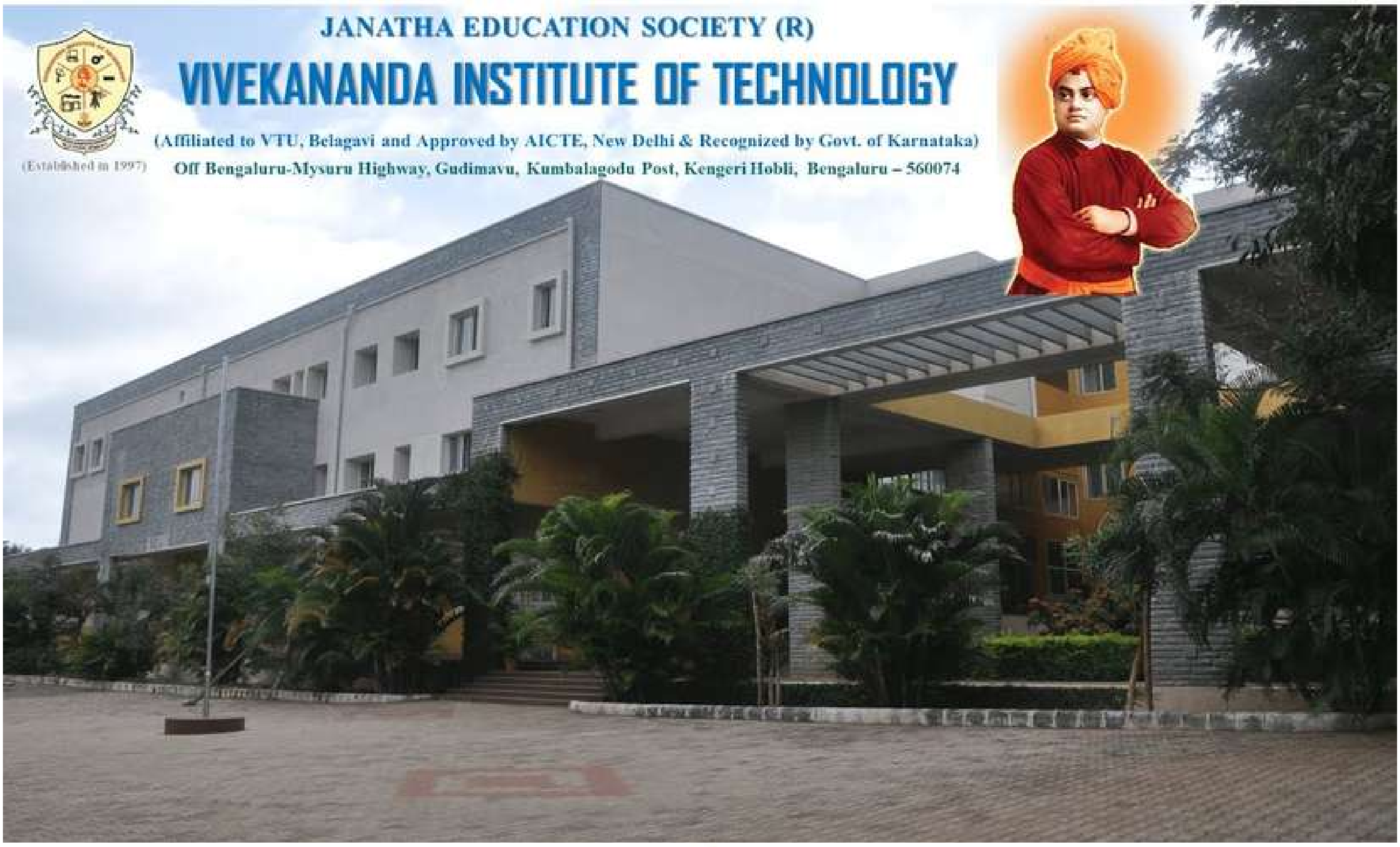
GREEN, ENERGY AND ENVIRONMENT AUDIT REPORT(2018 - 2023)



VIVEKANANDA INSTITUTE OF TECHNOLOGY

Audit Conducted and Submitted by

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DECEMBER 2023

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ABOUT THE COLLEGE

At Vivekananda Institute of Technology, We value every individual in our care and it is our aim to provide the best possible academic environment in which students can succeed. Our campus has grown from its inception in 1997 to accommodate over 1200 + pupils in first-class teaching facilities which are amid beautifully kept surroundings.

Vision:
To become an outstanding Knowledge dissemination centre at the cutting edge of Engineering and Technology to produce globally acceptable competent Professionals who will be in the forefront of technological innovations for the benefit of mankind.

Mission

- To provide an excellent infrastructure and conducive ambience in the Institute.
- To impart quality technical education combined with ethical values.
- To produce world class Professionals to take up challenging assignments of latest an advancement in technology and engineering.
- To inculcate attitudes for research and developmental activities.
- To leave a legacy for development of next level engineers and technologists.

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GREEN AUDIT

GREEN AUDIT

A green audit is a systematic evaluation of an organization's operations, practices, and policies to identify areas for improvement in terms of environmental sustainability and resource efficiency. It is also known as a sustainability assessment or environmental impact assessment. The primary objectives of a green audit include identifying areas of environmental impact, measuring resource consumption, and developing strategies to minimize negative effects and maximize sustainability

In this context, the Green Campus Audit becomes a systematic tool for managing the college's environment, emphasizing sustainability, and nurturing an eco-friendly culture within the city. The goal is to blend environmentally sound practices with education, encouraging sustainable behaviors and integrating user-friendly technology within the campus.

To achieve this, the audit emphasizes maintaining a green landscape within the urban setting, encompassing a diverse array of trees, plants, lawns, and shrubs. This reduces pollution and aids in conserving biodiversity, managing landscapes, implementing proper water irrigation, and preserving natural topography within the city environment.

Green audits are important because they help businesses and colleges to:

- Remain compliant with state and federal regulations, and avoid fines or other penalties
- Create safer working conditions
- Reduce their impact on the world around them
- Ensure the best environmental sustainability practices
- Lower the risk of health risks and dangers to people on the learning site
- Adhere to norms and standards of environmental management systems
- Determine the best grades from the National Assessment and Accreditation
- Evaluate their environmental impact, raise awareness about sustainability, and enhance their reputation
- Drive sustainable practices, reduce costs, and foster a culture of environmental responsibility

OBJECTIVES OF GREEN AUDIT

1. The primary goal of the green audit is to secure the best practices for environmental sustainability.
2. It reduces the possibilities of health hazards and threats for the students on the learning campus.
3. There are several norms and standards in the environmental management system, and the green audit helps you conform to the norms.
4. The audit also helps identify the ideal protocols that develop a sustainable ecosystem on the campus.

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BIODIVERSITY ASSESMENT

Estimation of tree biomass can be done with the help of indirect non-destructive method using allometric equations with measurable parameters are used for quantifying the biomass of a tree.

The method uses diameter at breast height (DBH) for the estimation of the above-ground, below ground biomass for its strong correlations with the tree diameter. Additionally, a simple model which needs only the diameter as input has also been accepted as an effective method for the purpose of determining above-ground biomass.

