Carbon Footprints: Assessment and Mitigation

विश्वभारती ⌘ विश्वभारती ⌘VISVA-BHARATI

(A Central University and an Institute of National Importance)

World Heritage Site
As Inscribed by UNESCO on 17 September, 2023

Santiniketan-731235

West Bengal, India

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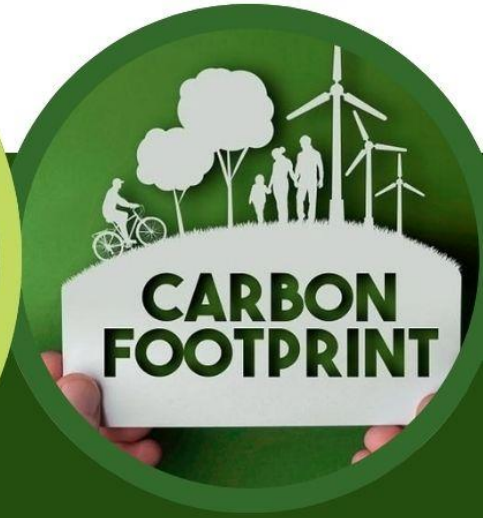

EXECUTIVE SUMMARY

Visva-Bharati (A Central University), founded on Rabindranath Tagore's philosophy of harmony between human life and nature, undertook a comprehensive Carbon Footprint assessment to measure greenhouse gas (GHG) emissions arising from its academic, residential, administrative, and support activities and to strengthen institutional climate accountability. The assessment was conducted in accordance with the Greenhouse Gas (GHG) Protocol, categorizing emissions under Scope 1 (direct emissions from stationary and mobile fuel combustion), Scope 2 (indirect emissions from purchased electricity), and Scope 3 (other indirect emissions, including commuting, food consumption, waste management, wastewater generation, and electricity transmission and distribution losses). Activity data for the financial year 2024–25 were collected from institutional records and field surveys, and emissions were calculated using standard emission factors recommended by IPCC and the India GHG Program. The total carbon footprint of the university for the reporting year was estimated at **7745.64 tonnes of CO_2 equivalent**, with Scope 3 emissions contributing the largest share (**51.32%**), primarily due to food consumption, purchased electricity transmission and distribution loss (T & D loss), and commuting, followed by Scope 2 emissions from electricity use (**44.44%**) and Scope 1 emissions from direct fuel use (**4.24%**). In addition, the assessment measured the carbon sequestration potential of the extensive campus vegetation cover using an area-based approach and an average sequestration rate of 7 t CO_2 per hectare per year for tropical mixed plantations, estimating an annual sequestration potential of **approximately 2601.54 tonnes of CO_2**, which partially offsets institutional emissions. Based on the findings, the report recommends enhancing energy efficiency, increasing renewable energy adoption, promoting sustainable mobility, improving food and waste management practices, and strengthening plantation and biodiversity conservation initiatives in alignment with national sustainability goals. Several such initiatives have already been taken by the University. Key carbon footprint reduction initiatives encompass tree transplantation; waste-to-wealth programs as part of waste management; introduction of renewable energy through solar panels; waste paper recycling at the Hand-Made Paper-Making Section, Silpa-Sadana; Swachhata Abhiyan; vermicompost production; handmade paper manufacturing from jute sliver & caddies, water hyacinth, fallen leaves, rice straw, corn husk, algae, and other agricultural waste; woven mats from water hyacinth; and azolla cultivation.

List of Tables

List of Plates & Figures

List of Abbreviations

AICTE	**All India Council for Technical Education**
AQAR	**Annual Quality Assurance Report**
CH_4	**Methane**
CFCs	**Chlorofluorocarbons**
CO_2	**Carbon Dioxide**
CO_2e	**Carbon Dioxide Equivalent**
DBH	**Diameter at Breast Height**
DG	**Diesel Generator**
GHG	**Greenhouse Gas**
GWP	**Global Warming Potential**
HEI	**Higher Educational Institution**
IIM	**Indian Institute of Management**
IPCC	**Intergovernmental Panel on Climate Change**
kWh	**Kilowatt-hour**
LPG	**Liquefied Petroleum Gas**
NDC	**Nationally Determined Contribution**
N_20	**Nitrous Oxide**
SDGs	**Sustainable Development Goals**
STARS	**Sustainability Tracking, Assessment and Rating System**
T&D	**Transmission and Distribution**
tCO_2	**Tonne of Carbon Dioxide**
tCO_2e	**Tonne of Carbon Dioxide Equivalent**
UGC	**University Grants Commission**
UNAI	**United Nations Academic Impact**
WBSEDCL	**West Bengal State Electricity Distribution Company Limited**
WBCSD	**World Business Council for Sustainable Development**
WRI	**World Resources Institute**

1. INTRODUCTION

Present times have witnessed extreme climate scenarios and their unprecedented impact on the environment globally, whether it is record rains, killer heat waves, wildfires, avalanches, or floods across different regions of the world and in many cities of India. These varied natural catastrophes clearly indicate the growing intensity of climate change, largely driven by excessive greenhouse gas (GHG) emissions resulting from unsustainable human activities. Educational institutions are not immune to the impacts of climate change, and their responsibility in addressing climate-related challenges is increasingly recognized through structured sustainability reporting and assessment frameworks such as the Times Higher Education World University Rankings, United Nations Academic Impact (UNAI), and the Sustainability Tracking, Assessment and Rating System (STARS).

In India, apex bodies such as the Ministry of Education, University Grants Commission (UGC), All India Council for Technical Education (AICTE), and other regulatory authorities encourage higher educational institutions to adopt climate-resilient and low-carbon practices. Several initiatives, including commitments towards Net Zero Emissions and sustainable campus development, have been promoted to align institutional functioning with national and global climate goals.

In this context, a Carbon Footprint Assessment of a university campus becomes a crucial exercise to understand emission sources, quantify greenhouse gas emissions, and align institutional operations with climate mitigation objectives.

Globally, universities and colleges have increasingly committed to sustainable development and climate action, contributing to the achievement of the United Nations Sustainable Development Goals (SDGs), particularly SDG 7 (Affordable and Clean Energy), SDG 12 (Responsible Consumption and Production), and SDG 13 (Climate Action). India, as part of its commitment to the 2030 Nationally Determined Contributions (NDCs), has adopted a multi-pronged strategy that includes diversification of energy sources, enhancement of energy efficiency, increased reliance on non-fossil fuel energy, and promotion of low-carbon development pathways.

Within this broader framework, assessing and managing carbon emissions at the institutional level is essential, and a Carbon Footprint Assessment serves as a scientific and policy-relevant tool to support these national priorities.

Modernization and industrialization, while improving living standards, have resulted in intensive energy consumption, increased dependence on fossil fuels, rapid urbanization, and rising emissions of greenhouse gases. As a result, issues such as global warming, the greenhouse effect, ozone depletion, and climate change have become major environmental concerns. These challenges highlight the urgent need to adopt sustainable development pathways and reduce carbon emissions at all levels.

National initiatives such as Swachh Bharat Abhiyan and the UGC's emphasis on "Green Campus, Clean Campus" further underline the important role of higher educational institutions in promoting environmental sustainability and climate responsibility. In this context, a Carbon Footprint Assessment emerges as a focused mechanism to quantify emissions, identify major carbon-intensive activities, and plan effective mitigation measures.

1.1 Purpose and Scope of Carbon Footprint Assessment

A Carbon Footprint Assessment is a systematic process of measuring and evaluating the greenhouse gas emissions generated directly or indirectly by an institution as a result of its activities. The concept of carbon assessment has evolved in response to growing concerns over climate change and the increasing concentration of carbon dioxide and other greenhouse gases in the atmosphere.

Unlike a general green assessment, which broadly assesses environmental practices, a carbon footprint assessment specifically focuses on quantifying emissions associated with energy use, transportation, fuel consumption, waste generation, and other carbon-intensive processes within the campus.

The primary purpose of a carbon footprint assessment is to identify emission sources, assess their magnitude, and evaluate compliance with sustainability goals, regulatory expectations, and stakeholder commitments. The assessment enables institutions to understand their contribution to climate change, explore opportunities for emission reduction, improve energy efficiency, reduce operational costs, and enhance environmental performance.

Continuous carbon assessment supports informed decision-making, strengthens institutional accountability, and facilitates progress towards long-term climate mitigation targets.

Educational institutions undertake carbon assessments to measure emissions from electricity consumption, fuel use, transportation systems, and other operational activities. The assessment also helps in developing or refining institutional climate action plans, establishing emission baselines, and monitoring progress over time. By generating reliable emission data, carbon footprint assessments support transparent reporting, risk assessment, and strategic planning aligned with institutional vision and mission.

1.2 General Steps Involved in Carbon Footprint Assessment

The carbon footprint assessment process in an educational institution follows a structured and systematic approach to ensure accuracy, transparency, and consistency. The general steps involved include:

1. Comprehensive data collection related to energy consumption, fuel usage, transportation, waste generation, and other relevant emission sources across the campus.
2. Documentation and verification of activity data through bills, records, logs, and supporting evidence to ensure reliability.
3. Application of standard emission factors and methodologies to calculate greenhouse gas emissions across different operational scopes.
4. Identification of major contributors to the overall carbon footprint.
5. Development of action plans aimed at reducing emissions through energy efficiency, renewable energy adoption, behavioural changes, and nature-based solutions.

1.3 Carbon Assessment, Carbon Footprint and Carbon Sequestration

A carbon assessment helps in understanding the extent of carbon emissions within a university campus and identifying opportunities to reduce the release of carbon-containing compounds into the atmosphere. Among the major greenhouse gases, carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), and chlorofluorocarbons (CFCs), carbon dioxide

contributes the highest share to global warming due to its ability to trap heat in the atmosphere. Consequently, reducing emissions and enhancing carbon sequestration are considered critical strategies for mitigating climate change.

The term “carbon footprint” refers to the total greenhouse gas emissions caused directly and indirectly by an individual, organization, activity, or product over its life cycle.

A carbon footprint assessment evaluates emissions across Scope 1 (direct emissions), Scope 2 (indirect emissions from purchased electricity), and Scope 3 (other indirect emissions such as transportation and waste). Such assessments are essential for understanding emission patterns, supporting compliance with sustainability standards, improving operational efficiency, and strengthening institutional reputation through transparent environmental reporting.

Carbon sequestration refers to the long-term storage of carbon in vegetation, soils, geological formations, and other natural reservoirs. It occurs through natural processes and human interventions such as afforestation, soil management, and biodiversity conservation. Enhancing carbon sequestration within university campuses through tree cover, green spaces, and soil conservation helps offset a portion of institutional emissions and supports climate mitigation efforts. The balance between emissions and sequestration reflects the overall carbon performance of the campus.

1.4 Scope of the Present Study

This report attempts to quantify carbon emissions arising from electricity consumption, fossil fuel use, transportation, residential activities, and other operational processes within the university campus. The analysis covers academic, non-academic, residential, and biodiversity-related activities to identify key emission sources contributing to the overall carbon footprint. Based on the findings, the report highlights the targeted measures taken by the University aiming at emission reduction, enhanced carbon sequestration, and transition towards a sustainable and low-carbon campus.

1.5 Objectives

- To quantify greenhouse gas emissions from major campus activities of Visva-Bharati (A Central University) under Scope 1, Scope 2, and Scope 3.
- To identify key sources contributing to the overall carbon footprint of Visva-Bharati.
- To assess the carbon sequestration potential of campus vegetation cover.
- To establish a baseline carbon inventory for future monitoring and planning.
- To recommend strategies for reducing emissions and enhancing campus sustainability by reducing carbon footprint.

