

**ASUTOSH COLLEGE**  
**KOLKATA – 700026**

**PROCEEDINGS OF THE MEETING OF THE GOVERNING BODY OF ASUTOSH COLLEGE HELD ON 13.01.2016 IN THE COLLEGE PREMISES WITH PROF. SAUGATA ROY IN THE CHAIR.**

**MEMBERS PRESENT**

1. Prof. Saugata Roy
2. Dr. Dipak Kumar Kar
3. Prof. Sunanda Sanyal
4. Dr. Kalyan Rudra
5. Sri Dipankar Sarkar
6. Dr. Chandranath Mukherjee
7. Prof. Siddhartha Kar
8. Dr. Tapti De
9. Prof. Apurba Roy (Invitee)
10. Prof. Ena Chatterjee (Invitee)
11. Sri Partha Sarathi Pal

**ITEM NO.1:** Principal to place the Proceedings of the Governing Body meeting dated 02.09.2015 for confirmation.

**RESOLVED THAT**

The Proceedings of the Governing Body meeting dated 02.09.2015 be confirmed.

**ITEM NO. 2:** Principal to report the results of C. U. B.A./B.Sc./B.B.A. Part I and Part II Examinations.

**RESOLVED THAT**

The results of C.U. B.A./B.Sc./B.B.A. Part I and Part II Examination 2015 be noted. The Governing Body appreciates and congratulates the Teachers and Students for the good results.

**ITEM NO 3:** Principal to report the joining of Dr. Phalguni Mukherjee, Assoc. Prof. in Mathematics w.e.f. 27.11.2015(AN) after a period of leave w.e.f. 03.07.2012.

**RESOLVED THAT**

The joining of Dr. Phalguni Mukherjee, Assoc. Prof. in Mathematics be noted. Principal be authorized to send the proposal to DPI for re-fixation of pay of Dr. Phalguni Mukherjee.

**ITEM NO 15:** Principal to place the application for ten computers in the laboratory of Electronics and one each in Bengali & Psychology Departments.

**RESOLVED THAT**

The application for computers in Electronics, Bengali, Psychology Departments be approved.

**ITEM NO 16:** The Principal to place drafts on policies of (a) Code of conduct of students, (b) Green Campus at the Second Campus and (c) for persons with disabilities. The policies are drafted by the IQAC of the college for betterment of the educational atmosphere. The Principal also to place a proposal for conducting green audit.

**RESOLVED THAT**

The above mentioned policies and the proposal be approved.

**ITEM NO 17:** Principal to place the leave applications of the following Staff:

**RESOLVED THAT**

The leave applications of the following staff be approved.

**ITEM NO 18. Miscellaneous:**

- 1. The requisition for LCD Projector of Psychology Department be approved.
- 2. The proposal made by HLL Limited for installation of automated vending machine for sanitary napkins for the girl students be approved.
- 3. The Bill of Rs 1, 48, 290/- for renovations of Statistics Department be approved.
- 4. The construction of Platform (estimated cost of Rs 48, 251/-) for Generator at Canteen Building be approved.
- 5. The proposal for Air Conditioner (estimated cost Rs 2 lakh), Coloured Xerox Machine (estimated cost Rs 2.7 Lakh) and Furniture (estimated cost Rs 1.57 Lakh) for B Voc and Community College be approved.

*[Signature]*  
PRESIDENT,  
GOVERNING BODY  
ASUTOSH COLLEGE

*[Signature]*  
SECRETARY  
GOVERNING BODY  
ASUTOSH COLLEGE



# ASUTOSH COLLEGE

92, Shyamaprasad Mukherjee Road, Kolkata 700026

(2022-2023)

## GREEN, ENVIRONMENTAL & ENERGY AUDIT REPORT



Prepared by

**RSP Green Development & laboratories Pvt. Ltd.**

(ISO Certified and QCI - NABET Accredited Environmental Consultant Organization)





**RSP Green Development & Laboratories Pvt. Ltd.**

An ISO 9001: 2015 & ISO 14001: 2015 Certified Company

**QCI-NABET ACCREDITED ENVIRONMENTAL CONSULTANT**

CIN NO : U74999WB2017PTC219565



NABET / EIA / 1922 / IA0049

## GREEN AUDIT- ASUTOSH COLLEGE CERTIFICATE

This is to certify that the Green Audit report of Asotosh College is based on the original data collected during the period of study. Further, it is certified that the baseline data was prepared by the internal Green Audit team of Asutosh College, Kolkata and submitted to us. The content of the baseline data of the study has been personally verified by the Green Audit Team for validity and reliability. The data used in the study are original in nature and have not been presented or published elsewhere. Photographs used in the report are either taken directly by the audit team or are given by the internal audit team.

RSP Green Development & Laboratory Pvt. Ltd.



Pinaki Roy

Managing Director

## Acknowledgement

RSP Green Development & Laboratory Pvt. Ltd. sincerely extends gratitude to the authority and administration of the Asutosh College, Kolkata for assigning us the responsibility of Green Audit in their college campuses. We appreciate the cooperation extended to our team during the entire process. We convey our thanks to Prof. Saugata Roy, President, Governing Body, Dr. Manas Kabi, Principal , Asutosh College and all faculty members of the Asutosh College for giving us necessary inputs to carry out this very vital exercise of Green Audit. We are also thankful to members of IQAC and other faculty members who were actively involved while collecting the data and conducting field measurements.

We look forward to many more fruitful associations with this eminent academic Institute.



Pinaki Roy

Managing Director

RSP Green Development & Laboratory Pvt. Ltd.

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## 1.0. Introduction

Green Audit is a stage wise review process of systematic identification, quantification, recording, reporting, analysis and documentation of components of environmental diversity of the institute or organization. It is a systematic assessment of day-to-day activity with reference to the utilization of resources as well as waste management. It aims to analyze environmental practices within and outside of the concerned place; leading to an eco-friendly atmosphere. It helps to determine how and where the energy, water or other resources are being used, based on which the institution can design effective management policies and implement changes towards sustainable use of resources. It can create health consciousness and promote environmental awareness, values and ethics. It also helps to enlighten staff and students of the institution for better understanding of Green impact on campus. On this background it becomes essential to adopt the system of the Green Campus for the institutes which will lead for environmental sustainability. Especially in colleges and universities where young minds dwell, ensuring an ecosystem with endurable qualities is the need of the hour. The green influence on the campus is vital to guarantee the best learning environment and healthy ecosystem for everyone associated with the site. The green audit report determines the greenery quotient on the campus and covers other influential environmental aspects. It includes the consumption and management of energy resources and environmental components.

National Assessment and Accreditation Council (NAAC) was introduced by the University Grants Commission or UGC in September 1994. NAAC was established for reviewing the performance and operational quality of Indian universities and colleges. The National Assessment and Accreditation Council have made it mandatory that all Higher Educational Institutions should submit an annual Green Audit Report. Moreover, it is part of Corporate Social Responsibility of the Higher Educational Institutions to ensure that they contribute towards the mitigation of global warming through enforcement of carbon footprint reduction measures and improved management steps.

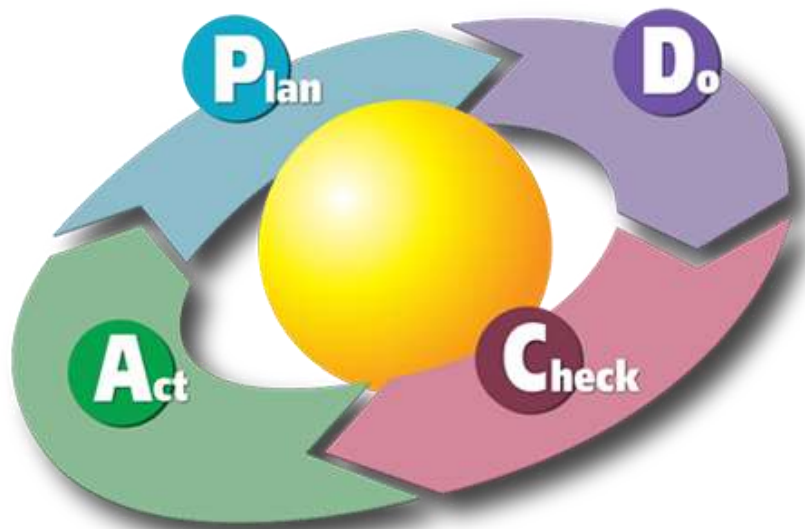
- **Self-assessment** – It allows the universities and colleges to review the ideal steps and implement them for the campus. The audit assists in self-assessment and the decision-making process.
- **Awareness** – It develops awareness among everyone associated with the campus with conscious and consistent efforts.





- **Improved scopes** – By complying with the norms, universities can ensure higher scopes of getting the best grade from NAAC. It is vital to follow the systematic way and implement the best steps for green audits on the campus under professional guidance.

The PDCA cycle audit is a systematic way of checking and improving the quality and performance and it involves four phases: planning the improvement, implementing the change, measuring the results, and acting on the feedback.



**PDCA Cycle of Green Audit**

### **1.1 Need for Green Audit**

Green Audit is assigned to the Criteria 7 of NAAC, National Assessment and Accreditation Council which is a self-governing organization of India that accredits the institution according to the scores assigned at the time of accreditation.

The Audit report helps to understand the current practices of sustainability with regard to the use of water and energy, generation of wastes, transportation, purchase of goods, etc; establishing a baseline of existing environmental conditions with focus on natural and physical environment and create awareness among students and staff concerning real issues of environment and its sustainability. Based on the audit report, the college can make the best strategies to make the campus ideal for students, teachers, and anyone associated. It also helps the college acknowledge the wastage volume and consider different recycling projects



for developing a sustainable ecosystem for the learners. Simply put, it is a way to minimize wastage and create a more suitable place for learning with improved NAAC grades.

## **1.2 Objectives of Green Audit**

The main aim of this green audit is to assess the environmental quality and the sustainable management strategies being implemented in Asutosh College. It is also to promote a culture of environmental awareness and eco-friendliness within the college premises and to gain a deeper understanding to the impact of their actions among students and staffs, so that they can contribute positively to the larger goal of protecting the mother earth.

The objectives of Green Audit include:

- Documentation of baseline data of good practices, strategies and action plans towards improving environmental quality for future along with corrective actions and future plans.
- To ensure the performance of the Institution with respect to environmental standards and in compliance with existing laws and regulations
- Maintain conformity with the norms and standards in the environmental management system and to design ideal protocols that develop a sustainable ecosystem on the campus.
- Assessment of water use, waste management, energy consumption, biodiversity, health and environmental quality in the campus.
- Identification of the gap areas and suggest recommendations to improve the Green Campus status of the College.
- To conserve the natural resources and mass awareness

The Green and Environmental Auditing intend to

- Develop efficient resource management practices.
- Establish a foundation for enhanced sustainability efforts.
- Enable waste management by reducing waste generation, segregation of waste and recycling of biodegradable waste, e-waste, and other solid waste, conserve freshwater.
- Promote a plastic-free campus, no-smoking zone, noise-free zone and foster health awareness among all stakeholders.



- Empower organizations to improve their environmental performance.
- Cultivate environmental ethics and values among young individuals.

### **1.3 About the Institution**

Asutosh College, situated in the vibrant city of Kolkata, West Bengal, recognizes the importance of environmental responsibility and sustainability in today's world. The institution has undertaken a commendable journey towards creating a greener and more eco-conscious campus.

The Green and Environmental Audit conducted at Asutosh College is a comprehensive process that delves into the various components of the college environment. This meticulous examination includes identifying areas where environmental improvements can be made, quantifying their impact, and recording data for analysis.

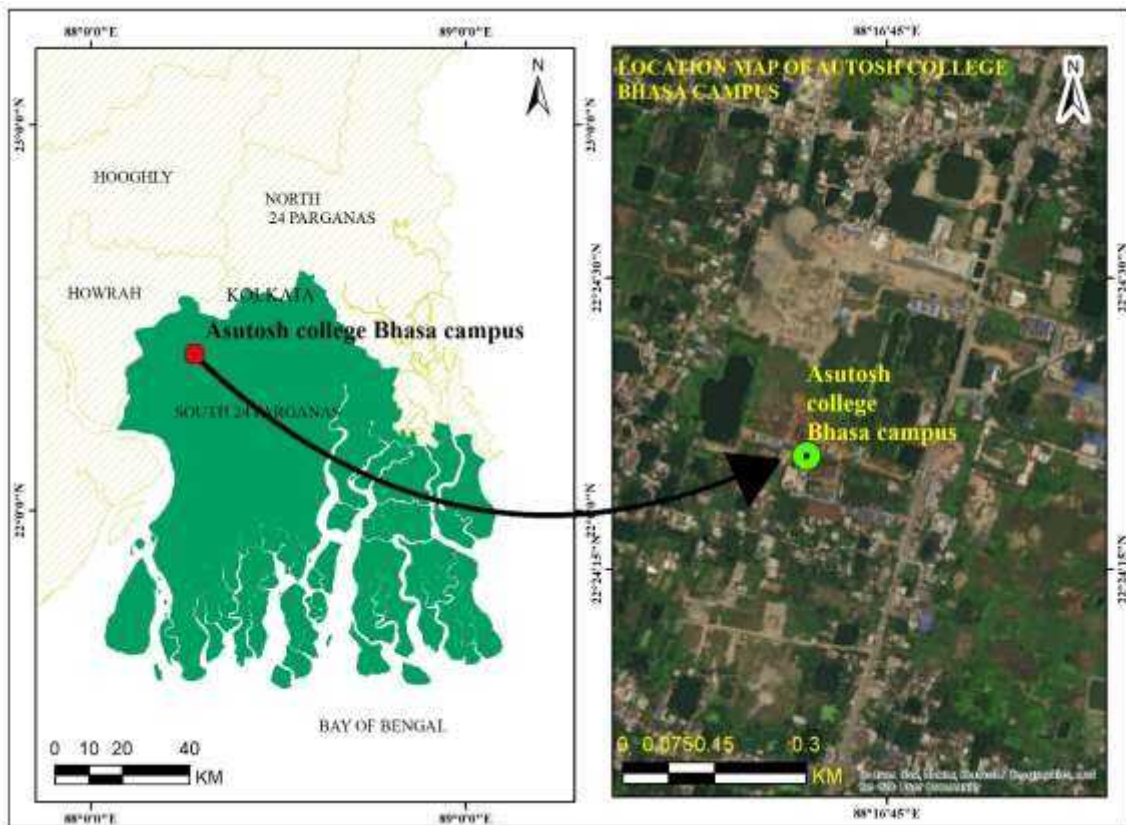
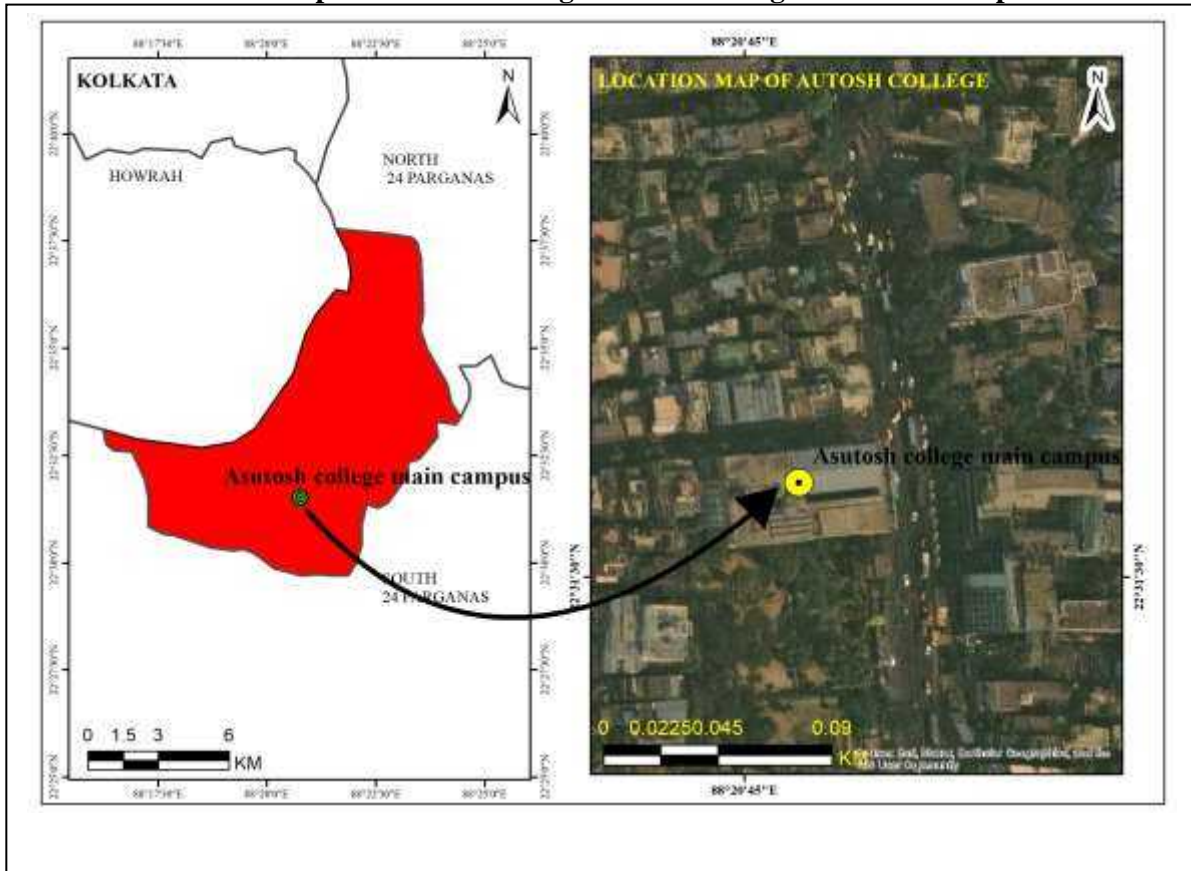
The college's commitment to sustainability extends beyond its urban campus areas. Even though four out of the five units are in an urban setting, the institution has made remarkable efforts to minimize its ecological footprint. Notably, the second campus at Bhasa stands out as a shining example of a green campus. It features a Medicinal Plant Garden, an Integrated Aquaculture unit, a Rainwater Harvesting System, Solar Panels, and a Biogas Plant. These eco-friendly initiatives demonstrate the college's dedication to environmental preservation and sustainable practices.

Furthermore, the Energy Audit, emphasizes the college's commitment to efficient resource management. This audit not only helps in reducing energy consumption but also contributes to cost savings, making the institution more financially sustainable.

Asutosh College's Green and Environmental Audit is a proactive step toward building a sustainable future. It reflects the institution's dedication to environmental responsibility, energy efficiency, and the holistic development of its students and staff. By implementing eco-friendly practices and fostering environmental awareness, Asutosh College is not only shaping responsible citizens but also setting a valuable example for other educational institutions and the community at large.



**Location Map of Asutosh College Main Building and Bhasa Campus**



### 1.3.1. History of the college

Asutosh College, affiliated to the University of Calcutta, is one of the most well-known landmarks on the educational landscape of Kolkata. Founded in 1916 by one of the pioneers of modern education in India, Sir Asutosh Mookerjee, the college, earlier known as South Suburban College (renamed Asutosh College in 1924, after the demise of its founder), was set up initially to cater to the educational needs of South Calcutta/Kolkata. It soon transcended the limitations of locality and established itself as a premier institute of learning, not only of Kolkata, but also of West Bengal and its neighbouring states. The first college in West Bengal to undergo the process of Assessment and Accreditation by the National Assessment and Accreditation Council (NAAC) of India, in 2002, under the new scheme initiated by the UGC, Asutosh College. With its avowed Tagorean motto- Jnan Jetha Mukto, ‘Where Knowledge is Free’ – our College attempts not just to disseminate knowledge irrespective of differences, but also, in keeping with the Tagorean vision of education, to promote a more holistic approach towards the same as a means of liberating the mind and spirit from the bondage of ignorance, prejudice, and unreason.



