Dinabandhu Andrews College

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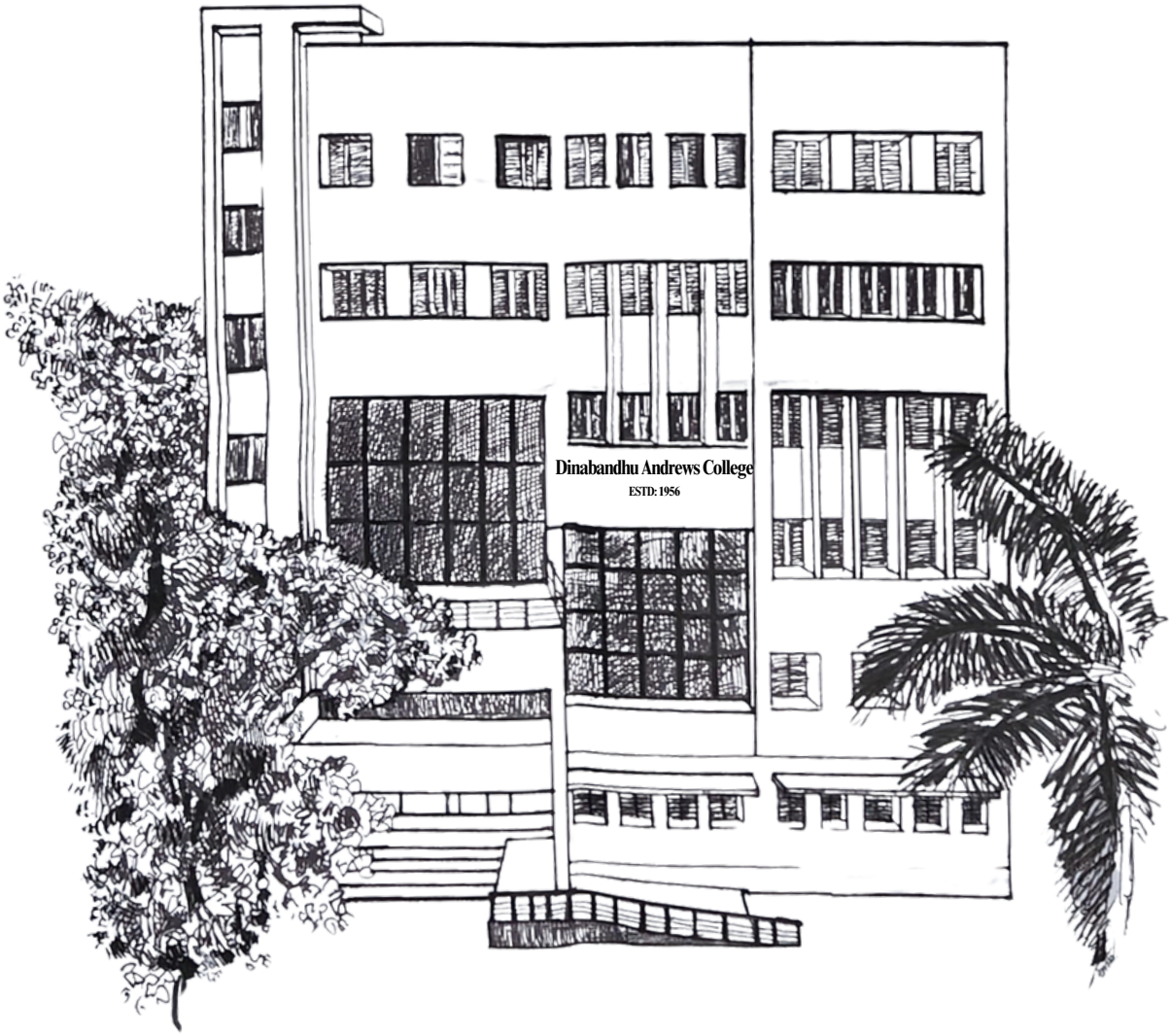
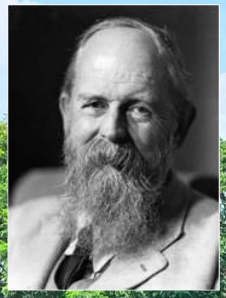


GREEN AUDIT REPORT OF DINABANDHU ANDREWS COLLEGE



Executed by

INTERNAL QUALITY ASSURANCE CELL (IQAC)
DINABANDHU ANDREWS COLLEGE, GARIA, KOLKATA-700084

January

2023

GREEN AUDIT REPORT OF DINABANDHU ANDREWS COLLEGE

2022-23

Executed by

INTERNAL QUALITY ASSURANCE CELL (IQAC)

DINABANDHU ANDREWS COLLEGE, GARIA, KOLKATA-700084

January

2023

CONTENTS

Green Audit Report of Dinabandhu Andrews College, Garia, Kolkata, South 24 Pargana has been prepared by the team of environmental experts from the college staff under the supervision of Dr. Krishna Chaudhury & IQAC Coordinator. Based on the review of findings of internal green & environmental audits conducted by Pollution Projects and Consultants and experts from the faculties, non-teaching staff & students.

The audit was conducted from July 2022 to November 2022.

The Green Audit Report also presents green initiatives followed and taken up by the college and provides suggestions and recommendations to improve environmental sustainability.

Signature (Internal Member)	Signature (Internal Member)	Signature (Internal Member)	Signature (External Member)	Signature (External Member)
	Coordinator, IQAC Dinabandhu Andrews College	Principal Dinabandhu Andrews College Kolkata-700 084	APHORISTIC QUALITY INDIA PVT. LTD. KOLKATA	Prof. Aniruddha Mukhopadhyay Dept. of Environmental Science University of Calcutta
Dr. Krishna Chaudhury **Faculty** **Department of Botany** **Dinabandhu Andrews College**	**Dr. Joy Sarkar** **Coordinator** **Internal Quality Assurance Cell** **Dinabandhu Andrews College**	**Dr. Somnath Mukhopadhyay** **Principal** **Dinabandhu Andrews College**	**Mr. Sudipta Jana** **Lead Auditor - ISO 9001, ISO 14001, ISO 50001 and ISO 45001** **Aphoristic Quality India Pvt. Ltd.**	**Dr. Aniruddha Mukhopadhyay** **Professor,** **Department of Environmental Science** **University of Calcutta**

GREEN AUDIT REPORT OF DINABANDHU ANDREWS COLLEGE

1. INTRODUCTION:

Green Audit of an institute refers to a systematic process of green accounting, quantification of conditional bioresources and subsequent recording and reporting of components of natural resources of environmental diversity on a sustainable basis. In most institutes, certain space is earmarked for the development of a 'green belt' where some horticultural species are propagated for beautification along with medicinal plant gardens and arboreal species, which provide an ideal microclimate for biodiversity sustenance therein. The concept of "green belt" has evolved in recent years to encompass not only "Green space" but also "Green structure", considering all urban green spaces, an important aspect of sustainable development in the 21st century. It aims to analyse environmental practices within and outside of the concerned place, which will have an impact on the eco-friendly atmosphere.

The Ministry of Environment & Forests and Climate Change (MoEF) has taken several policy initiatives and promoted the integration of environmental concerns in developmental projects. A green audit is a valuable means for a college to determine how and where they are using the most energy or water, or other resources; the college can then consider how to implement changes and make savings. It can create health consciousness and promote environmental awareness, values and ethics. It provides staff and students with a better understanding of the Green impact on campus. 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. As per the National Forest Policy, 1988 (NFP), It is necessary to encourage the planting of trees alongside roads, railway lines, rivers and streams and canals, and on other unutilised lands under State/corporate, institutional or private ownership. NFP give emphasis on green belt development. **It says – Green belts should be raised in urban/industrial areas as well as in arid tracts. Such a program will help to check erosion and desertification as well as improve the microclimate**.

The Census of India, 2011 revealed that 31.6% of the country's population resided in urban areas. In absolute terms, it accounted for 37 crore population. The urban component has been raised to around 40% in 2026. Thus, plants can be effectively used as bioindicators of air pollutants, although their sensitivities could vary across the plant community, with tolerant species showing no or minimal symptoms while sensitive ones showing symptoms even if the air pollutants increase in small amounts (Singh, 2003). On this background, it becomes essential to adopt the system of the Green Campus for the institutes, which will lead to sustainable development and, at the same time, reduce a sizable amount of atmospheric CO_2 from the environment. The National Assessment and Accreditation Council, New Delhi (NAAC) has made it mandatory that all Higher Educational Institutions should submit an annual Green Audit Report. Moreover, it is part of the Corporate Social Responsibility of Higher Educational Institutions to ensure that they contribute towards the reduction of global warming through carbon footprint reduction measures.

2. OBJECTIVES:

It is very important to assess the quality and quantity of the green cover vis-à-vis identifying those components, which directly and indirectly related to environment safety, reducing carbon footprint and sustainable landscaping of the institution. The college has been putting efforts into keeping our environment clean since its inception by maintaining a garden and aquatic body. Therefore, the purpose of the present green audit is to identify, quantify, describe and prioritise the framework of Environment Sustainability in compliance with the applicable regulations, policies and standards. The main objectives of carrying out Green Audit are:

- To document the floral and faunal diversity of the college;
- To record the meteorological parameter of Kolkata, where the college is situated;
- To document the ambient environmental condition of weather, air, water and soil of the college campus;
- To analyse carbon sequestration;
- To estimate the Energy requirements of the college

3. ABOUT THE COLLEGE:

Dinabandhu Andrews College is a premier institution of higher education under the University of Calcutta, and it was founded in 1956 by a decision of the Government of India [Letter No. BH-5(5)/55-Genl, dated 07.01.1956] to establish five new colleges on a sponsored basis for the higher education of the children of displaced persons from East Pakistan (now Bangladesh) who had settled at Jadavpur, Baisnabghata, Narkeldanga, Dum Dum and Bon-Hooghly. In pursuance of the decision mentioned above, the Government of West Bengal sanctioned the establishment of five new colleges on a sponsored basis for the said purpose (Government of West Bengal Order No. 7805-Edn, dated 24/25.07.1956) with affiliation to 'Intermediate' and 'Degree' courses in Arts and Science.

The college at Baisnabghata was named after Rev. C.F. Andrews (12th February 1871— 5th April 1940)), a noted educationist and close associate of Gurudev Rabindranath Tagore and Mahatma Gandhi, who had come to India from England as a Christian missionary and subsequently identified himself with the cause of social reforms and India's independence. He earned the epithet 'Dinabandhu' for his compassionate services to the poor.

The college started discharging its duties satisfactorily and later took on additional responsibilities by introducing new subjects and courses of all streams (Arts, Science and Commerce) at the General and Honours levels. The number of students has increased steadily over the years. Postgraduate courses in Zoology and Electronic Science were introduced in 2000 and 2006, respectively. Infrastructural development took place in the form of modernisation and expansion of library facilities, setting up of a Computer Centre and a Conference Room, installation of two power generators of capacities 63 KVA and 30 KVA, the establishment of a roof-top Photo Voltaic Solar Power Plant of the capacity of 20 kW, upgradation of classrooms, commissioning of LPG-based burner points in the laboratories of the Departments of Physics and Chemistry and the like.