CARBON SEQUESTRATION

There a total of 61 species of trees within the VKIT campus, which comprised of 1270 individual trees. The table below presents the descriptions of the identified species including their scientific names, common names, height, wood density, Shannon diversity index, Simpson index, Poilu evenness index, abundance and carbon content in terms of individual counting.

Advantages of Carbon Sequestration

- By absorbing extra carbon dioxide from the atmosphere, carbon sequestration prevents the occurrence of climate change.
- The deep injection is feasible since the gas can be easily liquefied and transmitted easily through pipelines.
- Deep injection of carbon dioxide improves the extraction of fuels like oil and methane from their reserves in addition to removing excess pollutants from the air.
- In the foreseeable future, coal is not anticipated to be totally replaced by renewable energy sources like solar and wind. Yet, carbon sequestration may make it possible to lower emissions by 80% to 85% while still using fossil fuels.
- There haven’t been any events of carbon dioxide leaking out from the injection site, and it won’t happen for 1000 years.

Overall Biodiversity patterns of across the blocks in Vivekananda college

Indices	B1	B2	B3	B4	B5	Total/Average
Shannon Diversity index (H)	2.73	2.74	2.73	2.08	2.25	2.51
Simpson Dominance Index	0.13	0.10	0.07	0.20	0.17	0.14
Poilu Evenness index	1.25	1.14	1.80	0.96	0.96	1.22
No. of Species	41	34	18	21	27	61
Basal area	478.40	514.93	33.98	80.00	104.69	1212.01
Total trees	290	298	87	193	402	1270
Carbon content(t)	2277.968	2450.28	153.96	364.37	470.62	5717.198
Carbon EQ(t)	8352.55	8984.36	564.521	1336.02	1725.61	20963

B1 ENTRACE TO GROUND

Sl.no	Vegetation characters	value
1	No of species	41
2	No of individuals	290
3	No of families	20
4	Basal area	478.40
5	Above Ground Biomass (t)	3961.684
6	Below Ground Biomass (t)	594.2526
7	Total biomass(t)	4555.936
8	**CARBON CONTENT(t)**	**2277.968**
9	**CARBON EQ(t)**	**8352.55**

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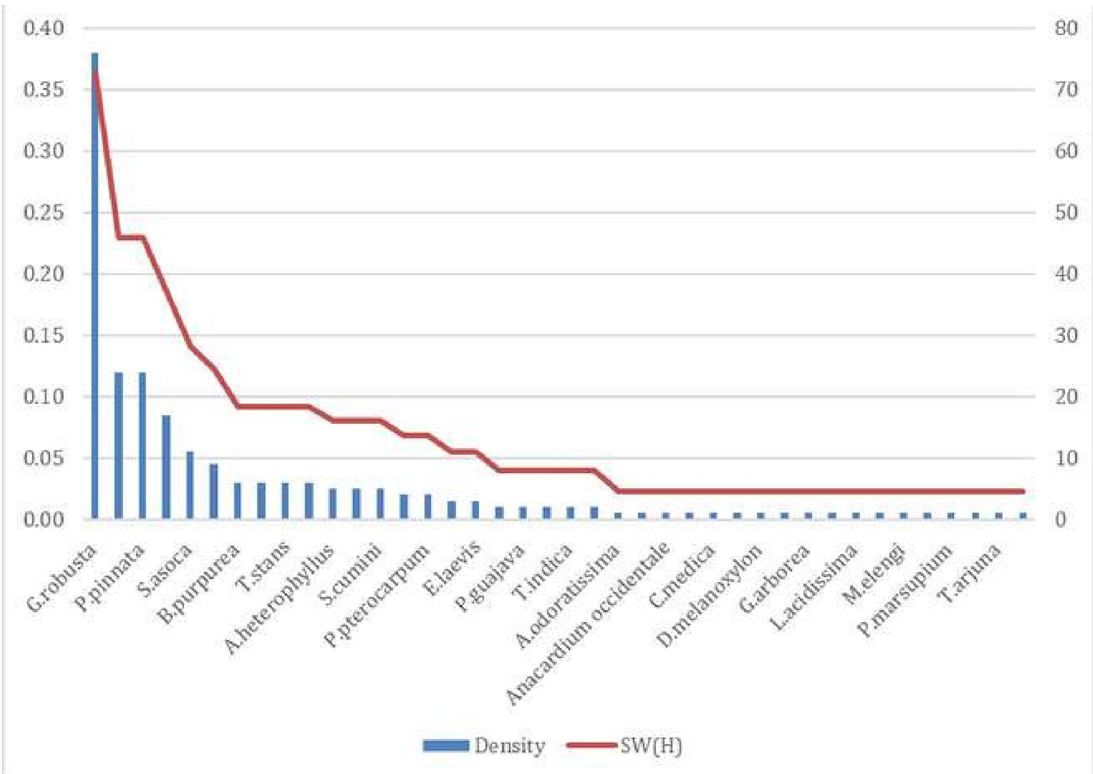
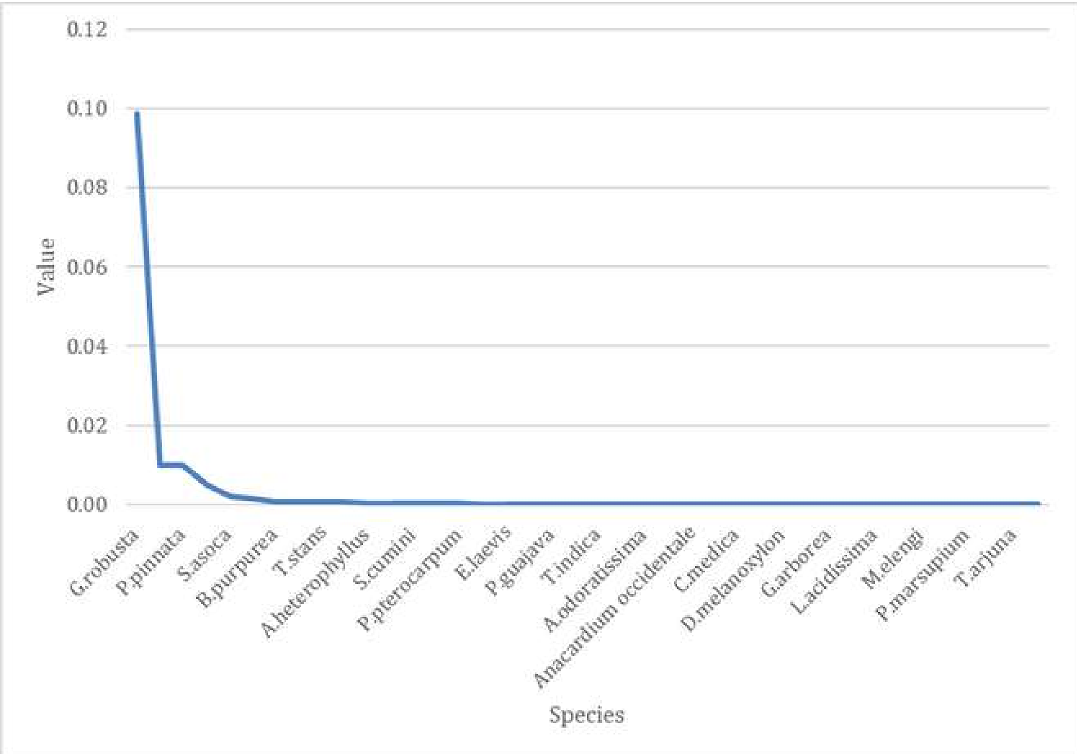
The relationship between tree species density and the Simpson index reveals the intricate ecological dynamics within a given ecosystem. As tree species density increases, the Simpson index provides a quantitative measure of biodiversity by assessing the dominance and evenness of species distribution. High tree species density coupled with a lower Simpson index suggests a more diverse and balanced ecosystem, showcasing a harmonious coexistence of various species. Conversely, a lower tree species density with a higher Simpson index may indicate dominance by a few species, potentially signalling ecological imbalance or stress. Understanding this correlation aids in evaluating the health and resilience of forest ecosystems, informing conservation strategies and sustainable land management practices.