SOUTH SUBURBAN COLLEGE  
26, Lansdowne Road.  
THE FIRST OF ITS KIND IN SOUTH CALCUTTA.  
The nucleus of Asutosh College  
1916-1917



### **1.3.2. About the College**

Asutosh College which began its journey as an Intermediate-level college in pre-independent India, is today a centre of Postgraduate studies and research, with B. Voc. and Community College schemes reinforcing its reputation as an institution that promotes education for all. The college has consistently maintained a sustained programme of development, the pace of which has gained momentum with every passing year. It currently runs Undergraduate courses in twenty-six (26) subjects, including Business Administration, six (6) Postgraduate courses, besides courses under B. Voc. and Community College schemes. Add-on courses, and various other training courses, details of which are provided in relevant sections of the Self-Study Report (SSR) that follows. As the college has grown in academic and curricular dimensions, it has also of imperative necessity grown in physical and infrastructural dimensions, and in keeping with the demands of an age of information, duly equipped with its digital dimension in the form of a website designed and maintained by its own Computer Science and IT departments.

The college itself is spread across two main campuses – the First, or metropolitan campus, comprising the Main Building on 92, S. P. Mukherjee Road, with two ancillary units, the Asutosh College Training Centre (ACTC) and the Humanities Block on the adjacent Basanta Bose Road, and the Centenary Building on Kalighat Road; and the Second or suburban campus in Bhasa, South 24Parganas. Human resources constitute the principal asset of our college, and these include students and staff – both teaching and non-teaching –, as well as other stakeholders including the alumni.

### **1.3.3 Vision and Mission of the College**

Asutosh College, formerly known as South Suburban College, was established on 17th July, 1916, under the visionary leadership of Sir Asutosh Mukherjee, one of the pioneers of modern education in India.

A premier learning institute of West Bengal, the college, as of today, has created its niche as a centre of both Undergraduate & Postgraduate studies and research in more than 28 disciplines including some of the emerging areas of recent times.



## **Vision**

To establish a benchmark of excellence and self-reliance as an institute of higher education both within the country and globally.

The core values which will help us realise our vision:

Equity

Creativity

Endeavour

Discipline

Perseverance

These five values are like the five senses that constitute the sensory world of living beings.

## **Mission**

To strive towards realising our vision of evolving into an ideal institute of higher education by

- Ensuring a campus environment that is inclusive, and non-discriminatory on grounds of any kind of specific identity;
- Adopting a holistic approach towards education with the aim of creating responsible and sensitive human beings and not just holders of academic degrees;
- Nurturing an environment of academic freedom, where 'Knowledge is free' 'JNĀN JETHĀ MUKTA';
- Promoting need-based and skill enhancing education to cope with the changing requirements of society;
- Making a difference to society through community outreach activities;
- Sustaining environmental awareness through on-campus green initiatives.



Main Building →



ACTC Building →



← Humanities Building



Centenary Building →



← Second Campus (Bhasa)





<b>Academic Departments and Research Centre</b>				
<b>Science</b>	<b>Humanities</b>	<b>Management</b>	<b>Vocational</b>	<b>Research Centre</b>
<b>Bio-Chemistry</b>	<b>Bengali</b>	<b>BBA</b>	<b>B.Voc</b>	<b>Asutosh College Research Centre</b>
<b>Botany</b>	<b>English</b>			
<b>Chemistry</b>	<b>Hindi</b>			
<b>Computer Science</b>	<b>History</b>			
<b>Economics</b>	<b>Philosophy</b>			
<b>Electronics</b>	<b>Political Science</b>			
<b>Geography</b>	<b>Sanskrit</b>			
<b>Geology</b>	<b>Sociology</b>			
<b>Mathematics</b>	<b>Journalism and Mass Communication</b>			
<b>Microbiology</b>	<b>Communicative English</b>			
<b>Physics</b>				
<b>Psychology</b>				
<b>Statistics</b>				
<b>Zoology</b>				
<b>Environmental Science</b>				
<b>Industrial Fish and Fisheries</b>				



### **1.3.4 Infrastructure and area of College**

#### **Asutosh College Main Building**

The main building is presently located at 92, Syamaprasad Mukherjee Road with student capacity of more than 6000, about 250 teachers and 180 non-teaching staffs. The building is located in close proximity to Jatin Das Park and Jatin Das Park Metro Station. The Building is dedicated for administrative work and academic activities.

#### **Asutosh College Training Centre**

The Asutosh College Training Centre (ACTC) building was constructed during the Platinum Jubilee Year of the college in 1991. It is located across the north face of the college at 10, Basanta Bose Road. It houses the reading section of the Central Library, Post Graduate and newly introduced Departments. It also includes the Asutosh College Training Centre (ACTC) where students are trained for job-screening examinations for easy entry into the job market.

#### **Centenary Building**

The Centenary Building of the college at 22, Kalighat Road to house the Post Graduate courses and to mark the centenary year of Asutosh College was inaugurated by His Excellency the President of India on 1, April 2015. The Centenary Building includes a modern seminar hall along with a conference room, e-library, instrumentation centre and smart-classrooms to ensure a better teaching-learning process.

#### **Humanities Block**

The four-storied building at 16, Basanta Bose Road (previously served as Boys' Hostel) accommodates all the Humanities Departments. It was renovated in the pre-centenary year of the college. Right now, the IT office and Health Check-up centre of Asutosh College run in the ground floor

#### **Asutosh College Second Campus**

The second campus of Asutosh College which is dedicated to research activities is also meant to build as a sustainable green campus. Various eco-friendly initiatives are to be taken to designate the campus as a Green Campus.

**Total Land Area:** Total land area of the area 11 acres i.e 44,528 sq. meters

#### **Components of Bhasa Campus**

1. Solar panel
2. Rainwater harvesting system
3. Integrated Aquaculture
4. Biogas plant
5. Medicinal Plant garden

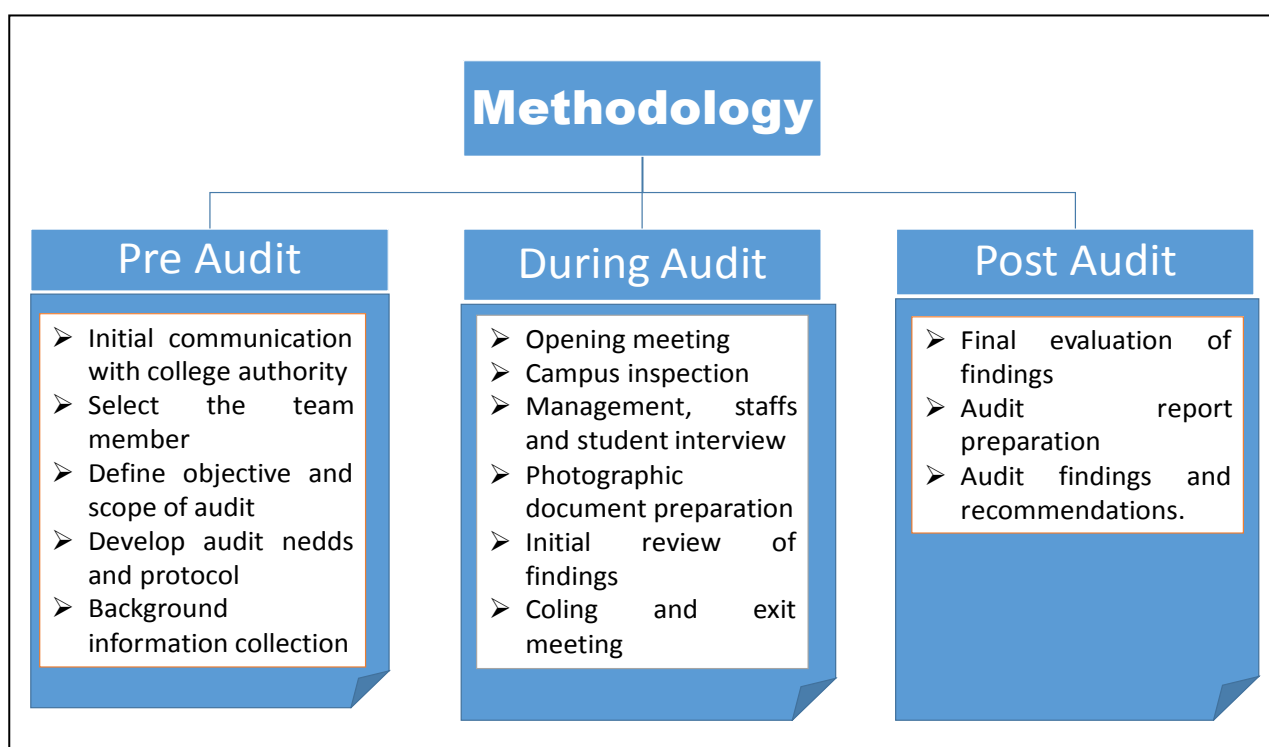


## 2. Methodology

This green and environmental audit of Asutosh College was performed of during July 2022 to June 2023.

In order to perform green audit, the methodology that included different tools such as preparation of questionnaire, physical inspection of the campus, observation and review of the documentation, interviewing key persons and data analysis, measurements and recommendations was adapted. Methodology includes gathering information through onsite visits, group discussions, campus surveys, inquiries, and observations. Additionally, the Auditing Report incorporates perception studies and opinion surveys as part of the evaluation process.

### Flow chart of methodology



### 2.1 Target Areas of Green Audit

Green audit aims to evaluate the efficient use of energy and water; minimize waste generation or pollution, biodiversity status and also efficiency in resource utilization. These indicators assessed focusing on the reduction of contribution to emissions, procure a cost effective



and secure supply of energy, encourage and enhance energy use conservation, promotes personal action, reduce the institute's energy and water consumption, reduce wastes to landfill, and integrate environmental considerations into all contracts and services considered to have significant environmental impacts. Target areas included in this green auditing are water, energy, waste, and biodiversity and carbon footprint.

### **2.1.1 Water Management Auditing**

Water is a natural resource which is required for sustenance of all living creatures. While freely available in many natural environments, in human settlements potable (drinkable) water is less readily available. Groundwater depletion and water contamination are taking place at an alarming rate. Hence it is essential to examine the quality and usage of water in the Institutions or organizations. Water auditing is conducted for the evaluation of facilities of water intake, water usage and facilities for water treatment &/or reuse. The concerned auditor investigates the relevant method that can be adopted and implemented to balance the demand and supply of water.

### **2.1.2 Energy Management Auditing**

Energy conservation is an important aspect of campus sustainability which is also linked with carbon foot print of the campus. Energy auditing deals with the conservation and methods to reduce its consumption related to environmental degradation. It is therefore essential that any environmentally responsible institution examine its energy use practices and incorporate alternative energy resources wherever possible.

### **2.1.3 Waste Management Auditing**

Human activities create waste; and unsustainable ways of waste handling, storage, collection, transport and disposal may pose risks to the environment and public health. Solid waste generated in the campus can be divided into three categories: bio-degradable, non-biodegradable and hazardous waste.

1. Bio-degradable wastes include food wastes, canteen waste, wastes from toilets etc.
2. Non-biodegradable wastes include plastic, tins and glass bottles etc.
3. Hazardous waste is waste that is likely to be a threat to health or the environment like cleaning chemicals, acids and petrol.

Unscientific management of these wastes such as dumping in pits or burning them may cause harmful discharge of contaminants into soil and water supplies, and produce greenhouse



gases contributing to global climate change respectively. Special attention should be given to the handling and management of hazardous waste generated in the college.

Bio-degradable waste can be effectively utilized for energy generation purposes through anaerobic digestion or can be converted to fertilizer by composting technology. Non-biodegradable waste can be utilized through recycling and reuse. Thus the minimization of solid waste is essential to a sustainable college. The auditor diagnoses the prevailing waste disposal policies and suggests the best way to combat the problems.

#### **2.1.4 Biodiversity/ Green Campus Management Auditing**

Trees play an important ecological role within the urban environment, as well as support improved public health and provide aesthetic benefits to cities. In one year, a single mature tree will absorb up to 48 pounds of carbon dioxide from the atmosphere, and release it as oxygen. The amount of oxygen released by the trees of the campus is good for the people in the campus. Campus biodiversity is reflection of the ecological health of the campus. A sustainable strategy is required for adopting environment friendly viable wayouts for a green campus.

#### **2.1.5 Carbon Footprint Auditing**

Burning of fossil fuels (such as petrol) has an impact on the environment through the emission of greenhouse gases into the atmosphere. The most common greenhouse gases are carbon dioxide, water vapour, methane, nitrous oxide and ozone. Of all the greenhouse gases, carbon dioxide is the most prominent greenhouse gas, comprising 402 ppm of the Earth's atmosphere. The release of carbon dioxide gas into the Earth's atmosphere through human activities is commonly known as carbon emissions. Vehicular emission is the main source of carbon emission in the campus, hence to assess the method of transportation that is practiced in the college is important.

### **2.2 Audit Team**

A Team comprised of the Faculty members of the College and representatives from the RSP Green Development & Laboratories Pvt. Ltd. (ISO Certified and QCI - NABET Accredited Environmental Consultant Organization) conducted the Green Audit.

#### **Members from Asutosh College**

1. Chairperson: Head of the Institution:

Manas Kabi, Principal



2. Teachers to represent all levels:

- i. Dr. Keya Ghosh , Associate Professor in Chemistry
- ii. Dr. Tathagata Ray Chaudhuri, Associate Professor in Botany
- iii. Dr. Abhik Kundu, Associate Professor in Geology
- iv. Dr. Rina Kar Dutta, Associate Professor in Philosophy
- v. Dr. Dhiman Dutta, Assistant Professor in Statistics
- vi. Dr. Priyadarshini Mallick, Assistant Professor in Microbiology
- vii. Sri Arnab Kumar Ghoshal, Assistant Professor in Computer Science
- viii. Dr. Reema Roy, Assistant Professor in Journalism and Mass Communication
- ix. Dr. Bidisha Maitra Sen, Assistant Professor in Industrial Fish and Fisheries
- x. Smt. Shramana Roy Barman, Assistant Professor in Environmental Science
- xi. Dr. Bidisha Datta, Assistant Professor in BBA

3. One member from the Management:

Dr. Sayani Mukhopadhyay, Associate Professor in Geography

4. The senior administrative officer (Office Superintendent/Manager):

Sri. Sarthak Banerjee, Head Clerk

5. One nominee each from the Local Society/Trust, Students and Alumni:

From Local Society/ Trust: Smt. Kajari Banerjee, Councillor, Ward No. 73, Kolkata Municipal Corporation

From Students : Sri. Uttaran Banerjee, Students Representative

From Alumni : Dr. Amlan Chakraborty, Professor & Director, A. K. Choudhury School of Information Technology, University of Calcutta & Head, IT & Technology Innovation cell, Department of Higher Education, Govt. of West Bengal.

6. One nominee each from the Employer/Industrialists/Stakeholders:

From Employer: Dr. Ashis Ghosh (Jt. DPI, Govt. of West Bengal)

From Industrialist: Suraj Shankar Bose, Gladiatech Consultancy Services Private Limited

From Stakeholders: Sri Debajit Chattopadhyay (Assistant Commissioner of Police, Kolkata Police)

7. One of the senior teachers as the Coordinator of the IQAC: Dr. Sriparna Datta Ray, Associate Professor in Zoology.



## **Members from RSP Green Development & Laboratories Pvt. Ltd.**

1. Dr. Madhurima Bakshi (Sr. Environmentalist)
2. Ms. Sreerupa Chatterjee (Jr. Environmentalist)

### **3. Observations & Findings**

The findings and observations after campus visit, group interactions, survey and review have been analyzed and represented below.

#### **3.1. Water Management**

##### **Water Audit**

Asutosh College is situated in an urban area (Kolkata Municipal Corporation) and in a prime location of south Kolkata region of West Bengal, never faces any water scarcity challenges. Municipal water supply is the main source of water in the main campus, Centenary building and ACTC building and Asutosh College Research Centre, Bhasa campus. The institution promotes effective water management practices. A rainwater harvesting systems in Bhasa campus has been installed to recharge groundwater and partially meet daily water requirements. It is imperative for environmentally responsible institutions to scrutinize their water utilization and recycling practices as well as the water quality.

➤ **Water Usage:**

The water on campus serves various purposes, including drinking, laboratory work, cleaning, cooking, gardening, toilet and other purposes.

➤ **Water Consumption:**

The daily water consumption amounts to approximately 21,000 gallons (gl).

➤ **Water Wastage:**

Water wastage is minimal, with leakage and misuse accounting for only 1% of water on campus. Even small drips from leaky taps and occasional overflows can still lead to significant water loss each day.

➤ **Water Recycling:**



Recycling is a process regarded as a key part of the green movement. This encourages some good practices in an Institution which could be beneficial for us along with the environment. Recycling doesn't mean we can only renew certain materials like plastics, paper and glass. There are several ways in which we can recycle waste water also.

Water coming from an air conditioner (AC) outlet/drain is mostly wasted. On a hot humid day, an AC unit can drip up to 2 gallons of water, which accumulates on its evaporator coil as it cools and dehumidifies the air. So this water is non toxic. It is much like distilled water (condensed form of water vapours present in the air). It is not used for drinking purpose but the water is collected in buckets or in large barrels. This condensate is used for topping up of inverter battery, watering indoor plants and also used in a wet lab (in the autoclave during steam sterilization process). So definitely we should try to collect and use the wastewater in some other efficient ways.

There is an active rainwater harvesting units on Bhasa campus. However, insufficient management of water reuse and surface water utilization, resulting in a low water management policy rating.

➤ Water quality assessments:

Regular monitoring of drinking water in the institutions has determined that the drinking water quality meets high health standards as per BIS-Drinking water specification (IS:10500-2012).

Sl. No.	Parameters	Values
1.	pH	7.74
2.	EC	0.304 $\mu\text{S/cm}$
3.	TDS	245mg/l
4.	DO	6.8mg/l
4.	Salinity	67.54 mg/l
5.	Hardness	176mg/l
6.	Alkalinity	212mg/l
7.	Faecal coliform	Absent







## Reuse and Recycling of Water

### Rain Water Harvesting

The second campus in Bhasa, located on Diamond Harbour Road in South 24 Pgs, has taken a significant step towards sustainable water management by implementing a rainwater harvesting system (Details provided in Section 3.4.2).



## 3.2 Energy Audit

An energy audit is an inspection survey and an analysis of energy flows for energy conservation in a building. It may include a process or system to reduce the amount of energy input into the system without negatively affecting the output. In commercial and industrial real estate, an energy audit is the first step in identifying opportunities to reduce energy expense and carbon footprint.

### Principle of Survey

When the objective of study is an occupied building then reducing energy consumption while maintaining or improving human comfort, health and safety are of primary concern. Beyond simply identifying the sources of energy use, an energy audit seeks to prioritize the energy uses according to the greatest to least cost-effective opportunities for energy savings.

### Survey Report:

We have performed a survey in Asutosh College. The total College area comprising of five campuses located at five different locations. Four out of five are in Urban area of Kolkata and one is located in South 24 Pgs. These are listed below:

1. Asutosh College Main Building
2. Asutosh College Training Center.
3. Asutosh College Humanities Block
4. Asutosh College Centenary Building
5. Asutosh College Second Campus (Bhasa)

### Energy Audit Report of Asutosh College Main Building

This report has been made with the purpose of analyzing the actual electricity bill amount with the consumption of electricity based on estimated data collected from users of different departments of Asutosh College Main Building.

