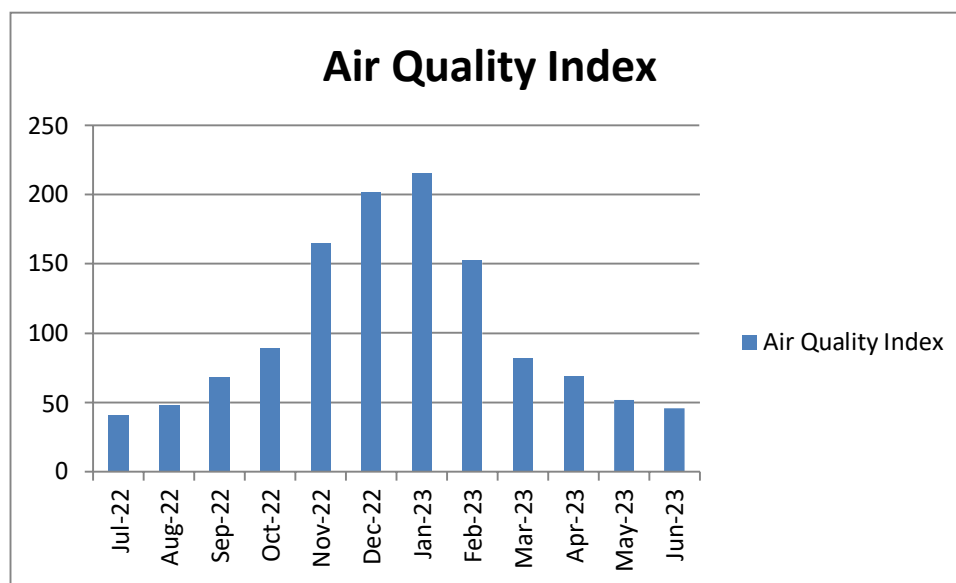


Figure 7: Air Quality Index of Barasat Govt College (2022-23) (Data source: College Authority)

7. Carbon Budget of the College:

Carbon budget is estimated by calculation of combined capacity to carbon sequestration against the total carbon emission from different sources. Carbon sequestration is mainly done by plants in biomass and soil in the form of organic carbon. On the other hand, carbon is emitted from electricity consumption, Fossil fuel burning during transport, LPG use, water consumption and building material use. In all the cases amount of carbon is transferred into CO₂ equivalent by standard factor.

Table 9: Estimation of Carbon Sequestration by Vegetation (Calculated based on the data supplied by the college)

Pre-Audit Data to be Provided by the College Authority (2022-23) _BGC_VU_03/2024																
S. No.	Common name	Scientific Name	Number	Plant Height (Feet)	Circumference of the tree trunk at the breast height (cm)	Circumference of the tree trunk at the breast height (inch) (H)	Plant DBH (Diameter at breast Height in cm)	Plant DBH (Diameter at breast Height in inch) (D)	Green Weight above Ground (W1)	Green weight below ground (W2) W2= W1 * 0.2	Total Green Weight (TW) = W1 + W2	dry weight of the tree (Dw): TW * 0.725	Carbon Sequestration in trees (WC) =Dry Weight (DW) * 0.47(IPCC,2006) in Pound	Weight of Carbon-di-oxide (CO2) Sequestration (WCS) = Weight of Carbon (WC) * 3.6663 Pearson et.al.,2007) in Pound	Weight of Carbon-di-oxide (CO2) Sequestration (WCS) * No. of trees in Pound	Weight of Carbon-di-oxide (CO2) Sequestration (WCS) * No. of trees in kg (1Pound = 0.454 kg)
1	Ranjana	<i>Adenanthera pavonina</i>	1	70	274	107.87	87.26	34.35	360.72	72.14	432.86	313.83	147.50	540.77	540.77	245.51
2	Chatim	<i>Alstonia sp</i>	3	30	90	35.43	28.66	11.28	50.78	10.16	60.93	44.17	20.76	76.12	228.36	103.68
3	Kadam	<i>Anthocephalus cadamba</i>	2	60	201	79.13	64.01	25.20	226.81	45.36	272.17	197.32	92.74	340.02	680.04	308.74
4	Araucaria	<i>Araucaria sp.</i>	9	40	67	26.38	21.34	8.40	84.02	16.80	100.82	73.09	34.35	125.95	1133.57	514.64
5	Shupuri	<i>Areca sp.</i>	11	35	37	14.57	11.78	4.64	40.58	8.12	48.70	35.31	16.59	60.84	669.20	303.82
6	Kathal	<i>Artocarpus sp</i>	3	45	173	68.11	55.10	21.69	146.43	29.29	175.71	127.39	59.87	219.52	658.55	298.98
7	Neem	<i>Azadirachta india</i>	3	30	79	31.10	25.16	9.91	74.29	14.86	89.15	64.63	30.38	111.37	334.12	151.69
8	Bamboo	<i>Bambusa tulda</i>	7	05-Jan	18	7.09	5.73	2.26	2.82	0.56	3.38	2.45	1.15	4.23	29.59	13.43
9	Peacock flower	<i>Caesalpinia sp</i>	2	25	110	43.31	35.03	13.79	51.72	10.34	62.06	44.99	21.15	77.53	155.06	70.40