2. ABOUT VISVA-BHARATI (A CENTRAL UNIVERSITY)

Plate 1: Picture of Santiniketan Griha, the Oldest Building (1863) in Visva-Bharati

2.1 Brief History

In 1863, Maharshi Debendranath Tagore took on permanent lease 20 acres (81,000 m^2) of land, with two chhatim (Alstonia scholaris) trees, at an annual payment of Rs. 5, from Bhuban Mohan Sinha, the talukdar in Raipur, Birbhum. He built a house there and named it Santiniketan (Plate 1). In 1901, Gurudev Rabindranath Tagore started a Brahmacharyashram, known as Patha Bhavana.

Visva-Bharati was founded by the first non-European Nobel Laureate, Rabindranath Tagore, in 1921. Visva-Bharati was declared to be a central university and an institution of national importance by an Act of Parliament in May 1951 (Act No. 29 of 1951). The President of India is the Paridarsaka (Visitor) of the University, the Governor of West Bengal is the Pradhana (Rector), and the Prime Minister of India acts as the Acharya (Chancellor). The President of India appoints the Upacharya (Vice-chancellor) of the University.

In May 1951, Visva-Bharati was declared to be a Central University and "An Institution of National Importance" by an Act of Parliament. It was granted the status of a unitary, teaching and residential university. The status and function of all the major institutions have been redefined in successive amendments.

Rabindranath Tagore established a school at Santiniketan in 1901, around which the structure of the university developed. The school, known as Patha-Bhavana from 1925, repudiated British systems, holding classes in the open air under trees for a harmonious man-nature relationship.

2.2 Geography and Campus Environment

The University is situated in Santiniketan Taluk, Birbhum district, West Bengal (23°40′44″N 87°40′25″E). The locality comes under the midland region of West Bengal, which has the geographical features of undulated land areas tapering into paddy fields. The raised part of the region provides conducive conditions for the growth of tropical evergreen and deciduous varieties of fruit-yielding and other trees.

From the beginning, Tagore wanted his students to be aware of their environment, be in communication with it, probe it, make experiments and collect data and specimens. And to guide them, he wanted teachers who could go beyond book-learning. In this context, one might mention Tejes Chandra Sen, who, along with Jagadananda Roy, was one of the pioneering teachers of Nature Study in India. They were able to instill in children a love for and curiosity about the natural world. Teaching activities are conducted in shaded green spaces of the campus (Plate 2), highlighting the role of tree cover in creating a low-carbon, environmentally supportive learning environment.

Santiniketan today is a veritable botanist's paradise. Plants, trees, creepers, and orchids from various parts of India and "abroad have been made to flourish in this once semi-desert. Tagore himself took a deep interest in planting trees. He introduced the Vriksharopana, or tree-planting ceremony, in 1928, popularizing the concept. His son, Rathindranath, was a horticulturist by training and introduced several new trees and plants into Santiniketan. The Santiniketan community in general shares this interest in trees and gardening. The campus

has many tree-lined pathways with potted plants along the road (Plate 3), illustrating green cover that aids in microclimate regulation, air purification, and carbon absorption. The seasons are clearly marked in Santiniketan; one knows the end of one season and the beginning of the other with the sights and smells of blossoms in bloom.

Plate 2: Teaching activities conducted in shaded green spaces of the campus.

Plate 3: Tree-lined pathway with potted plants along the campus road

2.3 Educational Structure

The University offers 283 Programmes, 3740 Courses across 60 Departments and 2 Schools. Education from Kindergarten to M.Phil. and Ph.D. It has 8 Bhavanas: Bhasha Bhavana (16 departments & centres), Vidya Bhavana (9), Kala Bhavana (5), Sangit Bhavana (2), Siksha Bhavana (11), Vinaya Bhavana (3), Palli Siksha Bhavana (12), Palli Samgathan Vibhaga (4). Besides, there are two schools (Patha Bhavana and Siksha Satra) and one hospital (Pearson Memorial Hospital). The University has almost 10700 students on its rolls in various

programmes, with girls forming almost 55%. There are 470 teaching staff in the aided stream in various disciplines. More than 50% of the members of different faculties are women. There are about 584 non-academic, administrative staff members and other supporting staff who work in the university office and different departments.

2.4 Core Values, Mission, and Vision

The core values of Visva-Bharati encompass excellence, accountability and transparency, holistic human development, mutual cultural interface, eco-centric education, and social responsibility/reform. Visva-Bharati envisions a creative space where knowledge is viewed through the frames of poetry, language, art, and music, supporting inclusive social development and the harmonious growth of society and mankind in line with Tagore's ideals. Its mission is to study the mind of man across diverse truths; unite Eastern cultures through research; approach the West from Asia's unified standpoint; foster East-West fellowship for world peace via free idea exchange; establish a cultural centre for studying religions, literature, history, science, and arts of Hindu, Buddhist, Jain, Islamic, Sikh, Christian, and Western civilizations in simplicity and cooperation; win villagers' friendship by addressing their welfare and problems; and initiate dialogue between academic rural economy/culture research and on-field experience.

2.5 Vision 2030 Roadmap

Focus areas include a global centre for language, performing and liberal arts; academic and research excellence; human resource development and social responsibility; e-governance and quality assurance; and infrastructure development with resource mobilization. By 2030, Visva-Bharati commits to becoming a global melting point of art, learning, and culture, escalating knowledge systems, integrating cultures toward "Yatra Visvam Bhavatyekanidam" (where the world makes a home in a single nest), and serving stakeholders through programmes in culture, history, religion, and languages. As Tagore's Ashrama Sangeet states: “She is our own, the darling of our hearts, Santiniketan. In the shadows of her trees, we meet in the freedom of her open sky. Our dreams are rocked in her arms.”

2.6 Visva-Bharati Campus and Infrastructure

The campus is spread across several interconnected zones, each dedicated to specific disciplines, cultural activities, and student life. Institutes and centres focus on language, arts, sciences, rural reconstruction, agriculture and music, while facilities and hostels support a vibrant residential community (Plate 4, Table 1). Together, these units create an integrated space where learning, research, culture, and everyday living coexist in close harmony.

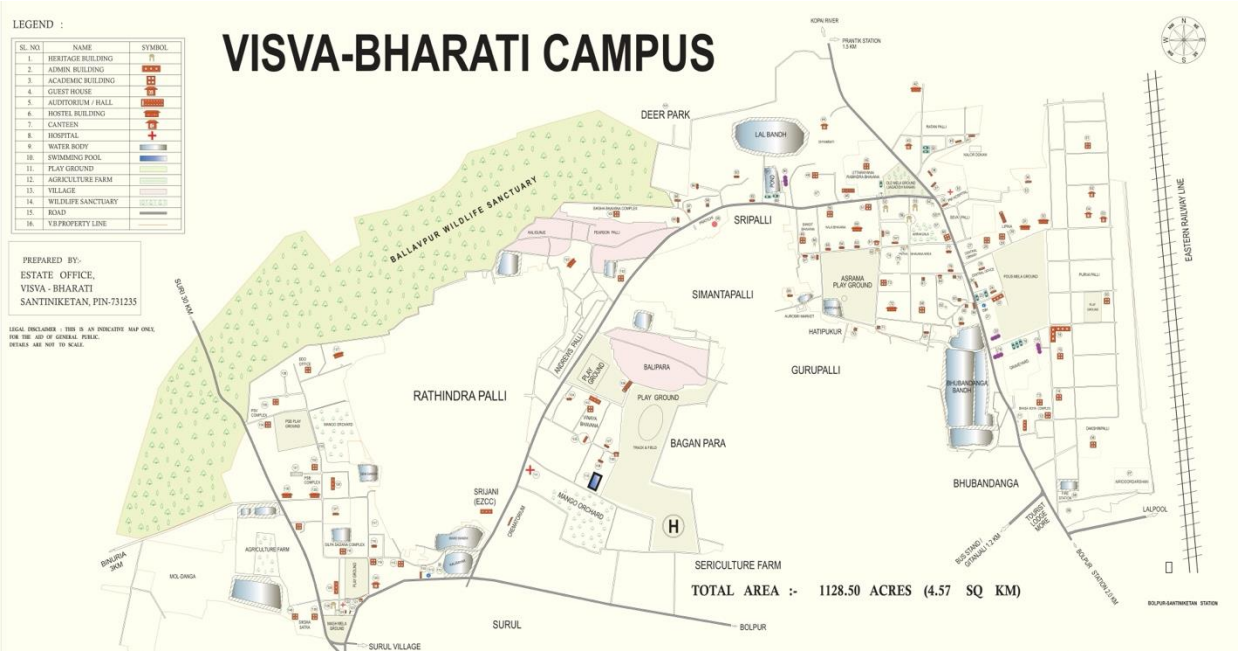

Plate 4: Map of Visva-Bharati campus

Table 1: Campus building and departments

Institutes	
1	Bhasha Bhavana
2	Vidya Bhavana
3	Siksha Bhavana
4	Kala Bhavana
5	Sangit Bhavana

6	Vinaya Bhavana
7	Palli Samgathana Vibhaga
8	Palli-Siksha Bhavana
9	Patha Bhavana
10	Siksha-Satra
11	Rabindra Bhavana
12	Granthana Vibhaga (Kolkata)
Centres	
1	Centre for Buddhist Studies
2	Centre For Endangered Language (CFEL)
3	A K D Centre for Planning & Development
4	Indira Gandhi Centre
5	Computer Centre
6	Centre for Journalism and Mass Communication
7	Siksha-Charcha
8	Agro-Economic Research Centre
9	Rathindra Krishi Vigyan Kendra
Facilities	
1	Central Administrative office
2	Central library
3	Auditorium
4	Proctor's office
5	Guest house
6	Museums

7	Swimming pool
8	Hospital
9	Ashram
10	Sports complex
Hostels	
1	Elmhirst Boys' Hostel
2	CIT Boys' Hostel
3	Social Work PG Boys' Hostel
4	Social Work UG Boys' Hostel
5	International Boys' Hostel
6	Purbapally Sr' Boys' Hostel
7	Pearson Pally Boys' Hostel (Ph.D)
8	Sripally Boys' Hostel
9	PSB Middle Boys' Hostel
10	PSB Eastern Boys' Hostel
11	Rathindra PG Boys' Hostel
12	Kala-bhavana Boys' Hostel
13	Santishree Boys' Hostel
14	Vinay Bhavana Boys' Hostel
15	Kala Sangit Boys' Hostel
16	Tan Boys' Hostel
17	Nichubunglow Boys' Hostel
18	Birlalaya Girls' Hostel (Ph.D)
19	Goenka Girls' Hostel

20	Ananda Sadana Girls' Hostel
21	Maitree Girls' Hostel
22	Khoai Girls' Hostel
23	Sreesadana Girls' Hostel
24	Vinay Bhavana Girls' Hostel
25	Sreeniketana Girls' Hostel
26	Pratima Girls' Hostel
27	Amrapali Girls' Hostel

3. THE CARBON FOOTPRINT OF VISVA-BHARATI

Greenhouse gases (GHGs) such as carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), and fluorinated gases absorb and retain atmospheric heat, intensifying global warming and climate change. These emissions primarily arise from anthropogenic sources including fossil fuel combustion for energy, vehicular transportation, industrial processes, and agricultural practices.

The **Greenhouse Gas Protocol (2011)**, developed through a partnership between the World Resources Institute (WRI) and the World Business Council for Sustainable Development (WBCSD), offers a standardized framework for organizations to measure and manage emissions.

This protocol categorizes emissions into three scopes:

- Scope 1: Direct emissions from owned or controlled sources.
- Scope 2: Indirect emissions from the generation of purchased electricity consumed by the organization.
- Scope 3: Indirect emissions from all other activities in the value chain, such as transportation, waste, and the production of purchased goods and services.

These scopes enable global organizations to quantify their carbon footprints, establish reduction targets, and enhance transparency and accountability in climate action.