Data Source: Electricity bill received by Asutosh College and data recorded by Calcutta Electric Supply Corporation (CESC)

The following table depicts the Units (kWh) consumed and units uploaded to CESC grid from roof top solar power plant at Asutosh College main building between July 2022 and June 2023 :




**Table: Electricity Consumption of Asutosh College Main Building**

CESC Consumer ID	CESC Consumer Number	Period of assessment	Units consumed (kWh)	Bill paid (Rs.)	Units Uploaded to grid (kWh)	Amount received (Rs.)
16000148021	85044002013	July, 2022- June, 2023	56508	3,82,680/-	4136	27416/-
16000148057	16051007006	July, 2022- June, 2023	54933	40,4270/-	0	0
85000024386	85038015007	July, 2022- June, 2023	4474	57,220/-	0	0
16000148010	16051003007	July, 2022- June, 2023	23693	1,73,180/-	0	0
Total:			1,39,608	10,17,350/-	4136	27,416/-
Additionally, as per in house record, energy generated by 2x10 Kwp SPV Power Plant grid -Tied System I and System II, LOA No. WBREDA/59(2013)/NIeT-02/15-16/340 & 341		July, 2022- June, 2023	16255			
Total		July, 2022- June, 2023	1,55,683			

**Findings:**

- Total electrical energy consumed at Asutosh College Main Building in the mentioned period is: **1,55,683 kWh**. Refer Table 1.0 above.
- The electricity is jointly consumed by three colleges at Asutosh College main building as reflected in electrical meter readings. Thus energy consumed by Asutosh College at Main Building is: **51894 kWh (1,55,683/3= 51894)**
- Energy consumed per month is: **4324.5 kWh (51894/12)**
- Total electricity bill paid Rs: **10,17,350/- Refer to Table 1.0.**
- The electric bill is jointly paid by three colleges at Asutosh College main building. Thus electric bill paid by Asutosh College is Rs: **3,39,117/- (10,17,350/3)**
- Average electric bill per month paid by Asutosh College at Main Building is Rs: **28260/- (3,39,117/12)**



- Total electrical energy uploaded to CESC grid from roof top solar power plant is: **4136 kWh**. Refer Table 1.0.
- Total rebate received/ revenue generated by uploading electrical energy to CESC grid from roof top solar power plant at Asutosh College Main Building during mentioned period is Rs: **27416/-**. Refer Table 1.0.
- Total green energy produced by Asutosh College in the mentioned period is = **(16,255+4,136) kWh = 20,391 kWh**
- Thus percentage of green energy produced by Asutosh College in the mentioned period is: 

We have estimated the monthly electricity consumption at Asutosh College main building in the following table:

**Table: Monthly Electricity Consumption of Asutosh College Main Building**

Floor	Tube Lights (No)	Tube Lights (Energy Consumed per month) (in kWh)	LED Bulbs/Tube (No)	LED Bulbs/Tube (Energy Consumed per month) (in kWh)	CFL Bulbs (No)	CFL Bulbs (Energy Consumed per month)	AC fan Number	AC fan (Energy Consumed per month) (in kWh)	Air Conditioning Machine (No)	Air Conditioning Machine (Energy Consumed per month)	Other Instruments (Energy Consumed per month)	Estimated Units Consumed during Summer (kWh)	Estimated Units Consumed during Winter (kWh)
Fourth	75	120	7	6	61	105	71	266	13	360	482	1338	713
Third	203	404	60	64	5	2.5	14	555	15	800	546	2373	1018
Second	168	268	69	55	5	10	11	351	3	90	68	843	402
First	116	185	111	86	16	32	91	271	5	781	243	1598	547
Ground	163	258	124	98	5	8.5	11	405	6	272	558	1601	924
Total	725	1237	371	310	92	158	53	1848	42	2303	1897	7752	3602
Lift & Pump												140	140
												7892	3742



**Source:** Feedbacks received from different departments situated in main building of Asutosh College regarding their respective usage of electricity and wattage of different electrical gadgets used by them. All the electrical gadgets have been physically verified.

**Findings :**

- Estimated units consumed during Summer (March 2022 to June 2022 & July 2022 to November 2022) at Asutosh College Main building is 7892 Kwh. Refer table 1.1 above.
- Estimated units consumed during Winter (December 2022 to February 2023) at Asutosh College Main building is 3742 Kwh. Refer table 1.1 above.

**Energy Audit Report of Asutosh College Training Center**

This report has been made with the purpose of analyzing the actual electricity bill amount with the consumption of electricity based on estimated data collected from users of different departments of Asutosh College Training Center.

**Source:** Electricity bill received by Asutosh College and data recorded by Calcutta Electric Supply Corporation (CESC)

The following table depicts the Units (kWh) consumed at Asutosh College Training Center between July 2022 and June 2023.

**Table: Units consumed at ACTC building**

CESC Consumer ID	CESC Consumer Number	Period of assessment	Units consumed (kWh)	Bill paid (Rs.)
16000150126	85038014001	July, 2022- June, 2023	73,198	5,62,990/-

**Findings:**

- Total electrical energy consumed at Asutosh College Training Center between July 2022 to June 2023 is: **73,198 kWh**. Refer Table 2.0 above.
- Average monthly electrical energy consumed at Asutosh College Training Center during the period is: **6,100 kWh (73198/12)**
- Total electricity bill paid at Asutosh College Training Center during same period is Rs: **5,62,990/-** Refer Table 2.0 above.



- Average monthly electricity bill paid per month at Asutosh College Training Center in the mentioned period is Rs: **46,916/- (5,62,990/12)**

We have estimated the monthly electricity consumption at Asutosh College Training Center in the following table:

**Table : Monthly electricity consumption at ACTC building**

Floor	Tube Lights (No)	Tube Lights (Energy Consumed per month) (in kWh)	LED Bulbs/Tube (No)	LED Bulbs/Tube(Energy Consumed per month) (in kWh)	CFL Bulbs (No)	CFL Bulbs (Energy Consumed per month)	AC fan Number	AC fan (Energy Consumed per month) (in kWh)	Air Conditioning Machine (No)	Air Conditioning Machine (Energy Consumed per month)	Other Instruments (Energy Consumed per month)	Estimated Units Consumed during summer (in kWh)	Estimated Units Consumed during winter (in kWh)
Fifth	54	224	17	34	6	15	44	330	7	329	1713	2645	1986
Fourth	60	240	3	6	0	0	31	233	5	156	44	679	290
Third	30	101	26	47	3	8	30	225	10	310	79	770	235
Second	19	76	73	146	0	0	23	173	10	316	156	867	378
First	49	230	13	26	4	10	31	278	5	150	1215	1909	1481
Ground	30	120	5	10	7	18	11	83	0	0	0	231	148
Total	242	991	137	269	20	51	170	1322	37	1261	3207	7101	4518
Lift and Pump												140	140
												7241	4658

**Source :** Feedbacks received from different departments situated in Asutosh College Training Center regarding their respective usage of electricity and wattage of different electrical gadgets used by them. All the electrical gadgets have been physically verified.

**Findings :**



- Estimated units consumed during Summer (March 2022 to June 2022 & July 2022 to November 2022) at Asutosh College Training Center is **7241** Kwh. Refer table 2.1 above.
- Estimated units consumed during Winter (December 2022 to February 2023) at Asutosh College Training Center is **4658** Kwh. Refer table 2.1 above.

### **Energy Audit Report of Asutosh College Humanities Building**

This report has been made with the purpose of analyzing the actual electricity bill amount with the consumption of electricity based on estimated data collected from users of different departments of Asutosh College Humanities Building.

**Source:** Electricity bill received by Asutosh College Humanities building and data recorded by Calcutta Electric Supply Corporation (CESC)

The following table depicts the Units (kWh) consumed at Asutosh College Humanities Building between July 2022 and June 2023:

**Table: Unit consumed at Humanities Building**

CESC Consumer ID	CESC Consumer Number	Period of assessment	Units consumed (kWh)	Bill paid (Rs.)
16000149887	85027007025	July, 2022- June, 2023	17,844	94,360/-

#### **Findings:**

- Total electrical energy consumed at Asutosh College Humanities Building in the mentioned period is: **17,844** kWh. Refer Table 3.0 above.
- Average monthly electrical energy consumed at Asutosh College Humanities Building in the mentioned period is: **1487** kWh. (**17,844/12**)
- Total electricity bill paid at Asutosh College Humanities Building in the mentioned period is Rs: **94,360/-**. Refer Table 3.0 above.
- Average monthly electricity bill paid per month at Asutosh College Humanities Building in the mentioned period is Rs: **7863/-**. (**94,360/12**)



We have estimated the monthly electricity consumption at Asutosh College Humanities building in the following table:

**Table:** Monthly electricity consumption at Asutosh College Humanities building

Floor	LED Bulbs/Tube (No)	LED Bulbs/Tube(Energy Consumed per month) (in kWh)	AC fan Number)	AC fan (Energy Consumed per month) (in kWh)	Air Conditioning Machine (No)	Air Conditioning Machine (Energy Consumed per month)	Other Instruments (Energy Consumed per month)	Estimated Units Consumed during summer (in kWh)	Estimated Units Consumed during winter (in kWh)
Third	22	44	13	98	4	239	22	403	66
Second	20	40	9	68	6	300	33	441	73
First	21	40	9	68	6	312	33	453	73
Ground	32	68	11	92	7	615	44	819	112
Total	95	192	42	326	23	1466	132	2116	324
Lift and Pump								140	140
					Total			2256	464

**Source:** Feedbacks received from different departments situated in Humanities Building of Asutosh College regarding their respective usage of electricity and wattage of different electrical gadgets used by them. All the electrical gadgets have been physically verified.

**Findings:**

- Estimated units consumed during Summer (March 2022 to June 2022 & July 2022 to November 2022) at Asutosh College Humanities Building is 2256 Kwh. Refer table 3.1 above.
- Estimated units consumed during Winter (December 2022 to February 2023) at Asutosh College Humanities Building is 464 Kwh. Refer table 3.1 above.





## Energy Audit Report of Asutosh College Centenary Building

This report has been made with the purpose of analyzing the actual electricity bill amount with the consumption of electricity based on estimated data collected from users of different departments of Asutosh College Centenary Building.

**Source:** Electricity bill received by Asutosh College and data recorded by Calcutta Electric Supply Corporation (CESC)

The following table depicts the Units (kWh) consumed at Asutosh College Centenary Building between July 2022 and June 2023.

**Table : Unit consumed at Asutosh College Centenary Building**

CESC Consumer ID	CESC Consumer Number	Period of assessment	Units consumed (kWh)	Bill paid (Rs.)
85000042704	85041003053	July, 2022-June, 2023	17,814	1,86,540.0/-

### Findings:

- Total electrical energy consumed at Asutosh College Centenary Building from between July 2022 to June 2022 is: **17814 kWh**. Refer Table 4.0 above.
- Average monthly electrical energy consumed at Asutosh College Centenary Building during the period is: **1484.5 kWh (17814/12)**
- Total electricity bill paid at Asutosh College Centenary Building during same period is Rs: **1,86,540.0/-** Refer Table 4.0 above.
- Average monthly electricity bill paid per month at Asutosh College Centenary Building in the mentioned period is Rs: **15,545.0/- (1,86,540/12)**



We have estimated the monthly electricity consumption at Asutosh College Centenary building in the following table:

**Table: Monthly electricity consumption at Asutosh College Centenary building**

	CFL Bulbs/Tube (No)	CFL Bulbs/Tube(Energy Consumed per month) (in kWh)	Fan (No)	Fan (Energy Consumed per month) (in kWh)	Air Conditioning Machine (No)	Air Conditioning Machine (Energy Consumed per month)	Other Instruments (Energy Consumed per month)	Estimated Units Consumed during Summer (in kWh)	Estimated Units Consumed during Winter (in kWh)
Fourth	42	84	16	120	4	149	33	386	117
Third	36	72	16	120	4	150	24	366	96
Second	34	68	14	105	3	117	22	312	90
First	32	64	4	30	4	265	11	370	75
Ground	44	132	6	45	3	117	4	298	136
Basement	68	204	11	82.5	6	299	8	594	213
			Total					2326	727
Lift & Pump								140	140
			Total					2466	867

**Source:** Feedbacks received from different departments situated in Centenary Building of Asutosh College regarding their respective usage of electricity and wattage of different electrical gadgets used by them. All the electrical gadgets have been physically verified.

**Findings:**



- Estimated units consumed during Summer (March 2022 to June 2022 & July 2022 to November 2022) at Asutosh College Centenary Building is 2466 Kwh. Refer table 4.1 above.
- Estimated units consumed during Winter (December 2022 to February 2023) at Asutosh College Centenary building is 867 Kwh. Refer table 4.1 above.

### Energy Audit Report of Asutosh College Second Campus (Bhasa)

This report has been made with the purpose of analyzing the actual electricity bill amount with the consumption of electricity based on estimated data collected from users of different departments of Asutosh College Second Campus (Bhasa).

**Source:** Electricity bill received by Asutosh College 2<sup>nd</sup> Campus (Bhasa) and data recorded by West Bengal State Electricity Board (WBSEB)

The following table depicts the Units (kWh) consumed at Asutosh College 2<sup>nd</sup> Campus (Bhasa) between July 2022 and June 2023:


**Table 5: Unit consumed Asutosh College 2<sup>nd</sup> Campus (Bhasa)**

WBSEB Consumer ID	WBSEB INSTALLATION NO.	Month of year	Units consumed (kWh)	Bill paid (Rs.)
102262703	18212064	July, 2022- June, 2023	28658	3,04,634/-
Estimated Green Energy generated by photovoltaic panels attached with solar street lights (10 in number, 80 wP panel attached with 12V,75Ah battery can produce ~ 0.5 kWh energy in a sunny day)			1000	
Total			29658	

#### Findings:

- Total electrical energy consumed at Asutosh College Second Campus (Bhasa) in the mentioned period is: **29,658 kWh**. Refer Table 5.0 above.
- Average monthly electrical energy consumed at Asutosh College Second Campus (Bhasa) in the mentioned period is: **2472kWh . (29,658/12)**



- Total electricity bill paid at Asutosh College Second Campus (Bhasa) in the mentioned period is Rs: **3,04,634/-** Refer Table 5.0 above.
- Average monthly electricity bill paid per month at Asutosh College Second Campus (Bhasa) in the mentioned period is Rs: **25,386/- (3,04,634/12)**.
- Total green energy produced at Asutosh College Second Campus in the mentioned period is ~ **1000 kWh**
- Thus percentage of green energy produced at Asutosh College Second Campus in the mentioned period is:  : **33.41%**

We have estimated the monthly electricity consumption at Asutosh College Second Campus (Bhasa) in the following table:

Table 5.1: Monthly electricity consumption at Asutosh College Second Campus (Bhasa)

	LED Bulbs/Tube (No)	LED Bulbs/Tube(Energy Consumed per month) (in kWh)	Fan (No)	Fan (Energy Consumed per month) (in kWh)	Air Conditioning Machine (No)	Air Conditioning Machine (Energy Consumed per month) (in kWh)	Other Instruments (Energy Consumed per month) (in kWh)	Estimated Units Consumed during Summer (in kWh)	Estimated Units Consumed during Winter (in kWh)
Academic Building	57	114	45	338	1	40	443	935	452
Boys Hostel	47	88	42	315	0	0	162	565	403
Girl's Hostel	43	88	41	320	0	0	180	588	408
Canteen, Street Light, Pump etc	9	18	5	38	0	0	1189	1245	56
PG Building	25	50	19	143	1	20	13	226	193
					Total			3559	1512



**Source:** Feedbacks received from different departments situated in Second Campus (Bhasa) of Asutosh College regarding their respective usage of electricity and wattage of different electrical gadgets used by them. All the electrical gadgets have been physically verified.

**Findings:**

- Estimated units consumed during Summer (March 2022 to June 2022 & July 2022 to November 2022) at Asutosh College Second Campus (Bhasa) is 3559 Kwh. Refer table 5.1 above.
- Estimated units consumed during Winter (December 2022 to February 2023) at Asutosh College Second Campus (Bhasa) is 1512 Kwh. Refer table 5.1 above.

**Summarized Energy Audit Report of Asutosh College**

This report has been made with the purpose of analyzing the actual electricity bill amount with the consumption of electricity based on estimated data collected from users of different departments of Asutosh College.

**Source:** Electricity bill received by Asutosh College and data recorded by Calcutta Electric Supply Corporation (CESC) and West Bengal State Electricity Board (WBSEB).

The following table depicts the Units (kWh) consumed at different buildings and campuses of Asutosh College. Also units uploaded to CESC grid and units used from roof top solar power plant at Asutosh College between July 2022 and June 2023:

**Table 6.0:Units (kWh) consumed at different buildings and campuses of Asutosh College**

Serial Number	Building Name	Units consumed (kWh)	Bill paid (Rs.)	Units Uploaded to grid (kWh)/Green Energy Generated	Amount Received from CESC as reimbursement for uploading electricity to the grid (in Rs.)
1	Main Building	51,894	3,39,117/-	4136	27,416/-



2	ACTC Building	73,198	5,62,990/-	0	0
3	Humanities Building	17,844	94,360/-	0	0
4	Centenary Building	17,814	1,86,540/-	0	0
5	Second Campus (Bhasa)	29,658	3,04,634/-	1000	0
Total		1,90,408	14,87,641/-	5136	27,416/-

### **Findings:**

- Total electrical energy consumed by Asutosh College in the mentioned period is: **1,90,408kWh**. Refer Table 6.0 above.
- Average monthly electrical energy consumed at Asutosh College in the mentioned period is: **15867kWh . (1,90,408/12)**
- Total electricity bill paid by Asutosh College in the mentioned period is Rs: **14,87,641/-** Refer Table 6.0 above.
- Average monthly electricity bill paid per month at Asutosh College in the mentioned period is Rs: **1,23,970/- (14,87,641/12)**.
- Total green energy produced at Asutosh College in the mentioned period is **5136 kWh**.
- Thus percentage of green energy produced at Asutosh College in the mentioned period is:

2.7%

### **Analysis and Recommendation**

The survey shows Asutosh College uses significant amount of energy every month which can be reduced in several ways.

1. Usage of Incandescent bulbs should be completely forbidden and should be replaced by LED's.
2. Usage of Air-Conditioning machines should restricted.



3. Usage of all kinds of electric lights during day time should be restricted.
4. Fans should be turned off while leaving any room.
5. Overflow of pumped water should be monitored.
6. Solar light can be used in all campuses.

## Solar Light

To ensure continuous and eco-friendly street lighting at Asutosh College's second campus in Bhasha, the college authorities have made a commendable move by installing solar street lights (Details given in Section 3.4.2)



## Agreement with CESE



### 3.3 Waste Management

Asutosh College is committed to ensure the proper management of laboratory wastes in compliance with local, state, and institutional regulations, prioritizing the safety and well-being of all department members, and protecting research, equipment, facilities, and the environment. There are two main types of laboratory waste: hazardous and non-hazardous, each requiring distinct disposal procedures.

- **Non-hazardous Solid and Liquid Waste Management**

The majority of non-hazardous materials generated during laboratory activities at Asutosh College are recyclable and can be disposed of as mixed dry recyclables. These materials include:

- Packaging for lab consumables
- Paper
- Hand towels
- Pipette tip boxes
- Cardboard
- Other dry non-hazardous laboratory wastes

To dispose of non-hazardous laboratory recyclables, follow these steps:

1. Use the provided clear bag bin liners for collection.
2. When the Laboratory Recycling bins are full, seal the bags.
3. Place sealed bags in the designated laboratory waste collection point.
4. Our cleaning contractors will transfer these bags to the building's designated waste collection point.





