

GREEN AUDIT REPORT



For the Year 2018 - 2023



The Neotia University
Sarisha, Diamond Harbour Road
24 Paragons (S), West Bengal - 743368



POETS FOUNDATION

(An international educational - literary - social - cultural organization)

Recognised by FOIPA under UNESCO

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Estd : 1996

**An Exclusive Audit Report on
Green / Environment quality of
The Neotia University (TNU)
D. H. Road, Sarisha, 24 Paragons (S), WB**

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VETTING AND VERIFICATION CERTIFICATE

This is to certify that the internal Environment / Green Audit team of The Neotia University, Sarisha, D. H. Road, Distt. 24 Paragons (S), WB, has conducted a detailed 'Environment / Green Audit' for its campus for the last five year i.e. 2018-2023. The environment / green audit was conducted in accordance with the applicable standards prescribed by the Central Pollution Control Board, Govt. of India, New Delhi, and the Ministry of Environment, Forest and Climate Change, Govt. of India, New Delhi. The audit involves land, water, air, energy, green inventory, solid and e-waste management, etc., and provides an 'Environmental / Ecological Management Plan', which the university can follow to minimize the impact on the institutional working framework.

We have gone through the information provided by the university's internal audit team. We have vetted and verified all the information / data.

According to the information provided to us we have analyzed the detailed of these and all of these are presented in the present 'Green Audit' Report Book. We are certifying that according to the information provided to us, the present environment / green audit gives a true and fair picture in conformity with environmental auditing principles accepted in India.

Members of External Audit Team

Pradip Kr. Chaudhuri

Manas Chakraborty

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April 21st, 2024

Kolkata

PREFACE

“Nature provides a free lunch, but only if we control our appetites.”

– William Ruckelshaus

Our mother earth has finite carrying capacity and if we exceed the carrying capacity it will trigger back to the ecological systems and welcome natural disasters. The environment / green audit is a measure to assess the activities those are performed and their impact on ecology and economy. The daily activities those are conducted at the university campus is to mobilize the resources need to address the identified gaps in adhering to the Sustainable Development Goals (SDGs).

The Neotia University campus is situated in a rural location adjacent to the coastal region of West Bengal. The university campus is rich in environmental ingredients like trees and herbs, flora and fauna, insects and reptiles, natural rainwater harvesting and conservation of the bio-species. The university community has taken initiatives through internal and external supports in building up a sustainable habitat campus. Nevertheless, due to natural climate change and environmental impact, there is need for continual monitoring and assessment of environmental and ecological factors to have better living ambient.

The environment cum green audit is an initiative to measure, assess and evaluate the interventions taken in the upgradation of environment as well as environmental parameters and take the remedial measures.

The present report is the result of measurement, assessment and evaluation of different parameters and initiatives so as to identify the progress and gap for the campus development in context to environmental impact and benefits. The report is based on the factual data those were collected by the internal audit team. The observation, suggestions and recommendations are based on the national as well as international practices aiming towards attaining national and international environmental standards.

In this respect the internal audit team is grateful to all the stake holders for their kind cooperation and help in recording data. The audit team is also grateful to the Governing Board of the university for their kind trust in developing this audit report in taking necessary measures for making the campus a ‘Cleaner and Safer’ one.

1. INTRODUCTION

1.1 Green / Environmental Audit - An Efforts towards Environment Sustainability and exploration on Energy Conservation opportunities in adhering to the 'Sustainable Development Goals (SDG)'.

Use of natural resources caused a controversy since the industrial revolution. Question arises who control resources, who benefitted from their exploitations and what are impact on economy, ecology and environment. To address these questions there need in depth studies on the human activities and their impact on the environment. This calls for auditing of the environmental status and necessary actions to be recommended for stabilizing the ecological systems. The evaluation is required to measure on input output and is reflected in audit term. Our mother earth has a finite carrying capacity and it is about 100 GJ (277.8×10^2 kWh) / hector / year. If the external load on environment and ecology exceed that carrying capacity, it triggers back to the habitat systems by welcoming natural disasters.

The rapid environmental degradation at the local, regional, national and global level is leading to global 'Environmental poverty'. Stabilization of human population, adoption of environmentally sound and sustainable technologies, reforestation and ecological restoration are crucialelements in creating an equitable and sustainable future for all humans in harmony with natural resources. The main objective to carry out green / environmental audit is to check green practices followed by university and to conduct a well formulated audit report to understand where the university / institute stand on a scale of environmental soundness. Green audit is the procedure of systematically identifying, quantifying, recordings, reporting and analyzing the environmental diversity components of any organization. It aims to analyze the environmental practices insideand outside of the relevant place, which will have an impact on the environment. Focus was given to assess the consumption of energy, electricity, water as well as disposal of liquid waste,solid waste, hazardous waste, e-waste and an inventory of trees on campus is also prepared to check how much CO₂ is sequestered and O₂ is released. It is an important tool for universities/ institutions in their consumption of energy, water, or other resources; and then consider and planned to implement changes and make savings. It can create health awareness and promote environmental awareness and ethics. It allows faculty, students and other staff to better understand the impacts of green activities on the premises.

Self-inquiry is a natural and expected development of quality education. Therefore, the university / institutemust evaluate its contribution towards a sustainable future. An environmental sustainability has become an increasingly crucial issue for every nation; the role of higher education institutions

in environmental sustainability has become more important.

It is mentioned above that the recent rapid urbanization and economic development have led to several environmental and ecological problems. In this context, it is necessary to adopt a green campus system for the university / institute which will lead to sustainable development while reducing the large amount of atmospheric greenhouse gas (GHG) emissions in the environment. Government of India through its National Environment Policy (2006) has made mandatory for every organization to have green audit / environmental audit in their organization. The process of environmental audit was formalized by Supreme Audit Institution according to the guidelines given in Manual of Standard Orders issued by Authority of the Controller and Auditor General of India 2002. University Grants Commission (UGC) has mentioned about emergence of 'Green Campus, Clean Campus' mission mandatory for all higher educational institutes. As environmental sustainability is becoming an increasingly important issue for the nation, the role of higher educational institutions in relation to environmental sustainability is more prevalent. Accordingly, realizing the need of being responsible towards environment the National Assessment and Accreditation Council (NAAC), an autonomous body has also added the concept of Green / Environmental Audit in accreditation methodologies of State and Central Universities as well as colleges.