4. VISION AND MISSION:

OUR VISION

The college is one of the largest colleges in the southern part of the South 24 Parganas district, mainly focussing on delivering not only quality education but also mass motivating institutions to the economically backward class students -like from remote Sundarbans and villages from the extreme south of the district. We are emphasising to development of technically competent and intellectually-vital graduates through practically focused quality learning experiences, thus assuring productive careers for them.

OUR MISSION

- Upliftment of Rural Students through technical education.
- Quality training programs in need-based modern technology.
- To maintain state-of-the-art infrastructure in laboratories.
- To promote the culture of self-employment.
- To inculcate moral, ethical, and spiritual values in education at all levels.

5. GEOGRAPHICAL LOCATION OF THE COLLEGE:

The college has a **sprawling pollution-free campus spread over 8,215 sq. m (Approximately 2.03 acres)** of land in the prime location of the South 24 Pargana district. The institution is situated just beside the Raja Subodh Chandra Mullick Road near Baishnabghata. It is situated between 22°28′8.09″ N- 22°28′6.01″ N latitude and 88°22′40.17″E- 88°22′44.84″E longitude.

Table: 1. Land use the land cover of the campus

CATEGORIES OF LAND USE: Rural	***AREA (m^2)***
Area of pond	2,000 (Approx.)
Garden	1,500 (Approx.)
Open area with trees	950 (Approx)
Built up area	3,765
The total area of the campus	**8,215**

Plate: 1. Satellite image of Dinabandhu Andrews College Campus (Source: Imagery ©2022 CNES/Airbus, Maxar Technologies, Map data ©2022)

The total area of Dinabandhu Andrews College Campus is 8,215 sq. m out of which the built-up area is 3,765 sq. m, which is 45.83%, the garden area includes 1,500 sq. m, which is 18.25%, and open paved space with scattered trees and shrubs is 950 sq. m (11.56% of the campus). It has been observed that approximately 30% area of the campus is an open area with, to some extent, green cover.

6. WEATHER DATA OF KOLKATA:

In Kolkata, the climate is warm and humid. The summer is not so hot, but due to high humidity, un-comfort is much higher. In summer, the maximum temperature can reach up to 44°C, and the minimum becomes 27°C. Winter is moderate, ranging from an average minimum of 10.4°C and a maximum of 25.8°C. The average annual precipitation level is about 1813.5 mm. The driest month is generally December. The greatest amount of precipitation occurs in July-August, with an average of 371.8 mm.

Table: 2. Weather data month-wise of Kolkata (Source: Google):

	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
Avg.Min. Temp (°C)	14.1	17.8	22.4	25.3	26.4	26.8	26.5	26.4	26	24.1	19.7	15.2
Avg. Max. Temp (°C)	25.8	29.2	33.5	35.3	35.3	33.8	32.4	32.2	32.4	32.2	30.1	27
Precipitation / Rainfall (mm)	15.4	24.6	36.8	55	118.5	276.7	371.6	372.1	325	179.6	32.6	5.6
Avg. Rel. Humidity (%) (at 17.30 IST)	61	54	51	62	68	77	82	83	82	75	67	65

7. ENVIRONMENTAL PARAMETERS ANALYSES:

A. AMBIENT AIR QUALITY:

The ambient air quality data inside and outside the campus for one year shows that more or less at a permissible state in comparison to polluted sites in other parts of Kolkata.

Inside the college campus, ambient air quality is very satisfactory. Ambient air quality data for 24 hours of sampling show SO_2 & NO_3 are 12 and 14 $\mu g/m^3$, respectively. Nitrogen dioxide is also very low (14 $\mu g/m^3$). Suspended particulate matters are within the very low limit, that is PM_{10} and $PM_{2.5}$ 40 and 21 $\mu g/m^3$ respectively. Parameters of ambient air quality inside the campus are within the range of Indian living standards, and there are a number of factors responsible for this cleanliness and calmness. Firstly, the campus is surrounded by four storied building with some vegetation, and secondly DG set is not operational on a frequent basis as power cut is very occasional. Furthermore, no air-polluting industry is established in the vicinity.

Air quality outside the campus is also in the significant satisfactory range. Sampling near the main gate shows SO_2 & NO_3 are 25 and 32 $\mu g/m^3$ respectively. Nitrogen dioxide is also low (32 $\mu g/m^3$). Suspended particulate matters are within the very low limit, that is PM_{10} and $PM_{2.5}$ are 55 and 27 $\mu g/m^3$ respectively (Table:).

In both the samplings, ammonia and carbon dioxide are at their very minimum level. Ambient air quality reports significantly permissible at a satisfactory level. However, the existence of Raja Subodh Chandra Mullick Road beside the college and the frequent movement of buses, autos and taxis through this road imparted the presence of more than 50% SPM_{10} outside the campus. Sprinkling or misting of water outside the campus is recommended at least thrice a week in summer and six days a week in the winter season to minimise the PM_{10} and $PM_{2.5}$.

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TEST REPORT
AMBIENT AIR

Customer Name	: M/s. Dinabandhu Andrews College	Report No.	: G/22(05)/10
Address	: 54, Raja Subodh Chandra Mallick Road Milan Park, Baishnabghata, Garia, Kolkata 700084	Report Date	: 28-05-2022
		Sampling Date	: 19/20-05-2022
		Sample Received Date	: 20-05-2022
		Sample Code No.	: GA/22(05)/10
Type of Sample	: Ambient Air	Test Start Date	: 20-05-2022
Sampling Location	: Inside College Campus	Test End Date	: 28-05-2022

Sl. No.	Parameters	Unit	Standard	Result	Standard Ref. Methods	Time Weighted Average
1	Particulate Matter $_{10}$ (PM_{10})	($\mu g/m^3$)	100	40.0	IS 5182 (Part 23): 2006 (RA 2017)	24 Hours
2	Particulate Matter $_{2.5}$ ($PM_{2.5}$)	($\mu g/m^3$)	60	21.0	In house method SOP No. SOP/02/02, Issue & Dated 02/04/2015 (Prepared based on CPCB Guidelines)	24 Hours
3	Sulphur dioxide (SO_2)	($\mu g/m^3$)	80	12.0	IS 5182 (Part 2): 2001 (RA 2017)	24 Hours
4	Nitrogen dioxide (NO_2)	($\mu g/m^3$)	80	14.0	IS 5182 (Part 6) : 2006 (RA 2017)	24 Hours
5	Carbon monoxide (CO)	(mg/m^3)	4	0.13	APHA (Air Analysis) (3rd Edition) Method 128	1 Hours
6	Ammonia (NH_3)	($\mu g/m^3$)	400	14.0	APHA (Air Analysis) (3rd Edition) Method 401	24 Hours

The results relate only to the parameters tested

....end of report...

Pollution And Project Consultants Kolkata

Tanmoy Chakrabarty
Quality Manager
Authorised Signatory
For Pollution And Project Consultants

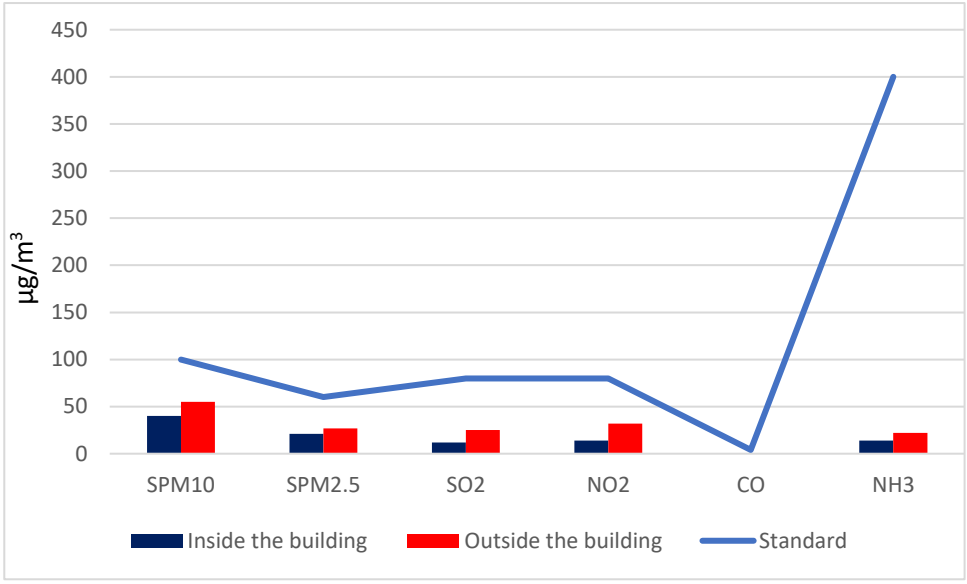

Fig: 1. Comparison of different air quality parameters inside and outside of the building with standard

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TEST REPORT
AMBIENT AIR

Customer Name	: M/s. Dinabandhu Andrews College	Report No.	: G/22(05)/11
Address	: 54, Raja Subodh Chandra Mallick Road Milan Park, Baishnabghata, Garia, Kolkata 700084	Report Date	: 28-05-2022
		Sampling Date	: 19/20-05-2022
		Sample Received Date	: 20-05-2022
		Sample Code No.	: GA/22(05)/11
Type of Sample	: Ambient Air	Test Start Date	: 20-05-2022
Sampling Location	: Near college Main Gate	Test End Date	: 28-05-2022

Sl. No.	Parameters	Unit	Standard	Result	Standard Ref. Methods	Time Weighted Average
1	Particulate Matter $_{10}$ (PM_{10})	($\mu g/m^3$)	100	55.0	IS 5182 (Part 23): 2006 (RA 2017)	24 Hours
2	Particulate Matter $_{2.5}$ ($PM_{2.5}$)	($\mu g/m^3$)	60	27.0	In house method SOP No. SOP/02/02, Issue & Dated 02/04/2015 (Prepared based on CPCB Guidelines)	24 Hours
3	Sulphur dioxide (SO_2)	($\mu g/m^3$)	80	25.0	IS 5182 (Part 2): 2001 (RA 2017)	24 Hours
4	Nitrogen dioxide (NO_2)	($\mu g/m^3$)	80	32.0	IS 5182 (Part 6) : 2006 (RA 2017)	24 Hours
5	Carbon monoxide (CO)	(mg/m^3)	4	0.275	APHA (Air Analysis) (3rd Edition) Method 128	1 Hours
6	Ammonia (NH_3)	($\mu g/m^3$)	400	22.0	APHA (Air Analysis) (3rd Edition) Method 401	24 Hours

The results relate only to the parameters tested

....end of report...

Pollution And Project Consultants Kolkata

Tanmoy Chakrabarty
Quality Manager
Authorised Signatory
For Pollution And Project Consultants

B. WATER ANALYSIS:

Water quality testing is important because it identifies contaminants and prevents water-borne diseases. Drinking or using contaminated water can result in severe illness or death. That is why it is important to ensure that drinking water is safe, clean and free from bacteria and disease.
The parameters for water quality are determined by the intended use. Work in the area of water quality tends to be focused on water that is treated for human consumption or in the environment.

Drinking water indicators:
The following is a list of indicators often measured by situational category:

- Alkalinity
- Colour of water
- pH value
- Taste and odor [geosmin, 2-Methylisoborneol (MIB), etc.]
- Specific conductivity
- Total Dissolved Solutes [(TDS) by sodium, chloride, potassium, calcium, manganese, and magnesium]
- Total Suspended Particulate Matter (TSS)
- Microorganisms such as faecal coliform bacteria
- Total hardness
- Amount of chloride

Two water sample reports have been furnished here, which are conducted and provided by Pollution and Project Consultants (P.P.C.) approved by West Bengal State Pollution Control Board (SPCB).