Solid state fermentation of solid waste Submerged fermentation of Liquid & Solid waste

- **Glass from Laboratories**

Glass waste generated in laboratories can include laboratory glassware (e.g., Pyrex) or chemical/solvent bottles (e.g., Eurobottles, Winchester). However, it's crucial to differentiate between clean and contaminated glassware:

- Glassware contaminated with hazardous materials, and which cannot be effectively decontaminated, must be treated as hazardous laboratory waste.

For the disposal of laboratory glassware:

1. Broken laboratory glassware should be placed in a laboratory sharps bin.
2. Larger items of laboratory glassware that do not pose a sharps hazard should have any metal, rubber, or plastic fittings removed.
3. Carefully deposit these larger glass items into the green glass recycling bins located within the respective department.

By following these guidelines for non-hazardous and glass laboratory waste disposal, Asutosh College ensures the responsible management of waste, promoting safety, environmental protection, and compliance with all relevant regulations.

- **Biological Waste Management**

Biological waste encompasses materials that either contain or have been contaminated by biohazardous agents. This category includes various subtypes:

1. **Animal Wastes:** These arise from practical classes involving animals.
2. **Microbiology and Biotechnology Wastes:** Materials from labs specializing in microbiology and biotechnology.
3. **Plant Wastes:** Generated in botanical laboratories.
4. **Waste Sharps:** This category comprises hypodermic needles, syringes, scalpels, and broken glass.



Proper management and disposal of biological waste are essential to ensure the safety and well-being of all individuals within the college and to maintain a safe and hygienic environment.

The Dept. of Microbiology, Environmental Science, Botany follows the subsequent Regulations to manage Bio-Medical Waste as per CPCB Bio-Medical Waste Management Rules, 2016: -

- Microbiological cultures and contaminated swabs, cotton plugs and disposable petri plates with agar are autoclaved and discarded as per Rule.
- Contaminated glassware with media are decontaminated by autoclaving and media are subsequently disposed of in designated bins.
- Waste is discarded in designated bins, and finally shifted to Municipal Waste Collectors / Authorized Waste Collection facilities.
- Prescribed two coloured bins – Yellow and Blue are placed at designated places as per the need of various generation points.
- Regular training and sensitization to students and laboratory personnel are done.



Packing of biodegradable waste before decontamination



Decontamination of biodegradable waste by autoclaving





Disposal of decontaminated wastes in designated bins

- **E-waste Management**

Managing electronic waste (E-waste) at Asutosh College is conducted following a systematic approach:

1. **Collection and Storage:** E-waste collected from various sources is stored in a designated storage room.
2. **Regular Disposal:** E-waste is disposed of annually in compliance with established protocols and regulations.
3. **Buyback System:** For pharmacology rotating drums that are beyond repairable condition, a buyback system is implemented. Additionally, empty toners, cartridges, outdated computers, and electronic items are sold as scrap to facilitate their safe recycling.
4. **Repair and Reuse:** Old monitors and CPUs are examined and repaired by skilled technicians, promoting their reuse within the college.

This comprehensive approach ensures responsible management of E-waste, aligning with sustainability and environmental protection efforts.

**An agreement has been signed for E-Waste management between Asutosh College and IT systems and solutions on 02.01.2020.**

- **Hazardous Waste Management**



Hazardous laboratory waste encompasses various materials that necessitate specific disposal procedures. These are as follows:

**a) Chemical Waste:**

- Unused and surplus reagent-grade chemicals.
- Intermediates and by-products resulting from research and educational experiments.
- Batteries.
- Anything contaminated by chemicals.
- Used oil of all types.
- Spent solvents, including water-based solvents.
- Mercury-containing items.

**b) Clinical Waste:** Not applicable in this context.

**c) Radioactive Waste:** Not applicable in this context.

**d) Laboratory Waste of Unknown Hazard:** In cases where uncertainty exists regarding whether a laboratory waste item is hazardous or not, please follow these steps:

1. Submit a service request to the customer helpdesk team.
2. Label the item as 'hazardous.'
3. Keep it separate from other waste for assessment by the waste management team.

This meticulous approach ensures that hazardous laboratory waste is correctly identified and disposed of according to relevant procedures, promoting safety and environmental responsibility.

**Miscellaneous Waste Management:**

**a) Polystyrene Boxes:**

- Ensure polystyrene boxes are hazard-free before disposal.
- Large polystyrene boxes should be taken to the laboratory waste collection point.

**b) Large Packaging:**



- Clean and hazard-free large packaging.
- Remove inner packaging:
  - Place in a laboratory recycling bin or clear bag and take to the collection point.
- Fold and tape outer packaging to reduce volume before taking it to the collection point.

#### c) Laboratory Equipment:

- If equipment is in good working order, keep it in its designated place.
- For equipment not in good working order, request removal via the customer helpdesk.
- Ensure unwanted equipment is free from chemical, biological, or radiochemical hazards.

#### d) Gas Cylinders:

- Return unwanted gas cylinders to the original supplier to avoid rental charges.
- If unable to return to the supplier, request assistance from the customer helpdesk.
- Cylinders can be repatriated to the correct supplier or emptied for scrap metal recycling.

Efficiently managing miscellaneous waste maintains safety and sustainability in the laboratory environment.

#### Tips for Laboratory Waste Management:

1. **Maintain Accurate Inventories:** Keep thorough records and ensure your inventory is up to date. This helps prevent unnecessary purchases and reduces waste.
2. **Chemical Substitution:** Whenever possible, substitute hazardous chemicals with safer alternatives in your laboratory procedures.
3. **Avoid Bulk Purchases:** Try to avoid buying chemicals in bulk quantities to minimize excess waste and expiration of chemicals.
4. **Recycling:** Explore recycling options for laboratory materials like xylene, formalin, and ethyl alcohol. These can often be distilled, filtered, or recycled.
5. **Container Management:** Reduce the size and number of containers you use, especially if you find that they aren't regularly filled.



6. **Handle All Chemicals as Hazardous:** Treat all chemicals as if they were hazardous to ensure there's no chance of contamination.
7. **Proper Storage:** Store hazardous waste in appropriate containers designed for this purpose.
8. **Labeling:** Ensure that each container holding hazardous laboratory waste is clearly labeled with accurate details of its contents.
9. **Student Training:** Regularly train students in safety procedures for adding waste to and removing it from storage containers. Keep the training concise and easy to understand.

## Management Procedure

Laboratories employ a system of colored bins for the collection of waste materials, following these specific guidelines:

Colour of bins	Red	Blue	Green	Yellow	Black
Materials disposed	Plastic bottles, gloves, infected plastics, used or discarded bags, Microbiology cultures etc	Glass items, needles, syringes, blades, used and unused sharps	Residual plant parts, food waste, office waste, plastic materials, cardboard general waste	Animal parts, items contaminated by blood or fluids, solid cotton etc	All non-hazardous miscellaneous wastes, paper wastes etc.

Departments use different bins for waste management, and the process involves three key steps:

1. Waste Segregation (WS)
2. Neutralization (N)
3. Off-site Recycling (OR)



Based on the different laboratory waste materials following is a list of bins used by different departments:

Based on the different laboratory waste materials following is a list of bins used by different departments:

Name of the department	Characterizing lab waste	No. of Bins used					Managing processes
		R	B	G	Y	BL	
Botany	Plastics, bottles, glass goods, plant parts, chemicals, microbiology cultures, miscellaneous	1	1	1	-	1	WS
Zoology	Residual animal bodies, chemicals, food items, autoclaved media, eppendorf, glass items, plastic materials	1	1	1	1	1	WS
Chemistry	Chemicals, glass materials, gas cylinders, miscellaneous etc	1	1	1	1	1	OR
Microbiology	Autoclaved culture media, discarded bags, glass items, needles, food waste, cotton, glass goods, plastic goods, paper waste	1	1	1	1	1	WS
Environmental Science	Chemicals, biological waste	1	1	1	1	-	WS
Geology	Papers, food items, plastics, e-wastes	1	1	-	-	1	WS
Geography	Papers, electrical wire waste, miscellaneous	-	-	1	-	1	OR
Biochemistry	Microbial culture media, residual pathological samples, Eppendorf, glass goods, plastics, miscellaneous	1	1	1	1	1	WS
Computer	Empty toners, cartridges, outdated computers, and electronic items and miscellaneous	-	-	1	-	1	OR
Physics	Electrical wire waste, papers, miscellaneous	-	-	1	-	1	WS & OR
Electronics	E-waste, papers, miscellaneous	-	-	1	-	1	OR





পশ্চিমবঙ্গ পশ্চিম বঙ্গাল WEST BENGAL

AN 082829

Memorandum of Understanding

This Memorandum of Understanding (hereinafter called as "MOU") is made and executed at 8<sup>th</sup> of May, 2023 valid for till 8<sup>th</sup> of May, 2028.

M/s ASUTOSH COLLEGE, its office at 92, Shyama Prasad Mukherjee Rd, Kolkata, West Bengal 700026, acting through its Authorized Signatory Mr. /Ms. **DR. MANAS KABI** (hereinafter referred to as 'The Company', which expression unless repugnant to the context or subject shall mean and include its successors, representatives, assigns, administrators and executors) of the party of **FIRST PART**.

AND

M/s. Redivivus Recyclers Private Limited, a company incorporated under the provisions of Companies Act, 1956 having its registered office at 11, Allenby Road, Kolkata 700020 acting through its Authorized Signatory Mr. Pranov Goel duly Authorized by board (hereinafter referred to as 'Vital Waste', which expression unless repugnant to the context or subject shall mean and include its successors, representatives, assigns, administrators and executors) of the party of **SECOND PART**.



*Manas Kabi*  
08/05/2023  
ASUTOSH COLLEGE  
92, S. P. MUKHERJEE ROAD  
KOLKATA-700 026

REDIVIVUS RECYCLERS PVT. LTD.  
KOLKATA

*Pranov Goel*  
08/05/23

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MOU of waste management





## 3.4 Green Campus

### 3.4.1 Campus Biodiversity

Documentation of floral diversity of the college campus

**LOCATION: SITE 1: Asutosh College Training Center**

SL. NO.	SCIENTIFIC NAME	COMMON NAME	FAMILY	NO. OF INDIVIDUALS	PLANT/TREE TYPE	SIGNIFICANCE
1.	<i>Dieffenbachia seguine</i>	Dumbcane	Araceae	24	Ornamental (indoor house plant)	
2.	<i>Tabernaemontana divaricata</i>	Crepe Jasmine	Apocynaceae	1		
3.	<i>Spathiphyllum wallisii</i>	Peace Lily	Araceae	1	Ornamental (indoor plant)	Perennial housing plant produces white long lasting flowers, look like hood of cobra.
4.	<i>Dracaena fragrans</i>	Striped Dracaena	Asparagaceae	3	Ornamental	Best Air Purifying Houseplant, increases Concentration and Sharpens Focus, increases humidity, has great ornamental value, Maintenance- low.
5.	<i>Rhapis excelsa</i>	Broadleaf Lady Palm	Arecaceae	1	Ornamental	probably native to southern China and Taiwan. It is not known in the wild; all known plants come from cultivated groups in China.
6.	<i>Azadirachta indica</i>	Neem tree	Meliaceae	1	Medicinal	a natural medicine, pesticide, and fertilizer. Neem extracts can be used against hundreds of pests and fungal diseases that attack food crops.
7.	<i>Strobilanthes crispera</i>	Pokok pecah kaca (Malaysia)	Acanthaceae	1	Medicinal	It has been used as an anti-diabetic, diuretic and laxative in traditional folk medicine. Furthermore, <i>S. crispera</i> has potential in treating cancer, as evidenced in previous studies.
8.	<i>Araucaria columnaris</i>	Christmas Tree	Araucariaceae	1	Ornamental	Among the most common species of <i>Araucaria</i> planted as an ornamental tree and street tree in warm temperate climates.
9.	<i>Peperomia pelucida</i>	Shiny Bush	Piperaceae	2	Medicinal	has been used for treating abdominal pain, abscesses, acne, boils, colic, fatigue, gout, headache, renal disorders, and rheumatic joint pain.
10.	<i>Polyalthia longifolia</i>	False Ashoka Tree	Annonaceae	5	Medicinal	This plant is used as an antipyretic agent in indigenous systems of medicine.
11.	<i>Plerandra elegantissima</i>	False Aralia	Araliaceae	1	houseplant	grown as a houseplant in temperate regions. It requires high humidity. Keeping the potting soil moist will benefit this plant.



12.	<i>Aglaonema commutatum schott</i>	Chinese Evergreen	Araceae	4	Ornamental	have been grown as luck-bringing ornamental plants in Asia for centuries. This tropical genus is known for its intolerance of cold temperatures. Chilling injury can begin at 15 °C (59 °F).
13.	<i>Ficus religiosa</i>	Ashwattha/Peepal tree	Moraceae	1	Medicinal	The sacred fig is considered to have a religious significance in three major religions that originated on the Indian subcontinent, Hinduism, Buddhism and Jainism. used traditionally as antiulcer, antibacterial, antidiabetic, in the treatment of gonorrhoea and skin diseases.
14.	<i>Dypsis lutescens</i>	Areca Palm	Arecaceae	4	Indoor plant	Cleaner air and non-toxic for pets, palms (including the <i>Dypsis lutescens</i> ) was named as one of the best air purifying plants
15.	<i>Dieffenbachia sarah</i>	-	Araceae	1	Ornamental	The sap is used in tropical America as an antidote (counter-irritant) against snakebites, and to treat rheumatism and gout externally. It is also used to treat tumors and warts. The seed oil is applied on wounds, burns and inflammations. In Brazil a leaf decoction is gargled to relieve angina.
16.	<i>Dieffenbachia bowmannii</i>	Dumb Cane	Araceae	2	Herbaceous indoor plant	The sap is used in tropical America as an antidote (counter-irritant) against snakebites, and to treat rheumatism and gout externally. It is also used to treat tumors and warts. The seed oil is applied on wounds, burns and inflammations. In Brazil a leaf decoction is gargled to relieve angina.

## LOCATION: SITE 2: Asutosh College Main Building

SL. NO.	SCIENTIFIC NAME	COMMON NAME	FAMILY	SPECIES COUNT	PLANT/TREE TYPE	SIGNIFICANCE
1.	<i>Tabernaemontana divaricata</i>	Crepe Jasmine	Apocynaceae	40 (appx.)	Ornamental & medicinal	medicinal benefits such as an anti-epileptic, anti-mania, brain tonic, and anti-oxidant. The aim of the present study was to evaluate the effect of ethanolic extract of TD leaves on burying behavior in mice.
2.	<i>Murraya paniculata</i>	Orange Jasmine/Kamini	Rutaceae	30 (appx.)	Ornamental & medicinal	It is valued especially for its essential oil, cultivated in India for medicinal use, is often grown as a hedge and is widely planted in the tropics and subtropics as an ornamental, where it is valued especially for the intense orange-blossom fragrance of its flowers and its small red fruits.
3.	<i>Azadirachta indica</i>	Neem tree	Meliaceae	2	Medicinal	-
4.	<i>Mangifera indica</i>	Mango	Anacardiaceae	1	Fruit-bearing & medicinal	it has been an important herb in the Ayurvedic and indigenous medical systems for over 4000 years.



5.	<i>Psidium guajava</i>	Common Guava	Myrtaceae	1		Has been used in traditional medicine by many cultures throughout Central America, the Caribbean, Africa, and Asia. used for inflammation.
6.	<i>Typhonium flagelliforme</i>	-	Araceae	1	Medicinal herb	A prominent plant candidate from aroid family, endowing various curative properties against a variety of illness and infections.
7.	<i>Dieffenbachia seguine</i>	Dumbcane	Araceae	9	Ornamental plant	cultivated as indoor houseplant. Sap is toxic.
8.	<i>Dracaena fragrans</i>	Striped Dracaena	Asparagaceae	15	Indoor plant	
9.	<i>Codiaeum variegatum</i>	Garden Croton	Euphorbiaceae	8	Ornamental	Cultivated for beautiful foliage with varieties of colors.
10.	<i>Livistona chinensis</i>	Chinese fan palm	Arecaceae	1	Indoor potted palms-	the right amount of light, warmth, and water is a must for growing a healthy plant, they require good soil drainage.
11.	<i>O.T.U-1</i>	Bengal Shrub-Mint	Lamiaceae	1		
12.	<i>Aglaonema commutatum</i>	Chinese Evergreen	Araceae	13		Loves humidity, tolerates dry air thrives even without water and food
13.	<i>Rhapis excelsa</i>	Broadleaf Lady Palm	Arecaceae	5		
14.	<i>Dracaena marginata</i>	Large-leaved Dragon Tree	Asparagaceae	10	Indoor plant	grows in semi desert areas, well known for its tendency to ooze red blood like resin when cut or damaged.
15.	<i>Racenea rivularis</i>	Majesty Palm	Arecaceae	2	Indoor tree	slow-growing plant, adding no more than 1 foot per year until it reaches about 10 feet in height.
16.	<i>Dypsis lutescens</i>	Areca Palm	Arecaceae	4	Perennial	They are best planted in the spring, and they have a slow to moderate growth rate.
17.	<i>Dieffenbachia sarah</i>	-	Araceae	1		
18.	<i>Dracaena reflexa</i>	Song of India	Asparagaceae	8	Medicinal & Ornamental	cures, malaria, diarrhea, dysentery, etc.
19.	<i>Alocasia odora</i>	Elephant Ear Plant	Araceae	3	Ornamental	Alocasia is 'the tree that grows up to the heavens'. It thereby stands for seizing opportunities when they arise, even when they're risky.
20.	<i>Polyscias balfouriana</i>	Variegated Dinner-plate Aralia	Araliaceae	1	ornamental	Generally cultivated in the gardens
21.	<i>Chamaedorea elegans</i>	Parlour Palm/ Neanthe Bella Palm	Arecaceae	2	Indoor houseplant	The parlor palm is one of the most heavily sold houseplant palms in the world. It is one of several species with leaves that are harvested as xate.
22.	<i>Syngonium podophyllum</i>	Arrow-head plant	Araceae	5	Indoor plant	sap dangerous for humans and pets.
23.	<i>Aglaonema nitidum</i>	Silver Queen	Araceae	6	ornamental plants	Grown as luck-bringing ornamental plants in Asia for centuries
24.	<i>Dieffenbachia x bausei</i>	Dumb Cane	Araceae	4	Indoor Plant	herbaceous Plant, sap is toxic.
25.	<i>Spathiphyllum wallisii</i>	Peace Lily	Araceae	1	Ornamental (indoor plant)	Perennial housing plant produces white long lasting flowers, look like hood of cobra.



