GREEN AUDIT REPORT
2022-2024
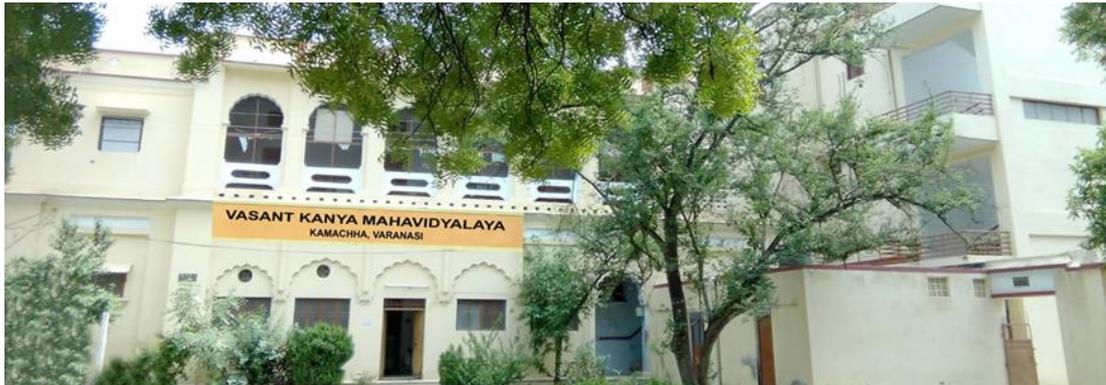
VASANT KANYA MAHAVIDYALAYA
(Admitted to the Privileges of Banaras Hindu University)
KAMACHHA-221010
VARANASI

Prepared by

PROF. KAVITA SHAH

INSTITUTE OF ENVIRONMENT AND SUSTAINABLE DEVELOPMENT

BANARAS HINDU UNIVERSITY

VARANASI – 221005.

Dr. Kavita Shah
Professor
Institute of Environment and Sustainable Development
Banaras Hindu University, Varanasi, Uttar Pradesh, India, 221005

Certificate

This is to certify that **"Green Audit"** for **Vasant Kanya Mahavidyalaya, Kamachha-221010, Varanasi** has been conducted in June 2022 – May 2023 and June 2023 – May 2024 to assess the environmental impact and green initiatives, planning and efforts made to implement them in the college campus based on institutional working framework. The Green initiatives carried out by the Institution was found to be satisfactory. The efforts taken by the management and faculty towards sustainable environment on-campus is appreciable.

Place: Varanasi

Date: 30th May, 2024

Prof. Kavita Shah
Institute of Environment and Sustainable Development
Banaras Hindu University
Varanasi-221005

Acknowledgement

Green Audit Team

The external assessment team for Green Audit consisted of

Prof. Kavita Shah	Institute of Environment and Sustainable Development, Banaras Hindu University
Ms. Chitra Pokharia	Member, IESD, Banaras Hindu University
Mr. Vyomendra Chaturvedi	Member, IESD, Banaras Hindu University

Disclaimer:

Green Audit Team has prepared this report of 2022-24 for Vasant Kanya Mahavidyalaya, Kamachha, Varanasi based upon the input data collected on site or provided by the representatives of college complemented with the best judgment capacity of the expert team. While all reasonable care has been taken in its preparation, details contained in this report have been compiled in good faith based on information gathered. It is further informed that the calculations arrived at, are based on the best estimates and no representation, warranty or undertaking, expressed or implied are levied on the audit team. The Audit Team has no responsibility towards any direct or consequential loss arising from the use of any information, statements or projections in the report.

Prepared by:
Vyomendra Chaturvedi

Technical Review by:
Prof. Kavita Shah
IESD, BHU

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Executive Summary

Educational institutions now a days are becoming more sensitive to environmental factors and more concepts are being introduced to make them eco-friendly. 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. The activities pursued by colleges can create a variety of adverse environmental impacts. The environmental assessment should be conducted in such a way that it provides, as specifically as possible, a baseline reference for future sustainability programming. Green audit is defined as an official examination of the effects a college has on the environment.

Green audit is a snapshot in time, in which one assesses campus performance in complying with applicable environmental laws and regulations. Though a helpful benchmark, the audit almost immediately becomes outdated unless there is some mechanism in place to continue the effort of monitoring environmental compliance.