Carbon dioxide equivalent (CO_2e) is a standard unit of measurement used to express the impact of different greenhouse gases (GHGs) in terms of the amount of carbon dioxide (CO_2) that would have the same global warming potential (GWP) over a specified time period (usually 100 years). It allows for the comparison of emissions from various gases, such as methane (CH_4), nitrous oxide (N_2O), and fluorinated gases, by converting them into an equivalent amount of CO_2e based on their respective GWPs.

The emission factor used in this study is taken from the IPCC (2006) standard emission coefficients, India GHG Program (2015) & IIM Kozhikode Carbon footprint Assessment Report (2025).

3.1 Operational Boundary:

Scope 1: Direct GHG emissions from:

- Captive power generation activities, including the combustion of fossil fuels in stationary sources of electricity generators, and LPG consumption in canteens and kitchens.
- Combustion of fuels in mobile sources- Visva-Bharati-owned & controlled vehicles and the fuel used for the horticulture activities.

Scope 2 : Indirect emissions from:

- Purchased electricity, including renewable and non-renewable power.

Scope 3: Other Indirect GHG emissions from:

- Commuting of teaching staff, non-teaching staff, students, and others on the campus.
- Material procurement, consumption and disposal.
- Waste management and disposal.
- Upstream and downstream activities.

3.2 Scope 1 GHG Emissions

Under the **GHG Protocol (2011),** Scope 1 emissions refer to direct greenhouse gas emissions that occur from sources owned or controlled by an organization, such as fuel combustion in organization's vehicles or facilities. These emissions are produced by activities under the direct operational control of Visva-Bharati.

Stationary Combustion

The Greenhouse Gas (GHG) Protocol defines stationary combustion as the burning of fuels in stationary equipment or devices that do not move. Under the GHG Protocol, emissions from stationary combustion are categorized as Scope 1 emissions, since they are direct emissions from owned or controlled sources. To calculate these emissions, the protocol recommends using fuel consumption data and applying the appropriate emission factors for each type of fuel consumed.

The campus has a total of four diesel generator (DG) sets (Kala Bhavana, Rabindra Bhavana, Central library & Administrative office) installed for backup power supply (Plate 5). During the data collection period, operational and fuel consumption data were available for three generator stations. One generator had been newly installed in the administrative office building and was not yet in regular operation. Hence, carbon emission calculations from DG usage in this report are based on data obtained from the three functional generators only (Table 2), assuming 10 operational hours in a month with 14 litres/hour diesel consumption for 10 months (vacation period of about 2 months) as informed by the operator. Emissions from the newly installed generator were not included in the present estimation due to the absence of operational data, but may be incorporated in future assessments once sufficient usage records are available.

Plate 5: Diesel generators in the campus

Table 2: Stationary emission data

Activity	Source	Consumption	Emission factor	Unit of emission factor	Equivalent CO_2 emission (Kg)	Equivalent CO_2 emission (Tonne)
Stationary combustion	Diesel	4200 Litre	2.68	Kg/Litre	11,256	11.25
	LPG	99,750 Kg	2.9	Kg/Kg	2,89,275	289.27
TOTAL						**300.52**

LPG is used in 28 kitchens/canteens, serving a total of 2850 students residing in 27 hostels.

A sample-based approach was used to estimate LPG consumption in hostel kitchens. Data on monthly LPG use and the number of boarders were collected from one representative hostel kitchen. Per capita LPG consumption was calculated by dividing total consumption by the number of students served. This per-student value was then extrapolated to all hostels using the total number of boarders across the campus (Table 3). Annual LPG consumption was estimated by multiplying the total monthly consumption by the number of operational months in a year. The final estimated value represents total stationary fuel use from hostel kitchens and is used to calculate emissions using standard LPG emission factors. Table 3 shows the fuel consumption details and their emissions for the financial year 2024-25.

Table 3: Stationary emissions source details from kitchens/canteens

Sl. No.	Description	Value
1	Sampled Kitchen	PSB Kitchen
2	Number of boarders in sample kitchen	160
3	LPG consumption	560 kg/ month
4	LPG consumption /student	3.5kg/student/month
5	Total number of hostels	27
6	Total number of boarders	2850
7	Estimated total LPG consumption (all hostels)	9975 kg/month
8	Number of operational months per year	10 months
9	**Estimated annual LPG consumption (all hostels)**	**99,750 kg/year**

Mobile Combustion

The GHG Protocol defines mobile combustion as the burning of fuel in mobile sources that are owned or controlled by an organization. The mobile sources on the campus include vehicles (Plate 6). The university has 2 buses and 3 ambulances.

The mobile emission is calculated in Table 4, obtaining data from the Transport section of the University.

Plate 6: Bus of Visva-Bharati

4: Mobile emission data from owned vehicles

Activity	Sources	Consumption (Litre)	Emission factor	Unit of emission factor	Equivalent CO_2 emission (Kg)	Equivalent CO_2 emission (Tonne)
Owned vehicle	Diesel	9223.94	2.68	Kg/Litre	24720	24.72
	Petrol	1435.02	2.31	Kg/Litre	3315	3.31
TOTAL						**28.03**

Summary Scope 1 Emissions

For the year 2024-25, total scope-1 CO_2 equivalent emissions were 328.02 tonnes of CO_2e (Table 5). The major share is from stationary combustion, which accounts for 91.46% of total scope 1 emissions with 300.52 tonnes of CO_2e emissions (Fig. 1).

Table 5: Summary Scope 1 Emissions (FY 2024-25)

Classification	Activity	Equivalent CO_2 emissions (Tonne)
Scope 1	Stationary combustion	300.52
	Mobile combustion	28.03
Total equivalent CO_2 emission		**328.55**

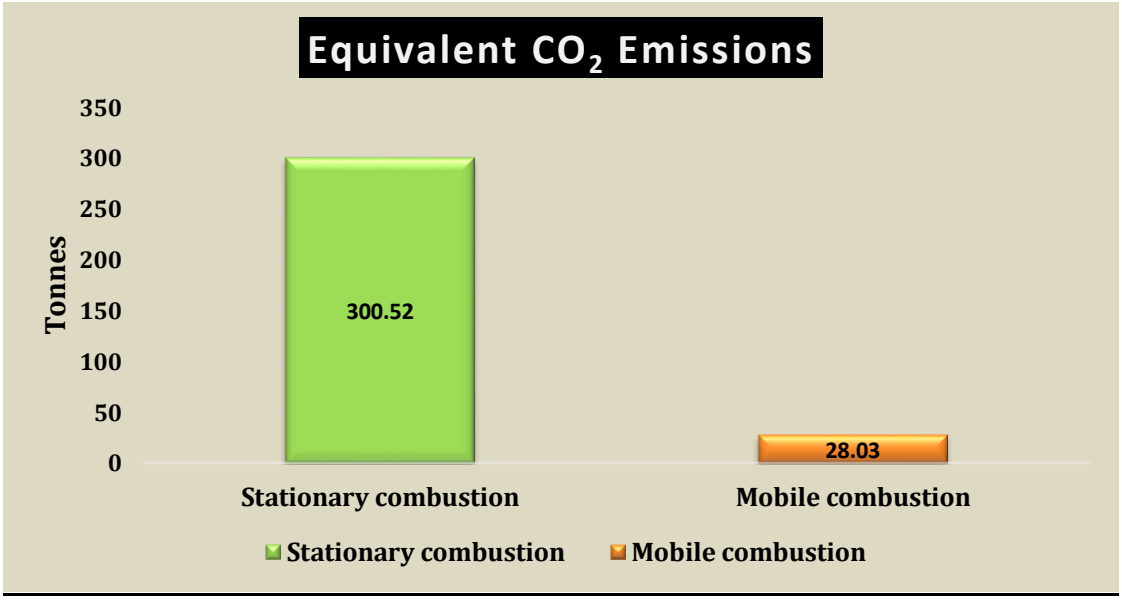

Fig. 1: Summary Scope 1 Emissions

3.3 Scope 2 GHG Emissions

Under the **GHG Protocol (2011)**, Scope 2 GHG emissions refer to indirect emissions from the consumption of purchased electricity, steam, heating, and cooling. These emissions occur at the power generation source, but the organization is responsible for them due to its demand for the energy.

The electricity is purchased from West Bengal State Electricity Distribution Company Limited (WBSEDCL).

Data on electricity consumption were collected from institutional electricity bills and meter records maintained by the Engineering section of the University for the reporting year. The total consumption was compiled by categorizing usage into major sectors such as residential facilities, academic buildings, and other service units (street lights).

The electricity consumption details and the CO_2 emission for the financial year 2024-25 are tabulated below (Table 6 & Table 7):

Table 6: Annual electricity consumption at Visva-Bharati (FY 2024-25)

Sl. No.	Category	Consumption (kWh)
1	Residential	26344
2	Academic	3953011
3	Others	218310
Total		**4197665**

Table 7: Scope 2 Emissions (Electrical) FY 2024-25

Activity	Fuel type	Consumption (kWh)	Emission factor	Unit of emission factor	Equivalent CO_2 emission (Kg)	Equivalent CO_2 emission (Tonne)
Purchased Energy	Electricity	4197665	0.82	Kg/kWh	3442085.3	**3442.09**

3.4 Scope 3 GHG Emissions

Under the **GHG Protocol (2011)**, Scope 3 GHG emissions refer to indirect emissions that occur in the value chain of an organization, both upstream and downstream. These emissions can result from activities such as purchased goods and services, capital goods, business travels, employee commute, waste disposal, etc. Unlike Scope 1 and Scope 2 emissions, Scope 3 emissions are not directly controlled by the organization, making them more challenging to measure and manage.

Emission through students and employee commute

A baseline assessment of commuting-related emissions was conducted in 2022. The present estimates have been derived by applying a uniform 10% increase across all commuting categories, assuming growth in campus population and vehicle usage. An average of 20 km per day is taken for each vehicle. Emission factors were adopted from IPCC (2006) Guidelines for National Greenhouse Gas Inventories for fuel-based calculations and India GHG Program (2015) India-Specific Road Transport Emission Factors for distance-based vehicular emissions.

Plate 7: Vehicles used for commute in the campus

A significant proportion of students within the campus use cycles and electric rickshaws (locally known as “toto”) for daily commuting. As these vehicles do not involve on-site combustion of fossil fuels, they do not produce direct tailpipe emissions, thereby contributing to reduced carbon emissions and improved local air quality within the campus. This transition towards cleaner modes of transport can be considered a positive step toward sustainable campus mobility and lowering the overall carbon footprint. The rest of the students and employees use 2-wheelers and 4-wheelers for commuting (Plate 7).

The emissions from student and employee commutes are tabulated below (Table 8).

Table 8: Emission through students and employee commute

Vehicle type	Number Of Vehicles	Km/ day	Km/month (30 days) (average 20km/day)	Km/year (10 operational months)	Emission Factor ($KgCO_2e$/ Km)	Equivalent CO_2 emission (Kg)	Equivalent CO_2 emission (tonne)
2-wheelers	550	20	330000	3300000	0.035	1,15,500	115.5
4-wheelers	220	20	132000	1320000	0.13	171600	171.6
Avg. no. of Tourist Buses	5	10	1500	15000	0.82	12300	12.3
Total						**299400**	**299.4**

Emission through Purchased Electricity Transmission & Distribution (T&D) loss

The facility purchases electricity from the state grid. It is reported that there is transmission and distribution loss of 18.03% from the generation side to the user end as per the West Bengal State Electricity Distribution Company Limited (WBSEDCL) report FY 2024-25.