Tree species density vs Shannon index of each species in block 1

The interplay between tree species density and the Shannon index unveils critical insights into the diversity and complexity of a forest ecosystem. Tree species density reflects the number of different species present, while the Shannon index accounts for both the abundance and evenness of these species. As tree species density rises, the Shannon index provides a nuanced measure of biodiversity, capturing not only the variety of species but also their relative proportions. A higher tree species density coupled with an elevated Shannon index signifies a more intricate and balanced ecological community, characterized by a rich mix of species with equitable representation. Conversely, a lower tree species density and a lower Shannon index may indicate a less diverse or imbalanced ecosystem. This relationship serves as a valuable tool for assessing and managing forest biodiversity, informing conservation efforts and sustainable forestry practices.



Tree species density vs Simpson index of each species in block 1

B2 CIVIL BLOCK BOYS HOSTEL ROAD

Sl.no	Vegetation characters	value
1	No of species	34
2	No of individuals	298
3	No of families	16
4	Basal area	514.93
5	Above Ground Biomass(t)	4261.36
6	Below Ground Biomass(t)	639.20
7	Total biomass(t)	4900.56
8	**CARBON CONTENT(t)**	**2450.28**
9	**CARBON EQ(t)**	**8984.36**

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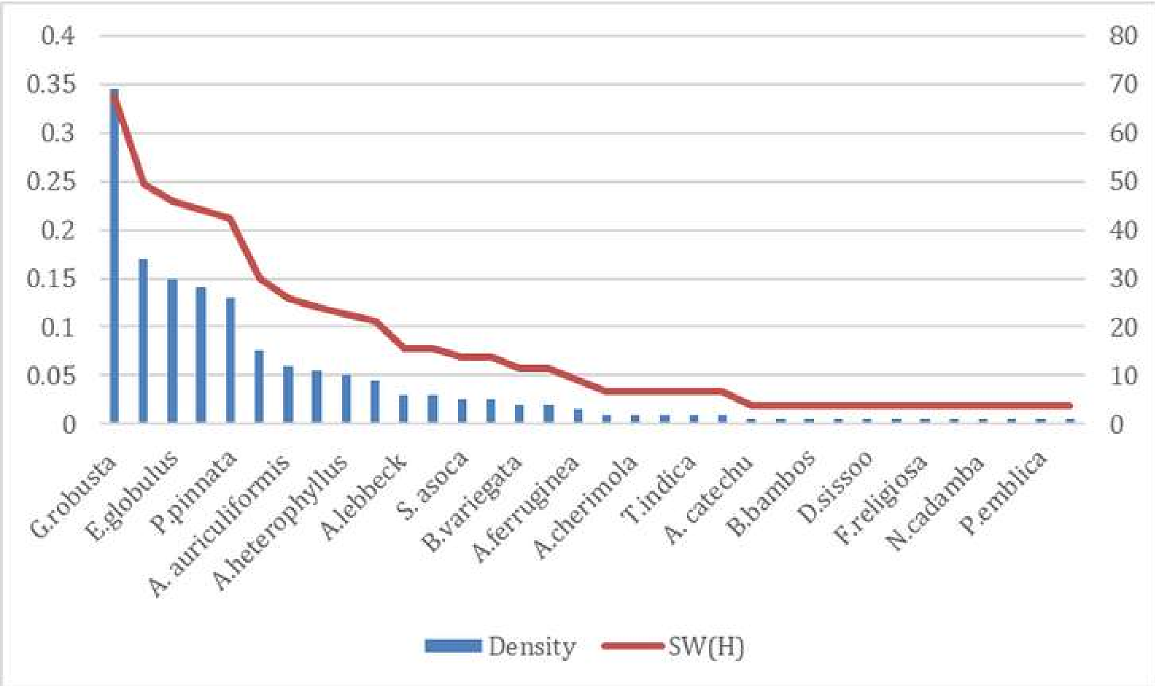
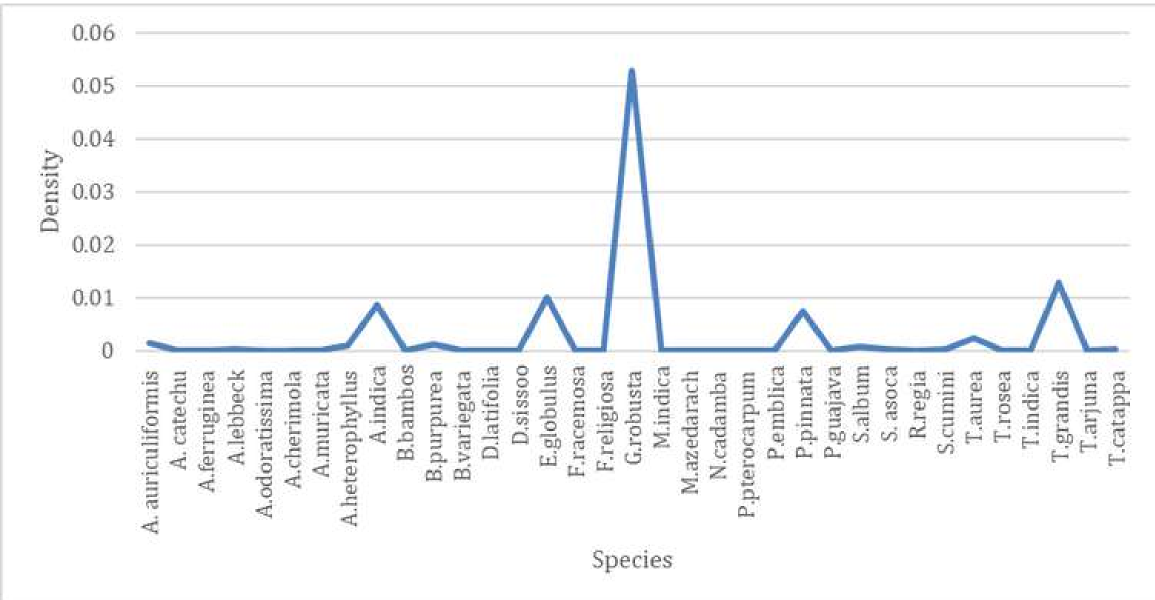