The educational institutions are playing a major role in developing human resources in this aspect as a result the educational institutions required to carry out a detailed study in their own organization to examine their status. The outcome of studies will provide the information on ecology and economy in achieving the UN Sustainable Development Goal 4 (SDG 4) for quality education.

The major challenges of the 21st century is i. Mobility, ii. Water, iii. Waste management and iv. Energy. Rapid urbanization and industrialization at present challenges on these issues. The rapid urbanization is responsible for exploitation of natural resources, forests and wildlife, generating waste, polluting the air, water and degrading the quality of ecological system resulting as global warming, greenhouse effect, ozone depletion, climate change, etc. Thus, there need for assessment on the quality of ecological system to combat its degradation.

As environmental sustainability is becoming an increasingly important issue for the nation, the role of higher educational institutions in relation to environmental sustainability is more prevalent. Green / Environmental Audit is the most efficient ecological tool to solve such environmental problems. It is a process of regular identification, quantification, documenting, reporting and monitoring of environmentally important components in a specified area. Through this process, the regular environmental activities are monitored within and outside of the concerned sites which have direct and indirect impacts on the surroundings. A green audit can be one of the initiatives for such

institutes to account for their energy, water resource use as well as wastewater, solid waste, hazardous waste generation. The green Audit process can play an important role in the promotion of environmental awareness and sensitization about resource use. It can create consciousness towards ecological values and ethics. Through the green audit, one can get direction about how to improve the condition of the environment.

With this aim in view The Neotia University, whose campus is situated at the Sarisha village on Diamond Harbour (D.H.) Road of 24 Paragons (S) district of state West Bengal (WB) conducted Green / Environmental Audit with a team consisting of faculty member and supporting staffs having expertise energy and environment. The details of the audit are presented in the text of this present volume. This has been checked, vetted and verified by the experts of External Audit Team members from an UNESCO affiliated International Organization.

1.2. Philosophy behind Green / Environmental Audit:

Environmental / Green auditing is the process of identifying and determining whether the university's practices are eco-friendly and sustainable. Although the university is located in a rural area of West Bengal full with greeneries and natural resources, nevertheless, over the period of time the excess use of resources like water, energy, chemicals and other consumables are become habitual for the university community and due to ignorance contaminating the land, water and eco systems. Now, time has come to develop necessary mechanisms for evaluating the resource consumption pattern, handling of wastes carefully. Green / environmental audit regulates all such practices and gives an efficient way of using the natural resources. The climate change and resource depletion problem is knocking at the door and it is necessary to verify the processes to protect the eco system a cleaner and safer one in achieving sustainable development goal. The green / environmental audit provides an opportunity for it. It also increases overall consciousness among the university community involved with various activities.

1.3. Goals of Green / Environmental Audit:

The University has conducted a green / environmental audit with specific goals as:

- ❖ Evaluate the quality of habitat ambience of the University
- ❖ Examine the facilities for Waste Management
- ❖ Enhancement of environmental awareness among the university community
- ❖ Documentation of green practices to be followed at the university campus
- ❖ Analysis of Strengths, Weaknesses, Opportunity and Threat (SWOT) in green practices
- ❖ Conduction of survey to identify the ground reality about green practices.
- ❖ Possible solutions for problems identified from the above survey.
- ❖ Analysis in identification of environmental risk.

- ❖ The long-term goal of the environmental audit program is to collect baseline data of environmental parameters and resolve environmental issues.
- ❖ Motivation of university community for optimized sustainable use of available resources in fulfilling the need for circular economy.

1.4. Objectives of Green / Environmental Audit:

- ❖ Examination on the current practices that can have impact on environment like resource utilization, waste management, etc.
- ❖ Preparation of an Environmental Statement Report on green practices to be followed by different Schools / departments / academic units, supporting services, and administration units.
- ❖ Recommendation on goals, vision, and mission for Green practices on the university campus.
- ❖ Identification and analysis of significant environmental issues.
- ❖ Establishment and implementation of Environmental management plans in various academic and research sectors.
- ❖ Assessment for better performance in green practices and its valuation.

1.5. Criteria VII of NAAC:

Universities are playing a key role in the development of human resources worldwide. Higher education institutes campus run various activities with the aim to percolate the knowledge along with practical dimension among the society. Likewise, different technological solutions related to the environment are also provided by the higher education institutes. Different types of evolutionary methods are used to assess the problem concerning the environment. It includes Environmental Impact Assessment (EIA), Social Impact Assessment (SIA), Carbon Footprint Mapping, Green audit, etc.

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

Students are the major strength of any academic institution. Practicing green action in any educational institution will inculcate the good habit of caring for natural resources in students.

Many environmental activities like plantation and nurturing saplings and trees, cleanliness drives, bird watching camps, no vehicle day, rainwater harvesting, etc. will make the students good citizens of the country.

Through Green / Environmental Audit, the higher educational institutions can ensure that they contribute towards the reduction of global warming through the reduction of Carbon Footprint of the university / institution campus.

1.5. Benefits of Green Audit to an Educational Institute:

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

- ❖ Help to protect the environment in and around the campus.
- ❖ Methods for introduction of cost-saving methods through waste minimization and energy conservation.
- ❖ Empower the organization to frame a better environmental performance.
- ❖ Presentation of a good image of the institution through its clean and green campus.
- ❖ Introduction of efficient resource management systems.
- ❖ Create and nurture a green campus.
- ❖ Enabling of waste management through reduction of waste generation, and waste recycling.
- ❖ Introduction of a plastic-free campus and evolve health consciousness among the stakeholders.
- ❖ Recognize the cost-saving methods through waste minimizing and reuse.
- ❖ Authenticate conformity with the implemented laws.
- ❖ Empower the organizations to frame a better environmental performance.
- ❖ Enhance the alertness for environmental guidelines and duties.
- ❖ Impart environmental education through systematic environmental management approach and improving environmental standards.
- ❖ Benchmarking for environmental protection initiatives.
- ❖ Exploration on financial savings through a reduction in resource use.
- ❖ Development of ownership, ethical, moral and social responsibility for the university and its environment.
- ❖ Developing an environmental ethic and value systems in the youngsters.
- ❖ Green auditing should become a valuable tool in the management and monitoring of environmental and sustainable development programs of the university.
- ❖ Building up a positive impression through green initiatives for the upcoming NAAC visit.