## LOCATION: SITE 3: Asutosh College Centenary Building

SL. NO.	SCIENTIFIC NAME	COMMON NAME	FAMILY	SPECIES COUNT	PLANT/TREE TYPE	SIGNIFICANCE
1.	<i>Thrinax radiata</i>	Florida thatch palm	Areceae	1	Ornamental plant	Native to Caribbean islands.
2.	<i>Carica papaya</i>	Papaya Tree	Caricaceae	2	Fruit-bearing tree	Papayas contain an enzyme called papain that aids digestion & is also high in fiber and water content that help to prevent constipation and promote regularity and a healthy digestive tract.
3.	<i>Polyscias balfouriana</i>	Variegated Dinner-plate Aralia	Araliaceae	50	Ornamental shrub	Generally cultivated in the gardens
4.	-	Ivy Lata	-	-	Creepers (ornamental)	-
5.	<i>Zamia pumila</i>	Coontie Palm	Zamiaceae	2	Ornamental	Prefers filtered sunlight to partial shade, but hardy enough to tolerate full sun and cold weather.
6.	<i>Thaumatococcus bipinnatifidum</i>	Tree Philodendron	Araceae	18	Ornamental	tropical plant usually grown in full sun, but can tolerate and adapt to deep shade. Grows best in rich, moisture-retentive soil that can be slightly alkaline.
7.	<i>Aglaonema nitidum</i>	Silver Queen	Araceae	1	Ornamental	Grown as luck-bringing ornamental plants in Asia for centuries.
8.	<i>Aglaonema Costatum</i>	Snow White Aglaonema/ Chinese Evergreen	Araceae	6	Ornamental plant	Poisonous due to calcium oxalate crystals. If ingested they cause irritation of the mucous membranes, and the juice can cause skin irritation and painful rash.
9.	<i>Aglaonema commutatum</i>	Chinese evergreen	Araceae	1	Ornamental	Does well in diffuse sun or good indirect light and prefers high humidity but tolerate dry air, commonly grown as a houseplant and resembles dumb cane.
10.	<i>Dracaena marginata Tricolor</i>	Tricolour Dragon Tree	Asparagaceae	1	Indoor plant	Commonly known as dragon tree grow in semi desert areas. Suitable for house plants
11.	<i>Pandanus amaryllifolius</i>	Pandan leaves	Pandanaceae	1	Indoor plants	Native to India and Bangladesh. Widely cultivated plant is sterile with rare flowers and can be propagated by cuttings. The leaves are used in Indian recipes to add aroma to rice. Leaves are either used fresh or dried.
12.	<i>Rhapis excelsa</i>	Broadleaf Lady Palm	Areceae	13	Ornamental	Grows up to 4 m in height and 30 mm in diameter in multi-stemmed clumps with glossy, palmate evergreen leaves divided into broad, ribbed segments. Non-toxic for cats, dogs.



13.	<i>Tabernaemontana divaricata</i>	Crepe Jasmine	Apocynaceae	5	Houseplant	Both single and double-flowered forms are cultivated, the flowers of both forms being white. The plant blooms in spring but flowers appear sporadically all year.
14.	<i>Syngonium podophyllum</i>	Arrow-headed plant	Araceae	14+60=74	Indoor plant	sap dangerous for humans and pets.
15.	<i>O.T.U 2</i>	Palm	Arecaceae	1		
16.	<i>O.T.U 3</i>					

### LOCATION: SITE 4: Asutosh College 2<sup>nd</sup> (Bhasa) Campus

Sl. No	Common name	Scientific Name	Family	Plant/Tree Type	Ecological Significance
1	Gulf Leaf Flower	<i>Phyllanthus fraternus</i>	Phyllanthaceae	Medicinal	Medicinal uses: in the treatment of jaunties, fever, urinary disorders, kidney stone etc.
2	Holy Basil	<i>Ocimum tenuiflorum</i>	Lamiaceae	Medicinal	Holy basil is used for the common cold, influenza ("the flu"), H1N1 (swine) flu, diabetes, asthma, bronchitis, earache, headache, stomach upset, heart disease, fever, viral hepatitis, malaria, stress, and tuberculosis.
3.	Green chiretta	<i>Andrographis paniculata</i>	Acanthaceae	Medicine	It is mainly used for liver problems as it protects the liver against damage caused by free radicals due to its antioxidant and anti-inflammatory activity
4.	Aloe vera	<i>Aloe barbadensis</i>	Asphodelaceae	Medicinal	Aloe vera are claimed to be very effective in treatment of various ailments, such as burns, allergic reactions, rheumatoid arthritis, rheumatic fever, acid indigestion, ulcers, diabetes, skin diseases, dysentery, diarrhea, piles and inflammatory conditions of the digestive system and other
5.	Madagascar Periwinkle	<i>Catharanthus roseus</i>	Apocynaceae	Medicinal	Madagascar periwinkle is used for diabetes, cancer, sore throat, cough, insect bite, and many other conditions, but there is no good scientific evidence to support these uses.
6.	Black nightshade	<i>Solanum nigrum</i>	Solanaceae		Black nightshade has been used for stomach irritation, cramps, spasms, pain, and nervousness. Some people apply black nightshade directly to the skin for a skin condition called psoriasis, hemorrhoids, and deep skin infections (abscesses).
7.	Ashwagandha	<i>Withania somnifera</i>	Solanaceae	Medicinal	Ashwagandha contains chemicals that might help calm the brain, reduce swelling, lower blood pressure, and alter the immune system.
8.	Spearmint	<i>Mentha spicata</i>	Lamiaceae	Medicinal	Spearmint is used for digestive disorders including gas, indigestion, nausea, diarrhea, upper gastrointestinal tract spasms, irritable bowel syndrome (IBS), bile duct and gallbladder swelling (inflammation), and gallstones.
9.	Candy leaf	<i>Stevia rebaudiana</i>	Asteraceae	Medicinal/	It is used as a non-nutritive sweetener and herbal supplement. A non-nutritive sweetener is one that contains little to no calories. Stevia is used as a healthful alternative to added sugar in many meals and beverages.



10.	Liquorice	<i>Glycyrrhiza glabra</i>	Fabaceae	Medicinal	Licorice suggested uses include adrenocortical insufficiency, arthritis, bronchitis, dry cough, peptic ulcers, gastritis, infections (bacterial/viral), prostate cancer, sore throat, systemic lupus erythematosus, and upper respiratory inflammation.
11.	Henna	<i>Lawsonia inermis</i>	Lythraceae	Cosmetic	Henna is used in cosmetics, hair dyes, and hair care products. It is also used as a dye for nails, skin, and clothing
12.	Kulekhara	<i>Hygrophila schulii</i>	Acanthaceae	Culinary, Medicinal	The leaves are often used as a daily saag on with small fish and mustard. There is a lot of anti-oil derived from the whole plant. The Khulekhara leaf extract is also used for treating diarrhoea, inflammation, stomach pain and anaemia.
13.	Veld grape	<i>Cissus quadrangularis</i>	Vitaceae	Medicinal	It has also been used for bone fractures, weak bones (osteoporosis), scurvy, cancer, upset stomach, hemorrhoids, peptic ulcer disease (PUD), painful menstrual periods, asthma, malaria, and pain.
14.	Giant calotrope	<i>Calotropis gigantea</i>	Apocynaceae	Medicinal	People use the bark and root bark for medicine. Despite serious safety concerns, calotropis is used for digestive disorders including diarrhea, constipation and stomach ulcers; for painful conditions including toothache, cramps, and joint pain; and for parasitic infections including elephantiasis and worms.
15.	Shame plant	<i>Mimosa pudica</i>	Fabaceae	Medicinal	It majorly possesses antibacterial, antivenom, antifertility, anticonvulsant, antidepressant, aphrodisiac, and various other pharmacological activities. The herb has been used traditionally for ages, in the treatment of urogenital disorders, piles, dysentery, sinus, and also applied on wounds.
16.	Chinese chastetree	<i>Vitex negundo</i>	Lamiaceae	Medicinal	Chaste tree has been used to treat menstrual cycle problems and pain, premenstrual syndrome, and menopause. Chaste tree berries may help stimulate progesterone. This is a female hormone that rises 2 weeks before menstruation. It may help normalize estrogen and progesterone.
17.	Camphor basil	<i>Ocimum kilimandscharicum</i>	Lamiaceae	Medicinal	This basil is the source of commercial camphor production. It can be considered one of the most valuable plants in the garden for its use as an insect repellent, both in the garden and in the house. Dried leaves can be placed in sachets, stored with clothing and used to keep moths at bay.
18.	Clove basil	<i>Ocimum gratissimum</i>	Lamiaceae	Medicinal	The whole plant is used in treatments for digestive issues, headache and the flu. The essential oils in Clove basil, eugenol and thymol are used to soothe sore throats, fever and skin irritants.
19.	Ayapan	<i>Eupatorium triplinerve</i>	Asteraceae	Medicinal	The herb is stimulant, tonic in small doses and laxative when taken in quantity. A hot infusion is emetic and diaphoretic. Decoction of the leaves is antiseptic and haemostatic; useful against various kinds of haemorrhage and to clean foul ulcers. An aqueous extract of the dried leaves is a cardiac stimulant.
20.	Sweet flag	<i>Acorus calamus</i>	Acoraceae	Medicinal	Sweet flag is also used externally to treat skin eruptions, rheumatic pains and neuralgia. An infusion of the root



					can bring about an abortion whilst chewing the root alleviates toothache. It is a folk remedy for arthritis, cancer, convulsions, diarrhoea, dyspepsia, epilepsy etc.
21	Basil	<i>Ocimum basilicum</i>	Lamiaceae	Medicinal	Basil is commonly used for stomach problems such as spasms, loss of appetite, intestinal gas, diarrhea, constipation, and many other conditions, but there is no good scientific evidence to support these uses.
22.	Waterhyssop	<i>Bacopa monnieri</i>	Plantaginaceae	Medicinal	This herb contains so many healthy compounds, it is used as an anti-diabetic, liver-enhancer, anti-ulcerogenic, anti-pyretic (treats fever), carminative, analgesic, anti-asthmatic, anti-bacterial and many more.
22.	Indian sarsaparilla	<i>Hemidesmus indicus</i>	Apocynaceae	Medical	Sarsaparilla is a plant. The root is used to make medicine. Sarsaparilla is used for treating psoriasis and other skin diseases, rheumatoid arthritis (RA), and kidney disease; for increasing urination to reduce fluid retention; and for increasing sweating.
23.	Black pepper	<i>Piper nigrum</i>	Piperaceae	Medicinal, Culinary	People take black pepper by mouth for arthritis, asthma, upset stomach, bronchitis, a bacterial infection that causes diarrhea (cholera), colic, depression, diarrhea, gas, headache, sex drive, menstrual pain, stuffy nose, sinus infection, dizziness, discolored skin (vitiligo), weight loss, and cancer.
24.	Gurmar	<i>Gymnema sylvestre</i>	Apocynaceae	Medicinal	It is used for diabetes, metabolic syndrome, weight loss, and cough. It is also used for malaria and as a snake bite antidote, digestive stimulant, laxative, appetite suppressant, and diuretic.
25.	Malabar nut	<i>Justicia adhatoda</i>	Acanthaceae	Medicinal	Malabar nut is used to loosen chest congestion, open the breathing tubes (bronchi), and treat spasms. It is used for upper airway infections, common colds, cough, asthma, and tuberculosis.
26.	Indian leadwort	<i>Plumbago indica</i>	Plumbaginaceae	Medicinal	Leadwort is a potent medicinal agent used in the treatment of stubborn chronic rheumatoid arthritis, skin diseases and tumorous growths as recommended by Ayurveda. It also finds its use in correcting chronic menstrual disorders, viral warts and chronic diseases of nervous system.
27.	-	<i>Paederia scandens</i>	Rubiaceae	Medicinal	Paederia scandens has been used as a traditional medicine in Asian countries to treat jaundice, dysentery, and the pain of rheumatism.
28.	Camel grass	<i>Cymbopogon schoenanthus</i>	Poaceae	Cosmetics	lemongrass oil or camel grass oil is also used as a tonic and fragrance additive in personal care and cosmetic products such as hair dye, shampoo/conditioner, moisturizer/lotion, bath oil, exfoliant/scrub, anti-aging treatment, and acne treatment.
29.	Cathedral bells	<i>Kalanchoe pinnata</i>	Crassulaceae	Medicinal	They are eaten for diabetes, diuresis, dissolving kidney stones, respiratory tract infections, as well as applied to wounds, boils, and insect bites. It is useful for preventing alcoholic, viral and toxic liver damages.
30.	Sankar jata	<i>Uraria picta</i>	Fabaceae	Medicinal	The rhizomes of the plant are used in the Ayurvedic system of medicine as a bitter tonic, stimulant, antispasmodic, and to treat hysteria, convulsions, and epilepsy. The root has been medically



					used to treat insomnia and blood, circulatory, and mental disorders.
31.	Indian Thornapple	<i>Datura metel</i>	Solanaceae	Medicinal	Headache, Asthma, Stomach ache, Backache, Arthritis.
32.	-	<i>Capsicum annuum</i>	Solanaceae	Culinary, Medicinal	Capsicum ( <i>Capsicum annuum</i> ), also known as cayenne pepper, has been used orally for upset stomach, toothache, poor circulation, fever, hyperlipidemia, and heart disease prevention.
33.	Asian pigeonwings	<i>Clitoria ternatea</i>	Fabaceae		
34.	Indian pennywort	<i>Centella asiatica</i>	Apiaceae		
35.	Heart-leaved moonseed	<i>Tinospora cordifolia</i>	Menispermaceae		
36.	Indian bdellium-tree	<i>Commiphora mukul</i>	Burseraceae		
37.	Black Pepper	<i>Curcuma caesia</i>	Zingiberaceae		
38.	Ginger	<i>Zingiber officinale</i>	Zingiberaceae	Culinary, Medicinal	People commonly use ginger for many types of nausea and vomiting. It's also used for menstrual cramps, osteoarthritis, diabetes, migraine headaches, and other conditions, but there is no good scientific evidence to support many of these uses.
39.	Horse Gram	<i>Macrotyloma uniflorum</i>	Fabaceae	Culinary, Medicinal	Horse gram is often used in dishes like soups, stir-fries, curries, and dals. Ayurveda suggests consumption of horsegram keep the kidneys fit.
40.	Mexican mint	<i>Coleus amboinicus</i>	Lamiaceae	Medicinal	It is a folkloric medicinal plant used to treat malarial fever, hepatopathy, renal and vesical calculi, cough, chronic asthma, hiccough, bronchitis, helminthiasis, colic, convulsions, and epilepsy
41.	<b>Babchi</b>	<i>Psoralea corylifolia</i>	Fabaceae	Medicinal	Babchi ( <i>Psoralea corylifolia</i> ) oil is an important essential oil used in several traditional medicines to cure various disorders. This phytotherapeutic agent possesses a number of pharmacological activities including antibacterial, antifungal, antioxidant, anti-inflammatory, immunomodulatory, and antitumor factors.
42.	Myrobalan	<i>Terminalia chebula</i>	Combretaceae	Medicinal	<i>Terminalia chebula</i> is used for dysentery. <i>Terminalia bellerica</i> and <i>Terminalia chebula</i> are used as a lotion for sore eyes. <i>Terminalia chebula</i> is also used topically as a mouthwash and gargle. Intravaginally, <i>Terminalia chebula</i> is used as a douche for treating vaginal infections.
43.	Bastard Myrobalan	<i>Terminalia bellirica</i>	Combretaceae	Medicinal	<i>Terminalia bellerica</i> is used to protect the liver and to treat respiratory conditions, including respiratory tract infections, cough, and sore throat. <i>Terminalia chebula</i> is used for dysentery. <i>Terminalia bellerica</i> and <i>Terminalia chebula</i> are used as a lotion for sore eyes.
44.	Kurchi	<i>Holarrhena pubescens</i>	Apocynaceae	Medicinal	Its seeds are used as anthelmintic, and its bark is reported to have antidiarrheal properties. In Ayurvedic medicine it is used for treating anemia, jaundice, dysentery, stomach pains, diarrhea, epilepsy and cholera
45.	Ashoka tree	<i>Saraca asoca</i>	Fabaceae	Medicinal	The bark is also useful in dyspepsia, fever, and burning sensation. It is also used to treat menorrhagia, leucorrhoea, internal bleeding, hemorrhoids, and hemorrhagic dysentery.
46.	Blackboard tree	<i>Alstonia scholaris</i>	Apocynaceae	Medicinal	It is used for Chest Pain. Headache, Stomach ache,





					Gastric problems, Fever, Skin disease, Intestinal worms.
47.	Malabar leaf	<i>Cinnamomum tamala</i>	Lauraceae	Medicinal	Malabar nut is used to loosen chest congestion, open the breathing tubes (bronchi), and treat spasms. It is used for upper airway infections, common colds, cough, asthma, and tuberculosis.
48.	Neem Tree	<i>Azadirachta indica</i>	Meliaceae	Medicinal	Neem ( <i>Azadirachta indica</i> ) is a tree from South and Southeast Asia now planted across the tropics because of its properties as a natural medicine, pesticide, and fertilizer. Neem extracts can be used against hundreds of pests and fungal diseases that attack food crops.
49.	Arjun tree	<i>Terminalia arjuna</i>	Combretaceae	Medicinal	Its bark decoction is being used in the Indian subcontinent for anginal pain, hypertension, congestive heart failure, and dyslipidemia, based on the observations of ancient physicians for centuries.
50.	Clove	<i>Syzygium aromaticum</i>	Myrtaceae	Medicinal	Clove essential oil and eugenol derived from <i>S. aromaticum</i> have been documented to possess useful analgesic, anesthetic, and antiseptic effects and are therefore commonly used in dentistry
51.	True cinnamon tree	<i>Cinnamomum verum</i>	Lauraceae	Medicinal	Cinnamon aids in digestion and is effective for indigestion, nausea, vomiting, upset stomach, diarrhea and flatulence. Cinnamon also relieves acidity and morning sickness. Respiratory problems. Cinnamon helps in cold, flu, influenza, sore throat.
52.	Elephant apple	<i>Dillenia indica</i>	Dilleniaceae	Medicinal	Traditionally different parts of <i>Dillenia indica</i> are used for the relief of indigestion, asthma, influenza, dysentery, jaundice, promeho, weakness and rheumatic pain, but recent studies reported the extractives showed significant cytotoxic, CNS depressant and free radical scavenging activity.
53.	Malabar ebony	<i>Diospyros malabarica</i>	Ebenaceae	Medicinal	It is used externally to heal sores and wounds. When ripe, the fruit is beneficial in treating diarrhoea and dysentery; blood diseases; gonorrhoea and leprosy. The fruit is also said to break fever, to be an antidote for snake poisoning, and to be demulcent
54.	Red sandalwood	<i>Pterocarpus santalinus</i>	Fabaceae	Medicinal	It has been used in inducing vomiting and treating eye diseases, mental aberrations, and ulcers. The heartwood of Red sanders is known to have antipyretic, anti-inflammatory, anthelmintic, tonic, hemorrhage, dysentery, aphrodisiac, and diaphoretic activities. It has also been used as a cooling agent.
55.	Indian sandalwood	<i>Santalum album</i>	Santalaceae	Medicinal	Sandalwood oil has been widely used in folk medicine for treatment of common colds, bronchitis, skin disorders, heart ailments, general weakness, fever, infection of the urinary tract, inflammation of the mouth and pharynx, liver and gallbladder complaints and other maladies.
56.	Cluster fig	<i>Ficus racemosa</i>	Moraceae	Medicinal	The ancient system of Indian medicine, for various diseases/disorders including diabetes, liver disorders, diarrhea, inflammatory conditions, hemorrhoids, respiratory, and urinary diseases.
	Tamarind	<i>Tamarindus indica</i>	Fabaceae	Medicinal	The whole plant parts have rich