Tree species density vs Shannon index of each species in block 2



Tree species density vs Simpson index of each species in block 2

B3 MECHANICAL BLOCK

Sl.no	Vegetation characters	value
1	No of species	18
2	No of individuals	87
3	No of families	13
4	Basal area(t)	514.93
5	Above Ground Biomass(t)	267.7571
6	Below Ground Biomass(t)	40.16356
7	Total biomass(t)	307.9206
8	**CARBON CONTENT(t)**	**153.9603**
9	**CARBON EQ(t)**	**564.5212**

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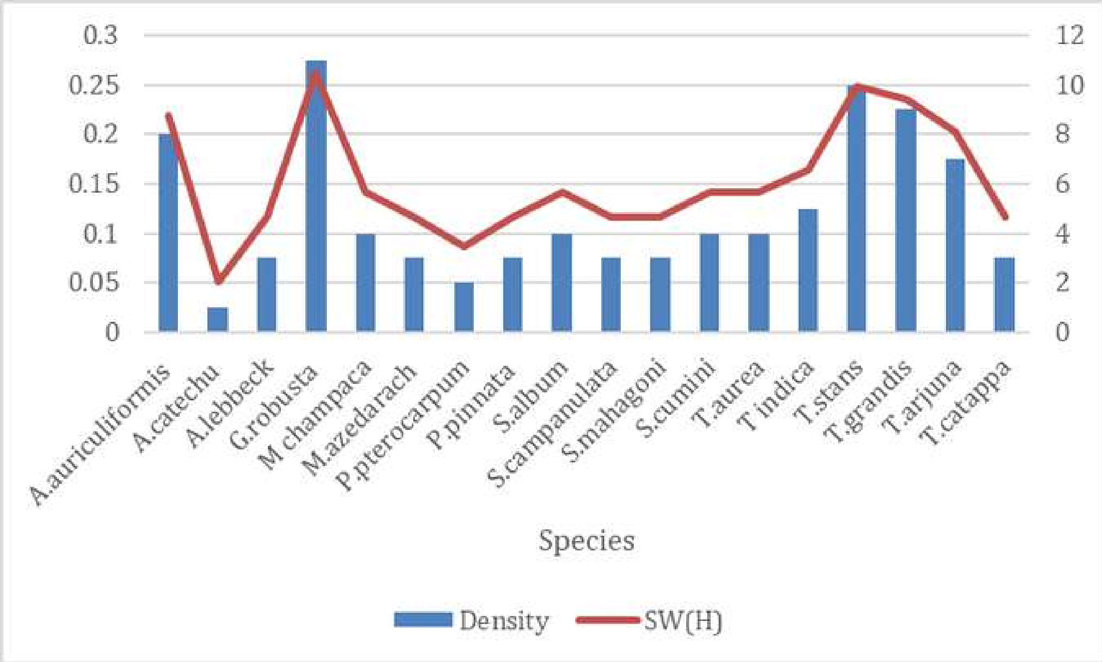
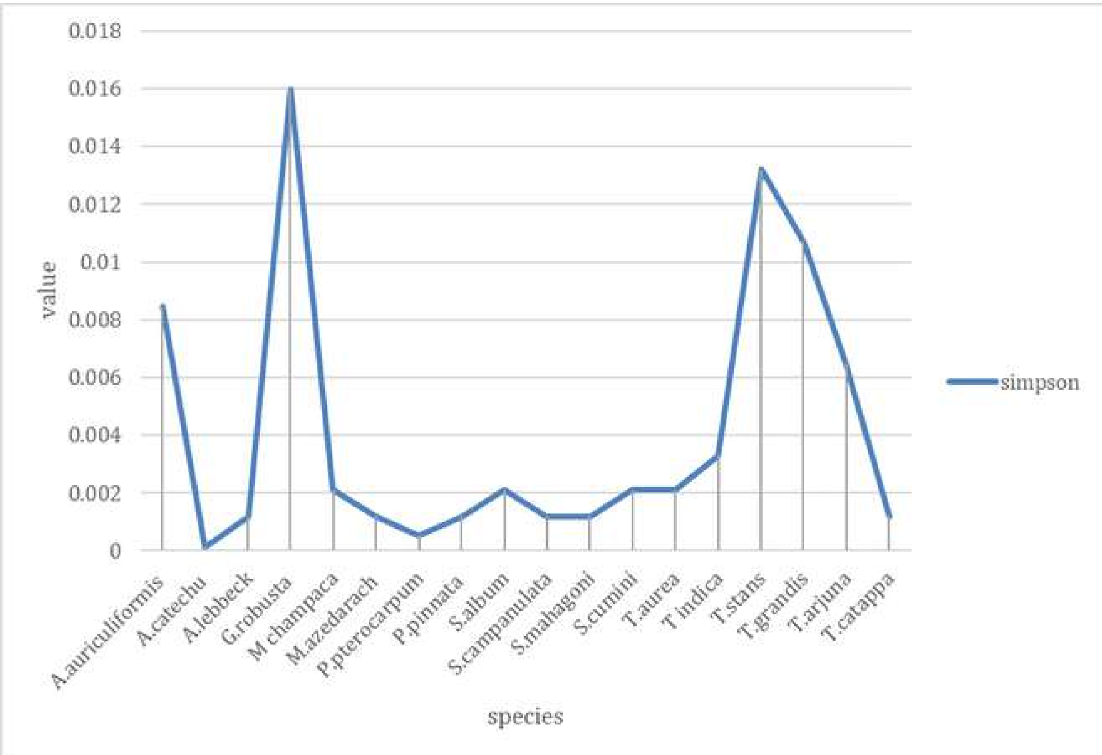


Tree species density vs Shannon index of each species in block 3



Tree species density vs Simpson index of each species in block 3

B4 BUS PARKING AREA TO TEMPLE,CANTEEN

Sl.no	Vegetation characters	value
1	No of species	21
2	No of individuals	193
3	No of families	15
4	Basal area(t)	514.93
5	Above Ground Biomass(t)	633.68
6	Below Ground Biomass(t)	95.05
7	Total biomass(t)	728.74
8	**CARBON CONTENT(t)**	**364.37**
9	**CARBON EQ(t)**	**1336.02**