One litre water sample was collected each from tap water inside the campus and surface water like pond. The test result of tap water shows all the parameters within permissible limits and safe for drinking (Table). Pond water is not highly eutrophied, but a certain level of coliform bacteria was found (23/ml) in comparison to tap water (<1.1/ml), which indicate it is not for drinking purpose in any way (Table). Dissolved oxygen is not at a satisfactory level in pond water (1.8 mg/l), whereas DO in drinking water is 5.2 mg/l, indicating a satisfactory level (BIS in IS-10500:2012). It is found that total dissolved solutes (TDS) is relatively high in tap water (808 mg/l) in comparison to the normal range 500 mg/ml (Bureau of Indian Standards in IS-10500: 2012), whereas pond water shows good TDS that is 235 mg/l (Fig. 2) which indicate biological and non-biological components are in good harmony and water quality does not deteriorate in the natural ecosystem. (Table). The standard TSS (Total dissolved Solutes) of drinking water should be between 5-10 mg/l, but it is quite low in tap water (2.5 mg/l). As per the Bureau of Indian Standards, less than 600 mg/l salinity is good for drinking, and considering this, as standard, both surface and treated water are in a safe condition. It has been seen that salinity 392.27 mg/l of tap water is comparatively higher than surface water (64.96) which is further supported by the higher specific conductivity of tap water (1270.0 μs/cm) than pond water (380.0 μs/cm).

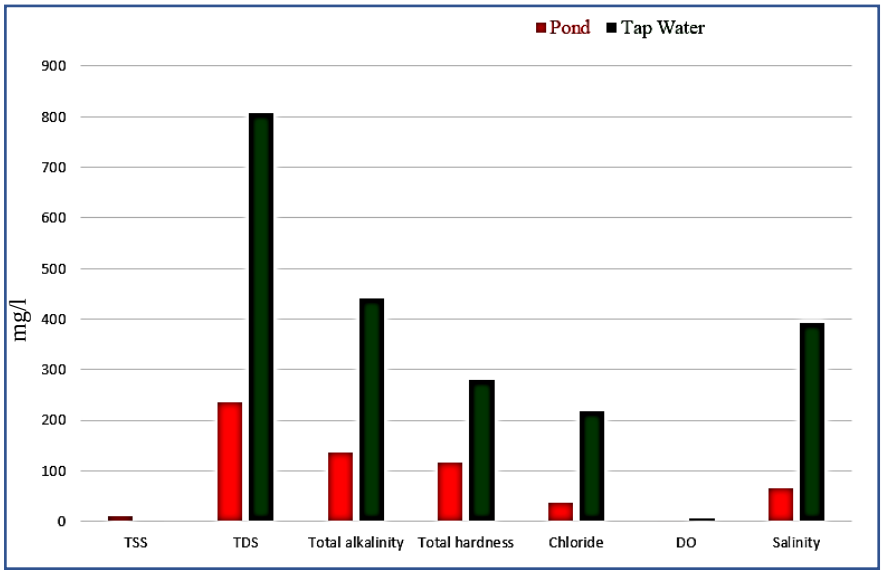

Fig: 2. Comparison of different water monitoring

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TEST REPORT
Water Sample

Customer Name	: M/s. Dinabandhu Andrews College	Report No.	: GW/22(05)/12
Address	: 54, Raja Subodh Chandra Mallick Road. Milan Park, Baishnabghata, Garia, Kolkata 700084	Report Date	: 28-05-2022
		Sampling Date	: 19-05-2022
		Sample Received Date	: 19-05-2022
		Sample Id No.	: GW/22(05)/12
Type of Sample	: Potable Water	Test Start Date	: 20-05-2022
Sampling Location	: Tap Inside College Campus	Test End Date	: 28-05-2022

Sl. No.	Parameters Tested	Unit	Results	LIMIT as per IS:10500:2012		Methods of Test (Reference)
				Requirement (Acceptable Limit)	Permissible Limit in the Absence of Alternate Source	
Physical Parameters :						
1	Sp. Conductivity at 25°C	µS/cm	1270.0	--	--	APHA 23rd Edition 2510 B : 2017
Chemical Parameters :						
2	pH	--	7.54	6.5-8.5	No relaxation	APHA 23rd Edition 2017 : 4500 H+B
3	Total Suspended Solid (TSS)	mg/l	<2.5	--	--	APHA 23rd Edition 2540 D : 2017
4	Total Dissolved Solids (TDS)	mg/l	808.0	500.0	2000.0	APHA 23rd Edition 2540 C : 2017
5	Total Alkalinity (as $CaCO_3$)	mg/l	440.00	200.0	600.0	APHA 23rd Edition 2320 B : 2017
6	Total Hardness (as $CaCO_3$)	mg/l	280.50	200.0	600.0	IS : 3025 (Part-21) 2009 (RA 2014)
7	Chloride (as Cl)	mg/l	217.15	250.0	1000.0	APHA 23rd Edition 4500 Cl B : 2017
8	Dissolve Oxygen (DO)	mg/l	5.20	--	--	APHA (23rd Edition) 2017 : 4500-O C
9	Acidity	mg/l	Nil	--	--	APHA (23rd Edition) 2017 : 2310 B
10	Salinity	mg/l	392.27	--	--	APHA (23rd Edition) 2017 : 2520 B
Bacteriological Parameters :						
11	Total Coliform	MPN/100ml	<1.1**	Shall not be detectable in any 100 ml sample		APHA 23rd Edition 9221 B & C : 2017

The results relate only to the parameters tested.

....end of report...

Note : ** Not Detected .

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TEST REPORT
Water Sample

Customer Name	: M/s. Dinabandhu Andrews College	Report No.	: SW/22(05)/17
Address	: 54, Raja Subodh Chandra Mallick Rd. Milan Park, Baishnabghata, Garia, Kolkata 700084	Report Date	: 28-05-2022
		Sampling Date	: 19-05-2022
		Sample Received Date	: 19-05-2022
		Sample Id No.	: SW/22(05)/17
Type of Sample	: Surface Water	Test Start Date	: 20-05-2022
Sampling Location	: College Pond	Test End Date	: 28-05-2022

Sl. No.	Parameter test	Unit	Result	Standard against which test are performed
1	pH value	--	7.23	APHA (23rd Edition) 4500 H+B : 2017
2	Total Suspended Solids (TSS)	mg/l	11.00	APHA (23rd Edition) 2540 D : 2017
3	Total Dissolved Solids (TDS)	mg/l	235.0	APHA (23rd Edition) 2540 C : 2017
4	Sp. Conductivity at 25°C	µS/cm	380.0	APHA (23rd Edition) 2510 B : 2017
5	Total Alkalinity (as CaCO3)	mg/l	137.0	APHA (23rd Edition)2320 B : 2017
6	Chloride (as Cl)	mg/l	35.95	APHA (23rd Edition) 4500 –Cl. B : 2017
7	Acidity	mg/l	Nil	APHA (23rd Edition) 2017 : 2310 B
8	Total Hardness (as $CaCO_3$)	mg/l	116.45	IS:3025 (Part-21) RA 2019
9	Salinity	mg/l	64.96	APHA (23rd Edition) 2017 : 2520 B
10	Dissolve Oxygen (DO)	mg/l	1.8	APHA (23rd Edition) 2017 : 4500-O C
11	Total Coliform	MPN/100 ml	23.0	APHA 23rd Edition 9221 B & C : 2017

The results relate only to the parameters tested.

....end of report...

Pollution And Project Consultants Kolkata

Tanmoy Chakrabarty
Quality Manager

Authorized Signatory
For Pollution And Project Consultants

C. SOIL ANALYSIS REPORT:

There are three samples of soil taken from the college campus, namely sample 1 from the back side college gate, sample 2 from the college garden and sample 3 from the bank of the college pond. Approximately 1 kg soil sample is collected from each site by soil sampling auger. Every soil sample shows a slightly alkaline pH (7.91-8.52). It has been observed that nitrogen (N), phosphorus (P) and Potassium (K) level is relatively low in all three sampling sites (Fig:). Generally, N:P:K exist in 4:2:1 ratio, but in the sampled soil, it is slightly different (Table:). The college garden soil sample is better (220.86 mg/kg) backside of the college gate sample shows poor N content (133.72 mg/kg) and moderate N content found in the college pond bank site (191.91). Standard soil phosphorus lies between 25-50 mg/kg, and here, in all three samples, P content is relatively low (12.21 mg/kg – 18.84 mg/kg) (Table). Normal potassium in Indian soil is 603 mg/kg, and here in all three samples, K is present in a significant quantity (654.57 mg/kg- 1004.5 mg/kg) (Table). Total Kjeldahl Nitrogen (TKN) is higher in all three samples (757.59 mg/kg- 1282 mg/kg). Total organic carbon varies from (3580 mg/kg- 8560 mg/kg). Phosphate (PO_4) quantity is satisfactory (1918.83 mg/kg-2275.09 mg/kg).

It has been found that out of three soil sampling, garden soil is much more fertile for the growth of plants, probably manuring, and soil nurturing for gardening enhances soil fertility by increasing NPK. The back side of the college gate is mostly landfilled by ash and debris of building material, and that is why soil fertility is poor and is reflected in the soil report. The pond bank is mostly undisturbed, and that is why showing moderate soil fertility and where natural soil fertility is maintained year after year.

Table: 3. Comparison of macronutrients in a different soil sample of a college campus

Parameter	Back Side of College Gate (S1)	College Garden (S2)	College Pond Bank (S3)
pH	8.43	7.91	8.52
Nitrogen (N)	133.72 mg/kg	220.86 mg/kg	191.91 mg/kg
Phosphorus (P)	12.21 mg/kg	18.84 mg/kg	14.15 mg/kg
TKN	757.59 mg/kg	1282.0 mg/kg	1085.15 mg/kg
PO_4	1918.83 mg/kg	2275.09 mg/kg	2059.05 mg/kg
Potassium (P)	654.57 mg/kg	1004.50 mg/kg	870.14 mg/kg

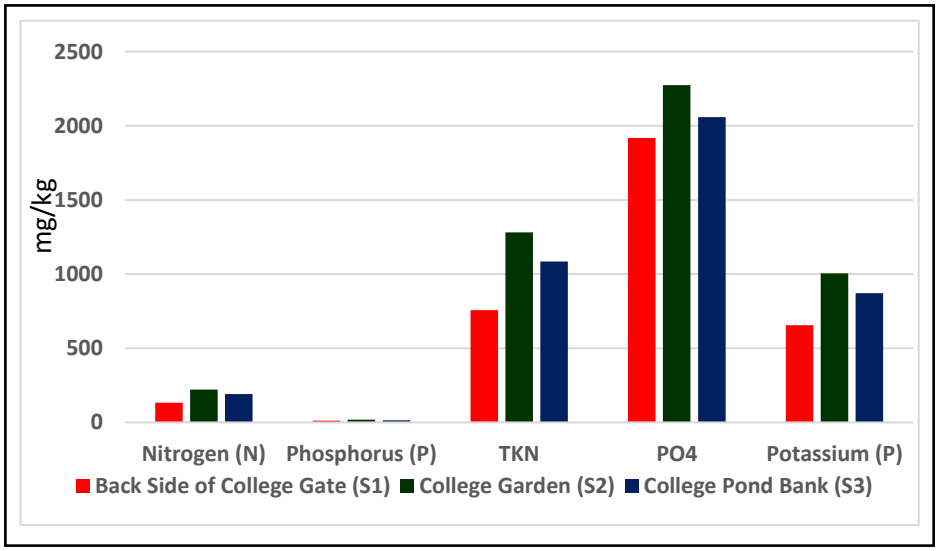

Fig: 3. Comparison of different soil parameters of three sample sites on the college campus