2. VISION AND MISSION OF THE UNIVERSITY

The university develops its academic programs through the Institute / Schools of Studies. The Institute / Schools of Studies are academic bodies responsible for all academic, research and translation of knowledge related activities of the university. Each School has different departments / academic units. These departments / academic units are responsible for the conceptualization, design, development and maintenance of the academic, research and professional programs and activities.

The existing Institute and Schools of Studies at present are as follows:

- i. School of Agriculture and Allied Sciences
- ii. School of Health Science
- iii. School of Hospitality and Culinary Art
- iv. School of Humanities, Management & Social Sciences
- v. School of Legal Studies
- vi. School of Maritime Studies
- vii. Institute of Nursing
- viii. School of Pharmacy
- ix. School of Science and Technology
- x. School of Skill Development and Vocational Studies

Vision of the University is to build up a responsible global citizen to serve the humanity. Mission is to develop under privileged students those are economically maimed and marginalized.

3. OBJECTIVES OF THE AUDIT

The main objectives of Environmental / Green Audit in any Academic Institution are:

- ❖ Enhancement of the awareness of employees and learners towards environmental impact on ecology and economy.
- ❖ Awareness of the initiative taken by university towards ecological conservation.
- ❖ Understanding and impact of Actors, Actions and Performance on the Environment and Ecology.
- ❖ Properly use of the natural resources as per the National policy related to the environment.
- ❖ Explore on the opportunities towards the waste minimization and safe disposal of wastes particularly the hazardous wastes.
- ❖ Exploration on the opportunities for Water and Energy conservation.
- ❖ Exploration on the reduction of Carbon Footprint.

- ❖ Educate various stakeholders for environmental conservation and management.
- ❖ Exploration on the possible environmental problems and methods for adopting possible solution.
- ❖ Educate the stakeholders with different aspects of disaster management.

4. SCOPE AND GOAL OF GREEN/ENVIRONMENTAL AUDITING

Government of India through its National Environment Policy in 2006 has made mandatory for every organization to conduct green audit / environmental audit in order to ensure a 'Clean, Safe and Healthy Environment' within as well as outside the organization. Further, it also helps in effective learning and provides a conducive learning about the environment and ecology. Efforts are taking place around the world in order to address various environmental issues. Green / environmental auditing is one among them for educational institutions. Green auditing helps organization to understand various environmental issues of the organization and identify existing lacuna or gap towards meeting the objective of National Environmental Policy and to plan accordingly for keeping it for habitat.

5. METHODOLOGIES USED FOR AUDITING

- An environmental audit is conducted in three phases e.g. i. pre-audit stage, ii. audit stage and iii. post-audit stage, accordingly the environmental audit was conducted.
- Pre-Audit Stage
- Pre-audit stage involved the identification of target areas for environmental auditing. Accordingly following target areas were identified:
 - Land Use System
 - Biodiversity Status
 - Climatic Conditions
 - Air Quality
 - Noise Pollution
 - Water quality, Resources and Management
 - Energy Consumption and Conservation option
 - Waste quality, Disposal and Management
 - Carbon Footprint Estimation
 - Awareness, Mitigation and Management practices

✓ **Audit Stage**

5.1. Collection of data, observation and interaction: This stage of the Audit involved the activities relating to collection of data, observation, interactions and discussion with the concerned stakeholders i.e., faculty, administration and staff members from different departments and sections of the university. A mixture of open ended and closed ended questionnaires were developed and used for data collection. Meetings with specific stakeholders of different target groups identified in the pre-audit stage were conducted for getting the desired information. Detailed discussions on some specific topic were also held.

5.2. Review of previous records and policies: This was carried out in order to understand the various initiatives taken by the university towards sustainable environmental conservation and amelioration. For the purpose, office registers, visitor's book, purchase registers, office communications, policy level documents of the Academic Council and Governing Board were also examined. Further, the published material such as prospectus, university annual reports, bulletins, and other magazines were also studied by the audit team for getting information / data on the target aspects.

5.3. Inspection of academic buildings / sections / various sites: The internal audit team also visited the various departments, sections, offices and its premises in order to have an idea of various activities carried. Campus greenery and gaps were identified. Team also had a visit to play ground, canteen, library, office rooms and parking area.

5.4. The stakeholders: The stakeholders included were students, academic, administrative and supporting staff of various schools, water supply staff, power and energy maintenance staff and system administration. The committee set up for the purpose discussed the issues related with key target areas. Questionnaires were prepared for getting information and accordingly meeting with concerned stakeholders were conducted. Data on water and energy use was collected from maintenance department.

✓ **Post-Audit Stage**

The Post-Audit Stage includes the production of the final report, prepare action plan to overcome the flaws and to keep a watch on the action plan.

6. FIGURE OF MERIT

6.1. Land Use System

As mentioned earlier that University is located in remote rural location of West Bengal State of India. It is geographically lies between 22.2608° N, 88.1979° E. The campus is operating around 64.00 acre of green land along with 20.18 acres for agricultural land for the field work / studies by students of the agriculture. The total buildup area of the university is about 16.46 acre which includes Academic and Administrative building, Laboratories and Workshops, Classroom, Common room, Canteen. The playground is about 3.85 acre; water bodies is about 4.42 acre. Besides these there are roads, residence building for faculty members, staff quarters, Guest House, Multipurpose Community Hall, Car parking area. The remaining area includes the experimental field / garden, plantation area and forest green cover etc. The details of land use are presented in Table 1 below. The ariel view of the university campus is presented in Fig.1.

Table 1. Land Use Data

Sl. No.	Categories	Area (Acre)
1.	Build up Area	16.46
2.	Play Ground	3.85
3.	Water Bodies	4.42
4.	Agricultural Field	20.18
Total Area		44.91

6.2. Climatic Parameters

6.2.1. Climate: The University is located in sub-tropical zone at the eastern region of India. The basic climatic pattern is mainly hot and humid in nature. There are three main seasons, the winter which is usually cold during December to March, the summer season, during which the temperature increases, thus, making the climatic conditions very warm and dry during April to mid-June, and a rainy season with warm and humid conditions from mid-June to mid-September. The period between winter and summer can be recognized as autumn during October to November and spring in between February to March, respectively.