Emission through Waste Water

Water consumption data were compiled from institutional records and classified into cleaning, bathing, and canteen and kitchen uses. The total consumption was derived by aggregating sector-wise usage to assess overall water demand on campus (Table 9)

Table 9: Sources of wastewater

Purpose	Quantity (Kilo litre)
Cleaning, bathing, etc	40500
Canteen & Kitchen use	6750
Total usage	**47250**

Emission through Food Waste

Food waste generation was estimated based on primary data collected from a sampled hostel kitchen serving 160 boarders. The per capita waste generation derived from the sample was multiplied by the total hostel population of 2,850 students across 27 hostels. Monthly estimates assume 30 days of operation, while annual estimates consider 10 operational months by excluding 2 months for summer, winter and puja vacation (Table 10).

Table 10: Emission through food waste

Parameter	Value	Remarks
Number of boarders in sampled kitchen (PSB)	160 students	Primary survey
Total food waste generated (sampled kitchen)	50 kg/day	Measured value
Average food waste per student	0.3125 kg/student/day	50 ÷ 160
Total hostel residents (27 hostels)	2,850 students	University records
Estimated total food waste generation	890.6 kg/day	0.3125 × 2,850
Estimated food waste per month	26,718 kg/month	Assuming 30 days
Estimated food waste per year (10 operational months; vacation period 2 months not considered)	**267,180 kg/year**	Excluding 2 months of summer, winter and puja vacation

Emission through Food Consumption

As part of the carbon assessment conducted at Visva-Bharati, we analyzed the food consumption patterns and their associated carbon emissions over a one-year period. The data covered a wide range of food products, including groceries, vegetables, fruits, non-vegetarian items, bakery products, dairy, and other consumables.

Food consumption was estimated using a sample-based approach from a representative hostel kitchen. Primary data on total monthly food consumption and the number of boarders served were collected through surveys and kitchen records. The average per capita food consumption was calculated by dividing the total food used in the sampled kitchen by the number of students it serves.

This per-student consumption value was then extrapolated to the entire hostel population using the total number of resident students across all hostels, as obtained from university

records. Monthly estimates were derived based on regular kitchen operations, and annual consumption was calculated by considering 10 operational months, excluding vacation periods such as summer, winter, and puja breaks (Table 11).

11: Emission through food consumption

Parameter	Value	Remarks
Number of boarders in sampled kitchen	160 students	Primary survey
Total food consumption (sampled kitchen)	3965 kg/month	Measured value
Average food consumption per student	24.78 kg/student/month	3965 ÷ 160
Total hostel residents (27 hostels)	2,850 students	University records
Estimated total food consumption	70623 kg/month	24.78 × 2,850
Estimated food consumption per year (10 operational months)	**706230 kg/year**	Excluding 2 months of summer, winter and puja vacation

Summary Scope 3 Emissions

The Scope 3 emissions assessment includes major indirect emission sources associated with university activities such as commuting, electricity transmission and distribution (T&D) losses, food consumption, and waste management. Among these, food consumption (70%) emerged as the largest contributor to emissions, followed by electricity T & D losses (15.61%), commute (7.53%) and food waste (4.70%) and wastewater generation (2.15%), (Table 12 & Fig. 2).

Emissions from daily commuting and food waste disposal also added a notable share to the total. When combined, these activities resulted in a substantial amount of indirect carbon emissions, indicating that value-chain-related operations and consumption patterns significantly influence the institution's overall carbon footprint.

Table 12: Summary Scope 3 Emissions (FY 2024-25)

Activity	Particulars	Quantity	Unit	Emission factor	Unit	Equivalent CO_2 emission (Kg)	Equivalent CO_2 emission (Tonne)
Commute						299400	299.4
Purchased electricity	Electricity T & D loss	756839	kWh	0.82	$KgCO_2e$ /kWh	620608	620.6
Food consumption	----	706230	kg	3.94	$KgCO_2e$ /kg	2782546	2782.5
Waste management	Food waste	2,67,180	kg	0.7	$KgCO_2e$ /kg	187026	187
	Waste water	47250	kl	1.81	$KgCO_2e$ /kl	85523	85.5
Total							**3975**

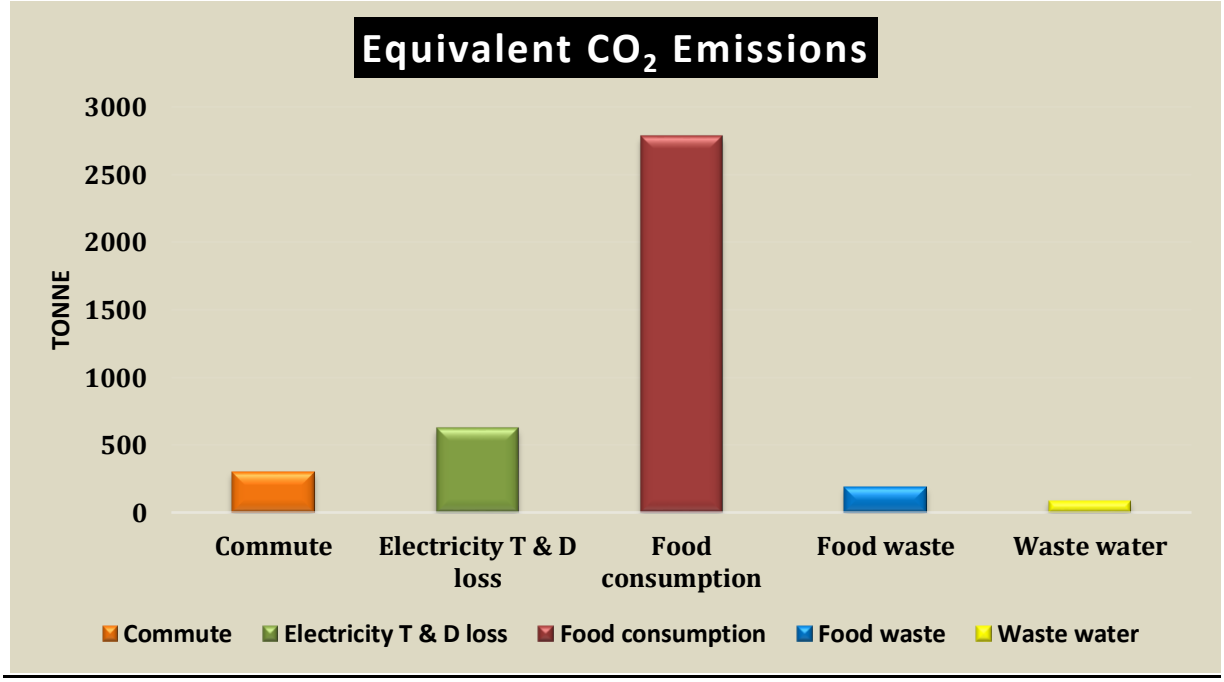

Fig. 2: Summary Scope 3 Emission

3.5 Summary Scope 1, Scope 2 and Scope 3 Emissions

The total carbon footprint of Visva-Bharati was estimated at **7745.64** tonnes of CO_2 equivalent (Table 13). Among the three emission scopes, Scope 3 contributed the largest share, accounting for 51.32% of the total emissions (Fig. 3). This indicates that indirect emissions from activities such as food consumption, commuting, waste generation, and other value-chain processes form the most significant part of the institution's carbon footprint. Scope 2 emissions, mainly from purchased electricity use, constituted 44.44% of the total, making it the second-largest contributor. In comparison, Scope 1 emissions from direct sources such as fuel use and generators accounted for only 4.24% of the total emissions. Overall, the results highlight that indirect emissions, particularly those linked to consumption patterns and electricity use, dominate the university's overall greenhouse gas profile.

Table 13: Summary Scope 1, Scope 2 and Scope 3 Emissions

Classification	Equivalent CO_2 emission (Tonne)	Percentage share (%)
Scope 1	328.55	4.24
Scope 2	3442.09	44.44
Scope 3	3975	51.32
Total CO2e Emissions	**7745.64**	

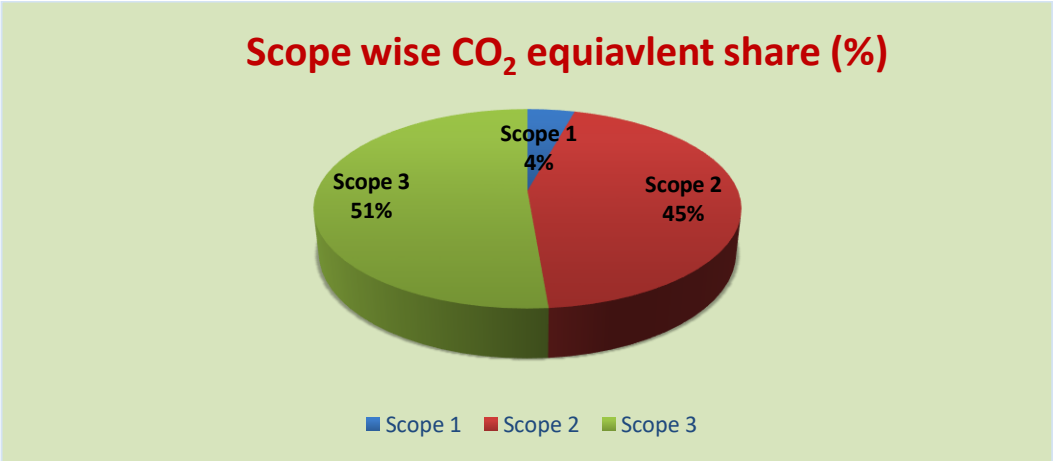

Fig. 3: Summary Scope 1, Scope 2 and Scope 3 Emissions

4. Carbon Sequestration in Visva-Bharati

After estimating the total carbon footprint of the campus, the next important step is to assess the carbon sequestration potential, which represents the capacity of the campus ecosystem to absorb and store carbon dioxide from the atmosphere. Carbon sequestration plays a crucial role in balancing greenhouse gas emissions by capturing carbon through natural sinks such as trees, shrubs, grasslands, and soil. In a university setting with substantial green cover, vegetation acts as a significant carbon sink and contributes to climate change mitigation by reducing the net carbon load. Estimating carbon sequestration helps in understanding how much of the emitted carbon can be offset through existing green assets within the campus. This assessment provides a more comprehensive picture of the institution's carbon balance by comparing total emissions with the carbon absorbed annually. It also highlights the ecological value of campus plantations, biodiversity, and green spaces, and supports informed decision-making for future plantation drives and sustainable landscape management.

Carbon sequestration refers to the process by which trees absorb carbon dioxide (CO_2) from the atmosphere during photosynthesis and store it in their biomass and surrounding soil (Fig. 4). The absorbed carbon is retained in different components of the tree, including trunks, branches, leaves, and roots, and is further transferred to the soil through litter fall and organic matter decomposition. This natural process plays an important role in offsetting greenhouse gas emissions and improving environmental sustainability.

Carbon sequestration rates in plantations vary significantly based on tree species, climate, soil conditions, and forest management practices.