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ENVIRONMENTAL POLLUTION CONTROL - Air, Effluent, Pharmaceuticals
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FORMAT NO.: PPC/FM/70 ISSUE NO.: 03 ISSUE Dt.: 01/01/2017 (Rev No.:02 Rev. Dt.: 28/05/2018)

TEST REPORT

SOIL

Customer Name	: M/s. Dinabandhu Andrews College 54, Raja Subodh Chandra Mallick Rd.	Report No.	: S/22(05)/04
Address	: Milan Park, Baishnabghata, Garia, Kolkata 700084	Report Date	: 28-05-2022
		Sampling Date	: 19-05-2022
		Sample Received Date	: 19-05-2022
		Sample Id No.	: S/22(05)/04
Type of Sample	: Soil	Test Start Date	: 21-05-2022
Sampling Location	: Near Back Side College Gate	Test End Date	: 28-05-2022

SL No.	PARAMETER TEST	UNIT	STANDARD AGAINST WHICH TEST ARE PERFORMED	RESULT
1	pH at 25°C	--	IS 2720 (Part 26) : 1987 (RA 2016)	8.43
2	Electrical Conductivity	µS/cm	IS 14767: 2000 (RA 2010)	230.0
3	Available Nitrogen (as N)	mg/kg	IS 14684 : 1999 (RA 2014)	133.72
4	Available Phosphorous (as P)	mg/kg	In-House Method SOP No. SOP/03/04, Issue No. 02 Date : 01/01/2018	12.21
5	Total Kjeldahl Nitrogen (TKN)	mg/kg	IS 14684 : 1999 (RA 2014)	757.59
6	Total Organic Carbon (TOC)	mg/gm	IS 2720 (Part 22) : 1972 (RA 2015)	3.58
7	Phosphate ($PO_4^{\equiv}$)	mg/kg	In-House Method SOP No SOP/03/24 Issue No. 02 Dated 01/01/2018	1918.83
8	Potassium (as K)	mg/kg	In-House Method SOP No. SOP/03/11, Issue No. 02 Date : 01/01/2018	654.57

The results relate only to the parameters tested.

....end of report...

Pollution And Project Consultants Kolkata

Tanmoy Chakrabarty
Quality Manager

Authorized Signatory
For Pollution And Project Consultants

POLLUTION AND PROJECT CONSULTANTS

ENVIRONMENTAL POLLUTION CONTROL - Air, Effluent, Pharmaceuticals
& Chemical Project Engineers. EIA & Disaster Management Study

TEST REPORT
SOIL

Customer Name	: M/s. Dinabandhu Andrews College 54, Raja Subodh Chandra Mallick Road	Report No.	: S/22(05)/05
Address	: Milan Park, Baishnabghata, Garia, Kolkata 700084	Report Date	: 28-05-2022
		Sampling Date	: 19-05-2022
		Sample Received Date	: 19-05-2022
		Sample Id No.	: S/22(05)/05
Type of Sample	: Soil	Test Start Date	: 21-05-2022
Sampling Location	: College Garden	Test End Date	: 28-05-2022

SL No.	PARAMETER TEST	UNIT	STANDARD AGAINST WHICH TEST ARE PERFORMED	RESULT
1	pH at 25°C	--	IS 2720 (Part 26) : 1987 (RA 2016)	7.91
2	Electrical Conductivity	µS/cm	IS 14767: 2000 (RA 2010)	118.0
3	Available Nitrogen (as N)	mg/kg	IS 14684 : 1999 (RA 2014)	220.86
4	Available Phosphorous (as P)	mg/kg	In-House Method SOP No. SOP/03/04, Issue No. 02 Date : 01/01/2018	18.84
5	Total Kjeldahl Nitrogen (TKN)	mg/kg	IS 14684 : 1999 (RA 2014)	1282.0
6	Total Organic Carbon (TOC)	mg/gm	IS 2720 (Part 22) : 1972 (RA 2015)	8.56
7	Phosphate ($PO_4^{\equiv}$)	mg/kg	In-House Method SOP No SOP/03/24 Issue No. 02 Dated 01/01/2018	2275.09
8	Potassium (as K)	mg/kg	In-House Method SOP No. SOP/03/11, Issue No. 02 Date : 01/01/2018	1004.90

The results relate only to the parameters tested.

....end of report...

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POLLUTION AND PROJECT CONSULTANTS

ENVIRONMENTAL POLLUTION CONTROL - Air, Effluent, Pharmaceuticals
& Chemical Project Engineers. EIA & Disaster Management Study

TEST REPORT

SOIL

Customer Name	: M/s. Dinabandhu Andrews College	Report No.	: S/22(05)/06
	54, Raja Subodh Chandra Mallick Rd.	Report Date	: 28-05-2022
Address	: Milan Park, Baishnabghata, Garia, Kolkata 700084	Sampling Date	: 19-05-2022
		Sample Received Date	: 19-05-2022
		Sample Id No.	: S/22(05)/06
Type of Sample	: Soil	Test Start Date	: 21-05-2022
Sampling Location	: College Pond Bank	Test End Date	: 28-05-2022

SL No.	PARAMETER TEST	UNIT	STANDARD AGAINST WHICH TEST ARE PERFORMED	RESULT
1	pH at 25°C	--	IS 2720 (Part 26) : 1987 (RA 2016)	8.52
2	Electrical Conductivity	µS/cm	IS 14767: 2000 (RA 2010)	188.0
3	Available Nitrogen (as N)	mg/kg	IS 14684 : 1999 (RA 2014)	191.91
4	Available Phosphorous (as P)	mg/kg	In-House Method SOP No. SOP/03/04, Issue No. 02 Date : 01/01/2018	14.15
5	Total Kjeldahl Nitrogen (TKN)	mg/kg	IS 14684 : 1999 (RA 2014)	1085.15
6	Total Organic Carbon (TOC)	mg/gm	IS 2720 (Part 22) : 1972 (RA 2015)	3.76
7	Phosphate ($PO_4^{\equiv}$)	mg/kg	In-House Method SOP No SOP/03/24 Issue No. 02 Dated 01/01/2018	2059.05
8	Potassium (as K)	mg/kg	In-House Method SOP No. SOP/03/11, Issue No. 02 Date : 01/01/2018	870.14

The results relate only to the parameters tested.

....end of report...

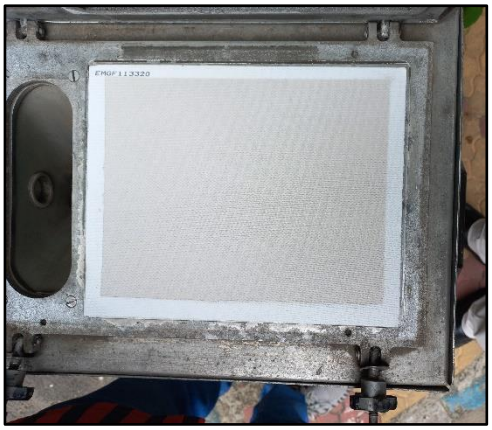
Pollution And Project Consultants Kolkata

Tanmoy Chakraborty
Quality Manager
Authorized Signatory
For Pollution And Project Consultants

Plate: 2. Environment quality monitoring on the campus

A. Ambient air monitoring inside the campus

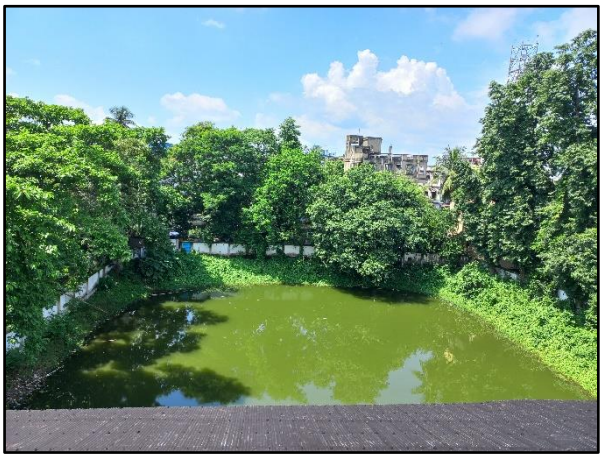
B. Placement of air filter in air monitoring machine



C. SPM accumulated on a paper filter

D. Placement of air monitoring machine on campus

E. Team effort during air monitoring



F. Pond at the eastern side of the campus

G. Collection of pond water sample

H. Soil sampling using augar in garden

I. Collection of top soil in the garden

J. Soil sampling at the periphery of pond

K. Soil sampling at the western side of the campus

8. GREEN AUDITING:

The college has both terrestrial and aquatic ecosystems on campus and thus focuses on to keep harmony in natural biodiversity on the basis of three pillar-like viable, bearable and equitable development. Sufficient efforts are initiated to achieve zero environmental footprints, positive impact on occupational health and performance and environmental literacy in all streams of education by proper curriculum by the university. The goal is to reduce CO_2 emissions, use green energy, and water use efficiency while creating an atmosphere where students can learn and be healthy.

Green auditing is done in three phases by the team headed by the IQAC Coordinator and other faculty members of the Department of Botany and Zoology.

1. Collection of phytosociological zoo diversity data and assessment of their present status,
2. Assessment of carbon sequestration and carbon footprint,
3. Assessment of environmental data -like soil, air, water quality *etc.*
4. Assessment of green energy like solar power on the campus.

A. Assessment on Phyto- and zoo diversity:

1. Phytodiversity:

The college campus is surrounded by green vegetation on the eastern side by some mango trees and trees at the periphery of grassland (open field on the southeastern side.). On the southern side, an aquatic body is present of approximately 1600 sq. m. The periphery of the pond is surrounded by some big trees -like *Ficus religiose, Neolamarkiana cadamba, Ficus bengalansis, Albizzia lebbeck, Polyalthia longifolia etc.* In the western part, a well-maintained garden is present where the central medicinal plant garden present and the area is surrounded by some big trees and shrubs -like *Terminalia arjuna, Artocarpus heterophylla, Polyalthia longifolia, Dalbergia sissoo, Swetenia mahagoni, Swetenia macrophylla etc.* Many trees were planted on different occasions, and in addition to that, some ornamental flowering plants were present -like *Tabernaemontana divericata, Mussaenda frondosa, Murraya paniculate* and many more (Table:). In the eastern part, seven big mango trees are present, along with silk cotton and margosa tree, respectively.