6.2.2. Rainfall: The rainfall occurs during the monsoon during mid of June to mid of September, however, sometimes even at the end of September also. The maximum rainfall occurs during July and August. Sometimes occasional rainfall occurs in the odd months also. The average annual rainfall is 166 cm.

6.2.3. Temperature: Temperature varies according to climatic conditions which tend to change drastically in the area. January and February are the coldest months while May and June are the hottest months. Generally, temperature remains high between March and June when it reaches close to mean maximum of 42⁰C. In rainy season it is hot and humid.

6.3. Biodiversity Pattern

The campus of the university is located at hot and humid climatic conditions. The campus has a patch of natural forest having a major tree species like etc. Plantation activities are usually undertaken during rainy season and national celebration day / event like 15th August, Earth Day, World Environment Day etc. Accordingly, many new species of economic and medicinal importance such as Tulsi, Alovera, Neem, Lemon Grass etc., have been introduced. Some herbs and shrubs were also planted in the campus. There are some faunal species are also found in the area. Table 2, 3 and 4 shows the status of the trees, shrubs, floral and faunal diversity of the campus. The tables from 5, 6 and 7 are the presentation of birds, insects and reptiles living in the campus. A typical picture of a tree in the campus is presented in fig.2.

Table 2. List of Trees in the campus

Sl.No.	Botanical Name	Common Name	Nos.	Avg. Age (Yrs.)	Avg Dia. (cm)	Avg.Ht. (feet)
1	Azadirachta indica	Neem Tree	38	14	28	20
2	Naga linga tree	Shiva Linga	9	14	28	22
3	Delonix regia	krishnachura Tree	59	14	28	35
4	African Tulip	Spathodia Tree	366	14	28	25
5	Rose of venezuela	Browner Tree	17	14	28	15
6	Neolamarckia Cadamba	Kadam Tree	34	14	33	40
7	Callistemon tree	Bottle brush Tree	18	14	28	25
8	Albizia Lebbeck Tree	Sirish Tree	18	14	28	35
9	Wikipedia	Debdaru Tree	77	14	28	30
10	Elephant apple	Chalta Tree	10	14	28	26
11	Ficus benamina	Weeping fig Tree	61	14	28	25
12	Lagerstroemia soeciosa	Furush Tree	15	14	28	20
13	Devil tree	Chatim Tree	24	14	28	22
14	Ficus Bbenghalensis	Banyan Tree	24	14	28	15
15	Mickey Mouse	Kanak chapa	1	14	28	25
16	Dalbergia Sissoo	Shisham Tree	34	14	28	27
17	Mangifera Insuca	Mango Tree	187	14	28	20'
18	Bullet Wood Tree	Boakul Tree	29	14	28	25
19	Cassia Grandis	Pink shower Tree	7	14	28	21
20	Caddia Fistula	Yellow shower	16	14	28	19
21	Swietenia	Mahogany Tree	32	14	33	45

22	Ficus Religiosa	Aswatha Tree	17	14	28	26
23	Lagerstroemia	Jarul Tree	48	14	28	20
24	Melaleuca Bracteata	Golden Bottle	32	14	28	21
25	Putranjiva Roxburghii	Putranjiva Tree	14	14	28	15
26	Wodyetia Bifurcata	Foxtail Tree	93	14	28	15
27	Cocos Nucifera	Coconat plum Tree	39	14	28	21
28	Bauhinia Variegata	Kanchan Tree	77	14	28	15
29	Albizia Lebbeck	Khirish Tree	27	14	28	26
30	Caesalpinia Pulcherrima Plant	Radhachura Tree	256	14	28	25
31	Tamarix Dioica	Jhau Tree	3	14	32	30
32	Tecoma Stans	Tecoma Tree	35	14	28	15
34	Grewia Asiatica	Phalsa Tree	4	14	28	21
35	Saraca Asoca	Ashok Tree	3	14	28	15
36	Plumeria Alba	Plumeria alba Tree	18	14	28	15
37	Ficus Racemosa Ficus Rox	Dumur Tree	9	14	28	22
38	Hevea Brasiliensis	Rubber Tree	4	14	32	25
39	Terminalia Chebula Retz	Haritaki Tree	2	14	28	22
40	Syzygium Cumini	Jamun Tree	49	14	28	25
41	Ficus Religiosa	Pakur Tree	12	14	28	21
42	Spondias Mombin	Amra Tree	6	14	28	25
43	Terminalia Arjuna	Arjun Tree	15	14	28	20
44	Artocarpus Heterophyllus Lam	Jackfruit Tree	21	14	32	24
	Total Nos., Average Age, Dia & Ht.		1860	14	28	22

Table 3. List of Shrubs species in the campus

Botanical Name.	Common Name.	Nos.	Avg. Age (yrs.)	Avg Dia. (mm)	Avg.Ht. (ft.)
Acalypha Indica	Acalypha Wilkesiana	2000	3	5	3
Duranta Repens	Duranta Erecta	300	2	5	1
Dianella Tasmanica	Dianella Tasmanica Plant	350	3	5	2
Tradescantia Spathacea	Rhoeo	500	3	4	0.5
Ixora Coccinea	Ixora Red	4500	3	5	3
Lantana Camara	Lantana Ground Cover	3000	3	5	1
Hymenocallis Littoralis	Spider Lily	2000	3	5	2
Codiaeum Variegatum	Croton Plant	1500	3	5	6
Rhapis Excelsa	Rhapis Plant	5000	3	5	8
Bougainvillea Glabra	Bougain Villea	40	3	5	2
Heptapleurum Arboricola	Scheffera Plant	150	3	5	3
Bauhinia Variegata	Kanchan Flower	200	2	5	3
Pedilanthus Tithymaloides	Pedilanthus	2000	3	5	2
Alpinia Calcarata Roscoe	Alpinia Alcarata	2000	3	5	3
Murraya Paniculata	Kamini Flower	2000	2	5	5
Not Known	Euphorbia Metallica	10	3	5	8
Hibiscus Rosa-Sinensis	Hibiscus Tree	1500	2	5	4