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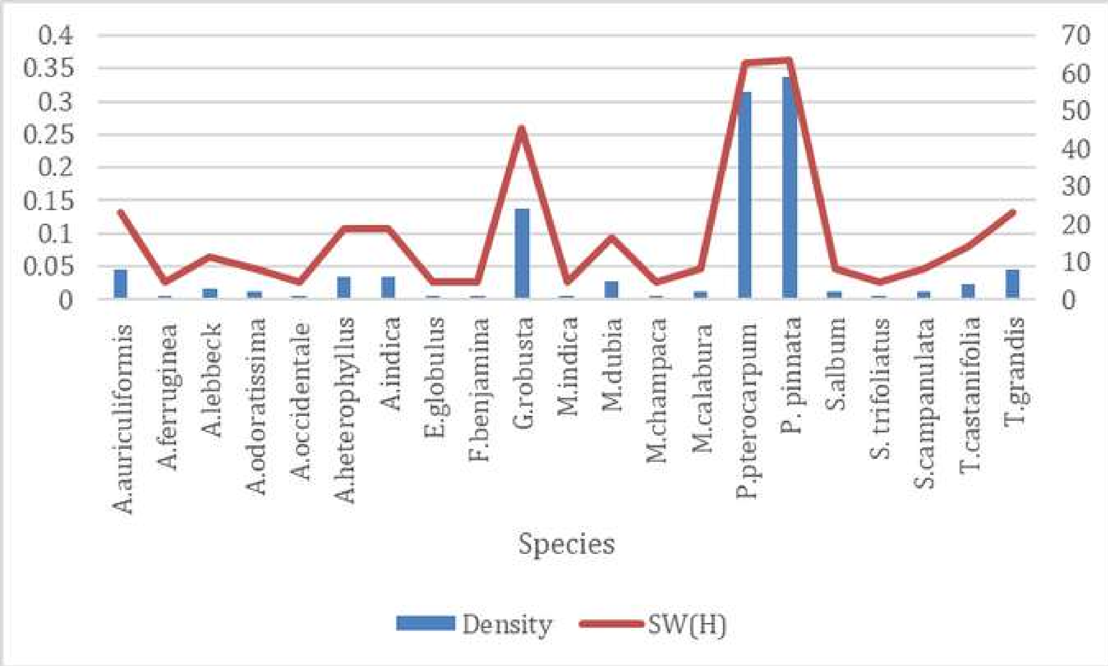
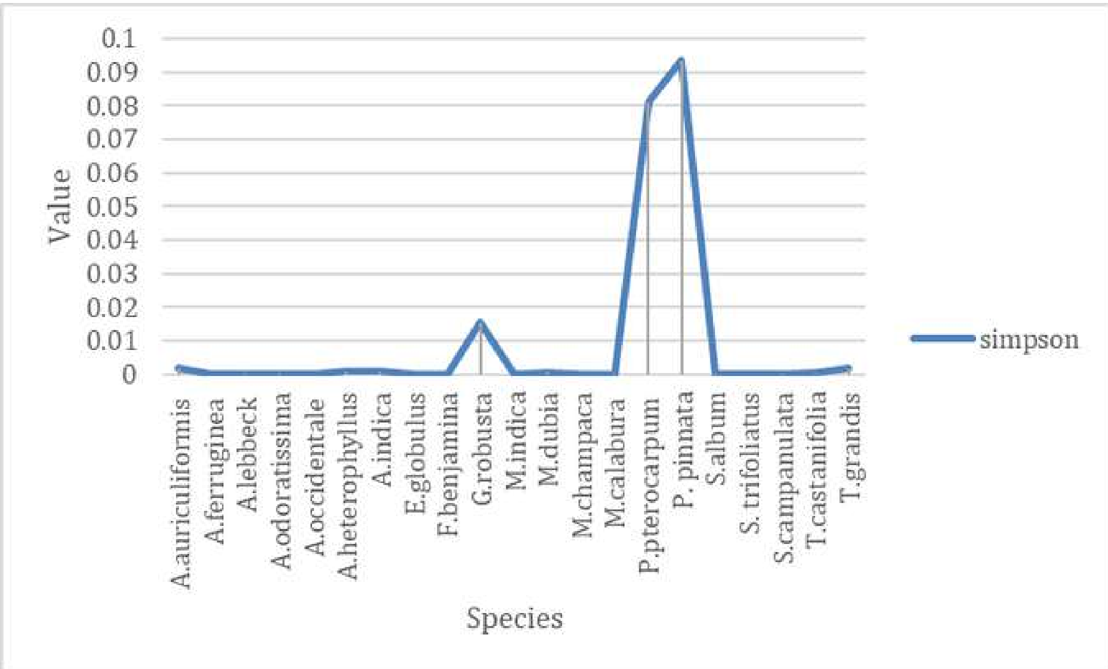


Tree species density vs Shannon index of each species in block 4



Tree species density vs Simpson index of each species in block 4

B5 PLAYGROUND AREA

Sl.no	Vegetation characters	value
1	No of species	27
2	No of individuals	402
3	No of families	14
4	Basal area(t)	104.69
5	Above Ground Biomass(t)	818.47
6	Below Ground Biomass(t)	122.77
7	Total biomass(t)	941.24
8	**CARBON CONTENT(t)**	**470.62**
9	**CARBON EQ(t)**	**1725.61**

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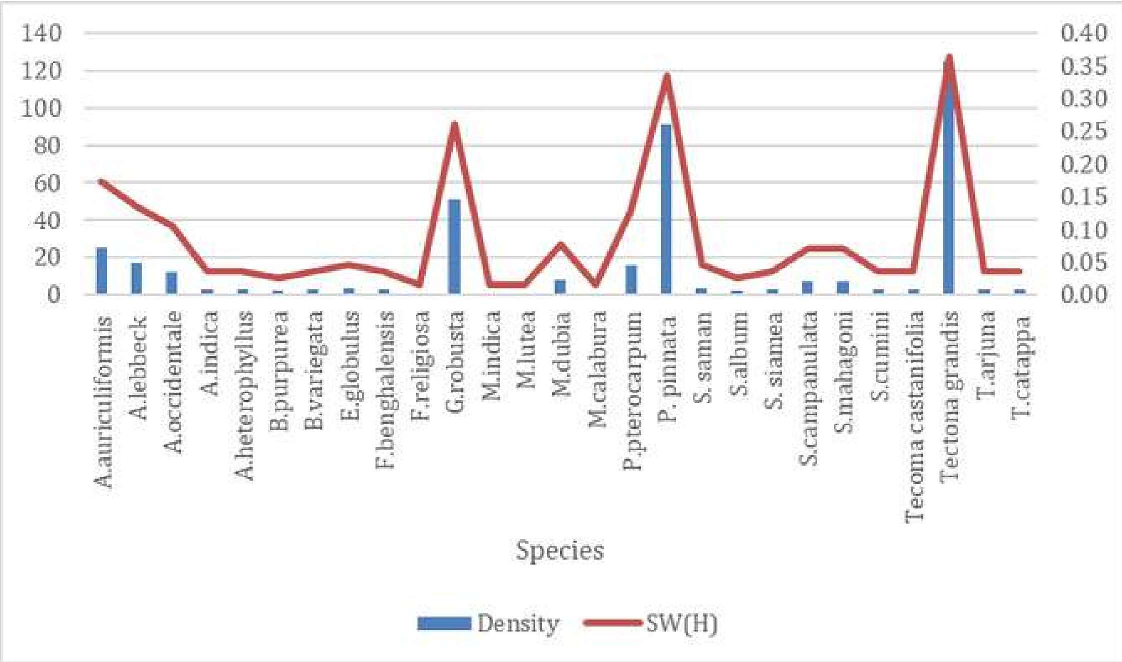
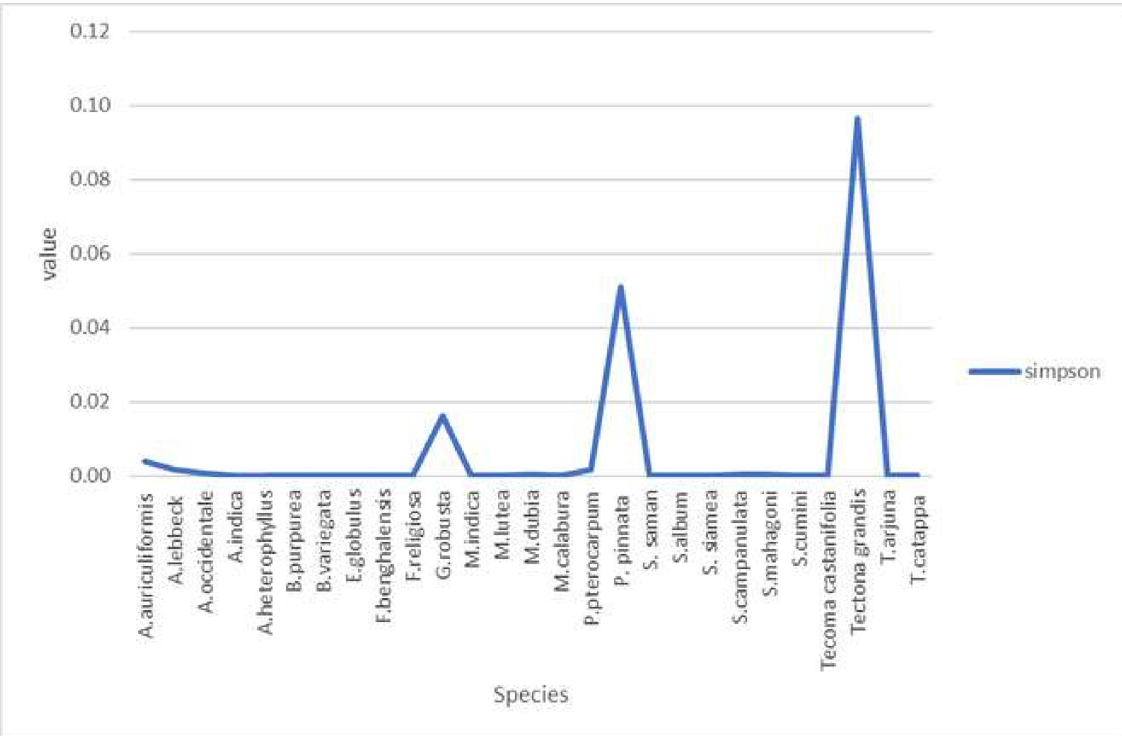