Table: 4. List of trees and shrubs species on the campus

Sl. No.	Scientific Name	Family	Common Name	Habit	IUCN Criteria
Trees and Shrubs					
1	*Mangifera indica* L.	Anacardiaceae	Aam (Bengali), Mango (English)	The tree is medium to large	LC.
2	*Terminalia arjuna* (Roxb.) Wight & Arn.	Combretaceae	Arjun tree (English, Hindi and Bengali)	It is a deciduous large-sized fluted tree	LC.
3	*Swietenia macrophylla* King	Meliaceae	Brazilian mahogany (E), Baro mehagoni (B)	Medium-sized semi-evergreen tree	VU.

Sl. No.	Scientific Name	Family	Common Name	Habit	IUCN Criteria
4	Ceiba pentandra (L.) Gaertn.	Malvaceae	White Silk-Cotton Tree (E), Swet Shimul (B)	Emergent tree	LC.
5	*Swietenia mahagoni* (L.) Jacq.	Meliaceae	Mahogany (E), Mehagoni (B)	medium-sized semi-evergreen tree	VU.
6	*Dalbergia sissoo* Roxb. [Amerimnon sissoo (Roxb.) Kuntze]	Fabaceae	Indian Rosewood (E), Sisham (H). Sisoo (B)	medium to large deciduous tree	VU.
7	*Neolamarckia cadamba* (Roxb.) Bosser	Rubiaceae	Burflower-tree (E), Kadam (B)	Large tree	LC.
8	*Roystonea regia* (Kunth) O. F.Cook	Arecaceae	Royal palm (E)	Tall tree	LC.
9	Polyalthia longifolia Sonn.	Annonaceae	Mast Tree (E), Debdaru (B)	Tall Evergreen tree	L.C.
10	*Ficus elastica* Roxb. ex Hornem.	Moraceae	Rubber Plant (English)	Large tree	LC.
11	*Plumeria rubra* L.	Apocynaceae	Temple Tree (E), Kathchampa (B)	Evergreen medium tree	LC.
12	*Murraya paniculate* (L.) Jack	Rutaceae	Chinese box (E), Kamini (B)	Small tree	LC.
13	*Artocarpus heterophyllus* Lam.	Moraceae	Jack fruit (E), Kanthal (B)	Medium sized tree	LC.
14	*Psidium guajava* L.	Myrtaceae	Guava (E), Pyara (B)	Medium size tree	LC.
15	*Azadirachta indica* A.Juss.	Meliaceae	Margosa tree (E), Neem (B)	Medium size tree	VU.
16	*Codiaeum variegatum* (L.) A. Juss.	Euphorbiaceae	Garden croton (E), Patabahar (B)	Shrub	LC.
17	*Ptychosperma macarthurii* (H.Wendl. ex H.J.Veitch) H.Wendl. ex Hook.f.	Arecaceae	Macarthuri Palm (English)	Tall, slender palm	LC
18	*Dypsis lutescens* (H.Wendl.) Beentje & amp; J. Drans f.	Arecaceae	Areca Palm, Butterfly Palm (English)	Small height palm	LC.
19	*Mussaenda frondosa* Linn.	Rubiaceae	Mussanda (E), Dhobi Tree (H)	Smaller shrub	LC.

Sl. No.	Scientific Name	Family	Common Name	Habit	IUCN Criteria
20	*Tabernaemontana divaricata* R.Br. ex Roem. & Schult.	Apocynaceae	Crape jasmine (E), Tagar (B)	Small tree	LC.
21	*Casuarina equisetifolia* L.	Casuarinaceae	Coast sheoak (E), Jhau (B)	Tall tree	LC.
22	*Ixora coccinea* L.	Rubiaceae	Jungle geranium (E), Swet Rangan (B)	Shrub	LC.
23	*Aegle marmelos* (L.) Correa	Rutaceae	Wood apple (E), Swet Beln (B)	Medium tree	VU.
24	*Alstonia scholaris* (L.) R.Br.	Apocynaceae	Devil tree (E), Chatim (B)	Tall tree	LC.
25	*Annona reticulate* L.	Annonaceae	Bullock's heart (English), Nona (Bengali)	Small tree	LC.
26	*Araucaria columnaris* J. R.Forst.Hook	Araucariaceae	Captain Cook's pine (English)	Tall tree	LC.
27	*Bougainvillea spectabilis* Willd.	Nyctaginaceae	Glory of garden (E), Baganbilas (B)	Lianas	L.C.
28	*Cascabela thevetia* (L.) Lippold	Apocynaceae	Yellow oleander (E), Kolke (B)	Small tree	LC.
29	*Cycas revoluta* Thunb.	Cycadaceae	Sago palm, Sago cycad (E)	Small unbranched tree	LC.
30	*Ficus religiosa* L.	Moraceae	Peepal (E), Ashwath (B)	Tall tree	LC.
31	*Lagerstroemia speciosa* (L.) Pers.	Lythraceae	Crape myrtle (E), Jarool (B)	Medium height tree	LC.
32	Morus alba L	Moraceae	White mulberry (E), Toont (B)	Small tree	LC.

Table: 5. List of herbaceous and shrub species

Sl. No.	Scientific Name	Family	Common Name	Habit	IUCN Criteria
Wild Herbaceous Species					
1	*Dieffenbachia amoena* W. Bull	Araceae	Dumb cane (E)	Herb	LC.
2	*Epipremnum pinnatum* (L.) Engl.	Araceae	Dragon-tail plant (English)	Herbaceous root creeper	LC.
3	*Cynodon dactylon*	Poaceae	Durba (B)	Prostrate herb	LC.
4	*Eclipta alba*	Asteraceae	Keshut (B)	Erect herb	LC.
5	*Boerhaavia diffusa* L.	Nyctaginaceae	Punarnava	Procumbent herb	LC.
6	*Vandellia crustacea*	Scrophulariaceae		Herb	LC.
7	*Vandellia hirsute*	Scrophulariaceae			LC.
8	*Majus japonica*	Scrophulariaceae			LC.
9	*Scoparia dulcis*	Scrophulariaceae	Wild coriander		LC.
10	*Cyperus rotundus*	Cyperaceae		Herb	LC.
11	*Commelina benghalensis*	Commelinaceae			LC.
12	*Tradescantia pallida*	Commelinaceae			LC.
13	*Dracaena marginata*	Asperagaceae	Dragon tree	Woody erect herb	LC.
14	*Cordyline fruticosa*	Asperagaceae	Good luck plant	Woody herb	LC.
15	*Cyanthillium cinereum* (Linn.) H. Rob.	Asteraceae	Little ironwood	Erect herb	LC.
16	*Ageratum conyzoides* L.	Asteraceae	Billygoat-weed	Erect herb	LC.
17	*Parthenium hysterophorus*	Asteraceae	Carrot grass	Allelopathic herb	Exotic LC.
18	*Croton bolplandianus*	Euphorbiaceae			LC.
19	*Cassia tora*	Fabaceae			LC.
20	*Stellaria media*	Caryophyllaceae			LC.
21	*Mikania scandens*	Asteraceae	Taralata (B)	Herbaceous twiner	Exotic LC.
22	*Lantana camara*	Verbenaceae		Allelopathic undershrub	LC.
23	*Cleome rutidosperma*	Capparidaceae		Herb	LC.
24	*Evolvulus nummularius* (L,) L.	Convolvulaceae		Root creeper	LC.
25	*Colocasia esculenta*	Araceae	Arum (E)	Semi aquatic herb	LC.
26	*Alternanthera sessilis*	Amaranthaceae		Prostrate herb	LC.
27	*Tilanthera philoxeroides*	Amaranthaceae		Erect herb	LC.
28	*Pistia strateotes* L.	Araceae	Water lettuce	Floating herb	LC.
29	*Utricularia stellaris* L.	Lentibulariaceae	Star bladderwort	Submerged aquatic	LC.
30	*Paspalum scrobiculatum*	Poaceae		Grass	L.C.
31	*Oplismenus burmanii*	Poaceae	Burmann's basketgrass	Grass	L.C.

Table: 6. Some Medicinal Plants in the campus

SL No.	Name	Family	Common Name	Parts Used and Uses	Uses
1	*Emblica officinalis*	Euphorbiaceae	Amlaki	Fruits	Enhance digestion, treat constipation, and reduce cough.
2	*Cinnamomum tamala*	Lauraceae	Tejpatta	Leaves	Cooking, adjunct therapy in diabetes.
3	*Terminalia chebula*	Combretaceae	Haritaki	Fruits	Increase in digestion power; clears and cleanses bowels.
4	*Terminalia bellirica*	Combretaceae	Bahera	Fruits	Rejuvenate and cleanses bowels
5	Piper cubeba	Piperaceae	Kababchini	Fruits	Mouthwash dried cubebs are internally used for oral and dental diseases.
6	*Syzygium aromaticum*	Myrtaceae	Labanga	pedicelled flower	Natural anthelmintic, Applied to a cavity in a decayed tooth.
7	*Cinnamomum zeylanica*	Lauraceae	Darchini	Bark	Used as a spice.
8	*Elaeocarpus ganitrus*	Elaeocarpaceae	Rudraksha	Fruits	Helpful in the management of high blood pressure.
9	*Terminalia arjuna*	Combretaceae	Arjun	Bark	Protect the liver and treat respiratory conditions, including respiratory tract infections, cough, and sore throat.
10	*Saraca indica*	Caesalpinaceae	Ashok	Bark	Used mainly in bleeding gynaecological conditions.
11	*Elettaria cardamomum*	Zingiberaceae	Chota elaichi	Fruits	common ingredient in cooking.
12	*amomum subulatum*	Zingiberaceae	Bara elaichi	Fruits	Used as flavourings and cooking spices in both food and drink.
13	*Ocimum sanctum*	Lamiaceae	Tulsi	Leaves	Leaves are used for the remedy of cough and cold.
14	*Adhatoda vasica*	Acanthaceae	Basak	Leaves	Leaves are expectorant.
15	*Cymbopogon citratus*	Poaceae	Lemon grass	Leaves	Lemon grass is used in culinary dishes.
16	*Acorus calamus*	Zingiberaceae	Boch	Rhizome	Used medicinally for a wide variety of ailments, and makes essential oil for the perfume industry.
17	*Calotropis gigantea*	Asclepiadaceae	Swet akanda	Leaves	Fungicidal and insecticidal properties of *Calotropis* have been reported.
18	*Hemidesmus indicus*	Asclepiadaceae	Anantamul	Roots	The extracts from the root are used as a coolant and a blood purifier.
19	*Hydrocotyl asiatica*	Apiaceae	Thankuni	Leaves	Constipation and stomach disorders are released.
20	*Wedelia calendulacea*	Asteraceae	Bhringaraj	Leaves	Widely used in hair fall treatment.
21	*Hygrophyla spinosa*	Acanthaceae	Kulekhanra	Leaves	Aphrodisiac, renal tonic, and health-promoting properties.
22	*Morinda citrifolia*	Rubiaceae	Nani	Fruits	Diabetes, high blood pressure, inflammation, tumours, bacterial infections.
23	*Eupatorium ayapana*	Asteraceae	Ayapan	Leaves	The herb is a stimulant, tonic in small doses and laxative when taken in quantity.
24	*Andrographis paniculata*	Acanthaceae	Kalmegh	Leaves	used for liver complaints and fever, and as an anti-inflammatory and immunostimulant.