4.1 Types of Carbon Stored in Trees

Carbon captured by trees is stored in the following forms:

Aboveground biomass: Trunk, branches, leaves, and fruits

Belowground biomass: Roots

Soil carbon: Carbon stored in soil through leaf litter and root decay

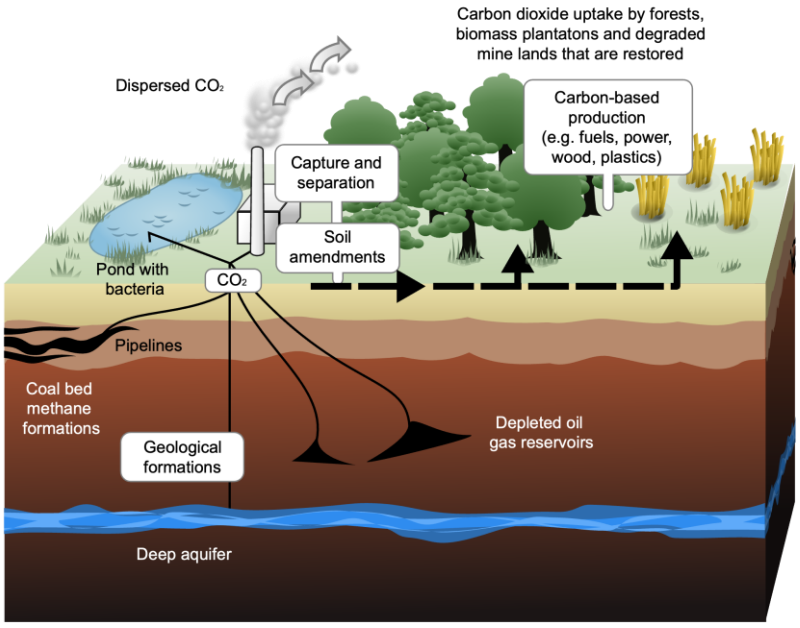

Fig. 4: Carbon Sequestration Process

Table 14 shows the general estimates for carbon sequestration per hectare per year for various plantation types:

Table 14: Average carbon sequestration based on plantation

Type of Plantation	Average Carbon Sequestration (tCO_2/ha/year)
Agroforestry Systems	1–4tCO_2/ha/year
Tropical Forest	5–10tCO_2/ha/year
Temperate Forest	2–5tCO_2/ha/year
Boreal Forest	1–3tCO_2/ha/year
Mangroves	4–6tCO_2/ha/year
Reforestation Projects	2–8tCO_2/ha/year (depends on tree species)

4.2 Methodology Adopted for Carbon Sequestration

The estimation of carbon sequestration for Visva-Bharati was carried out by adopting an area-based approach similar to the methodology used in the carbon assessment study of the Indian Institute of Management (IIM) Kozhikode. In that study, carbon sequestration was estimated using generalized sequestration rates for tropical plantations due to the presence of diverse tree species and the absence of species-wise biometric measurements such as diameter at breast height (DBH), tree height, and age.

According to the IIM Kozhikode methodology, carbon sequestration rates in plantations vary depending on species composition, climate, soil conditions, and management practices. For tropical forests and mixed plantations, the general sequestration range is reported to be about 5–10tCO_2 per hectare per year. Based on this range and the presence of mixed tree species such as teak, bamboo, sandalwood, and other hardwood varieties, the IIM study adopted an average sequestration factor of 7 tonne CO_2/ha/year as a representative value.

Visva-Bharati also has a large and diverse vegetation cover consisting of tropical and subtropical tree species such as Sal, Neem, Teak, Arjun, Ficus, Acacia, Cassia, Eucalyptus, and several ornamental and native species. As species-wise growth data were not available for individual trees, a similar area-based estimation approach was considered appropriate.

Therefore, following the methodology adopted in the IIM Kozhikode carbon audit, a moderate average sequestration factor of 7 tonne CO_2 per hectare per year was used for estimating carbon sequestration across the campus. This value falls within the standard range for tropical mixed plantations and provides a conservative and scientifically acceptable estimate.

The total annual carbon sequestration potential of the university was calculated by multiplying the total plantation area of the campus by the adopted average sequestration rate (Table 16).

Table 15: Area of campus

Common Area	Area in Acre
Total land area of the University campus	1128.895 acres
Academic buildings	14.27 acres
Residential buildings	5.54 acres

Administrative buildings	1.3 acres
Common facilities buildings	3.37 acres
Hostel buildings	14.45 acres
Agricultural area	117.5 acres
Health Centre	0.6 acre
Pond area	49.97 acres
Other facility	3.53 acres
Plantation area	918.365 acres

Table 16: Estimated total carbon sequestration

Total area (acres)	Total area (hectares)	Emission factor (tCO_2/ha/year)	Total Carbon sequestration (tCO_2/ha/year)
918.365	371.649	7	2601.54

Table 16 presents the estimated total carbon sequestration potential of Visva-Bharati based on the total plantation area available within the campus. The overall green cover was converted from acres to hectares and multiplied by an average sequestration factor of 7 tonne CO_2 per hectare per year, adopted from established tropical plantation estimates and the methodology used in similar institutional carbon assessments.

Based on this approach, the campus plantation area of 371.649 hectares is estimated to sequester approximately 2601.54 tonnes of CO_2 annually. This indicates that the extensive tree cover of the university functions as a significant natural carbon sink, contributing substantially to offsetting a portion of the total greenhouse gas emissions generated from institutional activities.

4.3 Vegetation Coverage

Visva-Bharati is situated in a peri-urban area where farming and agriculture are still being practiced in and around the campus. The campus biodiversity (Table-17, 18) is an example of how they have imbibed the local practices and culture in preserving local biodiversity within the campus. The University management and authorities, who are responsible for greening the campus, are aptly adopting methods to preserve local flora and fauna. The botanical garden and different concept-based gardens (spice garden, star plants garden, medicinal plants garden, Dasapushpam garden, ayurvedic preparation-based plants (eg. Nalpamara, Thriphala, etc.) are ideal for academic practices and learning while practicing.

Table 17: List of trees of Visva-Bharati

Sl. No.	Common Name in English	Local Name in Bengali	Botanical Name	Family
1.			*Thuja orientalis* Syn. *Platycladus oriental*	Cupressaceae
2.	African tulip	Rudrapalash	*Spathodea campanulata*	Bignoniaceae
3.	Ailanthus/Tree of heaven	Ailanthus	*Ailanthus excelsa*	Simaroubacea e
4.	Akashmoni	Sonajhuri	*Acacia auriculiformis*	Fabaceae
5.	Arjuna	Arjun	*Terminalia arjuna*	Myrtaceae
6.	Ashoka tree	Ashok	*Sarca asoca*	Fabaceae
7.	Aswattho	Pipal tree	*Ficus religiosa*	Moraceae
8.	Banyan	Bot	*Ficus bengalensis*	Moraceae
9.	Banyan	Krishna Bot	*Ficus bengalensis* var *Krishnae*	Moraceae
10.	Black Babool	Babla	*Vachellia nilotica* Syn. *Mimosa arabica, Acacia arabica*	Fabaceae
11.	Blue gulmohor	Neel kontho	*Jacaranda mimosifolia*	Bignoniaceae
12.	Bottle brush	Botol brush	*Melaleuca citrine* Syn. *Callistemon lanceolatus*	Myrtaceae
13.	Brownea/ Scarlet flame bean	Pakhi Phool	*Brownea ariza*	Fabaceae
14.	Bull bay	Magnolia	*Magnolia grandiflora*	Magnoliaceae
15.	Casuarina/ Australian oak	Jhau	*Casuarina equisetifolia*	Casuarinaceae

16.	Champak	Swarna champa	*Magnolia champaka* Syn. *Michelia champaca*	Magnoliaceae
17.	Child life tree	Putrabjiva/ jiosuta	*Putranjiva roxburghii*	Euphorbiaceae
18.	Chinese juniper	Jhau	*Juniperus chinensis*	Cupressaceae
19.	Christmas tree Monkey puzzle tree	Xmass	*Araucaria columnaris* Syn. *Araucaria cookii*	Araucariaceae
20.	Coffee	Coffee	*Coffea arabica*	Rubiaceae
21.	Cycas	Cycas	*Cycas circinalis*	Cycadaceae
22.	Cycas	Cycas	*Cycas revoluta*	Cycadaceae
23.	Davil's tree	Chhatim	*Alstonia scholaris*	Apocynaceae
24.	Eucalyptus	Eucalyptus	*Eucalyptus citriodora*	Myrtaceae
25.	Eucalyptus	Eucalyptus	*Eucalyptus maculate*	Myrtaceae
26.	Flame of forest	Palash	*Butea monosperma* Syn *B. Frondosa*	Fabaceae
27.	Gold mohor/ Radhachura	Radhachura	*Peltophorum pterocarpum*	Fabaceae
28.	Golden Shower	Amaltash	*Cassia fistula*	Fabaceae
29.	Bronze shower		*Cassia moschata*	Fabaceae
30.	Burmese Pink Cassia		*Cassia renigera*	Fabaceae
31.			*Cassia nodosa*	Fabaceae
32.			*Cassia marksiana*	Fabaceae
33.			*Cassia bakeriana*	Fabaceae
34.			*Cassia javanica*	Fabaceae
35.			*Cassia grandis*	Fabaceae
36.			*Cassia leptophylla*	Fabaceae
37.			*Cassia feruginea*	Fabaceae
38.			*Cassia hybrida*	Fabaceae
39.			*Cassia lancasteri*	Fabaceae
40.	Gulmohor	Gulmohor	*Delonix regia*	Fabaceae
41.	Indian beech tree		*Millettia pinnata* Syn. *Pongamia pinnata*	Fabaceae
42.	Indian boxwood	Jojongondha	*Gardenia latifolia*	Rubiaceae
43.	Indian coral tree	Lal Parijat	*Erythrina variegate*	Fabaceae
44.	Indian Cork tree	Himjhuri	*Millingtonia hortensis*	Bigniniaceae
45.	Indian fir	Debdaru	*Polyalthia longifolia*	Annonaceae
46.	Indian fir (drooping)	Pendulam debdaru	*Polyalthia longifolia 'Pendulata'*	Annonaceae
47.	Indian lilac	Ghora Neem	*Melia azedarach*	Meliaceae

48.	Kadamba	Kadam	*Neolamarckia cadamba* Syn. *Anthocephalus chinsis*	Rubiaceae
49.	Kassode tree	Minjiri	*Senna siamea* Syn. *Casia siamea*	Fabaceae
50.	Lucky nut	Kolke	*Cascabela thevetia* Syn. *Thevetia peruviana*	Apocynaceae
51.	Madras thorn	Jilipi	*Pithecellobium dulce* Syn. *Inga dulsis*	Fabaceae
52.	Majestic heaven lotus	Dadra	*Gostavia augusta*	Lecythidaceae
53.	Malabar Chestnut		*Pachira cyathophora*	Malvaceae
54.	Maple twist	Muchkunda	*Pterospermum acerifolium*	Malvaceae
55.	Medlar (variegated)	Holud bakul	*Mimusops elengi Variegata'*	Sapotaceae
56.	Medlar tree	Bakul	*Mimusops elengi*	Sapotaceae
57.	Mehogini (Large leave)	Mehogini	*Swietenia macrophylla*	Meliaceae
58.	Mehogini (West Indian)	Mehogini	*Swietenia mahagoni*	Meliaceae
59.	Mexican lilac		*Gliricida sepium* (Syn. *G. maculata)*	Fabaceae
60.	Neem	Neem	*Azadiracta indica*	Fabaceae
61.	Orchid tree	Kanchan	*Bauhinia purpurea*	Fabaceae
62.	Orchid tree	Kanchan	*Bauhinia variegata*	Apocynaceae
63.	Pagoda tree	Gulancha	*Plumeria alba*	Apocynaceae
64.	Pagoda tree	Gulancha	*Plumeria obtuse*	Apocynaceae
65.	Pagoda tree	Gulancha	*Plumeria pudica*	Apocynaceae
66.	Pagoda tree	Gulancha	*Plumeria rubra*	Apocynaceae
67.	Pride of India	Deshi Jarul	*Lagerstroemia speciosa*	Lythraceae
68.	Pride of India	Biliti Jarul	*Lagerstroemia thorelli*	Lythraceae
69.	Rain tree/ monkey pod tree	Jolsiris	*Samanea saman*	Fabaceae
70.	Ravenala tree	Pathopadak	*Ravenala madagascariensis*	Strelitziaceae
71.	Red Sandal wood	Lan Chandan	*Pterocarpus santalinus*	Fabaceae
72.	Rubber tree	Rubber	*Ficus elastica*	Moraceae
73.	Sal	Sal	*Shorea robusta*	Dipterocarpaceae
74.	Sandal Wood	Chandan	*Santalum album*	Santalaceae
75.	Sausage tree		*Kigelia pinnata*	Bignoniaceae
76.	Silk Cotton tree	Shimul	*Bombax ceiba*	Malvaceae