Tree species density vs Shannon index of each species in block 5



Tree species density vs Simpson index of each species in block 5

LIST OF ALL THE TREES IN THE CAMPUS

Sl no	Species Name	Common name	Family	No. of Individuals
1	Acacia auriculiformis Benth.	Ear-leaf Acacia	Leguminosae	77
2	Acacia catechu (L.f.) Willd.	Black Cutch	Leguminosae	1
3	Acacia ferruginea DC.	Foreign White Sundra	Leguminosae	4
4	Albizia lebbeck (L.) Benth.	Siris Tree	Leguminosae	32
5	Albizia odoratissima (L.f.) Benth.	Black Siris	Leguminosae	5
6	Anacardium occidentale L.	Cashew tree	Anacardiaceae	14
7	Annona cherimola Mill.	Cherimoya	Annonaceae	14
8	Annona muricata L.	Prickly Custard Apple	Annonaceae	3
9	Annona squamosa L.	Custard Apple	Annonaceae	1
10	Artocarpus heterophyllus Lam.	Jackfruit tree	Moraceae	24
11	Azadirachta indica A.Juss.	Neem	Meliaceae	54
12	Bambusa bambos (L.) Voss	Indian Thorny Bamboo	Poaceae	1
13	Bauhinia purpurea L.	Purple orchid tree	Fabaceae	18
14	Bauhinia variegata L.	Orchid tree	Fabaceae	7
15	Citrus medica L.	Wild Lemon	Rutaceae	1

16	Dalbergia latifolia Roxb.	Black Rosewood	Fabaceae	1
17	Dalbergia sissoo Roxb.	North Indian Rosewood	Fabaceae	2
18	Diospyros melanoxylon Roxb.	Bale	Ebenaceae	1
19	Ehretia laevis Roxb.	Nilgiri Ivory Wood	Bignoniaceae	3
20	Eucalyptus globulus Labill.	Eucalypt	Myrtaceae	37
21	Ficus benghalensis L.	Banyan	Moraceae	3
22	Ficus benjamina L.	Weeping Fig	Moraceae	1
23	Ficus racemosa L.	Fig tree	Moraceae	2
24	Ficus religiosa L.	Peepal tree	Moraceae	2
25	Gmelina arborea Roxb.	White Teak	Lamiaceae	1
26	Grevillea robusta A.Cunn. ex R.Br.	Silver Oak	Proteaceae	231
27	Lagerstroemia speciosa (L.) Pers.	Pride of India	Lythraceae	1
28	Limonia acidissima Groff	Wood Apple	Rutaceae	1
29	Madhuca longifolia var. latifolia (Roxb.) Acher.	Indian Butter Tree	Sapotaceae	1
30	Magnolia champaca (L.) Baill. ex Pierre	Champak Tree	Magnoliaceae	4

31	Mangifera indica L.	Mango tree	Anacardiaceae	12
32	Markhamia lutea (Benth.) K.Schum.	Siala	Bignoniaceae	1
33	Melia azedarach L	Persian Lilac	Meliaceae	13
34	Melia dubia Cav.	Great Neem Tree	Meliaceae	13
35	Michelia champaca L.	Champak Tree	Magnoliaceae	1
36	Mimusops elengi L.	Indian Medlar	Sapotaceae	1
37	Muntingia calabura L.	Singapore cherry	Elaeocarpaceae	3
38	Neolamarckia cadamba (Roxb.) Bosser	Kadamb Tree	Rubiaceae	1
39	Peltophorum pterocarpum (DC.) K.Heyne	Copper pod	Caesalpiniaceae	78
40	Phyllanthus emblica L.	Indian Gooseberry	Euphorbiaceae	2
41	Polyalthia longifolia (Sonn.) Thwaites	Cemetery tree	Annonaceae	1
42	Pongamia pinnata (L.) Pierre	Indian-beech	Fabaceae	203
43	Psidium guajava L.	Guava Tree	Myrtaceae	3
44	Pterocarpus marsupium Roxb.	Indian Kino Tree	Leguminosae	1
45	Samanea saman (Jacq.) Merr.	Rain tree	Fabaceae	4