Green auditing and the implementation of mitigation measures is a win-win situation for all the college, the learners and the planet. It can also create health consciousness and promote environmental awareness, values and ethics. It provides staff and students better understanding of green impact on campus. Green auditing promotes financial savings through reduction of resource use. It gives an opportunity for the development of ownership, personal and social responsibility for the students and teachers. Institutional self-enquiry is a natural and necessary outgrowth of a quality educational institution which is promoted by green audit. Thus, it is imperative that the college evaluates its own contributions toward a sustainable future.

Audit criterion is environmental cognizance, waste minimization and management, biodiversity, water and energy conservation and environmental legislative compliance by the campus. A questionnaire is used during audit. This audit report contains observations and recommendations for improvement of environmental consciousness. The green audit report is submitted with the Vasant Kanya Mahavidyalaya authorities for its betterment in the years to come.

Best Wishes

Prof. Kavita Shah
Institute of Environment and Sustainable Development
Banaras Hindu University – 221005.

1. INTRODUCTION

About the Vasant Kanya Mahavidyalaya

Vasant Kanya Mahavidyalaya is situated within the premises of the Theosophical Society at Kamachha, Varanasi. Established in 1954, it is run by Besant Education Fellowship and is affiliated to Banaras Hindu University. The college is situated in heart of Varanasi with a campus area of 10436.83 Sq. Mtr. The college at present runs Ph.D., Post-graduate and Undergraduate courses in arts and social sciences as well as Diploma courses sanctioned by UGC. With the motto of 'Education as Service', the institution aims at providing quality education and ensuring an all-inclusive growth. It cherishes the theosophical idea of Universal Brotherhood of Humanity, without distinction of race, creed, sex, caste and colour. The college has been accredited "A" by NAAC in its second cycle of accreditation in 2017.

Table 1: Campus layout and map

S. No.	Building Name	G.F. Area (Sq.Mtr.)	F.F. Area (Sq.Mtr.)	S.F. Area (Sq.Mtr.)	T.F. Area (Sq.Mtr.)	Roof Area (Sq.Mtr.)
1.	Administrative Wing Block 'A'	325.75	325.75	-	-	325.75
2.	Academic Wing Block 'C'	411.61	411.61	-	-	411.61
3.	Annie Besant Academic Block – 1	354.86	354.86	354.86	-	354.86
4.	Annie Besant Academic Block – 2	192.81	192.81	-	-	192.81
5.	Library	104.12	104.12	-	-	104.12
6.	Leela Sharma Block	635.00	635.00	635.00	635.00	635.00
7.	Canteen	97.85	-	-	-	-
	Total area	**2122.00**	**2024.15**	**989.86**	**635.00**	**2024.15**
	Total area covered			**7795.16**		
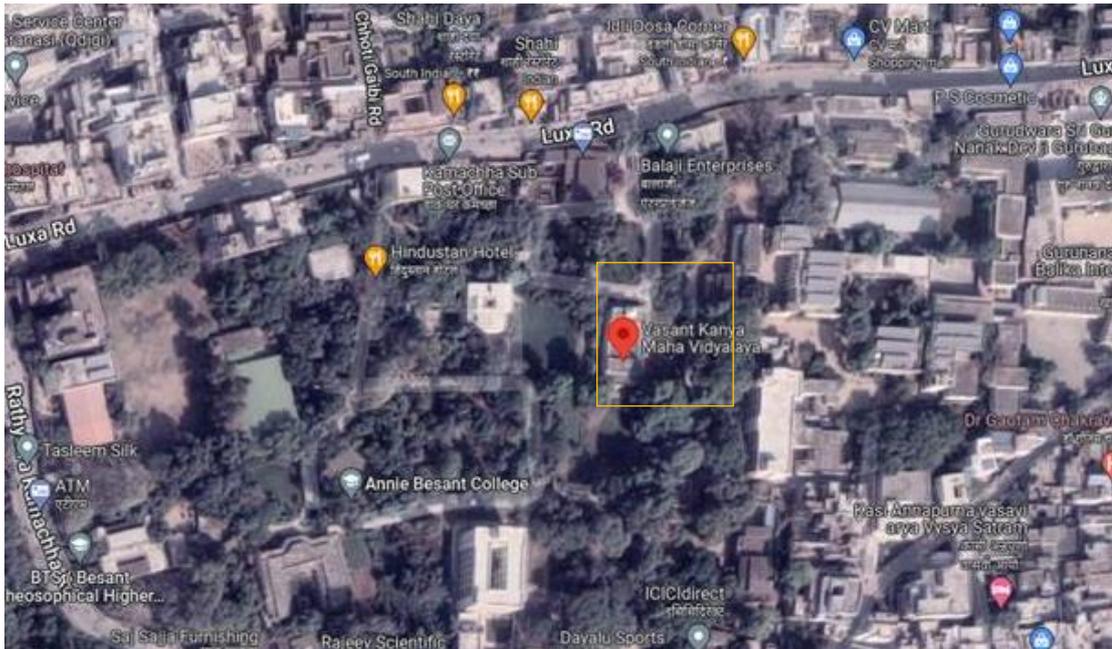
Figure 1: Satellite map showing location of Vasant Kanya Mahavidyalaya