Not Known	Sonap India	6000	2	5	3
Epipremnum Pinnatum 'Aureum'	Maney Plant	100	2	3	1
Heliconia Caribaea	Heliconia Yellow	100	2	5	2
Dracaena Marginata,	Desina Red	100	2	5	1
Syngonium Podophyllum	Syngonium	2000	2	5	1
Not Known	Felondon	100	2	5	1.5
genus Heliconia	Heliconia Metallica	50	3	5	2
Russelia Equisetiformis	Russelia Red	50	3	5	2
Nerium Oleander	Korobi Oleamder Red	300	5	5	5
Thevetia peruviana	Thevetia	30	5	4	8
	Total Nos. & Average Age Dia & Ht.	35,880	3	5	3

Table 4. List of Herbs species in the campus

Botanical Name.	Common Name.	Nos.	Avg. Age (Yrs.)	Avg Dia. (mm.)	Avg.Ht. (ft.)
Ocimum Tenuiflorum	Tulsi Plant	472	1.5	3	3
Bouteloua Dactyloides	Buffalo Grass	525	12	2	0.5
Cymbopogon citratus	Lemon Grass	231	4	3	2
Aloe barbadensis miller	Alovera	88	5	30	1.5
	Total Nos. & Average Age Dia & Ht.	1316	6	9.5	1.6

Table 5. List of Birds:

Zoological Name	Common Name
Corvus (Genus)	Crow
Strigiformes.	Owl
Cygnus cygnus	Swan
Alcedinidae	Kinfisher
Psittaciformes	Parrot

Table 6. List of Insects:

Lepidoptera	Butterfly
Grasshopper	Grasshopper
Caelifera	Bee
Diptera	Flies
Formicidae	Ant

Table 7. List of Reptiles:

Naja Naja	Cobra
Lacertilia	Lizard
Order Testudines	Turtle
Genus Varanus	Monitor Lizard

Table 8. Carbon sequestered by the Trees and Herbs

Species	Total Biomass above Ground (T)	Total Biomass below Ground (T)	Total Green Weight (T)	Total Dry Weight (T)	Carbon stored during lifetime (T)	CO ₂ absorbed during lifetime (T)	CO ₂ absorbed per year (T)
Tree	225	45	820	410	195	715	51
Herb	1240	248	1488	744	353	1297	432
Total	1465	293	2308	1154	548	2012	483

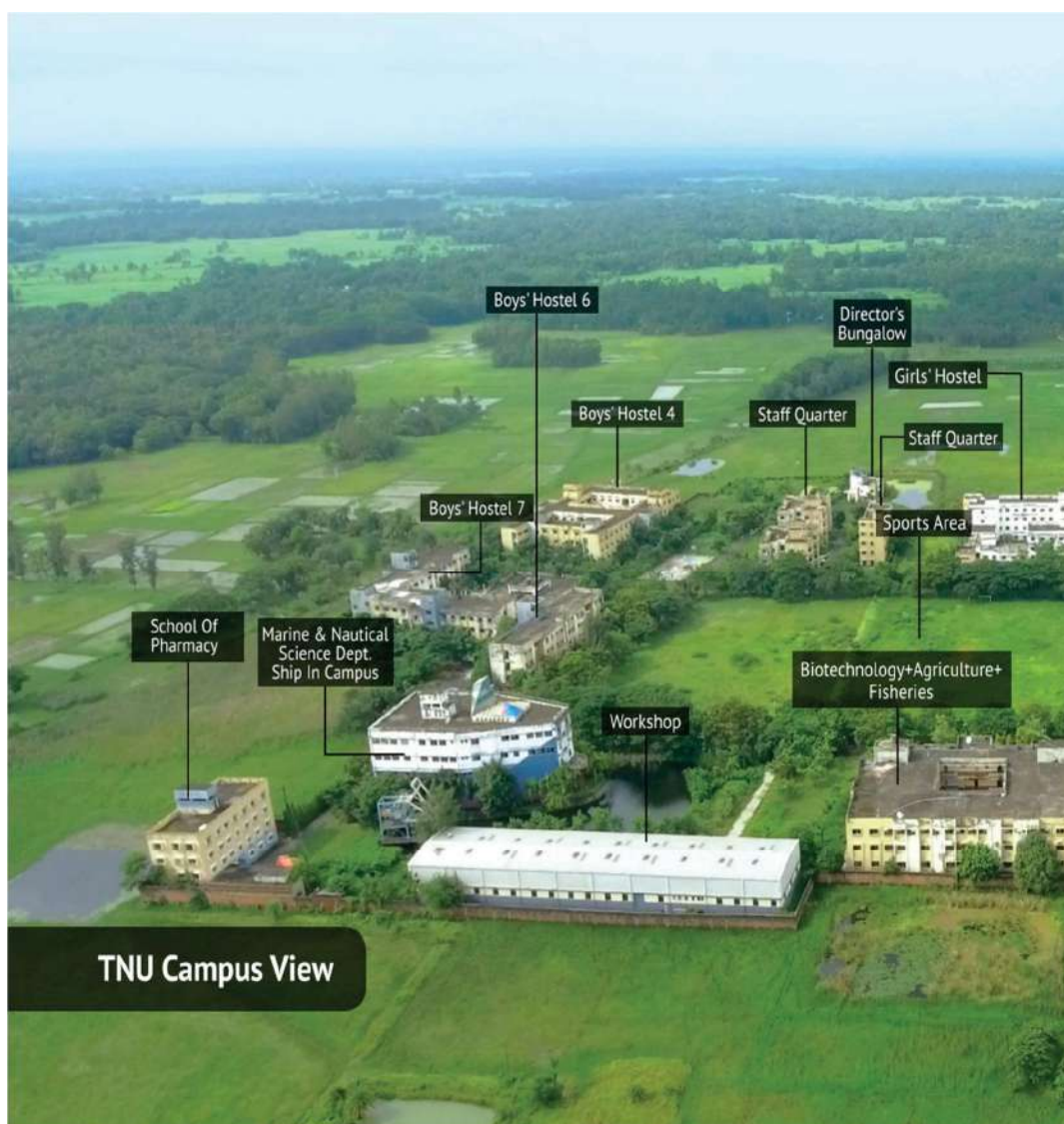


Fig.1: Aerial view of the University Campus



Fig. 2: A typical tree in the campus.