					nutritional value and wide usage in medicine. In traditional medicine it is used in wound healing, abdominal pain, diarrhea, dysentery, parasitic infestation, fever, malaria and respiratory problems.
58.	Sesame	<i>Sesamum indicum</i>	Pedaliaceae	Medicinal	Sesame is sometimes used for diabetes, high cholesterol, heart disease, and many other conditions, but there is no good scientific research to support these other uses. In foods, sesame oil is used as cooking oil and to make dressings and sauces. Sesame seeds are added to food for flavoring.
59.	-	<i>Swertia chirayita</i>	Gentianaceae	Medicinal	Chirata is used for fever, constipation, upset stomach, loss of appetite, intestinal worms, skin diseases, and cancer. Some people use it as “a bitter tonic.” In India, it has been used for malaria, when combined with the seeds of divi-divi ( <i>Guilandina bonducella</i> ).
60.	White mulberry	<i>Morus alba</i>	Moraceae	Medicinal	Popularly, fruits, roots, and leaves of <i>Morus alba</i> are used for the treatment of dizziness, insomnia, premature aging, and DM2. They also have a protective effect against atherosclerosis, liver and kidney disorders, and inflammation
61.	Nutmeg	<i>Myristica fragrans</i>	Myristicaceae	Medicinal	Nutmeg is derived from the seed of <i>Myristica fragrans</i> , and the spice, mace, is derived from the seed coat. Current uses of the plant include the treatment of gastrointestinal disturbances, such as cramps, flatulence, and diarrhea. It has been investigated as an antidiarrheal medication in calves.
62.	Fennel flower	<i>Nigella sativa</i>	Ranunculaceae	Medicinal	<i>Nigella sativa</i> has been used for centuries in herbal medicine to treat certain health conditions including asthma, bronchitis, and inflammation. It has also long been used as a spice and food preservative.
63.	Umbrella tree	<i>Pandanus odorifer</i>	Pandanaceae	Medicinal	<i>Pandanus odoratissimus</i> has been traditionally known as one of the Indian Ayurvedic medicines for a headache, rheumatism, spasm, cold, flu, epilepsy, wounds, boils, scabies, leucoderma, ulcers, colic, hepatitis, smallpox, leprosy, syphilis, cancer, dysuria, as well as a cardiotoxic, antioxidant, and aphrodisiac
64.	Blond plantain	<i>Plantago ovate</i>	Plantaginaceae	Medicinal	The psyllium in plantago has been used for GI conditions such as irritable bowel syndrome (IBS), diarrhea, constipation, and hemorrhoids. It has also been used to treat hyperlipidemia and for its anticancer effects, and it may be useful for glycemic control in patients with type 2 diabetes.
65.	Hing	<i>Ferula assa-foetida</i>	Apiaceae	Medicinal	It is widely used in India in food and as a medicine in Indian systems of medicine like ayurveda. Asafoetida has been held in great esteem among indigenous medicines, particularly in Unani system from the earliest times. of Farsi asa “resin “, and Latin foetidus means “smelling, fetid”.
66.	Levant cotton	<i>Gossypium herbaceum</i>	Malvaceae	Medicinal	It is also known to be used after birth to expel the placenta and to increase the lactation, as well as for gastrointestinal issues, such as hemorrhages and diarrhea, for nausea, fevers and headaches. In the Levant



					seeds of <i>Gossypium herbaceum</i> were also used for food, feed or oil extraction.
67.	Arabian coffee	<i>Coffea Arabica</i>	Rubiaceae	Medicinal	In Arabia a fermented drink from the pulp is consumed. Coffee is widely used as a flavoring, as in ice cream, pastries, candies, and liqueurs. Source of caffeine, dried ripe seeds are used as a stimulant, nervine, and diuretic, acting on central nervous system, kidneys, heart, and muscles.
68.	Camphor tree	<i>Cinnamomum camphora</i>	Lauraceae	Medicinal	The camphor tree, <i>Cinnamomum camphora</i> , has been reported to be used traditionally for the treatment of heart conditions, colds and fevers, respiratory complaints such as pneumonia, inflammatory conditions, infections, diarrhea, and hysteria. Topical applications act as a counterirritant and antiseptic.
69.	Mango Ginger	<i>Curcuma amada</i>	Zingiberaceae	Medicinal	Ayurveda and Unani medicine have been using <i>Curcuma Amada</i> as a part of their herbal remedies for centuries as a starter, diuretic, laxative, expectorant, aphrodisiac and more. It is locally used and orally consumed to relieve cold and cough and bronchitis in some cases.
70.	False daisy	<i>Eclipta prostrata</i>	Asteraceae	Medicinal	<i>Eclipta prostrata</i> , a traditional herbal medicine, has long been used in Asia and South America for the therapy of hemorrhagic diseases (e.g. hemoptysis, hematemesis, hematuria, epistaxis and uterine bleeding), skin diseases, respiratory disorders, coronary heart disease, hair loss, vitiligo,
71.	Crepe-ginger	<i>Cheilocostus speciosus</i>	Costaceae	Medicinal	The plant has many historical uses in Ayurveda, where the rhizome has been used to treat fever, rash, asthma, bronchitis, and intestinal worms. It is mentioned in the Kama Sutra as an ingredient in a cosmetic to be used on the eyelashes to increase sexual attractiveness.
72.	Cylindrical snake plant	<i>Dracaena angolensis</i>	Asparagaceae	Medicinal	Snake plants are also known for their ability to help remove toxic air pollutants.
73.	Willow-leaved justicia	<i>Justicia gendarussa</i>	Acanthaceae		Snake plants are also known for their ability to help remove toxic air pollutants. Though in small contributions, snake plants can absorb cancer-causing pollutants, including CO <sub>2</sub> , benzene, formaldehyde, xylene, and toluene.
74.	Flannel weed	<i>Sida cordifolia</i>	Malvaceae	Medicinal	<i>Sida cordifolia</i> is applied directly to the skin for numbness, nerve pain, muscle cramps, skin disorders, tumors, joint pain (osteoarthritis and rheumatoid arthritis), healing wounds, ulcers, scorpion sting, snakebite, and as a massage oil.
75.	True cardamom	<i>Elettaria cardamomum</i>	Zingiberaceae	Medicinal	Small cardamom [ <i>Elettaria cardamomum</i> (L.) Maton. (Family: Zingiberaceae)] capsules (fruits) have been used for traditional medicine applications including for the control of asthma, teeth and gum infections, cataracts, nausea, diarrhea, as well as cardiac, digestive and kidney disorders.
76.	Java Plum	<i>Syzygium cumini</i>	Myrtaceae	Medicinal	The bark is acrid, sweet, digestive, astringent to the bowels, anthelmintic and used for the treatment of sore throat, bronchitis, asthma, thirst, biliousness, dysentery and ulcers. It is also a good blood purifier.



77.	Achiote	<i>Bixa orellana</i>	Bixaceae	Medicinal	Thus, despite the different culture and traditions among the countries in South and Central America, several of the popular uses of <i>Bixa orellana</i> are the same, for example, antipyretic, aphrodisiac, antidiarrheal, antidiabetic, and insect repellent.
78.	Cutch tree	<i>Senegalia catechu</i>	Fabaceae	Medicinal	Catechu is most commonly used by mouth for stomach problems such as diarrhea, swelling of the colon (colitis), and indigestion. It is also used orally for pain from osteoarthritis and topically to treat pain, bleeding, and swelling (inflammation). But there is limited scientific evidence to support any of these uses.
79.	Malabar leaf	<i>Cinnamomum tamala</i>	Lauraceae	Medicinal	<i>Cinnamomum tamala</i> is an Ayurveda herb mentioned for the treatment of bad odor from mouth, black spots on the face, dental caries, swelling, cough and in complications of tuberculosis.
80.	Rudraksha	<i>Elaeocarpus ganitrus</i>	Elaeocarpaceae	Medicinal	Elaeocarpaceae, is used for treating diverse diseases such as mental illness, epilepsy, hysteria, cough and hepatic diseases. A combination of bark, stem and leaf of <i>Elaeocarpus floribundus</i> has been used as mouth wash and fruits has been used as antiseptic.
81.	Siamese rough bush	<i>Streblus asper</i>	Moraceae	Medicinal	<i>Streblus asper</i> Lour is a small tree found in tropical countries, such as India, Sri Lanka, Malaysia, the Philippines and Thailand. Various parts of this plant are used in Ayurveda and other folk medicines for the treatment of different ailments such as filariasis, leprosy, toothache, diarrhea, dysentery and cancer.
82.	Orchid tree	<i>Bauhinia variegata</i>	Fabaceae	Medicinal	<i>Bauhinia purpurea</i> is a species of flowering plant is used in several traditional medicine systems to cure various diseases. This plant has been known to possess antibacterial, antidiabetic, analgesic, anti-inflammatory, anti-diarrheal, anticancerous, nephroprotective and thyroid hormone regulating activity.
83.	Garden Asparagus	<i>Asparagus officinalis</i>	Asparagaceae	Medicinal	Asparagus is used along with lots of fluids as "irrigation therapy" to increase urine output. It is also used for bladder infections (urinary tract infections), joint pain, obesity, and many other conditions, but there is no good scientific evidence to support these uses
84.	Marsh herb	<i>Enhydra fluctuant</i>	Asteraceae	Medicinal	<i>Enhydra fluctuans</i> is nutritious and used in ascites, dropsy, anasarca and snakebite. This plant has been reported to have antioxidative and analgesic activities.
85.	Sacred Tree	<i>Butea monosperma</i>	Fabaceae	Medicinal	Bark is used as poultice for pimples; bark juice is given orally to cure intestinal worms. 'Luko1' has a stimulatory action on the endometrium and improves uterine circulation. Alleviates Diabetes Symptoms, Treats Hypertension, Detoxifies The Kidneys, Enhances Digestive System, Strengthens Respiratory Processes, Naturally Moisturizes Skin, Combats Skin Infections, Promotes Hair Growth,
86.	Ajwain	<i>Trachyspermum ammi</i>	Apiaceae	Medicinal	The fruit possesses stimulant, antispasmodic and carminative



					properties and is used traditionally as an important remedial agent for flatulence, atonic dyspepsia, diarrhea, abdominal tumors, abdominal pains, piles, and bronchial problems, lack of appetite, galactagogue, asthma and amenorrhoea.
87.	Indian lotus	<i>Nelumbo nucifera</i>	Nelumbonaceae	Medicinal	It is used for hematemesis, epistaxis, and hematuria, the flowers are used for lowering blood sugar levels, diarrhea, cholera, fever, and hyperdipsia. Rhizomes are promoted have purported diuretic, antidiabetic, and anti-inflammatory properties.
88.	Barbados nut	<i>Jatropha curcas</i>	Euphorbiaceae	Medicinal	<i>Jatropha curcas</i> is traditionally used to treat bacterial and fungal infections or febrile diseases, muscle pain or jaundice. It is also used for obtaining new drugs through the identification of active ingredients to eliminate pathogens or inhibit signs and symptoms of human and veterinary diseases.
89.	Salparni	<i>Desmodium gangeticum</i>	Fabaceae	Medicinal	<i>Desmodium gangeticum</i> is used as a tonic, febrifuge, digestive, anticatarrhal, antiemetic, in inflammatory conditions of chest and in various other inflammatory conditions in the Ayurvedic System of Medicine while <i>Desmodium adscendens</i> is widely used for the treatment of asthma in Ghana, Africa.
90.	Ceylon leadwort	<i>Plumbago zeylanica</i>	Plumbaginaceae	Medicinal	The paste of the whole plant is applied externally on any kind of skin diseases; extract of leaves and root is administered orally to alleviate arthritic pain; and the plant acts as a good digestive. Product 'Muscle & Joint Rub' is highly effective for backaches, muscular sprains and joint pains.
91.	Antmool	<i>Tylophora indica</i>	Asclepiadaceae	Medicinal	<i>Tylophora</i> by mouth for allergies, asthma, cancer, congestion, constipation, cough, inflamed skin, diarrhea, bloody diarrhea, gas, hemorrhoids, tender joints (gout), yellowed skin (jaundice), joint disorder (rheumatoid arthritis), whooping cough, to make someone vomit, and to cause sweating.
92.	Lemon	<i>Citrus limon</i>	Rutaceae	Medicinal, Culinary	Uses of lemon juice, known from traditional medicine, include treatment of high blood pressure, the common cold, and irregular menstruation. Moreover, the essential oil of <i>C. limon</i> is a known remedy for cough
93.	Holy Basil	<i>Ocimum tenuiflorum</i>	Lamiaceae	Medicinal	It is recommended for the treatment of bronchitis, bronchial asthma, malaria, diarrhea, dysentery, skin diseases,
94.	Water thymes	<i>Hydrilla verticillata</i>	Hydrocharitaceae	Medicinal	Therapeutically this plant may be used to provide complete nutrition, to improve digestion and gastrointestinal function, circulation, neurological health, blood sugar control, to strengthen immunity and increase endurance.
95.	Broom creeper	<i>Cocculus hirsutus</i>	Menispermaceae	Medicine	<i>Cocculus hirsutus</i> is widely used in various traditional medicine systems in South Asia for the treatment of fever, skin diseases, stomach disorders, urinary diseases and also as a sedative among many other uses
96.	Bengal currant	<i>Carissa carandas</i>	Apocynaceae	Medicinal	Its fruit is used in the ancient Indian herbal system of medicine, Ayurvedic, to treat acidity, indigestion, fresh and infected wounds, skin diseases, urinary



					disorders and diabetic ulcer, as well as biliousness, stomach pain, constipation, anemia, skin conditions, anorexia and insanity.
97.	Wild Eggplant	<i>Solanum surattense</i>	Solanaceae	Medicinal	It has been used traditionally for curing various ailments such as fever, cough, asthma and diabetes in south Indian traditional medicines
98.	Cymbopogon grass	<i>Cymbopogon winterianus</i>	Poaceae	Cosmetics, Repellent	Cymbopogon grass oil is mainly used as an insect repellent for humans and pets and is applied in soaps, detergents, household insecticides and technical products. d-Citronellal from the oil, which has few direct perfumery uses, is often converted into l-menthol or hydroxycitronellol.
99.	Musk mallow	<i>Abelmoschus moschatus</i>	Malvaceae	Medicinal	Ambrette is used for stomach and intestinal disorders with cramps, loss of appetite, and stomach cancer. It is also used for headaches, muscle spasms, hysteria, gonorrhoea, and lung problems. Some people use it as a stimulant. It has also been used to treat snakebites.
100.	Turmeric	<i>Curcuma longa</i>	Zingiberaceae	Medicinal	It is a medicinal plant extensively used in Ayurveda, Unani and Siddha medicine as a home remedy for various diseases including biliary disorders, anorexia, cough, diabetic wounds, hepatic disorders, rheumatism, and sinusitis.
101.	Oleander	<i>Nerium Oleandar</i>	Apocynaceae	Medicinal	Oleander is used for heart conditions, asthma, epilepsy, cancer, painful menstrual periods, leprosy, malaria, ringworm, indigestion, and venereal disease; and to cause abortions.
102.	True cardamom	<i>Elettaria cardamomum</i>	Zingiberaceae	Medicinal	Traditional medicine applications including for the control of asthma, teeth and gum infections, cataracts, nausea, diarrhea, as well as cardiac, digestive and kidney disorders.
103.	Indian heliotrope	<i>Heliotropium indicum</i>	Boraginaceae	Medicinal	Heliotropium indicum has been used widely for centuries on warts and to treat inflammations and tumours. Throughout tropical Africa it is used as an analgesic (rheumatism), diuretic and for numerous skin problems (e.g. yaws, urticaria, scabies, ulcers, eczema, impetigo).
104.	Blood amaranth	<i>Amaranthus cruentus</i>	Amaranthaceae	Medicinal	The seed, oil, and leaf are used as food. The entire plant is used to make medicine. Amaranth is used for ulcers, diarrhea, swelling of the mouth or throat, and high cholesterol, but there is no good scientific evidence to support these uses. In foods, amaranth is used as a pseudocereal.
105.	Chaff-flower	<i>Achyranthes aspera</i>	Amaranthaceae	Medicinal	It possesses valuable medicinal properties and used in treatment of cough, bronchitis and rheumatism, malarial fever, dysentery, asthma, hypertension and diabetes in Indian folklore. Present study was designed to evaluate anti-inflammatory activity of an aqueous extracts of <i>Achyranthes aspera</i> (AEAA).
106.	Anena	<i>Boerhavia repens</i>	Boerhavia repens	Medicinal	The whole plant of <i>Boerhavia repens</i> is used as Stomachic, laxative, emetic and diuretic. <i>Boerhavia repens</i> is an important medicinal plant having application in jaundice, fever, constipation and blood purifier. For treatment of skin disorders, leaves of <i>Boerhavia repens</i> is used.



107.	White goosefoot	<i>Chenopodium album</i>	Amaranthaceae	Medicinal	album is traditionally used as anthelmintic, cardiotoxic, carminative, digestive, diuretic and laxative. It is also useful in peptic ulcer, dyspepsia, flatulence, strangury, pharyngopathy, splenopathy, ophthalmopathy and general debility.
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## **Biodiversity of Bhasa Campus, Asutosh College**

**Table: List of Bird species found in Bhasa Campus, Asutosh College**

Common name	Species name
1. Greater Coucal	<i>Centropus sinensis</i>
2. Common Koel	<i>Eudynamys scolopaceus</i>
3. Common Hawk Cuckoo	<i>Hierococcyx varius</i>
4. Indian Cuckoo	<i>Cuculus micropterus</i>
5. White-breasted Waterhen	<i>Amaurornis phoenicurus</i>
6. Common Moorhen	<i>Gallinula chloropus</i>
7. Asian Openbill	<i>Anastomus oscitans</i>
8. Indian Pond Heron	<i>Ardeola grayii</i>
9. Cattle Egret	<i>Bubulcus ibis</i>
10. Great Egret	<i>Ardea alba</i>
11. Intermediate Egret	<i>Ardea intermedia</i>
12. Little Egret	<i>Egretta garzetta</i>
13. Little Cormorant	<i>Microcarbo niger</i>
14. Red-wattled Lapwing	<i>Vanellus indicus</i>
15. Shikra	<i>Accipiter badius</i>
16. Black Kite	<i>Milvus migrans</i>
17. Common Barn Owl	<i>Tyto alba</i>
18. Common Hoopoe	<i>Upupa epops</i>
19. Rufous Woodpecker	<i>Micropternus brachyurus</i>
20. Blue-throated Barbet	<i>Psilopogon asiaticus</i>
21. Coppersmith Barbet	<i>Psilopogon haemacephalus</i>
22. Green Bee-eater	<i>Merops orientalis</i>
23. Common Kingfisher	<i>Alcedo atthis</i>
24. Alexandrine Parakeet	<i>Psittacula eupatria</i>
25. Rose-ringed Parakeet	<i>Psittacula kramera</i>
26. Black Drongo	<i>Dicrurus macrocercus</i>
27. Rufous Treepie	<i>Dendrocitta vagabunda</i>
28. House Sparrow	<i>Passer domesticus</i>
29. White Wagtail	<i>Motacilla alba</i>
30. Common Tailorbird	<i>Orthotomus sutorius</i>
31. Red-whiskered Bulbul	<i>Pycnonotus jocosus</i>
32. Himalayan Bulbul	<i>Pycnonotus leucogenis</i>
33. Red-vented Bulbul	<i>Pycnonotus cafer</i>
34. Jungle Babbler	<i>Turdoides striata</i>
35. Asian Pied Starling	<i>Gracupica contra</i>
36. Common Myna	<i>Acridotheres tristis</i>
37. Oriental Magpie Robin	<i>Copsychus saularis</i>



**Table:List of Butterfly species found in Bhasa Campus, Asutosh College**

Sl. No.	Common Name	Scientific Name
1	Common jay	<i>Graphium doson</i> (Felder & Felder, 1864)
2	Tailed jay	<i>Graphium gamemnon</i> (Linnaeus, 1758)
3	Common mormon	<i>Papiliopolytes</i> (Linnaeus, 1758)
4	Lime butterfly	<i>Papiliodemoleus</i> (Linnaeus, 1758)
5	Common mime	<i>Chilasaclytia</i> (Linnaeus, 1758)
6	Blue mormon	<i>Papiliopolymnestor</i> (Cramer, 1775)
7	Common rose	<i>Pachlioptaaristolocheia</i> (Fabricius, 1775)
8	Crimson rose	<i>Pachliopta hector</i> (Linnaeus, 1758)
9	Common grass yellow	<i>Euremahecabe</i> (Linnaeus, 1758)
11	Common emigrant	<i>Catopsiliapomona</i> (Fabricius, 1775)
12	Mottled emigrant	<i>Catopsiliapyranthe</i> (Linnaeus, 1758)
13	Yellow orange-tip	<i>Ixias pyrene</i> (Linnaeus, 1764)
14	Common wanderer	<i>Pareroniavaleria</i> (Cramer, 1776)
15	Striped albatross	<i>Appiaslibythea</i> (Fabricius, 1775)
16	Common gull	<i>Ceporanerissa</i> (Fabricius, 1775)
17	Common jezebel	<i>Delias eucharis</i> (Drury, 1773)
18	Psyche	<i>Leptosianina</i> (Fabricius, 1793)
19	Pioneer	<i>Belenoisaurora</i> (Fabricius, 1793)
20	Blue tiger	<i>Tirumalalimniace</i> (Cramer, 1775)
21	Striped tiger	<i>Danausgenutia</i> (Cramer, 1779)
22	Plain tiger	<i>Danauschrysippus</i> (Linnaeus, 1758)
23	Brown king crow	<i>Euploeaklugii</i> (Moore & Horsfield, 1857)
24	Common crow	<i>Euploea core</i> (Cramer, 1780)
25	Common evening brown	<i>Melanitileda</i> (Linnaeus, 1758)
26	Common palmfly	<i>Elymniashypermnestra</i> (Linnaeus, 1763)
27	Common bushbrown	<i>Mycalesisperseus</i> (Fabricius, 1775)
28	Common three-ring	<i>Ypthimaasterope</i> (Klug, 1832)
29	Common five-ring	<i>Ypthimabaldus</i> (Fabricius, 1775)
30	Tawny coster	<i>Acraeaviolae</i> (Fabricius, 1775)
31	Common castor	<i>Ariadne merione</i> (Cramer, 1779)
32	Peacock pansy	<i>Junoniaalmana</i> (Linnaeus, 1758)
33	Grey pansy	<i>Junoniaatlites</i> (Linnaeus, 1763)
34	Lemon pansy	<i>Junonialemonias</i> (Linnaeus, 1758)
35	Blue pansy	<i>Junoniaorithya</i> (Linnaeus, 1764)
36	Common silverline	<i>Spindasisvulcanus</i> (Fabricius, 1775)
37	Common pierrot	<i>Castaliusrosimon</i> (Fabricius, 1775)





### 3.4.2. Green Campus Initiative

#### Integrated Aquaculture:

The fish pond at Asutosh College 2nd campus is a practical model of the integrated approach of fish culture along with duck culture and agricultural crops to the students of Fisheries Science.