SL No.	Name	Family	Common Name	Parts Used and Uses	Uses
25	*Piper longum*	Piperaceae	Pipul	Fruits	Pippali has known for Detoxifying the lungs; it helps to remove cold and congestion.
26	*Aloe vera*	Liliaceae	Ghritakumari	Leaves	Gel of leaves reduces the burning sensation and protects the skin, Laxatives.
27	*Lawsonia inermis*	Lawsoniaceae	Mehndi	Leaves	The plant is famous for its anticancer and anti-inflammatory activities.
28	*Rauvolfia serpentina*	Apocynaceae	Sarpagandha	Basal stem	Reduce blood pressure and is effective in schizophrenia.
29	*Curcuma caesia*	Zingiberaceae	Kalo halud	Rhizome	Fresh rhizomes are crushed and applied as a paste on the forehead for relief from migraine or applied on the body for sprains and bruises.
30	*Curcuma longa*	Zingiberaceae	Halud	Rhizome	Medicine for stomach ailments, stimulates bile secretion, blood purifier, liver ailments, and skin diseases.
31	*Barleria lupulina*	Acanthaceae	Bisallakarani	Leaves	Arthritis, insect bites and rheumatism.
32	*Mentha piperata*	Lamiaceae	Pudina	Leaves	Popular flavouring for food and drink. It is also used as a fragrance.
33	*Bryophyllum calycinum*	Crassulaceae	Patharkuchi	Roots	Used to treat high blood pressure and prevent any kind of cardiac problem.
34	*Vitex negundo*	Verbenaceae	Nishinda	Leaves	good muscle relaxant, pain relieving, anti-mosquito, anti-anxiety, anti-asthma.
35	*Asparagus officinalis*	Liliaceae	Satamuli	Fibrous fleshy roots	Diuretic.
36	*Datura suaveolens*	Solanaceae	Dhutura	Fruits	Antispasmodic has hallucination property.
37	*Vernonia anthelmintica*	Asteraceae	Somraj	Seeds	Astringent, anthelmintic and purgative.
38	*Vinca rosea*	Apocynaceae	Nayantara	Leaves	Used to treat some leukaemia, lymphomas, and childhood cancers.
39	*Abutilon indicum*	Malvaceae	Potari	Fruits	Used as a laxative, diuretic, sedative, astringent, expectorant, or tonic.
40	*Abroma augusta*	Sterculiaceae	Ulatkambal	Fruits	used in Ayurveda for gynaecological disorders, infertility treatment and amenorrhoea.
41	*Murraya koenigii*	Rutaceae	Curry leaves	Leaves	used as tonics as well as a stomachic, antidiabetic.
42	*Vitis quadrangularis*	Vitaceae	Harjora	Stem	Used for obesity, diabetes, and a cluster of heart disease risks.
43	*Azadirachta indica*	Meliaceae	Neem	Leaves	Anthelmintic, antifungal, antidiabetic, antibacterial, antiviral, contraceptive and sedative.
44	*Phyllanthus fraternus*	Euphorbiaceae	Bhuin amla	Leaves	Plant extract is a strong diuretic.

Plate: 3. Trees and shrubs present on the campus

A. Mango

B. Arjun

C. Big-leaf Mahogany

D. Silk Cotton

E. Mahogany

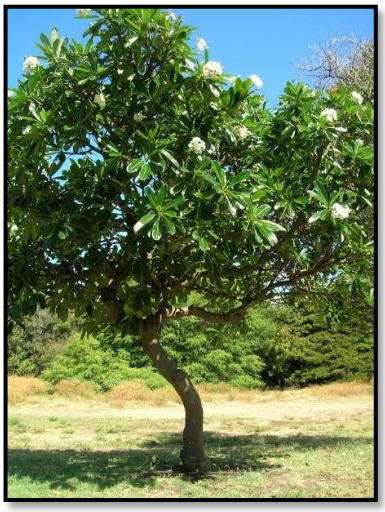
F. Shisham

G. Kadam

H. Cuban Royal Palm

I. Debdaru

J. Rubber Tree



K. Kath Golap

L. Kamini

M. Jack Fruit Plant

N. Common Guava

O. Neem Plant

P. *Ptychospermum* Palm

Q. *Areca* Palm

R. Dumbcane

S. Pride of India

T. Centipede Tongavine

U. Ashoka Plant

V. Coastal She-oak (Jhau)

W. Araucaria Plant

X. Sago Palm

2. Zoodiversity:

Many wild herbaceous and shrub species are present around the college which not only maintain the natural phytodiversity of the area but also provide hiding and nesting places for insects, birds and reptiles. Several avian species were sighted -like Indian Treepie *(Dendrocitta vagabunda*), Bee-Eater (*Merops philippinus*), Jungle Babbler, Common Myna, Kingfisher, Black Headed Oriole, Weaver Bird (*Ploceus benghalensis*), Rose Ringed Parakeet (*Psittacula krameri*), Common Buzzard (*Buteo buteo*), House Crow, House Sparrow, Indian Pond Heron (*Ardesta grayii*), Lesser Spotted Eagle (*Aquila pomarina*), Purple-Rumped Sunbird (*Nectarinia zeylonica*), Spotted Dove (*Streptopelia senegalensis*), Coppersmith Barbet, Red-Vented Bulbul (*Pycnonotus cafer*), Black Drongo, Indian Shag, Little Egret, White Winged Duck, Common Buzzard, Lesser Spotted Eagle, Crested Serpent Eagle *etc.* (Table:). At the evening time, Brown fish owl (*Bubo zeylonensis*) is situated in several locations.

Mammalian species are sighted and/or confirmed existence by local people -like Common Mangoose, Small Indian Civet, Short-nosed Fruit Bat, Three-striped Palm Squirrel, *Bandicota bengalensis, Rattus blanfordi etc.* (Table:3).

The region is an ideal habitat for snakes because availability of pray like mice and hiding places -like thick bushes around the pond, though they are not sighted, confirmed by the caretaker. Among the reptiles, garden lizards, Fan-throated Lizards are sighted during the survey. Water snake-like 'Jaldhora' (*Xenochorphis piscator)* is common in the pond. Although the direct sighting of snakes is not done, but interactions with gardener, security guard and caretaker confirmed the presence of *Daboia russelii* (Russel viper), Naja *kaouthia* (Indian Keute), *Naja naja* (Gokhro) *etc.* (Table:).

Table: 7. List of animals sighted or confirmed in the campus

Sl. No.	Scientific Name	Common Name	Family
Avian Species			
1	*Alcedo atthis*	Small Blue Kingfisher	Alcedinidae
2	*Ardesta grayii*	Pond Heron	Ardeidae
3	*Corvus splendens*	House crow	Corvidae
4	*Cypsiurus parvus*	Palm Swift	Apodidae
5	*Dicrurus adsimilis*	Black Drongo	Dicruridae
6	*Eudynamys scolopacea*	Koel	Cuculidae
7	*Micropterus brachyrus*	Rufus Woodpecker	Picidae
8	*Milrus mirans govinda*	Black ibis	Threskior mithidae
9	*Passer domesticus*	House Sparrow	Ploecidae
10	*Phalcrocorax niger*	Little Cormorant	Phalacrocoracidae
11	*Psittacula krameri*	Roseringed Parakeet	Psittadae
12	*Pycnonoctus cafer*	Redvented Bulbul	Pycnonotidae
13	*Spilornis cheela*	Crested Serpent Eagle	Accipitridae
14	*Streptopilia decaocta*	Indian Ring Dove	Columbidae
15	*Threskiornis acthiopica*	White Ibis	Threskior mithidae
Mammals			
16	*Funambulus palmarum*	Three striped squirrel	
17	*Rousettus leschenaultia*	Fruit Bat	
18	*Urva edwardsii*	Common Mangoose	
19	*Viverricula indica*	Small Indian Civet	
20	*Cynopterus brachyotis*	Shortnosed Fruit Bat	
21	*Bandicota bengalensis*	Lesser Bandicoot Rat	

22	*Rattus rattus*	House Rat
23		
Amphibians and Reptiles		
23	*Fejervarya limnocharis*	Cricket Frog
24	*Microhyla ornate*	Ornate Narrow mouther Frog
25	*Calotes versicolor*	Common garden lizard
26	*Ptyas mucosus*	Rat Snake
27	*Bungarus caeruleus*	Common Krait
28	*Xenochorphis piscator*	Water snake
29	*Sitana ponticeriana*	Fan-throated Lizard
30	*Daboia russelii*	Russel viper
31	*Naja kaouthia*	Indian Keute
32	*Naja naja*	Gokhro
33	*Ptyas mucosa*	Dhaman Snake

Plate: 4. Some avian species found in the campus

A. Treepie

B. Black-headed Oriole

C. Black Drongo

D. Coppersmith Barbet

E. Rose-ringed Parakeet

F. Indian Cormorant

G. Common Kingfisher

H. Common Myna

I. Common Crow

J. House Sparrow

K. Indian Pond Heron

L. Indian Spotted Eagle

M. Crow Pheasant

N. Asian Koel (Male and Female)

O. Jungle Bablar

P. Spotted Dove

Q. Bee Eater

R. House Swift

S. Purple-rumped Sunbird

T. Red-vented Bulbul

Plate: 4. Some Common reptiles and amphibian species found in the campus

A. Indian Garden Lizard

B. House Lizard

C. Rat Snake

D. Water Snake

E. Indian Keute

F. Glossy Grass Skink

G. Cricket Frog

Plate: 5. Some Common mammalian species found in the campus

A. Bengal Mongoose

B. Three Stripped Squirrel

C. Short-nosed Indian Fruit Bat

D. Small Indian Civet

E. Lesser Bandicoot Rat

F. Common House Rat

B. STUDIES ON IUCN RED LIST CATEGORIES OF SPECIES:

To assess the conservation status of species, IUCN red list categories (version 6.2, 2006) have been used. Among the five criteria mentioned in the guideline, only two that is 'b' and 'd' are utilised to evaluate the species belonging to the threatened category. Under b2, 'a' and 'c' have been utilised, and in the 'c', only 'iv', that is the number of mature individuals, is taken into consideration.

Table: 8. Criteria of IUCN Red list species

	CR	EN	VU
B. Geographic range in the form of either B1 (extent of occurrence) OR B2 (area of occupancy)			
B1. Either extent of occurrence	<100 km^2	<5000 km^2	<20,000 km^2
B2. or area of occupancy	<10 km^2	<500 km^2	<2,000 km^2
and 2 of the following 3:			
(a) severely fragmented or # locations	= 1	$\leq$ 5	$\leq$ 10
(b) continuing decline in (i) extent of occurrence, (ii) area of occupancy, (iii) area, extent and/or quality of habitat, (iv) number of locations or subpopulations and (v) number of mature individuals.			
(c) extreme fluctuations in any of (i) extent of occurrence, (ii) area of occupancy, (iii) number of locations or subpopulations and (iv) number of mature individuals.			
…… …… …… …… …… …… …… …… …… …… …… …..			
D. Very small or restricted population			
Either (1) number of mature individuals	<50	<250	<1,000
Or (2) restricted area of occupancy	na	na	typically:

9. Assessment of carbon sequestration and carbon footprint:

A. Carbon Sequestration:

Carbon is held in different natural stocks in the environment, especially in a biological organisms. Plants store carbon for as long as they live, in terms of the live biomass by carbon sequestration. Carbon sequestration is a mechanism for the removal of carbon from the atmosphere by storing it in the biosphere (Chavan and Rasal, 2012). Most terrestrial carbon storage is in tree trunks, branches, foliage, and roots which are often called biomass.