10	Papaya	<i>Carica papaya</i>	4	12	21	8.27	6.69	2.63	7.90	1.58	9.48	6.87	3.23	11.85	47.38	21.51
11	Fishtail palm	<i>Caryota sp.</i>	2	25	160	62.99	50.96	20.06	75.24	15.05	90.28	65.46	30.76	112.79	225.58	102.41
12	Cassia	<i>Cassia sp</i>	2	27	80	31.50	25.48	10.03	40.63	8.13	48.75	35.35	16.61	60.91	121.81	55.30
13	Jhau	<i>Casuarina sp.</i>	1	70	201	79.13	64.01	25.20	264.61	52.92	317.53	230.21	108.20	396.69	396.69	180.10
14	Batabi	<i>Citrus maxima</i>	2	15	10	3.94	3.18	1.25	4.69	0.94	5.63	4.08	1.92	7.04	14.08	6.39
15	Cycas	<i>Cycas sp.</i>	3	4	67	26.38	21.34	8.40	8.40	1.68	10.08	7.31	3.44	12.60	37.79	17.15
16	Gulmohor	<i>Delonix regia</i>	7	35	303	119.29	96.50	37.99	199.46	39.89	239.35	173.53	81.56	299.02	2093.13	950.28
17	Joba	<i>Hibiscus rosa-sinensis</i>	3	6	18	7.09	5.73	2.26	3.38	0.68	4.06	2.94	1.38	5.07	15.22	6.91
18	Bottle palm	<i>Hyophorbe lagenicaulis</i>	4	10	130	51.18	41.40	16.30	24.45	4.89	29.34	21.27	10.00	36.65	146.61	66.56
19	Rongon	<i>Ixora sp.</i>	8	6	18	7.09	5.73	2.26	3.38	0.68	4.06	2.94	1.38	5.07	40.58	18.42
20	Jarul	<i>Lagerstroemia speciosa</i>	4	22	215	84.65	68.47	26.96	88.96	17.79	106.75	77.39	36.37	133.36	533.44	242.18
21	Aam	<i>Mangifera Indica</i>	3	60	288	113.39	91.72	36.11	324.99	65.00	389.99	282.74	132.89	487.21	1461.64	663.58
22	Bokul	<i>Mimusops elengi</i>	4	20	35	13.78	11.15	4.39	21.95	4.39	26.34	19.10	8.97	32.90	131.62	59.75
23	Banana	<i>Musa sp.</i>	14	15	56	22.05	17.83	7.02	26.32	5.26	31.59	22.90	10.76	39.46	552.49	250.83
24	Mussaenda	<i>Musasenda sp</i>	2	12	63	24.80	20.06	7.90	23.69	4.74	28.43	20.61	9.69	35.52	71.04	32.25
25	Date palm	<i>Phoenix dactylifera</i>	2	20	42	16.54	13.38	5.27	26.34	5.27	31.61	22.91	10.77	39.49	78.97	35.85
26	Kathgolap	<i>Plumeria sp</i>	2	20	22	8.66	7.01	2.76	13.80	2.76	16.56	12.01	5.64	20.69	41.37	18.78
27	Debdaru	<i>Polyalthia longifolia</i>	9	17	136	53.54	43.31	17.05	43.48	8.70	52.18	37.83	17.78	65.18	586.65	266.34
28	Panthopadap	<i>Ravenala Madagascariensis</i>	12	45	117	46.06	37.26	14.67	99.02	19.80	118.82	86.15	40.49	148.44	1781.31	808.71
29	Royal palm	<i>Roystonea regia</i>	10	60	185	72.83	58.92	23.20	208.77	41.75	250.53	181.63	85.37	312.98	3129.80	1420.93
30	Segun	<i>Tectona grandis</i>	2	90	113	44.49	35.99	14.17	191.29	38.26	229.54	166.42	78.22	286.77	573.53	260.38
31	Arjun	<i>Terminalia arjuna</i>	3	70	258	101.57	82.17	32.35	339.68	67.94	407.61	295.52	138.89	509.23	1527.69	693.57
			144						Total Carbon-di-oxide (CO ₂) Sequestration (WCS) by the Trees						18037.69	8189