6.4. Air Quality

Air quality across the globe continues to deteriorate due to increasing emissions, threatening human health and contributing to climate change, biodiversity loss, and pollution and waste.

According to the World Health Organization (WHO), 99% of the global population breathes unclean air, and air pollution causes 7.0 million premature deaths a year. PM_{2.5}, which refers to particulate matter with a diameter equal to or less than 2.5 micrometers, poses the greatest health threat and is often used as a metric in legal air quality standards. When inhaled, PM_{2.5} is absorbed deep into the bloodstream and linked to illnesses such as stroke, heart disease, lung disease and cancer.

Pollutants tied to human and environmental health impacts include PM_{2.5}, PM₁₀, ground-level ozone, nitrogen dioxide and sulfur dioxide. The greater the density of pollutants in the air, the higher the Air Quality Index (AQI), a scale that runs from zero to 500. An AQI of 50 or below is considered safe, while readings above 100 are deemed unhealthy.

The University campus is full with trees, herbs and various species of trees, herbs, grasses etc. As a result, the ambience in the university campus is clean and dust free. Some number reptiles, birds,

insects and staying in the campus. The dust generated due to ancillary activities are settled water body in the campus. According to the data available in nearby data collection center reported that PM_{2.0} is the only particulate available in the university campus. Moreover, the other particulates emitted during agricultural and transportation activities settles on the ground surface and water bodies and has limited and no impact on human health. However, outside the campus the average AQI through the year is about 100 - 120.

6.4.1. Sources of air pollution: It was observed and revealed from data that the only possible sources of pollution in the university campus are as use of diesel / petrol vehicles, air-conditioners, power generator, kitchen waste and other biodegradable waste from canteen, use of electronic appliances and other. There is four (04) office vehicles, four (04) Buses, about personal eight (08) cars, five (05) personal two-wheelers and two (02) electrically auto rickshaws are being used by the employees of the organization. Nearly (36) people are using pooled vehicle / share auto taxi or shared two-wheeler for commuting to university. There are environment friendly e-vehicle i.e., cycle, but the percentage is very low nearly 7%. Further, people commuting through walking are also only 5-7%. There are very low chances of air pollution from outside as there are no commercial as well as the industrial activities are running near / adjacent the campus, as the campus is rich in greenery and water bodies.



Fig. 3: Weather monitoring system in the campus.

6.4.2. Noise pollution: As there are no industrial activities nearby / adjacent to the university thus there is no questions for sound pollution in the university ambience. Nevertheless, as the campus of the university is situated on the side of Diamond Harbour Road, there are chances of vehicular noise pollution seem to be within of standard limit of sound pollution. Moreover, the two diesel generators, one is 250 kVA and other one is 160 kVA operating during the load shedding period are kept in

sound proof conditions. Thus, there are no source for noise pollution in the campus.



Fig. 3a. Private Cars operates in the campus

6.5. Water Quality, Resource and Management

University has its own underground tube-well for meeting its water requirements for various purposes such as drinking, use in washrooms, canteen and gardening. The university have several staffquarters in the university premises, thus, there are household domestic water demand, water consumed in the university premises is for drinking, canteen, sanitary and gardening purposes. The university is located in the costal belt the underground water quality is very hard and salty in nature. University has the water treatment facilities for supplying clean and safe water in the campus. There are water treatment systems in every school of studies maintained by the organization for meeting the quality drinking water demand of the students, teachers and staffs. The underground water from tube-well is lifted to store at the overhead tanks through an electric pump motor system. There are about ten (10) numbers of water storage tanks with a capacity around 1000-liter capacity are placed in the roof top areas of the university buildings which are filled in daily or as when required.

6.6. Energy Consumption and Conservation options

The university campus is situated around the hot and humid in nature climatic zone as a result the electricity is needed not only for lighting but also running fans, cooling systems etc. during the summer seasons. Electricity also required for running computer systems and other ancillary operations. University has a server room which needs stable electricity for 24x7 hours. Apart from this university also has 24x7 security systems that require also demands electricity for lighting. The university has its own tube well connected with electric motor of 2 hp. Water from the tube well is lifted to overhead tanks daily and for the purpose pump motor systems run for 2 – 2.5 hours daily. University has a sanctioned load of 125 KW from West Bengal State Electricity Board (WBSEB).

The average electricity consumption of the university per month is approximately 95,560 – 1,07,318 kWh. The electricity consumed in 2022 is 11,46,726 kWh and 12,87,820 kWh in 2023. The average cost of electricity varying from Rs. 8.90 – 11.30 per kWh. The university has paid the amount for electricity in 2022 was Rs. 1,35,49,152/- and in 2023 was Rs. 1,50,37,519/- In addition to this, there are two diesel generators one having the capacity of 250 kVA and other one is 160 kVA installed for meeting energy requirement during power cut / failure duration. These are operating on an average one to two hours a day, for supplying electricity to the university campus. The amount of diesel consumed in 2022 was 4,581 and 5,360 liters in 2023 respectively. The consumption of the above amount of electricity is indirectly emitted 10,94,647 kg of CO₂ at the power generation site. The backup power from the diesel generator has also emitted a considerable amount of CO₂. It was mentioned that in 2022 and 2023 the amount of diesel used was 4,581 about 5,360 liters respectively. The CO₂ emitted for providing backup power was 2,978 and 3,484 kg respectively.

6.6.1. Renewable Energy Resources

Recently the University set up 52.3 kWp grid integrated solar photovoltaic (PV) power plant over the rooftop of SB3 building. The power generated from the PV power plant blended with the existing electrical power line and reducing the consumption of power supplied from WBSEB. The projected energy generated from this power plant will be 62,123 kWh / year and this will reduce not only the power consumption from WBSEB but also reduce the 52,812 kg of CO₂. In order to reduce the power consumption and indirect CO₂ emission reduce at the ‘zero’ level a PV power plant having capacity of 1.08 MWp may be consider for installing in university campus may be over the rooftop of the various buildings or in agricultural field. For this purpose, the PV power plant may be installed over four (04) acre land where both agricultural activities as well power generation can be conducted using ‘Agrivoltaic’ methods.