Methodology:

There are two methods of carbon estimation in tree species that is a destructive method and a non-destructive method, approved by many researchers. Here, the method of carbon sequestration estimation obtained from the published research paper -like Suryawanshi *et al.* 2014 and Pandya *e. al.* 2013

Tree diameter (D) was measured by dividing girth at breast height (GBH) by 3.14 (GBH/3.14). Biomass is evaluated of tree species found in sites covering 2450 sq. m. areas. Above Ground Biomass (AGB) is estimated by multiplying the bio-volume by the green wood density of tree species. Tree bio-volume (T_{BV}) value was established by multiplying of diameter and height of tree species by a factor of 0.4.

Bio-volume (T_{BV})=0.4 X $(D)^2$ x H

AGB=Wood density x $T_{.B.V.}$

Where; D= (GBH/π) diameter (meter) calculated from GBH, assuming the trunk to be cylindrical, H = Height (meter). Wood density is used from the Global wood density database (Zanne et al., 2009). The standard average density of 0.6 gm/ cm is applied as the trees encountered here are not present in the database. AGB include all living biomass above the soil. The above ground biomass (AGB) has been calculated by multiplying the volume of biomass and wood density. The volume was calculated based on diameter and height (Pandya *et al*., 2013). The belowground biomass (BGB) has been calculated by multiplying above ground biomass, taking 0.26 as the root shoot ratio (Chavan and Rasal, 2011; Hangarge*et al.*, 2012; Hangarge et al., 2012).

BGB=AGB x 0.26

Total biomass is the sum of the above and below ground biomass. (Sheikh et al., 2011)
Total Biomass (TB) = Above Ground Biomass + Below Ground Biomass

Carbon Estimation:

Generally, for any plant species, 50% of its biomass is considered as carbon (Pearson et al., 2005) i.e.
Carbon Storage = Biomass x 50 % or Biomass/2

Total Biomass
Total biomass is the sum of the above and below ground biomass. (Sheikh*et al.*2011).
Total Biomass (TB) = Above Ground Biomass + Below Ground Biomass

Table: 9. Estimation of carbon sequestration of species found in the plots of project area

Name	Family	No.	Avg. height (m)	Avg. GBH (m)	Average organic carbon (ton/ species)			Total.C storage (tons)
					AGB (Tons)	BGB (Tons)	Total biomass (Tons)	
Artocarpus heterophyllus	Moraceae	3	9	56	0.068702	0.017863	0.259694	0.129847
Araucaria cookie	Araucariaceae	1	10	42	0.042939	0.011164	0.054103	0.027051
Azadirachta indica	Meliaceae	2	15	92	0.309043	0.080351	0.778788	0.389394
Casuarina equisetifolia	Casuarinaceae	1	15	67	0.163905	0.042615	0.206521	0.10326
Ceiba pentandra	Malvaceae	1	16	130	0.658201	0.171132	0.829333	0.414667
Dalbergia sissoo	Fabaceae	2	13	95	0.28559	0.074253	0.719686	0.359843
Ficus elastica	Moraceae	1	8	50	0.048684	0.012658	0.061341	0.030671
Ficus religiosa	Moraceae	1	8	61	0.072461	0.01884	0.0913	0.04565
Lagerstroemia speciosa	Lythraceae	1	7	55	0.051544	0.013401	0.064945	0.032473
Mangifera indica	Anacardiaceae	9	12	75	0.164307	0.04272	1.86324	0.93162
Neolamarckia cadamba	Rubiaceae	2	9	82	0.147307	0.0383	0.371213	0.185606
Plumeria rubra	Apocynaceae	1	7	47	0.03764	0.009786	0.047426	0.023713
Polyalthia longifolia	Annonaceae	11	11	75	0.150615	0.03916	2.087519	1.043759
Psidium guajava	Myrtaceae	2	5	45	0.024646	0.006408	0.062108	0.031054
Roystonea regia	Arecaceae	2	15	102	0.379877	0.098768	0.957291	0.478646
Saraca asoca	Fabaceae	1	8	55	0.02109	0.00548	0.026573	0.013287
Swietenia macrophylla	Meliaceae	6	11	90	0.05890	0.01531	0.445337	0.222669
Swietenia mahagoni	Meliaceae	1	10	80	0.21688	0.05639	0.273275	0.136638
Terminalia arjuna	Combretaceae	1	6	38	0.15578	0.04050	0.026573	0.013287
Total		**49**	**Total**				**9.395986**	**4.697993**

Explanation of carbon sequestration:

Tree counting in the campus is tabulated in Table: 9. The species planted in different time phases exhibit significant carbon sequestration (Table:9). From the analysis, it has been observed that total 3.09 tons of carbon are sequestrated by 49 individual tree species (≤20 cm GBH) distributed over 2500 sq. m area These trees were mostly planted in 1980-1985 (?). It has been seen that, within 40 years, approximately 4.69 tons of carbon were sequestrated. It can be said that within the last ten years, existing trees sequestrated 1.1744 tons of carbon. Apart from tree species, many shrub, palm and herbaceous species are present and so the amount of carbon sequestration would be higher. It has been recommended to plant more trees around the pond and also inside the suitable places on the campus. It is being recommended to plant more trees approximately 31 more trees of different slow and fast-growing species. If 31 more trees are added, it is estimated that 3.09 tons of carbon might be sequestrated by 80 trees in the next ten years (Fig. 3); that means sequestration can be increased by 2.6 times.

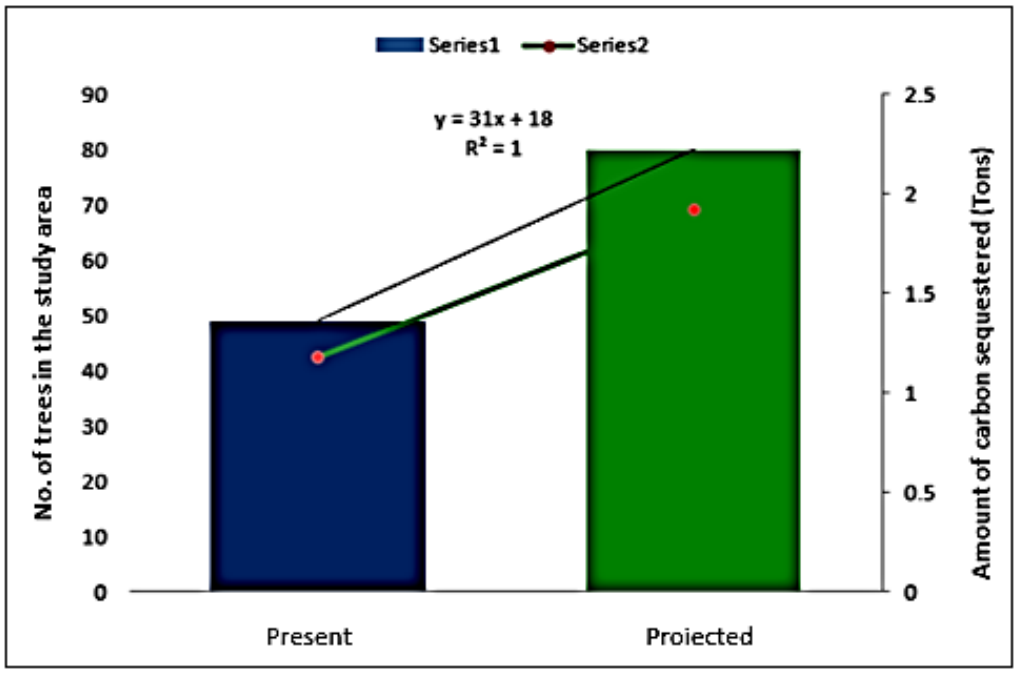


Fig. 4 Comparison of carbon sequestration by the present and projected vegetation by the trees over study sites

Table : 10. Comparison of carbon sequestration by the present and projected status of vegetation

Status of carbon sequestration	Present status of the carbon sequestration	Projected status of carbon sequestration	Cumulative benefit
Comparison	**1.1744 tons of carbon is sequestered by 49 individuals counted in the sites in the last 10 years, which is 0.1174 tons yearly.**	**1.9175 tons of carbon can be sequestered by 31 tree species in the next 10 years, that is, yearly 0.1975 tons.**	**0.3149 tons (approx.) of carbon can be sequestered yearly by 80 trees**

It is being proposed to establish more than 31 tree saplings and as much as herbaceous and shrub species. If we suppose to consider the present tree composition in the same present habitat without major alteration, the carbon sequestration can be reached 2.6 times more from the present status, that is 0.197 tons yearly in comparison to 0.117 tons yearly in the present time. It is recommended to establish both fast and slow-growing species together to increase the foliage volume, and if it is done very judiciously, the carbon sequestration potential can be maximised (Table: 10).

10. TRANSPORTATION AT DINABANDHU ANDREWS COLLEGE:

The college is situated at a very prime location in the South Kolkata region of South 24 Parganas District and is communicated by No. 5 and 6 Govt. bus stands as well as by Kolkata Metro Railway and by suburban railway. The nearest railway station is Garia (about 1 km distance), and the nearest metro railway is Kavi Nazrul (just five minute's walking distance). Approximately 50% of students and college staff avail railway route for their daily attendance to college and the rest of the members come either by their private or non-private vehicle (including fuel generated and not fuel generated vehicle respectively). Out of 50%, students mostly avail CNG generated auto rickshaws and buses of different routes which connect the greater part of South Kolkata. The students are encouraged to use cycles, and electric wheelers rather than four wheelers which lead to fuel saving and also the contribution of pollutants to the atmosphere is less.

11. ELECTRICAL POWER CONSUMPTION AND CARBON FOOTPRINT:

The entire college campus is well illuminated by light, and there are also two power generators of capacities 63 KVA and 30 KVA. There are 88 rooms including Classroom, Laboratory, Library, Office, store room, common room, staff room and canteen etc. All are equipped with single and double tube lights, fans, and exhausts in the laboratory. Some classrooms are equipped with ceiling fans and exhausts or AC (Table: 11). Out of 1128 electric appliances 25.6% (289) is single tube light of 40 Watt, 36.79% (415) is double tube light of 80 Watt, 31.56% (356) is ceiling fan of 75 Watt, 2.3% (26)and 2.1% (24) is exhaust fan (40Watt) and wall fan (50Watt) respectively, 1.59% (18) is AC (1500 Watt) (Table: 11). As a policy decision, the authority keeps on replacing the old filament bulbs, CFL bulbs and tube lights with low energy-consuming LED bulbs and LED tubes and bulky high-power consuming fans by energy efficient fans in order to keep the electricity consumption of the college as low as possible.