NOTE: Green weight of the trees above ground (W_1) (Xu and Mitchel 2011)
https://www.researchgate.net/publication/261884694_Carbon_sequestered_in_the_trees_on_a_university_campus_A_case_study

Below 10 inch diameter (D), $W_1 = 0.25D^2 \times H$

Above 10 inch diameter (D), $W_1 = 0.15D^2 \times H$

Number of trees	Weight of Carbon Dioxide Sequestration (Pound)	Weight of Carbon Dioxide Sequestration (Kg)
144	18037.69	8189

Table 10: Estimation of Carbon Sequestration by Soil/ Year (Calculated based on the data supplied by the college)

Type of the area	Area (meter square)	Soil Organic carbon (%)	Soil Organic Carbon (SOC) (g/m ²)	Total Carbon (C) sequestration (kg)	Carbon Dioxide (CO ₂) sequestration (kg) Pearson et al 2007 https://www.fs.usda.gov/research/treesearch/13292#
Area under Plantation (Vegetative cover)	2204.95	0.32	0.10400078	0.23	0.8416
Open bare land	1659.97	0.25	0.081250609	0.13	0.4950
Grass covered area	2180.02	0.32	0.10400078	0.23	0.8321
			Total	0.590914	2.17

Table 11: Estimation of Carbon Emission from Electricity Consumption/ Year
(Calculated based on the data supplied by the college)

Electricity Consumption in KWh	CO ₂ Emission/KWh	Emission of CO ₂ in kg/ Year
275940- 80,237 [Solar Energy Produced (On Grid)]	The Emission Factor for Electricity is 0.82 kg CO ₂ /KWh https://iitbhu.ac.in/contents/institute/admin/doc/admin_carbon_emissions%20in_co2.pdf https://cea.nic.in/wp-content/uploads/baseline/2023/01/Approved_report_emission_2021_22.pdf	226270 - 65794 = 1,60,475

Table 12: Estimation of Carbon Emission from Fuel Consumption/ Year (Calculated based on the data supplied by the college)

Component	Type of Fuel	Consumption of Fuel/ Year	Emission factor of Petrol/ Diesel in Kg CO ₂ /litter https://shaktifoundation.in/wp-content/uploads/2017/06/WRI-2015-India-Specific-Road-Transport-Emission-Factors.pdf	CO ₂ Emission/Year
Car	Petrol	654.6	2.27	1486
Bike	Petrol	38.4	2.27	87
Generator	Diesel	244.8	2.64	646
			Total	2219

Table 13: Estimation of Carbon Emission from LPG Consumption/ Year (Calculated based on the data supplied by the college)

Component	Uses	Consumption of LPG Cylinder / Year	CO ₂ Emission Factor in kg/ LPG (IPCC, 4 APRIL 2014) https://ghgprotocol.org/sites/default/files/Emission_Factors_from_Cross_Sector_Tools_March_2017.xlsx	CO ₂ Emission / Year
LPG (14.2)	Laboratories	12	6.1	1039
LPG (14.2)	Canteen	36	6.1	3118
			Total	4157

Table 14: Estimation of Carbon Emission from Water Consumption/ Year (Calculated based on the data supplied by the college)

Water Consumption/L/ Day	Water Consumption/ L/ 204 Day	Emission factor of Water <a href="https://www.researchgate.net/figure/Calculation-boundary-for-CO<sub>2</sub>-emission-factor-of-water_fig.2_276044385">https://www.researchgate.net/figure/Calculation-boundary-for-CO₂-emission-factor-of-water_fig.2_276044385	L to m ³	Emission of kg CO ₂ from Water
34430	7023720	0.59 kg CO ₂ / m ³	7023.72	4144