6.7. Waste Quality, Disposal and Management

Both biodegradable as well as non-biodegradable wastes are generated from various departments / sections of the university. The principal waste includes paper, grasses, electronic wastes, canteen wastes and other solid wastes. The university operating normally on six days (Monday-Saturday) in week except some public holiday. There are some hostels are in the campus thus a good number of students are visiting the campus every day except in long term holidays. The housekeeping staffs are cleaning university every day from 7.00 am to 8.00 am in the morning every day. Thus the waste generated through classrooms and administrative buildings are cleared by the housekeeping staff members. The normal wastes are papers, waste food and food packed items. There are separated out

during the cleaning time and puts them into the marked waste bins like biodegradable and non-biodegradable wastes. University notified for banning of plastic items in the university campus. Nevertheless, following provisions have also been made:



Fig. 4: Renewable Energy and ‘Agrivoltaic’ Systems operating in the campus

6.7.1. Biodegradable: There are two kinds of waste bins (Yellow, Red, Green and Blue) placed at different places / department / sections to collect the waste separately (Blue for biodegradable, Red for glass like items, Green for organic items and Yellow for non-biodegradable like plastics). Thereafter, the biodegradable wastes produced from various departments, sports ground or other places / areas are put into compost pits for making compost to use in manuring garden plants and seedling planted during planting season.

6.7.2. Non-Biodegradable: There is very low quantity of non-degradable waste in the campus as the university has limited numbers of staff quarters at present in the university premises, therefore, little amount of household domestic wastes is generated. Since university operates its various academic programs through its school / academic units / departments, therefore, all wastes collected by the house keeping staff in the morning hours are placed in the respective bins. Later on the municipal corporation people collect all the wastes and disposed in their marked site.

6.7.3. E-Waste: Besides the above wastes there are another category of waste is E-waste which includes computers, laptops, pen drives, printers, hard discs, CD’s and other solid waste, electrical & electronics equipment generated through different schools / departments / academic units / sections is disposed and managed by the ICT, maintenance and store department of the university and the details

are properly maintain in the stocks register. Thereafter in every five year the concerned departments categorize the useless items in to the wastes and disposed through auction as per the pollution control rule of the West Bengal.



Fig. 5. Various Waste Bins used in the campus



Fig. 5a: A typical Waste Bin placed on the side of an academic building.

6.8. Carbon Footprint Estimation:

Over the last decade, sustainability reporting has gained importance in both profit and nonprofit organizations. Sustainability reporting provides information to decision-makers and acts as a catalyst for organizational change. The United Nations' report 'Our Common Future' shows the multilateralism and interdependence of nations in the search for a sustainable path, or people's continuous efforts to attain a sustainable society. In the same way, the Sustainable Development Goals (SDGs) developed / framed by the United Nations General Assembly in 2015 provide clear guidelines and targets for all countries to adopt in accordance with their own priorities and the environmental challenges of the world at large. Goal 13 of the SDGs specifically focuses on the need to address the issue of climate change. The setting of goals and objectives under the aegis of the SDGs is an affirmative step to better educate the younger generation i.e. our students about sustainability and environmental impacts.

The carbon footprint (CF) is the measure of greenhouse gas (GHG) emissions that are directly or indirectly caused by the activities and are accumulated over the life stages of a product or service, expressed in carbon dioxide equivalents (e-CO₂). According to the Intergovernmental Panel on Climate Change (IPCC), there are 18 greenhouse gases with different global warming potential, but under the United Nations Framework Convention on Climate Change (UNFCCC) and its Kyoto Protocol, only Carbon dioxide (CO₂), Methane (CH₄), Nitrous Oxide (N₂O), Hydrofluorocarbons (HFCs), Perfluorocarbons (PFCs), and Sulphur hexafluoride (SF₆) are considered for the carbon accounting. The GHG protocol is used to calculate CF as it is used by the university in the study as it is a part of the sustainable initiative, which follows ISO guidelines and mandates using GHG protocol. The five main objectives of this standard and guidance are:

- i. To prepare a GHG inventory of the university that represents a true and fair account of its emissions through the use of standardized approaches and principles; simplify and reduce the cost of compiling a GHG inventory;
- ii. To provide the information that can be used to build an effective strategy to manage and reduce GHG emissions;
- iii. To provide information that facilitates participation in voluntary and mandatory GHG programs; and
- iv. Increase consistency and transparency in GHG accounting.

The Neotia University is measuring its Carbon Footprint (CF) since 2018 with the objective of quantifying the greenhouse gases produced by the institution directly as well as indirectly. This environmental management tool allows developing measures to reduce the environmental impact of the activities carried out on the campus.

The following steps were used in order to determine the GHG emissions related to each category:

1. Determine the energy consumption in each category, such as consumption of electricity in kWh, consumptions Diesel in liters, and consumption of liquefied petroleum gas (LPG).
2. Find the updated GHG emissions factor associated with each category,
3. Calculate amount of e-CO₂ emission in each category by multiplying consumption per emission factor associated with each category.
4. Prepare a GHG account statement for accounting the e-CO₂ GHG Emission sectors.

6.8.1. Direct Emission in campus:

- i. Four (04) no of Buses operating 20 min a day for five days for 40 weeks for carrying staffs and students.
- ii. Four (04) no of Office vehicles operating 20 min a day for 40 weeks
- iii. Eight (08) no of Personnel Car operating 20 min a day for 40 weeks
- iv. Five (05) no of Two Wheelers operating 20 min a day for 40 weeks
- v. Two (02) no of Diesel Generator operating as and when required for supplying electricity during power failure period.
- vi. Twenty (20) no of 14 kg LPG cylinder per month operating 300 days in year.

Total CO₂ emitted from Busses, vehicles, personal car is about 1,126 kg of CO₂ per year. The CO₂ emitted by burning of LPG gas 10,080 kg of CO₂ per year. The CO₂ emitted by diesel generator is about 3000 kg per year. Total direct emission of CO₂ 14,206 kg in the campus i.e. 14.2 Ton. The CO₂ neutralize by the campus is 483 Tons. Thus, CO₂ credited by university is 468.2 Ton per year and during the last five years i.e. 2018 to 2023, the additional CO₂ sequestered by the university is 2341 Tons. Thus the direct carbon credited by the university 2341 Tons.

6.8.2. Indirect Emission:

Indirect emissions cover by the generation and transmission of electricity that was used in campus. Emissions are derived from the acquisition and consumption of energy in the organization but physically produced outside the boundaries of the university.