The establishment of a roof-top Photo Voltaic Solar Power Plant with a capacity of 20 kWp is another step towards the shifting of the utilisation of green energy and thus moving towards a more reliable and greener option and **reducing its carbon footprint.**

Table: 11. Area of Rooms and important electrical appliances in college

Room No.	Nature of Room	Area (Sq.m)	Single Tube Light (40W)	Double Tube Light (80W)	Ceiling Fan (75W)	Exhaust (40W)	Wall Fan (50W)	AC
101	Principal's Room	22.3	1	5	2	1	0	1
102	Bursar's Room	22.3	2	1	2	0	0	0
103, 104, 105	Office Room	144	9	21	20	1	0	0
106	Physics Gen Lab.	115.94	6	10	8	0	0	0
107	Physics Lab. (Dark Room)	23.5	5	1	1	1	0	0
108	Physics Lab. (Electronics)	43.48	10	4	4	0	0	0
109	Physics Lab. (Library)	25.08	1	2	1	0	0	0
110,111 A & B	Physics Lab.	447.5	3	13	12	0	0	0
112	Physics Dark Room	37.16	3	6	4	1	1	0
113, 114	Classroom Gallery	188.02	13	13	12	0	0	0

115	Caretaker's Room	20.44	4	0	0	1	2	0
116, 117	Classroom	69.96	0	8	8	0	0	0
118	Library Reading Room	53.51	4	8	8	0	0	0
119	Library Reading Room	53.51	4	8	8	0	0	0
201	Girl's Common Room	46.45	0	4	4	0	0	0
202, 204, 205, 214, 219	Class Room	152.08	25	9	12	1	0	0
203, 211, 213	Chemistry Lab.	163.51	0	15	13	4	0	0
206	Evaluation Room	48.77	0	4	4	0	0	0
207, 208	Chem. Lab. (Physical & Inorganic)	220.45	0	25	4	5	0	0
209	Chem. Lab. Store	32.52	0	4	4	1	0	0
210	Chem. Sem. Lib.	25.08	1	1	1	1	0	0
212	Chem. Teachers' Room	23.41	0	2	2	0	0	0
215, 216	Stores	116.12	9	3	4	0	0	0
217	Boys' Common Room	98.29	15	0	0	0	4	0
218, 220	Mol. Bio. Lab.	90.21	11	11	6	0	0	0
221	NTS Union Room	17.84	0	3	2	0	0	0
222, 223	Principal's Room, Canteen	113.8	0	11	8	0	0	2
301, 303, 306, 307, 308, 309, 314, 314A, 315	Class Room	510.68	27	39	41	0	0	0
302, 304, 305	Electronics Lab.	159.97	31	6	13	0	0	3
310, 311	Botany Lab.	207.72	9	8	10	0	2	0
312, 312A, 313	Zoo. Lab.	118.73	5	17	15	0	0	0
401, 404,407, N409	Zoo. Lab.	166.1	23	19	16	0	1	4
402, 403, 406,	Zoo. Class Room	110.92	24	7	12	8	2	0
405	Store	5.57	0	3	0	0	0	0
N101, N102, N103,	Class Room	205.11	11	7	13	0	0	0
N104	Store	7.43	5	10	1	0	0	0
N105, N404	Sericulture Lab.	43.47	11	17	13	1	0	0
N107	Students' Canteen	122.91	0	7	6	0	0	0
N201-2	IGNOU Study Center	66.24	0	7	6	0	0	0
N203-4, N205	Comp. Center	101.91	0	8	0	0	5	4

N206	Conference Room	35.67	0	6	1	0	0	2
N207	Teachers' Common Room	122.91	2	12	19	0	4	0
N305-6, N401-2	Microbio. Lab.	139.72	0	20	12	0	3	2
N308	Geo. Lab.	37.62	0	4	4	0	0	0
N403	Math+Geo	71.35	0	7	6	0	0	0
	Students' Room		3	0	1	0	0	0
N405, N406, N407-8	Class Room	112.6	12	19	13	0	0	0
Total 88 Room		**4761.86**	**289**	**415**	**356**	**26**	**24**	**18**

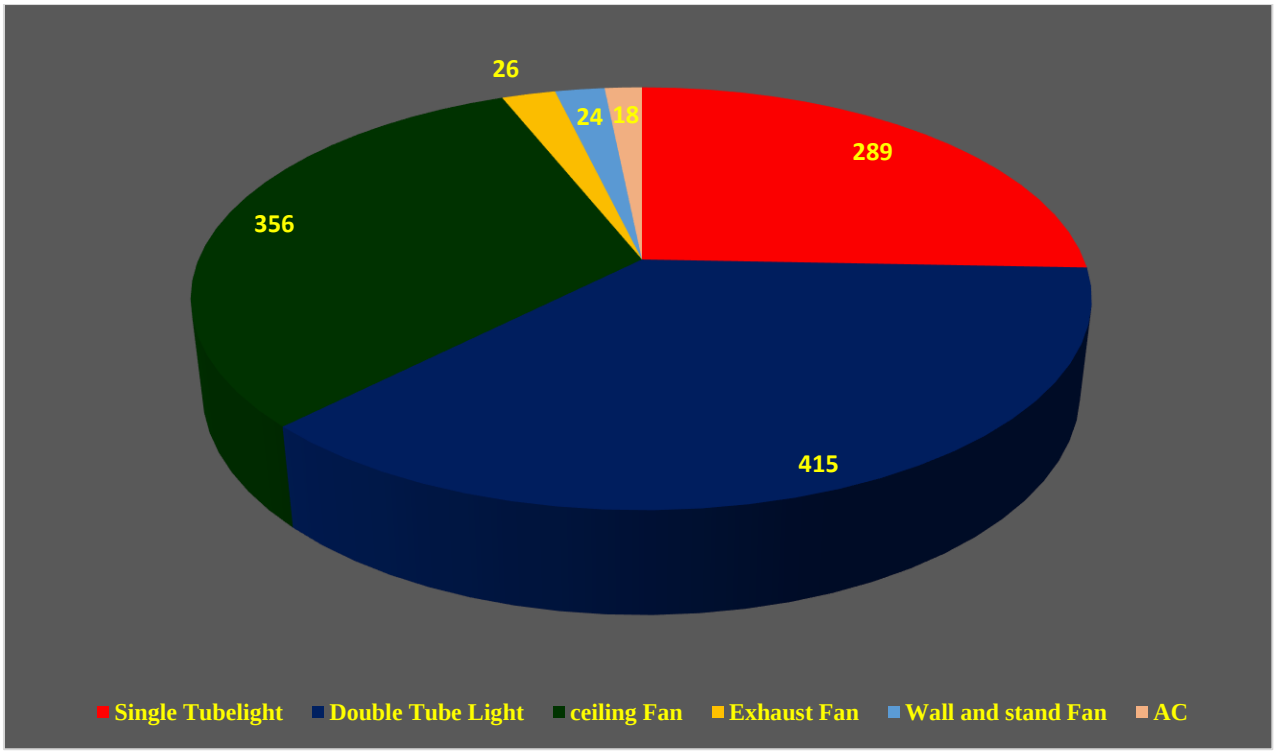


Fig: 5. Number of electric appliances in college rooms

Table: 12. Comparative statement of electrical appliances in college

Nature of electric appliances	Number	Percent (%)
Single Tube light	289	25.62057
Double Tube Light	415	36.79078
ceiling Fan	356	31.56028
Exhaust Fan	26	2.304965
Wall and stand Fan	24	2.12766
AC	18	1.595745
Total	= **1128**	

A. Renewable Energy Source:

On April 24th 2014, the Principal of the college first established communication with one a senior official of the West Bengal Renewable Energy Developmental Agency (WBREDA)—an organisation of Development of Power & NES, Government of West Bengal, with a proposal of establishment of Roof-top Solar PV Panel of 20 kWp capacity on the roof space of this college in a net-metering mode in order to reduce conventional electricity consumption by the college by way of supplementation of energy generated from Sun.

College authority thought it reasonable to establish the Photovoltaic Solar Panel in line with the thinking of the Government of West Bengal for fulfilling the following objectives:
1. Reduction of electricity consumption from the conventional grid
2. Reduction of expenditure on electricity bills
3. Reduction of carbon footprints, and
4. Advocating in favour of more and more use of solar power— a step towards a sustainable future.

B. Non-Renewable Energy Source:

It has been observed that more than 60% non-renewable energy is utilised for lighting the classroom, laboratory, office and others by single and double tube light, each of which 40 Watts and annually 101918.52 kW energy is required for lighting. Except for four months of winter total 63722.88 kW of energy is utilised for ceiling fans, wall and stand fans and to operate an air conditioning machine.

Table: 13 Summery of Non-renewable energy resource

Total Lighting Requirements	Percentage Lighting through Single tube light	Percentage Lighting through Double tube light
101918.52 kWh /Year	25.6%	36.7%

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12. SUGGESTIONS AND RECOMMENDATIONS

1. The amount of electricity used is really high. When applied here, solar power becomes a viable option for off-grid powering of college campuses.
2. Plastic product use should be prohibited on all college campuses.
3. The college campuses are, without a doubt, rich in biodiversity, yet, more plants, especially medicinal plantations, are needed. Fruit tree orchards are great for boosting bird populations.
4. There is an urgent need to form a Green Monitoring Team. The priority of this body is to maintain the greenery of the College campuses. A Green Monitoring Team needs to be established immediately. This group's top aim is protecting the college campuses' vegetation and maintaining the natural beauty of this college campus.
5. Members of the teaching staff, non-teaching staff, students, and, if possible, neighbourhood residents who are interested should make up the Green Monitoring Team.
6. It is possible to use a vermicomposting facility, the output of which can be used as fertiliser or manure for plantations.

7. The year-round sustainability of resource use and ecological balance on college campuses are required.
8. Enact an environmental policy for the college.
9. Make it a policy to only buy products that aren't harmful to the environment.
10. Introduce UGC Environmental Science course to all students.
11. Educate the public about environmental issues by holding more seminars and roundtable discussions.
12. Energy-efficient kitchen upgrades are being made.
13. Establish methods for managing water, waste and energy.

Criteria Wise Recommendations

Water

 Remove damaged taps and install sensitive taps if possible.
 Drip irrigation for gardens and vegetable cultivation can be initiated.
 Establish rainwater harvesting systems for each building.
 Establish water treatment systems.
 Awareness programs on water conservation are to be conducted.
 Install display boards to control the exploitation of water.

Energy

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

Waste

 Establish a functional biogas plant.
 A model solid waste treatment system is to be established.
 The practice of waste segregation is to be initiated.
 A model Vermicomposting plant is to be set up on the college campus.
 Establish a plastic-free campus.
 Avoid paper plates and cups for all functions in the college.

Green Campus

 All trees on the campus should be named scientifically.
 Create more space for planting.
 Grow potted plants on both veranda and classrooms.
 Create an automatic drip irrigation system during the summer holidays.
 Not just celebrating environment day but making it a daily habit.
 Beautify the college building with indoor plants.
 Providing funds to "Nature Club" to make the campus greener.
 Encouraging students not just through words but through action to make the campus green.
 Conducting competitions among departments to make students more interested in making the campus green.

Carbon footprint

 Establish a system of carpooling among the staff to reduce the number of four-wheelers coming to the college.

 Encourage students and staff to use cycles or public vehicles.

 Establish a more efficient cooking system to save gas.

 Discourage the students from using two-wheelers for their commutation.

 More use of generators every day should be discouraged.

13. ACKNOWLEDGEMENT

- Acknowledgement is given to "Pollution and Project Consultants" for their participation in the surveying process that led to the compilation of the Green Book of College Campuses.
- We appreciate the time and effort put in by the college's administration, office staff, departments, students, faculty members and other non-teaching staff who helped us to conduct this survey.