46	Santalum album L.	Sandalwood	Santalaceae	18
47	Sapindus trifoliatus L.	Soapnut Tree	Sapindaceae	1
48	Saraca asoca (Roxb.) Willd	True Asoka	Leguminosae	16
49	Senna siamea (Lam.) H.S.Irwin & Barneby	Ironwood tree	Caesalpiniaceae	3
50	Spathodea campanulata P.Beauv.	African tulip	Bignoniaceae	17
51	Swietenia mahagoni (L.) Jacq.	West Indian Mahogany	Meliaceae	10
52	Syzygium cumini (L.) Skeels	Indian Blackberry	Myrtaceae	18
53	Tabebuia aurea (Silva Manso) Benth. & Hook.f. ex S.Moore	Yellow Trumpet Tree	Bignoniaceae	21
54	Tabebuia rosea (Bertol.) Bertero ex A.DC.	Rosy Trumpet Tree	Bignoniaceae	1
55	Tamarindus indica L.	Tamarind Tree	Leguminosae	9
56	Tecoma castanifolia (D.Don) Melch.	Yellow bells	Bignoniaceae	7
57	Tecoma stans (L.) Juss. ex Kunth	Yellow Bells	Bignoniaceae	16
58	Tectona grandis L.f.	Teak	Verbenaceae	182
59	Terminalia arjuna (Roxb. ex DC.) Wight & Arn.	Arjun tree	Combretaceae	13
60	Terminalia catappa L.	Almond	Combretaceae	13
61	Wrightia tinctoria R.Br.	Milky Way Tree	Apocynaceae	1

KEY STONE SPECIES

FICUS RELIGIOSA
Peepal

FICUS BENGHALENSIS
Banyan

FICUS RACEMOSA
Cluster fig

FRUIT BEARING TREES

Artocarpus heterophyllus
Jackfruit tree

Psidium guajava
Guava tree

Muntingia calabura
Jamaican cherry

Phyllanthus emblica
Indian gooseberry

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AVENUE TREE

Monoon longifolium
False ashoka

Swietenia mahagoni
Mahogany

Grevillea robusta
Silver oak

Tectona grandis
Teak tree

ENDANGERED SPECIES

Santalum album
Sandalwood tree

LANDSCAPE PHOTOS

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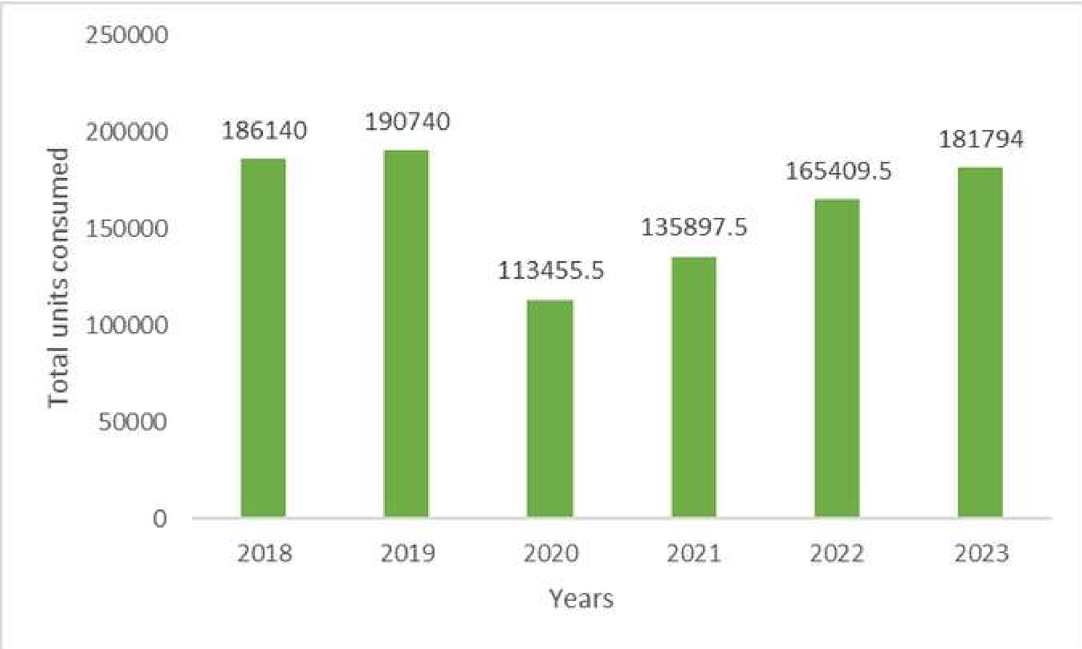
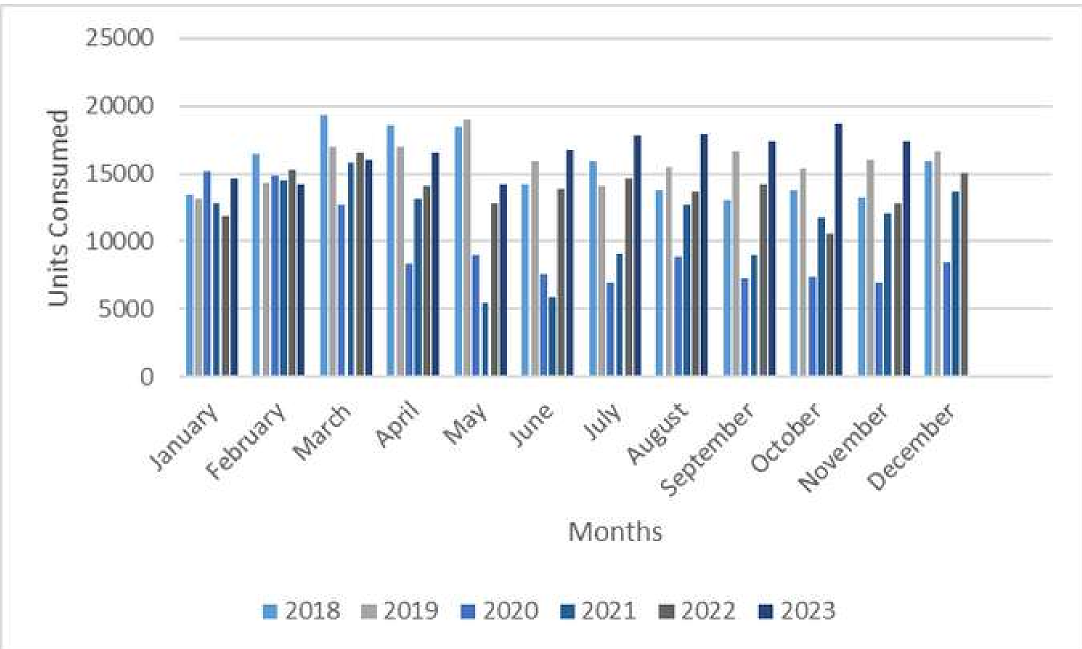
ENERGY AUDIT

ENERGY AUDIT

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





SOLAR PANELS

A solar panel is an apparatus that uses photovoltaic (PV) cells to convert sunlight into electrical power. Materials used in photovoltaic cells generate excited electrons when exposed to light. Direct current (DC) electricity is created when electrons go through a circuit. This electricity can be stored in batteries or utilised to power a variety of devices. PV modules, solar electric panels, and solar cell panels are other names for solar panels.

Typically, solar panels are installed in groups known as arrays or systems. One or more solar panels, an inverter (which changes DC electricity into AC electricity), and occasionally additional parts like controllers, metres, and trackers make up a photovoltaic system. It is possible to generate electricity for off-grid uses with a photovoltaic system.

Electricity from Diesel Generator (DG)

Diesel generators play a crucial role in providing backup power to educational institutions, ensuring uninterrupted operations during power outages. A 160 KVA, 75 KVA and 30 KVA capacity of DG set is kept to provide emergency power during load shedding period. The college maintain a logbook to record DG set's Diesel consumption and operational hours.