#### Description of the pond:

The pond at Asutosh College 2nd Campus measures about 7.5 bigha in area. Initially, the pond was not created for fish culture but it was created for earth filling of adjacent low lying lands by the sellers of the land. Hence the pond cannot be considered as a true fish culture pond (from fisheries point of view) due to its high depth.

Process of culture:

- Fish culture operation is done on the basis multiple stocking and multiple harvesting methods.
- Generally fingerlings of Indian and Exotic major carps are released into the pond after harvesting.
- Generally extensive method of fish culture is being practised here.
- Duck is simultaneously cultured with low expenditure as maximum feed of duck is obtained from the pond.
- Different crops are grown at the pond bank depending upon seasons.



Aquaculture Pond



Integrated Farming



## Biogas Plant

In a world where sustainable living practices are becoming increasingly important, bio-gas has emerged as a versatile and eco-friendly alternative fuel source for cooking, offering a plethora of benefits that go beyond simply providing a source of energy. Bio-gas is primarily generated from food waste, decomposable organic material, and kitchen waste, producing methane along with a minimal amount of carbon dioxide. This renewable energy source not only addresses the growing demand for cleaner cooking fuels but also tackles waste management challenges and contributes to organic gardening through the utilization of the resulting digested slurry.

One of the most significant advantages of bio-gas is its role as an alternative to liquefied petroleum gas (LPG) for cooking. LPG, though efficient, is derived from fossil fuels and contributes to greenhouse gas emissions. In contrast, bio-gas is a sustainable and renewable resource that can be produced locally. By utilizing food waste and kitchen scraps, households can significantly reduce their reliance on fossil fuels while minimizing their carbon footprint. The methane content in bio-gas burns cleanly and efficiently, making it a suitable replacement for LPG, especially in regions where access to conventional cooking fuels is limited.



## Biogas Plant

Beyond its applications in cooking, bio-gas offers an innovative solution to the problem of waste disposal. Food waste and organic material are notorious for emitting foul odors and attracting flies when left to decompose in open environments. Bio-gas units efficiently convert these waste materials into a valuable energy resource while eliminating these issues. The anaerobic digestion process within the bio-gas unit ensures that the waste is broken down without the release of unpleasant odors, making it a hygienic and eco-friendly waste management solution.



Moreover, the byproduct of the bio-gas generation process is equally valuable. The digested slurry, rich in nutrients and devoid of pathogens, can be used as organic manure in gardens. This organic fertilizer promotes soil health, enhances crop yields, and reduces the need for chemical fertilizers, further contributing to sustainable agriculture practices. Organic gardening with bio-gas-derived slurry not only closes the loop on waste management but also supports local food production and reduces the environmental impact associated with chemical fertilizers.

In conclusion, bio-gas presents a multifaceted solution that addresses the challenges of clean cooking, waste disposal, and organic gardening. By harnessing the power of methane produced from food waste and kitchen scraps, households can reduce their carbon footprint, eliminate unpleasant odors and flies, and enhance their gardens' fertility. As we navigate an era of increasing environmental consciousness, bio-gas stands as a shining example of how innovative technologies can pave the way for a more sustainable and eco-friendly future. Embracing bio-gas not only benefits individual households but also contributes to a cleaner and healthier planet for all.

### **Medicinal Plant Garden**

"Sushrut Medicinal Plants Garden" is a living tribute to the ancient Indian medical pioneer, Sushrut, renowned for his use of herbal remedies in treating patients. This garden, spanning nearly 7,000 square feet and nestled amidst the tranquil embrace of deodar trees, stands as a testament to the rich heritage of herbal medicine and the value of biodiversity in healing.



### **Medicinal Plant Garden**



Within the garden's well-thought-out layout, a diverse collection of over 100 medicinal plants, representing various plant families, thrives. These invaluable herbs have been carefully cultivated in elegantly designed beds, each adorned with informative nameplates displaying both their local and scientific names, as well as their angiospermic family classification.

The Sushrut Medicinal Plants Garden not only serves as an educational resource but also as a sanctuary for healing and well-being. Visitors can explore the profound connections between nature and health, learning about the potent therapeutic properties of these plants that have been harnessed for centuries in traditional medicine.

In this serene and informative haven, the ancient wisdom of Sushrut's herbal remedies finds new life, promoting the preservation of traditional healing practices and the conservation of biodiversity. The garden offers a space for research, education, and reflection, fostering a deeper appreciation for the healing power of the natural world and the importance of nurturing and protecting it for generations to come.

Some of the important plants/trees are

- Kalmegh (*Andrographis paniculata*)
- Harjora (*Cissus quadrangularis*)
- Gol morich/ Black pepper (*Piper nigrum*)
- Arjun (*Terminalia arjuna*)
- Red and White sandalwood
- Nutmeg (*Myristica fragrans*)



### Rain water Harvesting

The second campus in Bhasa, located on Diamond Harbour Road in South 24 Pgs, has taken a significant step towards sustainable water management by implementing a rainwater



harvesting system. This system is a testament to the institution's commitment to environmental stewardship and responsible water usage.

One key element of the rainwater harvesting system is the channelization of rainwater runoff from the college building's terrace. This runoff is efficiently directed into a recharge well strategically positioned near the southern end of the academic block. This method ensures that rainwater, which would otherwise go to waste, is captured and channelled into the ground, where it can help replenish the local groundwater table.



In addition to capturing rooftop runoff, the campus also addresses rainwater from unpaved areas through a collection trench. This trench serves as a vital interception point for surface runoff, preventing it from causing erosion or flooding. The collected rainwater from this trench is then directed into an abandoned open well on the campus grounds. This well now serves a new purpose – facilitating groundwater recharge. By allowing rainwater to percolate through the soil and into the groundwater, this system not only conserves water resources but also contributes to the long-term sustainability of the region's water supply.



Overall, the rainwater harvesting system at the second campus in Bhasa exemplifies responsible and eco-conscious practices. It demonstrates the institution's dedication to reducing its environmental footprint, conserving water resources, and actively contributing to the health of the local ecosystem. This initiative not only benefits the campus but also sets a positive example for the broader community in promoting sustainable water management practices.

### **Solar Plant**

To ensure continuous and eco-friendly street lighting at Asutosh College's second campus in Bhasa, the college authorities have made a commendable move by installing solar street lights. This sustainable initiative involves ten solar streetlight poles, each standing at a height of 5 meters, equipped with 80 Wp (watt-peak) solar panels. These solar panels efficiently capture sunlight throughout the day, converting it into clean and renewable energy. This harvested solar energy is then stored in Sealed Maintenance-Free (SMF) batteries with a capacity of 75 Ah (ampere-hours), which are attached to each streetlight pole.

The Solar LED Street Lighting System is designed to operate from dusk to dawn, ensuring that the campus is well-lit during the nighttime hours. Thanks to an automated system, the lights turn on using the stored battery power as natural light diminishes and fade away in the presence of natural light, thereby optimizing energy usage.

This installation not only provides uninterrupted and energy-efficient lighting for the campus but also serves as a model of sustainable practices. By harnessing the power of the sun and employing smart technology for illumination, Asutosh College's second campus demonstrates its commitment to reducing carbon emissions, conserving energy, and contributing to a greener and more sustainable future.



Solar Panel



## **Green initiatives at Main Campus, ACTC building and Humanities Building**

Urban green space is a crucial element in land-use planning, encompassing open areas designated for parks and other natural environments, such as blue spaces featuring water features. These spaces incorporate various forms of plant life and can range from well-maintained landscapes to more natural settings. Urban green space covers all vegetated urban land, both public and private, regardless of size or purpose. This category also includes small water bodies like ponds, lakes, or streams and is a key component of green infrastructure. Ensuring equitable access to public green spaces within cities is essential as they play a vital role in providing common services and promoting the health and well-being of urban communities.

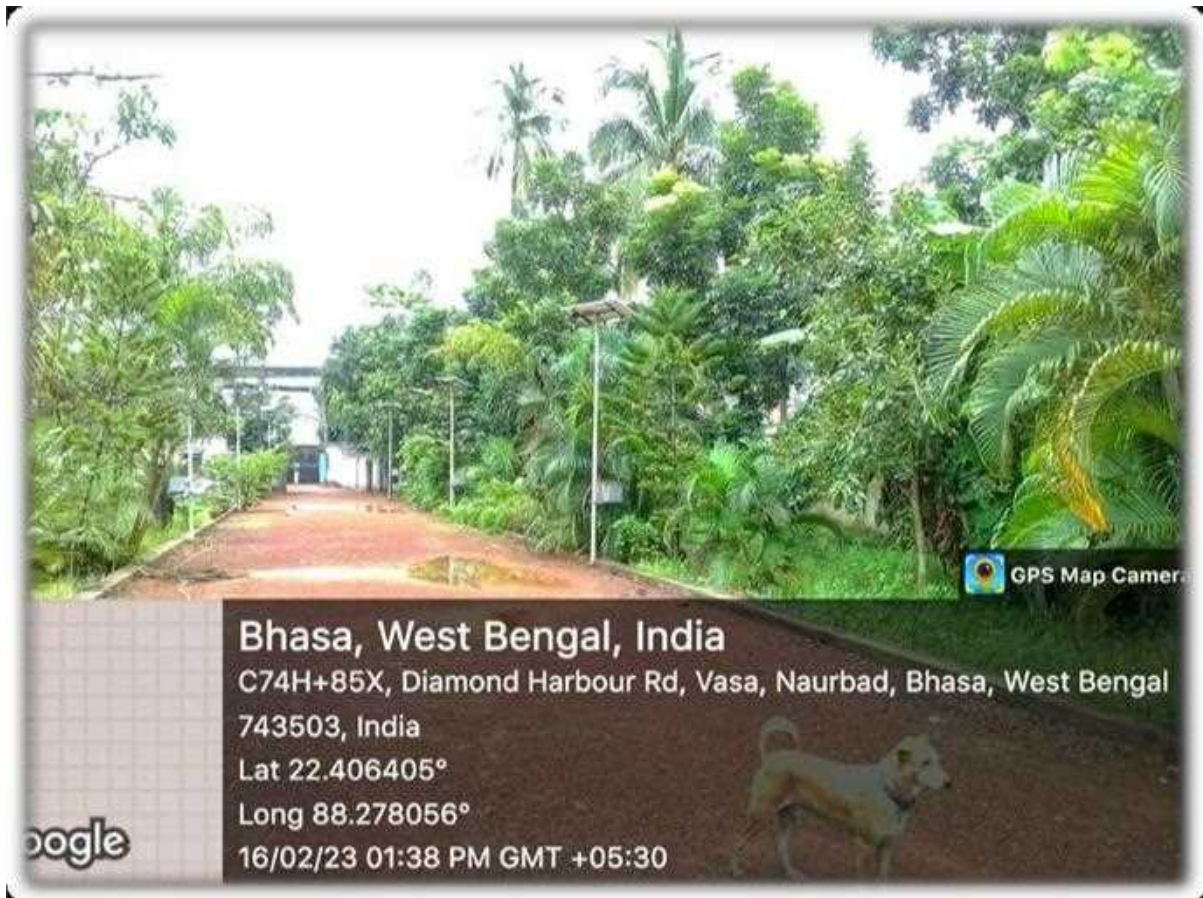
Citizens derive several benefits from urban open spaces, which can be categorized into four fundamental forms: recreation, ecology, aesthetic value, and positive health impacts. Notably, the psychological benefits experienced by visitors to these spaces increase with greater biodiversity, underscoring the importance of the quality of green spaces. The term 'urban forest' is often employed to describe green spaces that bring the benefits of the natural environment to the heart of urban communities.

Green space, defined as land partially or entirely covered with grass, trees, shrubs, or other vegetation, encompasses a variety of settings, including parks, community gardens, and cemeteries. The concept of Green Space originates from open space, which refers to undeveloped land accessible to the public. Open spaces serve as recreational areas for residents and contribute to enhancing the beauty and environmental quality of neighbourhoods.

- Park Green Space: Open to the public, primarily designated for human recreation and enjoyment, while also serving environmental and ecological functions.
- Protection Green Space: Urban Green Space reserved for sanitation, insulation, and security purposes. This category includes sanitation greenbelts, roadway protection green Space, windbreak forests, and grouped greenbelts.
- Institutional Green Space: Green Space located within institutional areas, such as schools and institutional units.



- Residential Green Space: Green Space found in residential areas, excluding residential community parks. This category encompasses grouped greenbelts, house-side green Space, and residential subdistrict roadway green Space.
- Street Garden Space: Green Space situated in the vicinity of roadways and porches. This includes street tree avenues, traffic island green space, traffic square green space, and parking lot green space.
- Vacant Land Space: Green Space in vacant land with no specific land use.





### 3.4.3 Clean Campus Initiative

The second campus of Asutosh College, located in Bhasa, boasts a distinct ambiance that sets it apart. It creates a serene world with its abundant greenery, a variety of trees, a habitat for birds, a herbal garden, and a sizable water feature. Although the campus is still undergoing development, the administration is committed to transforming it into a true Green Campus.

**Key initiatives undertaken for the Bhasa Green Campus encompass:**

- **Controlled Vehicle Access:** The College has implemented measures to limit vehicle access within the campus.
- **Solar Energy Utilization:** To reduce reliance on conventional power sources, a solar energy harvesting unit has been established.
- **Biogas Production:** A biogas unit is in the process of being set up and is regularly maintained.
- **Rainwater Harvesting:** The campus is equipped with a rainwater harvesting unit that is regularly monitored.
- **Medicinal Plants Garden:** A medicinal plants garden has recently been established on the second campus, where medicinal plants are cultivated and tended to.
- **Integrated Aquaculture Facility:** A large water body is dedicated to integrated aquaculture and fisheries studies and is well-maintained. Organic farming: Biodegradable waste has been used in vegetable farming practices.
- **Energy Conservation Measures:**

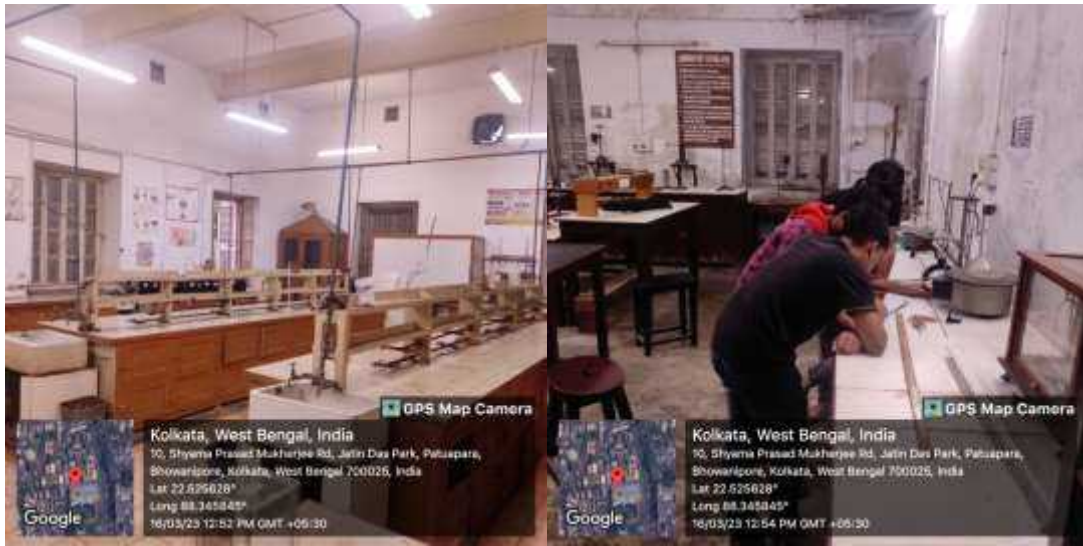
The college is transitioning to modern, low-energy-consumption resources to minimize electricity usage. Energy-consuming fixtures like tube lights, sodium lamps, and fans are being replaced with energy-efficient alternatives such as CFLs and fans with lower power consumption. Solar panels are planned for installation on the rooftops of campus buildings to generate electricity for laboratories and partial lighting. Daylight usage via windows and skylights is encouraged to reduce reliance on electric lighting.
- Energy-saving practices include turning off lights and fans in unoccupied classrooms, replacing outdoor mercury vapor lights with metal halide lights, maintaining tight seals on doors and windows during air conditioner operation, and powering down printers, copiers, and desk lamps when not in use.



- Computers and monitors are set to "Sleep" mode, and equipment is regularly checked for proper operation and maintenance.
- Solar energy harvesting units have been initiated at the Bhasa campus.
- **Raised embankment:** While the urban setting limits the institution's control, the Bhasa Campus has raised the surrounding land level to prevent water overflow from the water body during rainy seasons.
- **Carbon Neutrality Efforts:**  
Steps have been taken to reduce carbon dioxide emissions, including replacing coal with gas in the canteen, replacing incandescent bulbs with tube lights and CFLs, ensuring proper maintenance of air conditioners and cooling machines to minimize emissions, and using low-carbon-emitting generators.
- **Plantation:**  
In the main campus, Centenary Building and ACTC building, where open space is limited, narrow and tall trees have been planted; potted plants have been placed in staircases and corridors. A small garden is maintained in the ACTC building and a dedicated gardener is responsible for plant maintenance.

The N.C.C. and N.S.S. actively educate and inspire students about the advantages of a green campus. These initiatives collectively reflect our commitment to creating a sustainable and eco-friendly environment on our campuses, contributing to a cleaner and greener future.