Table 15: Carbon Budget of the College (2022-23)

Carbon Sequestration (Kg CO ₂)		Carbon Emission (Kg CO ₂)			
Plant	Soil	Electricity	Fuel (Transport)	LPG	Water
8189	2.17	1,60,475	2219	4157	4144
		94%	1.2%	2.4%	2.4%
Total Sequestration 8191		Total Emission 1,70,995			
Carbon Budget 1,62,804 (-ve)					

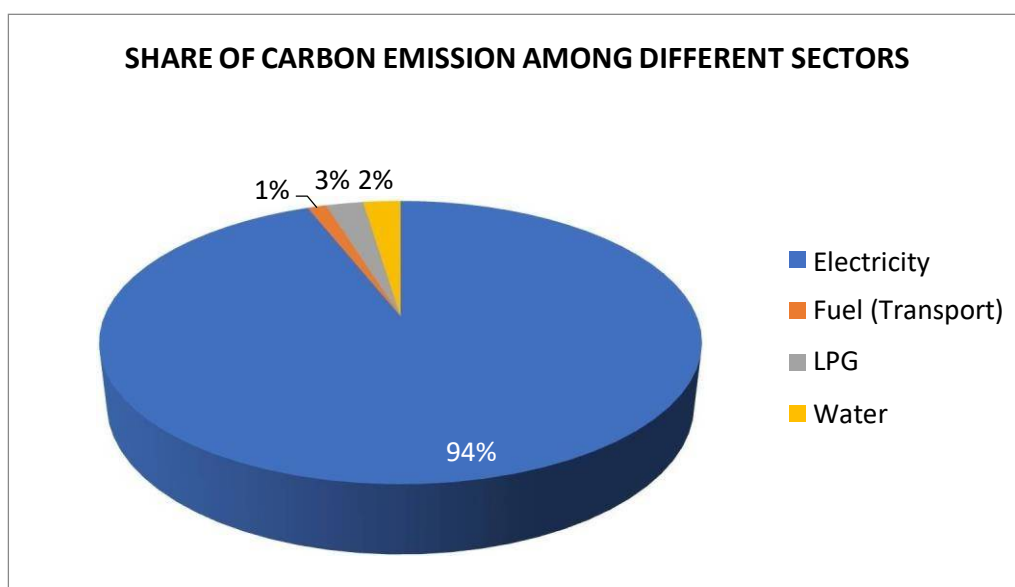


Figure 8: Relative share of carbon emission

8. Best Practices

1. College has organized a number of environment-related activities round the year involving all the stakeholders both within and outside the campus.
2. College has introduced a number of certificate and value-added courses, and integrated environmental initiatives into the major objectives of teaching-learning and research.
3. Green initiatives like solar power project, vermicomposting, landscaping and maintenance of medicinal plant garden, chemical waste management system, etc. are praiseworthy attempts.
4. College has signed MoU with two municipalities (Barasat Municipality and Madhyamgram Municipality) for solid waste management.
5. College has collaborated with WEBEL for electronic waste management.
6. College has replaced existing lights with LED lights as a drive for energy conservation.
7. A sensor-based monitoring station has been installed by Pollution Control Board for monitoring ambient air quality and level of noise.
8. College has an internal environmental audit team for regular monitoring of the status of environment and review of the impact of initiatives taken.
9. Wall magazine and notice board includes numerous environment related posters; instructions and signages on resource (water) conservation and energy savings are placed at prominent locations.
10. Documented information is maintained on varied aspects of environmental impacts, monitoring, and measurement since 2018.

9. Recommendations

9.1 Strategic

1. College should design, implement, and maintain an Environment Management System (EMS) to address its significant environmental aspects, minimise its impact on environment by systematic planning and planned execution of targets, timely review of performance and continual improvement of existing EMS.
2. College should adopt an environmental policy integrated into the priorities and strategic directions of the institute.
3. A systematic plan is to be formulated to achieve measurable environmental objectives aiming to prevention and mitigation of adverse environmental impacts and enhancing beneficial environmental impacts in tune with environmental policy.
4. Commitments from all levels and functions of the organisation including top management should be reflected and documented in their activities to execute the plans for enhancing environmental performances.
5. A mechanism must be set for periodical review of environmental performance and measures will be taken for continual improvement.
6. Effective communications should be made about the environmental information to interested parties and stakeholders wither via electronic media or printed version.