77.	Siris	Siris	*Albiziz lebbek*	Fabaceae
78.	Sissoo	Sisu	*Dalbergia sissoo*	Fabaceae
79.	Tamarind	Tentul	*Tamarindus indica*	Fabaceae
80.	Teak	Segun	*Tectona grandis*	Lamiaceae
81.	Tellicherry	Kurchi	*Holarrhena antidysenterica*	Apocynaceae
82.	Torch tree	Bonpulak	*Ixora pavetta* Syn. *I. praviflora*	Rubiaceae
83.	Trumpet tree (Caribbean)	Basantika	*Tabebuia argentea* Syn. *T. aurea*	Bignoniaceae
84.	Trumpet tree (Golden)	Basantika	*Handroanthus chrysotrichus* Syn. *Tabebuia chrysotricha,*	Bignoniaceae
85.	Trumpet tree (Pink)	Golapi basantika	*Tabebuia rosea*	Bignoniaceae
86.	Trumpet tree (Violet)	Beguni basantika	*Tabebuia avellanedae*	Bignoniaceae
87.	Trumpet tree (White)	Sada basantika	*Tabebuia pallida*	Bignoniaceae
88.	Weeping fig		*Ficus benjamina*	Moraceae
89.	West Indian pea	Bokful	*Sesbania grandiflora*	Fabaceae
90.	White champak	Swyet champa	*Magnolia champaka 'Alba'* Syn. *Michelia champaca 'Alba'*	Magnoliaceae
91.	Woolly dyeing rosebay	*Dudhkoraiya*	*Wrightia arborea* Syn. *W. tomentosa*	Apocynaceae
92.	Yellow Silk Cotton	Holud Shimul	*Cochlospermum religiosum*	

Table 18: List of fruit trees/shrubs/climbers of Visva-Bharati

Sl. No.	Common Name in English	Local Name in Bengali	Botanical Name	Family
1.	Aonla/Indian gooseberry	Amloki	*Phyllanthus emblica*	Phyllanthaceae/ Euphorbiaceae
2.	Areca nut/Betel nut	Supuri	*Syn. Emblica officinalis*	Arecaceae/ Palmae
3.	Bael/Golden Apple	Bael	*Areca catechu*	Rutaceae
4.	Banana	Kola	*Aegle marmelos*	Musaceae
5.	Ber/Indian jujube	Kul	*Musa paradisiaca*	Rhamnaceae
6.	Bullock's heart	Nona ata	*Ziiphus mauritiana*	Annonaceae
7.	Carambola/ Star apple	kamranga	*Annona reticulata*	Oxalidaceae

8.	Cashew nut	Kajubadam	*Averrhoa carambola*	Anacardiaceae
9.	Chironji	Piyal	*Buchanania cochinchinensis*	Chironji
10.	Coconut	Narkel	*Cocos nucifera*	Arecaceae/ Palmae
11.	Custard apple/ Sugar apple	Ata	*Annona squamosa*	Annonaceae
12.	Date	Khejur	*Phoenix dactylifera*	Arecaceae/ Palmae
13.	Dillenia/Elephant Apple	Chalta	*Dillenia indica*	Dilleniaceae
14.	Fig	Dumur	*Ficus carica*	Moraceae
15.	Grapes	Angur	*Vitis vinifera*	Vitaceae
16.	Guava	Peyara	*Psidium guajava*	Myrtaceae
17.	Hog palm	Deshi amra	*Spondias pinnaata*	Anardiaceae
18.	Hogpalm	Biliti amra	*Spondias mombin*	Anardiaceae
19.	Indian Almond	Kathbadam	*Terminalia catappa*	Combretaceae
20.	Indian ebony	Kendu	*Diospyros melanoxylon*	Ebenaceae
21.	Indian oersimmon	Deshi gaab	*Diospyros malabarica*	Ebenaceae
22.	Jackfruit	Kanthal	*Artocarpus heterophyllus*	Moraceae
23.	Jamun	Jam	*Syzygium cumini*	Myrtaceae
24.	Karonda	Karancha	*Carissa carandas*	Apocynaceae
25.	Khirni	Khirkul	*Manilkara hexandra*	Sapotaceae
26.	Lemon	Gongharaj/ goralebu	*Citrus limon*	Rutaceae
27.	Lime	Patilebu	*Citrus aurantifolia*	Rutaceae
28.	Litchi	Litchu	*Litchi chinensis*	Sapindaceae
29.	Longan	Anshfol	*Dimocarpus longan*	Sapindaceae
30.	Mango	Aam	*Mangifera indica*	Anacardiaceae
31.	Monkey jack/Monkey fruit	Madal	*Artocarpus lacucha*	Moraceae
32.	Olive	Jolpai	*Elaeocarpus serratus*	Elaeocarpaceae
33.	Palm	Taal	*Borassus flabellifer*	Arecaceae/Palmae
34.	Phalsa	Phalsa	*Grewia asiatica*	
35.	Pineapple	Anaros	*Ananas comosus*	Bromeliaceae
36.	Pomegranate	Dalim	*Punica granatum*	Lythraceae
37.	Pummelo	Batabi	*Citrus maxima Syn C. grandis*	Rutaceae
38.	Rose apple	Golap jam	*Syzygium jambos*	Myrtaceae
39.	Sapota	Sofeda	*Manilkara zapota*	
40.	Syn. Achras zapota	Sapotaceae		

41.	Sweet lemon	Musambi	*Citrus limettiodes*	Rutaceae
42.	Sweet lime	Misti jamir	*Citrus limetta*	Rutaceae
43.	Tamarind	Tentul	*Tamarindus indica*	Fabaceae
44.	Water apple	Jamrul	*Syzygium samarangense*	Myrtaceae

Students of related subjects are actively involved in gardening, maintenance, etc. of gardens within the campus. Further, they find the garden an apt place for discussions, combined studies, practicals, aesthetic purposes, spending leisure time, etc. Students are learning garden techniques by working in the garden with the help of teachers concerned. Garden makes ample space and scope for them to conduct practicals including budding, grafting, lawn making, etc. for students of Agriculture, Botany and Environmental Studies. They also find this as a good opportunity to observe and learn about birds and butterflies. Students from the department of Zoology learn about insects and their role in pollination by observing the same in the botanical garden. So far, 90 plant species are identified and maintained in the garden (Table 19). Students of Botany are doing bee keeping and are learning the bee preference towards plants from the garden. Preparation of vermi-compost and training on the same for those who are interested are conducted in the garden. There are enough resources (species of flora and fauna) available in different gardens and these resources are being utilized by the Botany and Zoology students for project works.

Table 19: List of ornamental shrubs of Visva-Bharati

Sl. No.	Common Name in English	Local Name in Bengali	Botanical Name	Family
1.	Alder (White)	Sada buttercup	*Turnera subulate*	Passifloreceae
2.	Alder (Yellow)	Holud buttercup	*Turnera ulmifolia*	Passifloreceae
3.	Aralia (dinner plate)	Aralia	*Polyscias balfouriana* Syn. *Aralia balfouriana*	Araliaceae
4.	Aralia (Ming)		*Polyscias fruticose*	Araliaceae
5.	Aralia (Fern-leaf)	Fern pata aralia	*Polyscias filicifolia*	
6.	Aralia (Variegated)		*Polyscias paniculata* 'Variegata'	Araliaceae
7.	Barleria (Rosy)	Jhinti (Golapi)	*Barleria cristata* 'Rosea'	Acanthaceae
8.	Barleria (White)	Jhinti (sada)	*Barleria cristata* 'Candida'	Acanthaceae
9.	Barleria (Yellow)	Jhinti (Holud)	*Barleria cristata* 'Prionites'	Acanthaceae

10.	Blue plumbago	Neel chita	*Plumbago auriculata*	Plumbaginaceae
11.	Blue sage	Kalo bashak	*Eranthemum pulchellum* Syn. *Daedalacanthus narvosus*	Acanthaceae
12.	Bush allamanda	Lota kolke	*Allamanda nerifolia*	Apocynaceae
13.	Bush allamanda	Lota kolke	*Allamanda schotti*	Apocynaceae
14.	Bush magnolia	Jhop magnolia	*Magnolia liliifera* Syn. *M. Mutabilis*	Magnoliaceae
15.	Cananga	Ketoki	*Cananga kirkii*	Annonaceae
16.	Candle bush	Dad mordon	*Cass1ita alata*	Fabaceae
17.	Cape jasmine	Gondhiraj	*Gardenia jasminoides*	
18.	Cat's tail	Shib jhul	*Acalypha hispida*	Euphorbiacece
19.	Catharanthus	Nayantara	*Vinca rosea*	Apocynaceae
20.	Chinese croton		*Excoecaria bicolor*	Euphorbiaceae
21.	Coleus	Coleus	*Solenostemon scutellarioides* Syn. *Coleus blumei*	Lamiaceae
22.	Common lantana	Kutush	*Lantana camera*	Verbanaceae
23.	Copper leaf	Tama pata	*Acalypha wilkesiana*	Euphorbiacece
24.	Coral plant	Lal russelia	*Russelia equisetiformis*	Coral plant
25.	Cotton rose	Sthala padma	*Hibiscus mutabilis*	Malvaceae
26.	Crape myrtle	Furush (Sada)	*Lagerstroemia indica* 'Candida'	Lythraceae
27.	Crape myrtle	Furush (Golapi)	*Lagerstroemia indica* 'Rosea'	Lythraceae
28.	Croton	Patabahar	*Codiaeum variegatum* 'Bangalore Beauty'	Euphorbiaceae
29.	Croton	Patabahar	*Codiaeum variegatum* 'Bank of Queen'	Euphorbiaceae
30.	Croton	Patabahar	*Codiaeum variegatum* 'Carnival'	Euphorbiaceae
31.	Croton	Patabahar	*Codiaeum variegatum* 'Cripsum'	Euphorbiaceae
32.	Croton	Patabahar	*Codiaeum variegatum* 'Delaware'	Euphorbiaceae
33.	Croton	Patabahar	*Codiaeum variegatum* 'Elite'	Euphorbiaceae
34.	Croton	Patabahar	*Codiaeum variegatum* 'Exotic'	Euphorbiaceae
35.	Croton	Patabahar	*Codiaeum variegatum* 'Fantacy'	Euphorbiaceae
36.	Croton	Patabahar	*Codiaeum variegatum* 'Fire'	Euphorbiaceae