Emission from electricity consumption in the campus is 11,46,726 kWh in 2022 and 12,87,820 kWh in 2023. The average electricity consumed per year in last five years i.e. 2018 – 2023 was 12,17,273 kWh. The standard emission of CO₂ from coal fired power plant per kWh of electricity about 850 gm. During the COVID-19 period i.e. 2020 – 2022, electricity consumed was about 33% of the average consumption. Thus total CO₂ emitted during per year during last five years 3788 Tons. The indirect carbon debited 3788 Tons. Thus, net carbon debited during the last five years is (-) 1,447 Tons.

Following is Carbon Account Statement of the University.

Carbon Emitted per Year (T)	Carbon Sequestered per Year (T)
Direct: 1. Vehicles operation in Campus: 1.126 2. LPG consumption in Campus: 10.08 3. DG Set operation for backup power: 3.00 Total: 14.206	Direct: 1. By Trees: 51.00 2. By Herbs: 432.00 Total: 483.00
	Carbon Credited: $483.00 - 14.206 = 468.794$ Ton per year.
Indirect: Electricity Consumption: 1035.00	

6.9. Awareness, Mitigation and Management Practices

The university has organized several awareness programs in the form of seminar, workshops, high ranking plenary lectures on sustainable development for the students, faculty members and the staff for educating them on the various environmental issues. They were also advised about the adoption of various green measures to be adopted in office as well as in their houses. In 3rd May of every year university is celebrating ‘International Sun Day’ for the encouraging about the adoption of solar power as the clean and safe source of energy. The Eco Club of the university is organizing several ecologies related activities for developing clean and safe eco systems of the university as well residential areas. A course on Environmental Studies is compulsory for all under graduate students in the academic program. In addition to these Industrial Ecology Engineering was introduced as the general elective as well as value added paper in adhering to the NEP-20. Further, university conducts plantation drives in the campus during World Environment Day and World Earth Day. University implemented ‘Agrivoltaic’ program for bring ‘food and energy security’ from same land.

Further, university has also adopted nearby villages for environmental awareness activities, health camps and other community programs being conducted through the participation of the students, faculty and staff members.

6.9.1. Maintenance of Lush Green Campus: University campus is situated over about sixty (60) acres of land which was used for the purpose of creating infrastructure required for the development of various academic infrastructure, accommodation of staffs and students. Construction of some new infrastructure are in progress without disturbing the green areas of the campus. Besides these university has taken following drives / program in maintain green infrastructure of the campus.

6.9.1a. Plantation Drives: Plantation of trees in various occasions are the regular activities in the campus, and usually in all important occasions and events, plantation activity is regularly taken up. University has maintained a garden in which different ornamental plants have been raised (fig. 6.).



Fig. 6: Flowers from Ornamental Trees

6.9.1b. Organic Composting: The activity of making organic compost has been initiated in the campus where all the biodegradable waste materials are filled up in the compost pit. In the course of time, organic compost is prepared. This organic compost is utilized for manuring in flowerbeds and plantations (fig.7).



Fig. 7: Organic Compositing.

6.9.2. Energy Conservation efforts: University is using star rated electrical & electronics equipment which saves energy. LED Bulbs / Tube-light, 3-5 star rated Air Conditioners.

University has always been effortful in making use of renewable energy resources. However, several solar PV street lights have been installed since 2018. At present a 52.3 kWp grid integrated PV power plant has been installed. It was recommended that some smart system will be introduced in the class rooms and other places in automatic switch off the light and fans in the absences of human beings.

This is the step forward for exploring the energy conservation opportunities and will definitely reduce the electricity consumption of the university and will reduce the electric bills.

6.9.3. Water Conservation Measures: It was mentioned at the introduction section that water will be another major problem for tomorrow. As a result, university adopted steps for water conservation measures both from supply side as well as demand side. The university campus has several water ponds used for fish culture as well as fisheries studies. These ponds store rain water and act as automatic water harvesting systems. Additionally, a water channel is flowing through the campus and also act as water harvesting areas. All academic schools have their water purifier systems and the waste water recharge through the channel. It has been observed underground water table does not have any significant change even in dry seasons also. This confirms about the water harvesting action in the campus.

7. RECOMMENDATIONS

The environ / green audit of any academic institution reveals, ways by which institute can reduce energy consumption, water conservation and reduction in emission of carbon dioxide and other greenhouses gases in the environment. The analysis indicates about the loading on the environment and human contribution to the degradation of the environment in the academic institution. It is a process to look into the total system and to take necessary measures for preserving the environment for future generation without hampering the ecological stability. This process of environment / green audit enables to assess the life style, action taken and assess its impact on the environment. The environment / green audit is the process of identifying and determining about the eco-friendly and sustainable practices of the academic institutions. Natural resources are used for human activities from the ancient age but with the time and industrial revolutions there were excess use of resources and that contaminated the air, water and put load on land. As the mother earth has the finite carrying capacity there need to study the load that human being is incorporating on the mother earth and its ecology. In the era of climate change and resource depletion it is necessary to verify the processes such that it should adheres with the sustainable development goals to address the ecology, economy and empowerment.

In the previous section discussions on carbon footprint (CF) has been made. In order to reduce the CF and to make a cleaner and safer habitat place following are the recommendations.

1. In case of mobility inside the university campus it is recommended to use battery operated vehicles.
2. Sensing systems required to be incorporated to reduce the electric consumption in case of operating light, fans and cooling systems.
3. Grid integrated solar PV power plants are recommended to install over the rooftop of every building in roof integrated fashions for power generation as well as reduction of corrosion and erosion effect of the rooftop surface.
4. Major efforts require to be taken for rainwater harvesting and automated water consumption devices.
5. Waste generated in the campus to be assed and explore it for reuse.
6. The biogas plant in the campus should be integrated to the kitchen for reduction of LPG consumption.
7. Solar hot water system should be installed over the hostels and the kitchens for supplying hot water for the reduction of electricity and LPG.
8. Use of plastic should be banned in the campus. Training should be conducted for the house keeping staff in educating them in segregating the wastes.
9. Green Audit should be conducted in every academic year and students should be trained accordingly.
10. Awareness program among the stake holders require to be organized in every academic year.

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