Diesel generators remain integral to maintaining uninterrupted power in educational institutions. However, a balanced approach that considers environmental impact, maintenance costs, and regulatory compliance is essential. Institutions should explore alternative power sources and technologies to meet sustainability goals while ensuring reliable backup power.

ENVIRONMENTAL AUDIT

Rainwater Harvesting from Rooftop - A Comprehensive Water Audit Report

This report provides a detailed analysis of rainwater harvesting from rooftop areas as part of a water audit. The purpose of the audit is to assess the potential for collecting and utilizing rainwater to supplement existing water sources, promote sustainability, and reduce dependency on external water supplies.

Rainwater harvesting involves the collection, storage, and utilization of rainwater for various purposes, including domestic use, irrigation, and groundwater recharge. The focus of this audit is on harvesting rainwater from rooftop surfaces.

Methodology:

- **Rooftop Area Assessment:**
  Measure the total rooftop area in square meters.

SL.NO	BLOCK	AREA (sq.m)	AREA (sq.ft)
1.	ADMIN, LIBRARY AND SEMINAR HALL BLOCK	2009	21624
2.	CS, GS, AI & ML BLOCK	1450	15607
3.	BOYS HOSTEL	1450	15607
4.	CANTEENBUILDING	200	2153
5.	MECHANICAL BLOCK	632	6803
6.	SPORTS COMPLEX	200	2153
7.	CIVIL ENGINEERING	800	8611

- **Rainfall Data:**

The average annual rainfall in the region of Bengaluru south is 970 mm according to IMD

- **Collection Efficiency:**

The efficiency of the rainwater collection system, accounting for factors such as spillage, evaporation, and system losses. A standard efficiency assumption of 85-90% is considered.

Calculation:

Harvested Water = Rooftop area (in sq.mts) × Average rainfall annually (in mm) × Collection efficiency (in %)

Results:

Based on the calculations, the potential amount of harvested water is determined. This figure represents a valuable resource that can contribute to water sustainability efforts.

SL.NO	BLOCK	AREA (sq.m)	RAIN WATER HARVESTED IN ltrs
1.	ADMIN, LIBRARY AND SEMINAR HALL BLOCK	2009	1656420.5
2.	CS, GS, AI & ML BLOCK	1450	1195525
3.	BOYS HOSTEL	1450	1195525
4.	CANTEENBUILDING	200	164900
5.	MECHANICAL BLOCK	632	521084
6.	SPORTS COMPLEX	200	164900
7.	CIVIL ENGINEERING	800	659600
TOTAL		6741	5557954.5

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The successful harvest of 5557954.5 liters of rainwater from the rooftop area, channeled for ground water recharge through strategically designed pits, marks a significant achievement in sustainable water management. This substantial volume not only underscores the effectiveness of the rainwater harvesting system but also emphasizes its positive impact on replenishing groundwater resources.

By harnessing rainwater through this initiative, we contribute to the preservation of local aquifers and enhance resilience in the face of changing climatic conditions. The implemented strategy not only serves as a commendable conservation effort but also sets a precedent for responsible water usage in our community.

As we conclude this phase of rainwater harvesting and groundwater recharge, it is essential to acknowledge the collaborative efforts of all stakeholders involved, from the meticulous design of the harvesting system to the diligent execution of the groundwater recharge through pits. This success underscores the potential for scalable and replicable models of sustainable water practices, offering a blueprint for future endeavours aimed at securing our water resources.

Moving forward, ongoing monitoring, periodic maintenance, and community engagement will be pivotal in sustaining the positive outcomes achieved. The utilization of rainwater for groundwater recharge not only fortifies our local water supply but also exemplifies a commitment to environmental stewardship and long-term water security.

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Vermicompost

The college has established a small Vermicomposting unit in which all the degradable items such as leaf litters, vegetable wastes obtained from Campus hostels to produce vermicompost. Solid trash is collected from various locations on campus and separated into bio-degradable and non-biodegradable components before being exposed to recycling and degrading processes such as composting materials. In the composting unit, appropriate bioinoculants are employed to properly breakdown solid waste. The compost is utilised to preserve the college's landscape.

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CONCLUSION

- A total of 1270 trees belong to 61 species were recorded in 28 acers area of college campus.
- The college is having very diversity consists of Grevillea robusta followed by Pongamia pinnata and Tectona grandis.
- The college campus also conserved Sandalwood species, listed as Endangered species under IUCN category.
- The college campus sequestered 20963 tons of carbon in trees, which is plying Important role in climate mitigation.
- The college management has installed name plates to trees to create awareness among faculty and students in the college.
- The college harvest 5557954.5 litters of rainwater per year, which is playing important role in ground water recharge.
- The college having dedicated Vermi-compost facility, which is used for garden maintenance.

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ಇವರಿಗೆ

ದಿನಾಂಕ: 19/03/2019

ಶ್ರೀ ಪ್ರಾಂಶುಪಾಲರು
ವಿವೇಕಾನಂದ ತಾಂತ್ರಿಕ ಮಹಾವಿದ್ಯಾಲಯ
ಬೆಂಗಳೂರು – 74

ವಿಷಯ:- UKIT ಕ್ಯಾಂಟೀನಿಂದ ವೇಸ್ಟ್‌ಗಳನ್ನು ತೆಗೆದು ಕೊಂಡು ಹೋಗುತ್ತಿರುವ ಬಗ್ಗೆ

ಮಾನ್ಯರೆ! ಈ ಮೇಲ್ಕಂಡ ವಿಷಯಕ್ಕೆ ಸಂಬಂಧಿಸಿದಂತೆ. ಕಂಬೀಪುರದಹಳ್ಳಿ ನಿವಾಸಿಯಾದ ಪುರುಷೋತ್ತಮ S/o ಮುತ್ತು ನಾರಾಯಣಪ್ಪ ಆದ ನಾನು ನಮ್ಮ ಗ್ರಾಮದಲ್ಲಿ ಒಂದು ಹಂದಿ ಫಾರಂನ್ನು ನಡೆಸುತ್ತಿರುತ್ತೇನೆ. ಇದರ ನಿರ್ವಹಣೆಗೆ ಪ್ರತಿ ನಿತ್ಯ ಎರಡು ಸರದಿಯ ವೇಸ್ಟ್ ಆಹಾರವನ್ನು UKIT ಕ್ಯಾಂಟೀನಿಂದ ತೆಗೆದು ಕೊಂಡು ಹೋಗುತ್ತಿರುತ್ತೇನೆ. ಎಂದು ಈ ಮೂಲಕ ತಿಳಿಸಲಾಗುತ್ತದೆ. ಆದ್ದರಿಂದ ತಾವುಗಳು ದಯಮಾಡಿ ಇದನ್ನು ಪರಿಗಣಿಸಬೇಕಾಗಿ ಈ ಮೂಲಕ ತಮ್ಮಲ್ಲಿ ಕೇಳಿಕೊಳ್ಳುತ್ತೇನೆ.

ವಂದನೆಗಳೊಂದಿಗೆ

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