9.2 Specific:

1. College should adopt a targeted plan for reducing electricity consumption.
2. Initiatives are to be taken to ensure the implementation of standard procedure of waste disposal, processing, recycling etc. by the municipality.
3. Proper signage regarding different issues linked to waste management should be placed at prominent places.
4. Laboratories must follow standard guidelines of laboratory waste collection and segregation using colour coding bags plus containers.
5. Deep burial of animal carcasses should be performed as per standard protocol.
6. The concrete chamber f o r chemical waste is suggested to be fixed with an air vent of standard height.
7. Use of plastic bottles should be reduced.
8. Installation of sanitary napkin incinerator is desirable.
9. College should allocate a budgetary provision for environment-related activities.

Some Observations during on-site Visit



Plate 2: Opening Meeting with Top Management of the College



Plate 3: Visit of Laboratory in the Dept. of Zoology



Plate 4: Visit of Laboratory in the Dept. of Botany

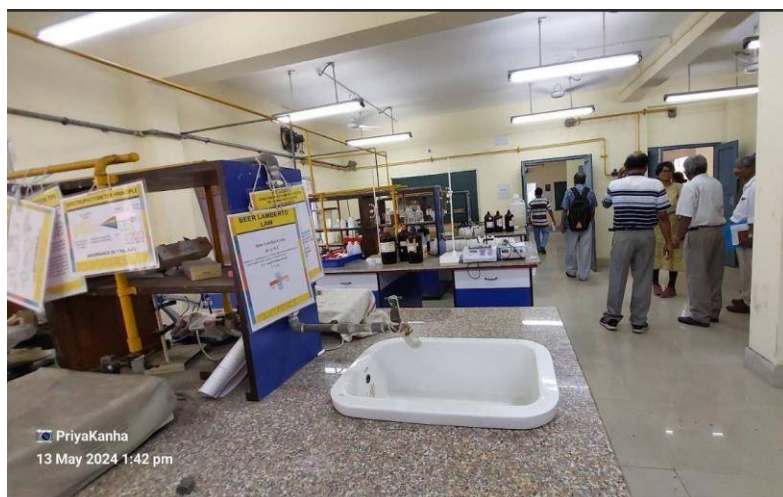


Plate 5: Visit of Laboratory in the Dept. of Chemistry



Plate 6: Visit of Laboratory in the Dept. of Physics



Plate 7: Green Initiative: Non-conventional Energy Generation form Solar Power



Plate 8: Green Initiative: Plantation in Earthen Pots



Plate 9: Green Initiative: Medicinal Plant Garden

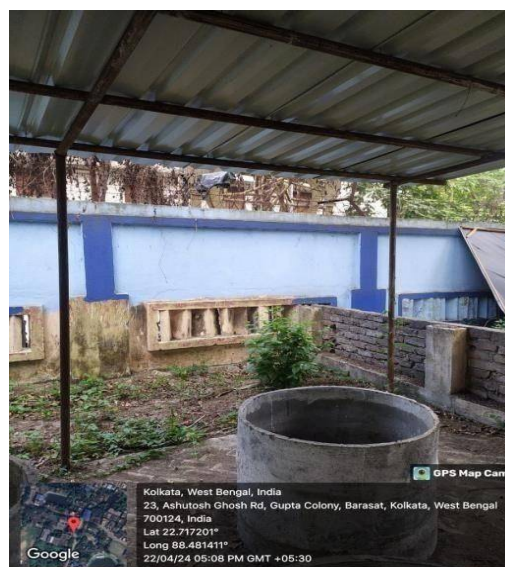


Plate 10: Vermicomposting Facility



Plate 11: Green Initiative: Chemical Waste Interception Pit



Plate 12: Green Initiative: Boards for Water Saving Awareness



Plate 13: Green Initiative: Posters on Environment Awareness



Plate 14: Green Initiative: Posters on Environmental Issues

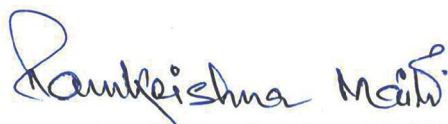


Plate 15: Closure Meeting with College Teachers and Staffs in Teachers' Room



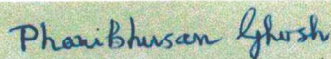
Plate 16: Interaction with College Teachers and Staffs during onsite visit

Signature



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