37.	Croton	Patabahar	*Codiaeum variegatum* 'Glory'	Euphorbiaceae
38.	Croton	Patabahar	*Codiaeum variegatum* 'Golden Ring'	Euphorbiaceae
39.	Croton	Patabahar	*Codiaeum variegatum* 'H.D. Maity'	Euphorbiaceae
40.	Croton	Patabahar	*Codiaeum variegatum* 'Princess'	Euphorbiaceae
41.	Croton	Patabahar	*Codiaeum variegatum* 'Punctatum aureum'	Euphorbiaceae
42.	Croton	Patabahar	*Codiaeum variegatum* 'Rainbow'	Euphorbiaceae
43.	Croton	Patabahar	*Codiaeum variegatum* 'Warrenii'	Euphorbiaceae
44.	Day Jasmine	Diner raja	*Cestrum diurnum*	Solanaceae
45.	Delek air		*Memecylon edule*	Melastomataceae
46.	Dombeya	Domrupani	*Dombeya sp*	Malvaceae
47.	Egyptian star flower		*Pentus lanceolata*	Rubiaceae
48.	Fire bush	Hamelia	*Hamelia patens*	Rubiaceae
49.	Fire cracker plant	Kanakambori	*Crossandra infundibuliformis* Syn. *C. Undulaefolia*	Acanthaceae
50.	Flag bush (Pink)	Golapi mussanda	*Mussaenda erythrophylla* 'Rosea'	Rubiaceae
51.	Flag bush (Red)	Lal mussanda	*Mussaenda erythrophylla* 'Scarlet'	Rubiaceae
52.	Flag bush (White)	Sada mussanda	*Mussaenda philippica*	Rubiaceae
53.	Flag bush (Yellow)	Holud mussanda	*Mussaenda luteola*	Rubiaceae
54.	Forest champa	Bon champa	*Spermadictyon suaveolens* Syn. *Hamiltonia suaveolens*	Rubiaceae
55.	Forest jasmine		*Clerodendrum inerme*	Verbenaceae
56.	Golden dew drop	Duranta	*Duranta repens* Syn. *D. erecta*	Verbenaceae
57.	Gustavia		*Gustavia spp*	Lecythidaceae
58.	Hydrangea/ Hortensia	Hydrangea	*Hydrangea Spp*	Hydrangeaceae
59.	Mallow/ Shoe black plant	Joba	*Hibiscus rosa-chinensis*	Malvaceae

60.	Mickey mouse plant	Kanak champa	*Ochna serrulate*	Ochanthaceae
61.	Mogra/Arabian jasmine	Beli	*Jasminum sambac*	Oleaceae
62.	Morning Kiss/ Musical Notes		*Clerodendrum macrosiphon*	Lamiaceae
63.	Oleander (pink)	Golapi karabi	*Narium oleander* 'Carnea'	Apocynaceae
64.	Oleander (red)	Rokto karabi	*Narium oleander 'Carmenumflore pleno'*	Apocynaceae
65.	Oleander (white)	Sada karabi	*Narium oleander* 'Album'	Apocynaceae
66.	Orange jasmine/ Chinese box	Kamini	*Murraya paniculate*	Rutaceae
67.	Orange jasmine/ Chinese box	Kamini	*Murraya exotica*	Rutaceae
68.	Orchid tree	Kanchan	*Bauhinia acuminata*	Fabaceae
69.	Orchid tree	Kanchan	*Bauhinia tomentosa*	Fabaceae
70.	Pin wheel	Tagor	*Tabernaemontana divaricata* Syn. *T. Coronaria*	Apocynaceae
71.	Poinsettia (Red)/ Fire ball	Lal pata	*Euphorbia pulcherrima*	Euphorbiaceae
72.	Poinsettia (White)	Sada poinsettia	*Euphorbia leucocephala*	Euphorbiaceae
73.	Poinsettia (Wild)	Jongli poinsettia	*Euphorbia heterophylla*	Euphorbiaceae
74.	Powder puff	Powder puff	*Calliandra hybrida*	Fabaceae
75.	Powder puff (Red)	Lal Powder puff	*Calliandra haematocephala*	Fabaceae
76.	Pride of Barbados	Krishna chura	*Caesalpinia pulcherrima*	Fabaceae
77.	Pride of Barbados	Radha chura	*Caesalpinia pulcherrima* 'Flava'	Fabaceae
78.	Queen of the night	Rater rani	*Cestrum nocturnum*	Solanaceae
79.	Rain of gold		*Thryallis glauca*	Malpighiaceae
80.	Rangan/ West Indian Jasmine	Rangan	*Ixora spp*	Rubiaceae
81.	Rose	Golap	*Rosa spp*	Rosaceae
82.	Shrub vinca	Dakur	*Kopsia fruticose*	Apocynaceae
83.	Spicy jatropha		*Jatropha panduraefolia*	Euphorbiaceae

84.	Star jasmine	Kundo	*Jasminum multiflorum*	Oleaceae
85.	Thorn apple	Dhutra	*Datura stramonium*	Solanaceae
86.	Variegated cassava		*Manihot esculenta* 'Variegata'	Euphorbiaceae
87.	Wax mallow	Lonka joba	*Malvaviscus arboreus*	Malvaceae
88.	Yellow bell	Tecoma	*Tecoma gaudichaudi*	
89.	Yellow bell	Tecoma	*Tecoma stans*	
90.	Yesterday-today-tomorrow		*Brunfelsia calycina* Syn. *Franciscea hopeana*	Solanaceae

It would be nearly impossible to learn taxonomy and morphology for Botany students if plants are not available nearby. Different species of plants in the garden make this possible. Students are keen in maintaining species that are dealt with in their syllabus for practicals and further observation. The authorities are keen in developing the garden to higher levels by getting funds from sources such as Spices Board. The grants in aid were rightly spent in developing a spice garden with respective identification names and other details pertaining to the species in the spice garden. The department of Botany and Nature Club initiated an agriculture garden where different species such as ginger, turmeric, chilli, etc are grown. The vegetables harvested from the vegetable garden are utilized either in different messes or sell it out among the staff and students. A portion is shared among the volunteers.

Arboretum

Visva-Bharati is maintaining an arboretum where natural species of plants are maintained. The plant diversity in the arboretum includes star plants, concept- oriented plants based on ayurvedic preparations, etc. It is a place to conserve endemic plant species as well. The University authority is keen to enrich the arboretum by adding plants of different values.

Fruit Yielding Plants

Currently, in Kerala, there is a trend in cultivation of different species of fruit yielding plants in farms and orchards. Visva-Bharati is also giving emphasis in adding new species and varieties of different fruit yielding plants in their campus. This would add value and awareness among students and staff about such plants. There are about 20 different fruit yielding species are available in the campus (Table 20). Although the fruit yielding species are cultivated at different places in a scattered manner, they are properly labelled and displayed.

Table 20: List of fruit yielding plants of Visva-Bharati

Sl. No.	Name
1.	Ananus comosus
2.	Annona muricata
3.	Annona squamosa
4.	Artocarpus integrifolia
5.	Artocarpushirsutus
6.	Citrus limon
7.	Garcinia mangostana
8.	Hylocereusundatus
9.	Mangifera indica
10.	Morus alba
11.	Musa paradisiaca
12.	Nepheliumlappaceum
13.	Nepheliummutabile
14.	Passiflora edulis
15.	Phyllanthus emblica
16.	Psidium guajava
17.	Punica granatum
18.	Spondias pinnata
19.	Syzygium jambos
20.	Syzygium samarangense
21.	Tamarindus indica

Medicinal Plants

The diversity of medicinal plants in any place, especially in an academic campus is indicative the emphasis that the institute given towards traditional knowledge. This would be a platform for awareness, learning, and source for local usage. Visva- Bharati is maintaining a medicinal plant garden that consists of a good wealth of plant species. The present status of flora that have medicinal importance is representative of regional and local floristic diversity. About 74 plant species in the medicinal plant garden were found maintained on the campus (Table 21).

Table 21: List of medicinal plants in Visva-Bharati

SL. No.	Name
1.	Achyranthes aspera
2.	Adenantherapavonina
3.	Adhatoda vasica
4.	Aerva lanata
5.	Aloe vera

6.	Alpinia calcarata
7.	Alpinia galanga
8.	Alstonia scholaris
9.	Andrographispaniculate
10.	Anisomeles indica
11.	Asparagus racemosus
12.	Azadirachtaindica
13.	Bacopa monnieri
14.	Biophytumsensitivum
15.	Boerhaviadiffusa
16.	Butea monosperma
17.	Calotropisgigantea
18.	Cardiospermumhalicacabum
19.	Careya arborea
20.	Cassia fistula
21.	Cassia occidentalis
22.	Catharanthusroseus
23.	Centella asiatica
24.	Chasalia curviflora
25.	Cinnamom umzeylanicum
26.	Clerodendrumviscosum
27.	Clitoria ternatea
28.	Cocos nucifera
29.	Coffea arabica
30.	Coriandrumsativum
31.	Costus pictus
32.	Curcuma longa
33.	Cycas circinalis
34.	Datura metel
35.	Datura stramonium
36.	Diospyros sp.
37.	Duranta plumieri
38.	Eclipta alba
39.	Elephantopus scaber
40.	Elettaria cardamomum
41.	Emblica officinalis
42.	Emelia sonchifolia
43.	Euphorbia hirta
44.	Evolvulus alsinoides
45.	Ficus benghalensis
46.	Ficus microcarpa
47.	Ficus racemose
48.	Ficus religiosa

49.	Garcinia mangostana
50.	Heliotropium indicum
51.	Hemidesmusindicus
52.	Hibiscus rosa-sinensis
53.	Holoptelea integrifolia
54.	Holarrhena antidysenterica
55.	Hopea parviflora
56.	Ipomoea sepiaria
57.	Ixora coccinea
58.	Kaempferiakalangal
59.	Lannea coromandelica
60.	Leucas aspera
61.	Mimosa pudica
62.	Murraya koenigii
63.	Myristica fragrans
64.	Nelumbium speciosum
65.	Ocimum basailicum
66.	Ocimum sanctum
67.	Oxalis corniculata
68.	Phyllanthus niruri
69.	Pimenta dioica
70.	Piper longum
71.	Plumbago rosea
72.	Pongamia pinnata
73.	Psidium guajava
74.	Rauvolfia serpentina

Birds of Visva-Bharati Campus

A list of bird species found in the university campus is given in Table 22. Status: VC=Very Common, C=Common; Migratory Status: R=Resident, W=winter visitor. S=summer visitor

Table 22: List of birds found in Visva-Bharati

Sl. No.	Scientific Name	Common Name	Status	Migratory
I	Order	Anseriformes		
	Family	Anatidae		
1	Dendrocygna javanica	Lesser Whistling-Duck	VC	R
2	Anser anser	Graylag Goose	C	W
3	Nettapus coromandelianus	Cotton Pygmy-Goose	VC	R
II	Order	Galliformes		
	Family	Phasianidae		

4	Ortygornis pondicerianus	Gray Francolin	C	R
III	Order	Podicipediformes		
	Family	Podicipedidae		
5	Tachybaptus ruficollis	Little Grebe	VC	R
IV	Order	Columbiformes		
	Family	Columbidae		
6	Columba livia	Rock Pigeon	C	R
7	Streptopelia decaocto	Eurasian Collared-Dove	VC	R
8	Streptopelia chinensis	Spotted Dove	VC	R
9	Treron Phoenicopterus	Yellow-footed Green-Pigeon	VC	R
V	Order	Cuculiformes		
	Family	Cuculidae		
10	Centropus sinensis	Greater Coucal	VC	R
11	Clamator jacobinus	Pied Cuckoo	C	S
12	Eudynamys scolopaceus	Asian Koel	VC	R
13	Hierococcyx varius	Common Hawk-Cuckoo	VC	R
VI	Order	Caprimulgiformes		
	Family-1	Caprimulgidae		
14	Caprimulgus asiaticus	Indian Nightjar	C	R
	Family-2	Apodidae		
15	Apus affinis	Little Swift	C	R
16	Cypsiurus balasiensis	Asian Palm-Swift	VC	R
VII	Order	Gruiformes		
	Family	Rallidae		
17	Gallinula chloropus	Eurasian Moorhen	VC	R
18	Fulica atra	Eurasian Coot	VC	W
19	Porphyrio poliocephalus	Gray-headed Swamphen	VC	R
20	Amaurornis phoenicurus	White-breasted		
VIII	Order	Charadriiformes		
	Family-1	Charadriidae		
21	Vanellus malabaricus	Yellow-wattled Lapwing	C	R
	Family-2	Jacanidae		
22	Metopidius indicus	Bronze-winged Jacana	C	R
IX	Order	Ciconiiformes		
	Family	Ciconiidae		