Main Building Laboratory



ACTC Building Laboratory



### 3.6 Beyond the Campus Initiatives

College life is not just about attending classes, earning grades, and obtaining a degree. It's a transformative journey that encompasses personal growth, skill development, and the exploration of diverse interests. One vital aspect of this journey is the involvement in "Beyond the Campus" activities, which extend the college experience beyond the classroom walls.

"Beyond the Campus" activities are an integral part of the college experience, offering students a plethora of opportunities to engage with their passions, broaden their horizons, and make lasting memories. These activities come in various forms, from clubs and organizations to volunteer work, internships, and cultural exchanges.



Community Outreach Activity on Environmental Awareness by Department of Environmental Science (May, 2023)



Participation in Environmental Debate and Quiz by Department of Environmental Science (June, 2023)





Study of Biodiversity in Rabindra Sarobar by Department of Environmental Science (May, 2023)



Environmental Awareness Campaign among traffic police by Department of Environmental Science (May, 2023)



Extension Activity School Visit by Asutosh College (Feb, 2023)





The Department of Biochemistry organized an awareness program entitled: “Eat Well Live Well” ( July , 2022)



A Study on Carbon sequestration of avenue trees in Kolkata by Department of Environmental Science (June, 2022)





Pollinator project by Department of Zoology (June, 2022-July, 2023)



Field Visit to Alipore Zoological Garden for Ethological Study of Animals in a Captive Environment by Department of Zoology ( April, 2023)





Students from both undergraduate and postgraduate Zoology Honours, from the Postgraduate Department of Zoology, Asutosh College, Kolkata had to participated in an Ecological Survey titled: Insect visitation pattern in three tropical entomophilous trees (Jarul; Lagerstroemia speciosa, Radhachura; Peltophorum pterocarpum & Gulmohar; Delonix regia) in Kolkata and adjacent areas



One day field visit for collecting entomological specimens at Rudrapur, Barasat, North 24 Parganas by Department of Zoology ( November, 2022)







Biodiversity Study at Rabindra Sarobar by Department of Zoology



Biodiversity Study at Botanical Garden by Department of Botany ( April, 2023)





Field Visit at North Bengal by Department of Botany



Biodiversity Study at North Bengal by Department of Environmental Science



(November 2022)



Visit to Industry by Department of Environmental Science (September, 2022)



Visit to Sundarban for Biodiversity Study and Awareness Program by the Department of Environmental Science (November, 2022)





Air Quality Monitoring Training Program of Post Graduate and Under Graduate Students by the Department of Environmental Science (May, 2023)



Socio economic study by Department of Environmental Science (April , 2023)



Excursion at Daringbari, Orissa by Department of Geography, 2022



### 3.7 Divyangjan (Differently able) Friendly Washroom

To ensure the comfort and convenience of individuals with disabilities, we have designed Divyangjan-friendly washrooms within our premises. These facilities reflect our commitment to providing a barrier-free and welcoming space for all members of our community.



## 4.0. Conclusion

The Green Audit of Asutosh College reveals a commendable commitment to sustainability, environmental stewardship, and responsible resource management. This comprehensive audit not only highlights the various green initiatives in place but also underscores the college's dedication to reducing its environmental footprint and fostering a culture of sustainability within its academic community.

One of the standout features of the Second Campus is the Integrated Aquaculture model, which serves as an invaluable learning resource for Fisheries Science students. While the pond's initial purpose may not have been for fish culture, it has transformed into a dynamic ecosystem where fish, ducks, and agricultural crops coexist harmoniously. This interdisciplinary approach not only provides hands-on experience but also showcases the potential for integrated, sustainable farming practices.

The Biogas Plant is another remarkable endeavour, addressing both energy needs and waste management. By harnessing the power of food waste and organic materials, the plant produces clean, renewable energy in the form of biogas. This not only reduces reliance on fossil fuels but also eliminates the odorous and unhygienic issues associated with food waste disposal. Furthermore, the utilization of digested slurry as organic fertilizer contributes to sustainable agriculture, completing the cycle of resource utilization.

The Sushrut Medicinal Plants Garden is a living tribute to the rich heritage of herbal medicine. With over 100 medicinal plant species, this garden not only educates but also conserves biodiversity and promotes the use of traditional healing practices. It serves as a sanctuary for reflection, research, and a profound connection between nature and health.

Rainwater Harvesting at the campus is a significant step toward responsible water management. It captures rainwater runoff and directs it into recharge wells, replenishing the local groundwater table. This practice not only conserves water resources but also contributes to the long-term sustainability of the region's water supply, particularly in areas prone to water scarcity.

The installation of Solar Street Lights demonstrates the campus's commitment to renewable energy and eco-friendly illumination. By harnessing solar energy for nighttime lighting, the campus reduces carbon emissions and showcases the potential of clean energy technologies.

Additionally, the campus's waste management practices are highly commendable. From the handling of non-hazardous and glass laboratory waste to the management of biological, electronic, and hazardous waste, the college ensures responsible waste disposal. This



meticulous approach prioritizes safety, environmental protection, and compliance with all relevant regulations.

In conclusion, Asutosh College serves as a beacon of sustainability and responsible resource management. The initiatives undertaken not only benefit the campus community but also set a positive example for the broader community. By integrating sustainable practices into its academic and operational fabric, the college prepares students to be future leaders in environmental conservation and fosters a culture of responsibility toward our planet.

As we navigate an era of increasing environmental consciousness and climate change, institutions like Asutosh College are pioneering a sustainable future. The Second Campus stands as a testament to what can be achieved when environmental stewardship, education, and innovative technologies come together. The green audit reaffirms the college's commitment to creating a cleaner, greener, and more sustainable future for all, and it serves as an inspiration for educational institutions and communities worldwide.

Asutosh College is not just a place of learning; it is a living embodiment of the values of sustainability, responsibility, and environmental consciousness. It reminds us that each small step toward a greener future can collectively lead to monumental change, and it encourages us all to take action in our own lives to protect the planet we call home.



## 5.0. Recommendations

### 5.1 Water Management

- Installation of Rain Water Harvesting is very essential to ensure water conservation. The roof top area can be used to harness rain water especially in monsoon season which can be used for daily routine work or ground water recharging after careful monitoring. Regularly maintain and upgrade the rainwater harvesting system to ensure it continues to capture and store rainwater effectively. Installation of rainwater harvesting in main building by reverse boring system can be done for ground water recharge. Educate the campus community and local residents about the importance of rainwater harvesting for water conservation.
- Installation of water conservation faucets in washrooms to minimize water usage and reduce the institute's water footprint. Review the sanitary wastewater disposal system from washrooms and explore options for more sustainable wastewater management.
- Monitoring of water consumption will be required for ensuring water efficiency. Water meter to be installed to monitor the consumption. The water meter readings to be recorded every day or every week at a fixed time.
- It is recommended to check water quality from water source for dissolved oxygen, acidity, alkalinity, chloride, hardness, pH, and conductivity, total dissolved solids and E-coli/ coliform at regular interval.
- The wash basin taps may be equipped with water saving fixtures.
- The flush tanks of the toilets may be fitted with dual volume system.
- Water conservation awareness campaigns and signboards need to be displayed on every floor.

### 5.2 Energy Management

- The energy audit recommend to avoid the use of more energy consuming electrical appliances and to replace with more environment friendly and energy efficient appliances (for example five stars rated Air conditioner, star rated fans) in the college.





- Ceiling fans have a very good scope for reducing power consumed using a technology called Brushless DC Motor or simply BLDC motor. BLDC technology, in general, has been in the market for a couple of decades. The traditional fan uses an induction motor and typically consumes 70- 90 watts. But BLDC fan, on the other hand, can reduce power consumption up to 65%.
- Prominent advantages of BLDC motor over induction motor are Lower Electricity Consumption, Longer backup on Inverters (even on Solar), improved reliability, Noise reduction, longer lifetime.
- **Scale up Solar Energy Initiatives** by installing additional solar panels on campus buildings to further reduce reliance on conventional power sources. Explore opportunities for energy storage solutions, such as larger battery banks, to increase the utilization of harvested solar energy.
- Use solar heating units may be encouraged to reduce electricity consumption.
- College may adopt sensor-based (occupancy sensors) energy conservation approach for offices, classrooms and washrooms as well.
- College may also replace existing tube lights with LEDs.
- To increase the carbon offset, it is recommended to extend the Solar PV for not just college building but also for hostel and staff quarters.
- Awareness campaigns to be organized and signboards need to be displayed on every floor.

### 5.3 Waste Management

- **Enhance Biogas Production:** Continuously monitor and improve the efficiency of the bio-gas plant to increase biogas production from food waste Investigate the potential for utilizing bio-gas in other campus facilities or for educational purposes, further reducing reliance on fossil fuels.
- **Enhance Waste Management Practices:** Implement a comprehensive waste reduction strategy to minimize non-hazardous waste generation through recycling and responsible consumption. Invest in additional hazardous waste disposal and management facilities to ensure safe handling of laboratory waste materials.



- **Expand E-waste Management:** Extend the scope of electronic waste management to include electronic devices, computer peripherals, and outdated equipment. Collaborate with local e-waste recycling agencies for responsible disposal and recycling of electronic waste.
- College must introduce color coded separate waste bin for efficient segregation and disposal of waste in adequate number.
- Workshops need to be conducted regarding stages of waste management and 3R scheme.
- College may undertake feasibility study to install sewage water treatment in the campus to recycle waste water and use it in flush or for gardening purpose.
- Leaf litter from the campus can be effectively used for aerobic/ vermi composting, so that the composted material can also be used as good manure.
- Laboratory waste may be managed efficiently to reduce any scope of contamination.
- Try to completely ban the use of plastic in the campus, and to encourage the use of biodegradable materials as alternatives. Try to achieve the goal of plastic free campus.
- Annual agreement with recyclers/ vendors for all kind of scraps and e waste needs to be followed up.
- Important and confidential reports/ papers can be sent for pulping and recycling after completion of their preservation period.
- Metal waste, wooden waste, unused equipments and scraps should be sent to authorized scrap agents for further processing
- Awareness signboards/ posters need to be displayed on every floor.

## 5.4 Green Campus

- Maintenance of biodiversity is needed.



- **Diversify Medicinal Plant Garden:** Expand the variety of medicinal plants in the Sushrut Medicinal Plants Garden, incorporating more species with therapeutic value. Establish partnerships with local healthcare institutions or research organizations to conduct studies on the medicinal properties of the plants.
- Review periodically the list of trees planted in the garden, allot numbers to the trees and keep records.
- Nature Club may assign scientific and common name tags on the plants to spread awareness among students.
- College may consider planting tree on the land, away from city, managed by college to offset the carbon footprint.
- Emphasis may be given to develop kitchen garden and roof top garden giving emphasis on indoor and Bonsai plants.
- Students may be encouraged to engage in preparing People's Biodiversity Register (PBR) in and around the campus.
- Environment friendly lifestyles to be encouraged among students, teachers and nonteaching staffs.

## 5.5 Carbon Footprint reduction and sustainable practices

- **Promote Sustainable Campus Culture:** Strengthen initiatives to reduce carbon emissions, such as promoting the use of public transportation and carpooling among students and staff.
- Develop educational programs and workshops to raise awareness and engage the campus community in sustainability efforts.
- **Expand Sustainable Agriculture Practices:** Consider expanding integrated aquaculture and agricultural initiatives to cover a larger area of the campus. Explore the possibility of introducing additional sustainable farming practices, such as organic vegetable gardening or vertical farming, to maximize resource utilization.
- **Long-Term Sustainability Goals:** Set ambitious long-term sustainability goals for the campus, such as achieving carbon neutrality, zero-waste status, or becoming a



recognized green campus. Develop a roadmap outlining the steps and milestones required to achieve these goals over time.

## 5.6 Others

**Regular Environmental Audits:** Conduct periodic environmental audits to assess the effectiveness of sustainability initiatives and identify areas for improvement. Involve students, faculty, and staff in the audit process to encourage participation and ownership of sustainability efforts.

**Documentation and Reporting:** Maintain comprehensive records and documentation of sustainability initiatives, including data on energy savings, waste reduction, and water conservation. Prepare annual sustainability reports to track progress and share achievements with the campus community and stakeholders.

**Community Engagement:** Collaborate with local environmental organizations, schools, and communities to share best practices and promote sustainability beyond the campus. Host sustainability-themed events, workshops, and seminars to engage the wider community in environmental conservation.

### **Student Involvement:**

Establish student-led sustainability committees or clubs to actively involve students in planning and executing green initiatives. Encourage student-led research projects related to sustainability to foster innovation and knowledge sharing.

### **Collaborative Research:**

Forge partnerships with academic institutions and research organizations to conduct interdisciplinary research on sustainability topics. Seek funding opportunities for sustainability research projects that can benefit both the campus and the broader community.

### **Continuous Improvement:**

Embrace a culture of continuous improvement, where feedback from stakeholders is actively sought and used to refine sustainability strategies. Stay informed about emerging technologies and best practices in sustainability to remain at the forefront of environmental conservation. By implementing these recommendations, Asutosh College's Second Campus can further elevate its commitment to sustainability and serve as a model for other



educational institutions and communities aiming to create a cleaner, greener, and more sustainable future.



## 6.0 Green Audit Checklist

<b>I. Water Efficiency &amp; Wastewater Management</b>			
<b>Sl.No.</b>	<b>Measures</b>	<b>Status</b>	<b>Remarks</b>
1	RO based water purifiers for drinking water	✓	
2	Aerators to water taps		
3	Automatic toilet faucets		
4	Drip irrigation/ Sprinklers (for plant watering system)	✓	Bhasa Campus
5	Dual flush toilet with cistern		
6	Dry mopping/cleaning methods adopted		
7	Sewage treatment plant for sewage recycle		
8	Rain water harvesting	✓	
9	Regular maintenance for leakage free plumbing system	✓	
10	Use of low flow/flow control water equipment or gadget		
11	Water free urinals (No flush urinals/ Zero flush urinals/ water less urinals/ air-based flushing system)		
12	Water balance diagram and water consumption monitoring at each consumption level		
13	Routine monitoring of water quality	✓	
14	Awareness signs displayed for promoting water conservation	✓	
<b>II. Energy Efficiency and On-site Energy Generation Mechanism</b>			
<b>Sl.No.</b>	<b>Measures</b>	<b>Status</b>	<b>Remarks</b>
1	Maintaining correct lux levels (70-300 lux) to avoid excessive light		Lux meter available
2	Computerized monitoring of electrical system		
3	On-site energy generation (Diesel generators, LPG)	✓	
4	Use of renewable energy (Solar, biogas)	✓	
5	Photocell occupancy sensor for Automatic light control	✓	



7	Regular maintenance of electrical system	✓	
8	Use of energy efficient equipments like VFDs, maximum star rated equipment.	✓	
9	Use of energy saving bulbs (Compact Florescent light/ LED lights)	✓	
10	Awareness signage on electricity conservation	✓	

### III. Solid Waste Management

Sr. No.	Measures	Status	Remarks
1	Waste segregation practices and supporting hardware for wastes egregation (Dry recyclable, organic, plastic, hazardous and E waste)	✓	
2	Setting up recycling/ composting/ biogas generation facility	✓	
3	Minimize use of paper through digitalization	✓	
4	Printing on both sides of paper/ Reuse of Printed paper/ envelops	✓	
5	Mechanism for collection & disposal of E-Waste as applicable regulation	✓	
6	Single use plastic free campus	✓	
7	Inventories of waste generation and records of waste disposal	✓	
8	Recycle/archiving of paper waste	✓	
9	Segregation of dry and wet waste	✓	
10	Purchase of electronic products from companies which have service for disposal of product with buy back policy	✓	
11	Recreating into new sustainable products	✓	

### IV. Good Day light Design

Sr. No.	Design Feature	Status	Remarks
1	Wide corridors open to daylight	✓	
2	Broad doors and windows allowing daylight	✓	
3	Building architecture which allows sunlight within buildings	✓	
4	Presence of Skylight/ Rooflight		



5	Enough natural illumination in classrooms/ seminar halls/laboratories	✓	
6	Ultraviolet (UV) filtering windows/ Use of exterior louvers or light coloured fabric or blinds for windows to control glare		
7	Operable/openable windows	✓	
8	Use of glass as facilitator of natural light	✓	
9	Use of insulated and tinted glass to filter heat gain	✓	

#### V. Ventilation

Sr. No.	Design Feature	Status	Remarks
1	Good ceiling height which allows internal air circulation	✓	
2	Self-movement ventilators in the roof		
3	Wide windows and doors for classrooms, laboratories, seminar halls	✓	
4	Wide corridors	✓	
5	Operable louvers	✓	
6	Exhaust fans in kitchen/toilets	✓	

#### VI. Temperature and Acoustic Control

Sl.No.	Design Feature	Status	Remarks
1	Roof design & type (Double/ False ceiling with plaster of paris etc.)	✓	
2	Sand stone cladding/tiling outside the walls		
3	Specially designed walls for temperature control, Sound noise barriers for windows/ walls		
4	Building construction allows diffused sunlight but not the heat. Specially designed glass walls/ windows with better U value/ factor depending upon climate conditions		
5	Use of insulation material (e.g. autoclaved aerated blocks, hollow blocks, Thermocrete etc.)		
6	Use of water bodies/ fountain to maintain temperature within building		
7	Climbing creepers on the walls		
8	Retro fitting the existing roofs with cool roof technology		
9	Use of landscaping as sound barrier		





11	Water free urinals (No flush urinals/ Zero flush urinals/ water less urinals/ air-based flushing system)		
12	Water balance diagram and water consumption monitoring at each consumption level		
13	Routine monitoring of water quality	✓	
14	Awareness signs displayed for promoting water conservation	✓	

**VII. Environmental Audit**

Sl. No.	Type of audit	Status	Remarks
1	Energy audit (includes energy consumption, thermal comfort, visual comfort)	✓	
2	Sound/ Noise and lux level monitoring (including indoor noise level, outdoor noise level)	✓	
3	Water and waste audit (including water consumption, quality, solid waste generation, solid waste disposal process)	✓	
4	Safety Audit	✓	

**VIII. Universal Access and Efficient Operation and Maintenance of Building**

Sl. No.	Design feature	Status	Remarks
1	Easy access to the main entrance of the building and minimum two exists	✓	
2	Energy efficient elevator		
3	Carpooling by staff and students/ use of Public transport/ Use of bicycles and battery- operated vehicles within campus	✓	
4	Preferred car park spaces for differently abled		
5	Ramp/ stairs with handrails on atleast one side	✓	
6	Restrooms (toilets) in common areas/ Restroom for differently abled	✓	
7	Braille assistance for differently abled	✓	
8	Availability of wheelchair	✓	
9	Emergency response plan for natural and manmade emergencies	✓	
10	Fire exits, assembly points, first aids, fire fighting systems	✓	



11	Regular maintenance of building	✓	
<b>IX. Green Program</b>			
Sl. No.	Green program	Status	Remarks
1	Upcycling of waste. Recycling beyond books i.e. paper, aluminium, plastic, e-waste	✓	
2	Creation of “Green Team” in the institution/library	✓	Eco Club
3	Awareness programs on environment, energy management & safety (external sessions and academic courses)	✓	
4	Outreach, activities, green programs (Tree plantation, waste segregation, plastic waste collection, cleaning etc.) records/ photos of programs	✓	
5	Presence of system/ methodology available for implementation of green initiatives and green projects (long term system-based continuity and not an isolated/ standalone activity)	✓	
6	Mindset for reduction, recycle of waste (Green mindsets)	✓	
5	Digitization	✓	
6	E-archiving	✓	
7	E-resources: E books, Online Journals, membership of consortium	✓	
8	Maintaining green campus / Greening of campus	✓	