23	Anastomus oscitans	Asian Openbill	C	R
X	Order	Suliformes		
	Family	Phalacrocoracidae		
24	Microcarbo niger	Little Cormorant	VC	R
XI	Order	Pelicaniformes		
	Family	Ardeidae		
25	Ardea cinerea	Gray Heron	C	R
26	Ardea purpurea	Purple Heron	C	R
27	Ardea alba	Great Egret	C	R
28	Ardea intermedia	Intermediate Egret	C	R
29	Egretta garzetta	Lesser Egret	VC	R
30	Bubulcus ibis	Cattle Egret	VC	R
31	Ardeola grayii	Indian Pond-Heron	VC	R
32	Nycticorax nycticorax	Black-crowned Night-Heron	C	R
XII	Order	Accipitriformes		
	Family	Accipitridae		
33	Pernis ptilorhynchus	Oriental Honey-buzzard	VC	R
34	Circus aeruginosus	Eurasian Marsh-Harrier	C	W
35	Accipiter badius	Shikra	VC	R
36	Milvus migrans	Black Kite	C	R
XIII	Order	Strigiformes		
	Family-1	Tytonidae		
37	Tyto alba	Barn Owl	C	R
	Family-2	Strigidae		
38	Otus bakkamoena	Indian Scops-Owl	C	R
39	Glaucidium radiatum	Jungle Owlet	R	R
40	Athene brama	Spotted Owlet	VC	R
XIV	Order	Bucerotiformes		
	Family	Upupidae		
41	Upupa epops	Eurasian Hoopoe	VC	R
XV	Order	Coraciiformes		
	Family-1	Alcedinidae		
42	Alcedo atthis	Common Kingfisher	C	R
43	Pelargopsis capensis	Stork-billed Kingfisher	VC	R

44	Halcyon smyrnensis	White-throated Kingfisher	VC	R
45	Ceryle rudis	Pied Kingfisher	R	R
	Family-2	Meropidae		
46	Merops orientalis	Green Bee-eater	VC	R
47	Merops philippinus	Blue-tailed Bee-eater	C	S
XVI	Order	Piciformes		
	Family-1	Megalaimidae		
48	Psilopogon haemacephalus	Coppersmith Barbet	VC	R
49	Psilopogon lineatus	Lineated Barbet	VC	R
50	Psilopogon asiaticus	Blue-throated Barbet	C	R
	Family-2	Picidae		
51	Dinopium benghalense	Black-rumped Flameback	VC	R
XVII	Order	Psittaciformes		
	Family	Psittaculidae		
52	Psittacula eupatria	Alexandrine Parakeet	C	R
53	Psittacula krameri	Rose-ringed Parakeet	VC	R
XVIII	Order	Passeriformes		
	Family-1	Campephagidae		
54	Coracina macei	Large Cuckooshrike	C	R
	Family-2	Oriolidae		
55	Oriolus kundoo	Indian Golden Oriole	C	R
56	Oriolus chinensis	Black-naped Oriole	C	W
57	Oriolus xanthornus	Black-hooded Oriole	VC	R
	Family-3	Artamidae		
58	Artamus fuscus	Ashy Woodswallow	VC	R
	Family-4	Aegithinidae		
59	Aegithina tiphia	Common Iora	VC	R
	Family-5	Dicruridae		
60	Dicrurus macrocercus	Black Drongo	VC	R
	Family-6	Laniidae		
61	Lanius cristatus	Brown Shrike	C	W
	Family-7	Corvidae		
62	Dendrocitta vagabunda	Rufous Treepie	VC	R
63	Corvus splendens	House Crow	VC	R
64	Corvus macrorhynchos	Large-billed Crow	R	R
	Family-8	Cisticolidae		

65	Orthotomus sutorius	Common Tailorbird	VC	R
66	Prinia hodgsonii	Gray-breasted Prinia	VC	R
67	Prinia inornata	Plain Prinia	C	R
68	Cisticola juncidis	Zitting Cisticola	C	R
	Family-9	Acrocephalidae		
69	Acrocephalus dumetorum	Blyth's Reed Warbler	C	W
	Family-10	Hirundinidae		
70	Hirundo rustica	Barn Swallow	VC	W
	Family-11	Pycnonotidae		
71	Pycnonotus cafer	Red-vented Bulbul	VC	R
	Family-12	Phylloscopidae		
72	Phylloscopus inornatus	Yellow-browed Warbler	VC	W
73	Phylloscopus fuscatus	Dusky Warbler	C	W
74	Phylloscopus nitidus	Green Warbler	VC	W
75	Phylloscopus trochiloides	Greenish Warbler	VC	W
	Family-13	Sylviidae		
76	Chrysomma sinense	Yellow-eyed Babbler	VC	R
	Family-14	Leiothrichidae		
77	Argya striata	Jungle Babbler	VC	R
	Family-15	Sturnidae		
78	Gracupica contra	Asian Pied Starling	VC	R
79	Sturnia malabarica	Chestnut-tailed Starling	VC	R
80	Acridotheres tristis	Common Myna	VC	R
	Family-16	Turdidae		
81	Geokichla citrina	Orange-headed Thrush	C	R
	Family-17	Muscicapidae		
82	Copsychus saularis	Oriental Magpie-Robin	VC	R
83	Eumyias thalassinus	Verditer Flycatcher	C	W
84	Ficedula albicilla	Taiga Flycatcher	VC	W

	Family-18	Dicaeidae		
85	Dicaeum erythrorhynchos	Pale-billed Flowerpecker	VC	R
	Family-19	Nectariniidae		
86	Leptocoma zeylonica	Purple-rumped Sunbird	VC	R
87	Cinnyris asiaticus	Purple Sunbird	VC	R
	Family-20	Estrildidae		
88	Lonchura punctulate	Scaly-breasted Munia	VC	R
	Family-21	Motacillidae		
89	Motacilla alba	White Wagtail	C	W
90	Anthus rufulus	Paddyfield Pipit	C	R
91	Anthus hodgsoni	Olive-backed Pipit	VC	W

5. Practices Adopted in Visva-Bharati to Reduce Carbon Footprint

5.1 Transplantation

Visva-Bharati has undertaken the initiative to transplant trees rather than cut them down. Mature trees are being shifted from their locations if there arises the need to remove them, rather than being felled or cut down (Plate 8). This is an environment-friendly initiative which seeks to balance the administrative and logistical needs of the university with its orientation towards the conservation of the natural fauna and environment of Santiniketan.

Plate 8: Transplantation

5.2 Solar panel

Visva-Bharati has undertaken the initiative to install solar power systems considering their renewable, environment-friendly nature, low maintenance requirements, and long-term potential for reducing electricity costs. At present, solar panels have been installed on the roofs of key buildings, including the Computer Centre, with further installations at other locations in the pipeline.

Currently, the University has two on-grid solar power plants connected directly to the internal electrical systems of the respective buildings through export–import tariff meters of WBSEDCL (Plate 9). These units are located at the Central Office and Bangladesh Bhavana, with installed capacities of 20 kWp and 15 kWp, respectively. The total annual electricity generation from these solar installations is approximately 6603 kWh, as obtained from electricity bill records. The power generated from these solar units is directly utilized and adjusted against the electricity consumption at their respective metering points.

These installations reduce dependence on conventional grid electricity and help lower the institution's overall carbon footprint. The use of solar energy reflects the university's commitment to sustainable campus development and clean energy adoption. Expansion of solar infrastructure in the future is expected to enhance energy security and support peak demand requirements. The generated solar power also supports regular institutional activities while promoting awareness about renewable energy among students and staff.

Plate 9: Solar panels

5.3 Waste Management

The rapidly growing aquatic weeds, water hyacinths, and clogged streams limit activities like fishing and boating, affect marine life, native plants, and animal communities, and cause significant economic loss. This can be converted into valuable products to reduce natural resource consumption(Plate 11 & 12). Algae, often considered a waste due to their rapid and uncontrollable growth in water bodies, are typically seen as a nuisance rather than a resource. With the growing environmental concerns and the urgent need for sustainable alternatives, we have tried to use algae as a valuable raw material, thus turning 'waste into wealth (Plate 14). The eco-friendly and biodegradable nature of jute has created a new domain in applying non-traditional, diversified products such as handmade paper for packaging and fashionable packaging items. The potential of jute, particularly waste slivers and caddies, is explored in handmade paper to be used as an alternate packaging material (Plate 11), which certainly improves the livelihood of those engaged in the jute business. Waste paper collected from different academic buildings of the campus is recycled and new handmade papers are produced (Plate 10**).** Handmade papers are also produced from fallen Leaves, Jute sliver waste, rice straws, and corn husk (Plate 13).

Plate 10: Waste Paper Recycling Programme at Hand-Made Paper-Making Section

Plate 11: Handmade paper from jute sliver and caddies and water hyacinth

Plate 12: Woven mats from water hyacinth, process of making woven mats

Plate 13: Handmade paper from fallen leaves, jute sliver waste, rice straw & corn husk.

Plate 14: Handmade paper from algae and other agricultural waste

5.4 Bio-consortium for Vermicomposting

Visva-Bharati has started to convert collected leaf litter and organic waste from Santiniketan and Sriniketan campuses into vermicompost as carbon footprint reduction initiative (Plate 15). This eco-friendly practice reduces pollution, enhances campus cleanliness, and generates sustainable resources, promoting environmental responsibility and supporting a cleaner, greener campus ecosystem. The objectives of this initiative are to develop a scientific system for converting fallen leaves into high-quality vermicompost using earthworms and microbes; isolate and multiply effective microbial strains; assess carbon credit and greenhouse gas reduction; evaluate ecosystem benefits; analyze economic viability for commercialisation and employment; and create a sustainable, replicable waste-to-resource model.

Plate 15: Vermicomposting

5.5 Azolla cultivation

The Dairy and Poultry Farm, Palli Siksha Bhavana has adopted Azolla cultivation as a sustainable initiative to reduce dependence on commercial feed and lower environmental impact (Plate 15). Grown in a 50 sq. ft. area, the unit produces about 2 kg of Azolla daily and is routinely used as a supplementary feed in poultry—50 g fresh per chicken per day and 2 g dried powder per quail per day—partially replacing commercial feed, improving feed efficiency, and reducing costs, with potential application as a protein-rich supplement for dairy cattle. This low-input practice promotes resource efficiency, reduces carbon footprint, supports eco-friendly livestock farming, and serves as a practical learning model for sustainable agriculture.

Plate 16: Azolla cultivation

5.6 Swachhata Abhiyan

Swachh Visva-Bharati, also termed "Green Visva-Bharati, Clean Visva-Bharati," represents a novel initiative by the entire campus community to institutionalise cleanliness as an integral part of university functioning (Plate 17). The management's steps toward this goal achieved

recognition when Visva-Bharati secured listings in the MHRD India Swachhata Campus ranking on two occasions.


Plate 17: Swachhata Abhiyan

6. Initiatives by Visva-Bharati to Reduce Carbon Footprint

Having an eco-friendly and sustainable environment in the era of global warming and carbon footprints is a real challenge. The University strives towards providing an eco-friendly campus by planting more trees in and around the campus, developing a plastic free campus environment. The University through its institute of agriculture encourages organic and herbal gardening, creating water bodies and aquatic life. The University tries to encourage lesser noise and air pollution by encouraging usage of cycles across both the campuses. Yoga and Meditation centre has been established for better holistic health development. There is increase in use of solar lights to avoid electric consumption and an efficient waste management programme is organized. Initiatives taken by the university to reduce carbon footprint are listed below:

- Production of vegetables for hostel students
- Swachhata Drive at Campus
- Introduction of Renewable Energy (Solar Panel) on a larger scale
- Water Treatment and Management, including Rainwater Harvesting
- Waste to Wealth as part of Waste Management on a larger scale
- Bio composting through the use of fallen leaves on the campus
- Plastic Free Campus
- Promoting the usage of LED Light
- Procurement of E-rickshaw

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