Table 2: General Information About the College:

A.	General Information	
	Name of the institution	**Vasant Kanya Mahavidylaya**
	Address	**Kamachha, Varanasi**
	Contact Details	**0542-2455382, 09454329315**
	Website	**www.vkm.org.in**
	Location	**Urban**
B.	Infrastructure	
	Built up area (including others)	**3968.03 Sq.Mtr.** **{2122.00 Sq. Mtr (VKM)}**
	Campus area	**10436.83 Sq.Mtr.**
	Roof area	**2024.15 Sq.Mtr.**
	Open space (including greenery area)	**6468.83 Sq.Mtr.**
	Built up area (only VKM)	**7795.46 Sq.Mtr.**
	Greenery area	**2087.46 Sq.Mtr.**
	No. of auditorium - AC/Non-AC	**01**
	Library	**01**
	Laboratories	**02**
	Pharmacy	**Facility provided at the level of BHU**
	Playground	**04**
	Students' hostels	**No hostel available under the college, however facility for girls hostel provided by Theosophical Society**
	Canteen	**01**
	Transport facilities	**-**

C.	**Courses and Class duration**	
	Class duration	**UG -3 years** **PG – 2 years** **Diploma in Spoken English – 6 months;** **Certificate in Spoken English – 1 year** **Certificate in Fashion Designing – 1 year** **Certificate in Self Realization through Theosophy– 6 months**
	Courses	**UG – 15** **PG – 11** **Ph.D. – 5** **Certificate – 3** **Diploma – 1**
	Total No. of working days	**286 days (2022-2023)** **284 days (2023-2024)**

D.	**Human Resources**		
		2022-2023	**2023-2024**
	Total Staff	**Teaching – 46** **Honorary/Guest Faculty – 18** **Non-teaching – 36**	**Teaching – 46** **Honorary/Guest Faculty – 18** **Non-teaching - 40**
	Total Student uptake	**Intake –2920** **(UG & PG)** **Admitted – 2183** **(UG, PG & PhD)**	**Intake – 2943** **(UG & PG)** **Admitted –2014** **(UG, PG & PhD)**
	Teacher: Student Ratio	**1:34**	**1:30**
	Girl Student: Boy Student Ratio	**241:1**	**222:1**
		VKM is a Women's College *In UG & PG, only girls are admitted* *In Ph.D., there are 14 male students in both the years.*	

2. NEED FOR GREEN AUDIT

As environmental sustainability is becoming an increasingly important issue for the nation, the role of higher education institutions in environmental sustainability becomes more pertinent. The green audit aims to examine environmental practices within and outside the College campus, which impact directly or indirectly on the atmosphere. Green audit can be defined as systematic identification, quantification, recording, reporting and analysis of components of College/college environment. It was initiated with the intention of reviewing the efforts within the institutions whose exercises can cause risk to the health of inhabitants and the environment.

Through the green audit, a direction as how to improve the structure of environment and inclusion of several factors that can protect the environment can be commenced. This audit focuses on the Green Campus, Waste Management, Water Management, Air Pollution, Energy Management & Carbon Footprint etc. being implemented by the institution.

In recent times, the Green Audit of an institution has become of paramount importance for self-assessment of the institution which reflects its the role in mitigating the present environmental problems. VKM is committed to responsible stewardship of resources and to demonstrate leadership in sustainable academic practices. The college supports the climate neutrality goals as outlined by the Government of India and monitors the sustainability of the research and education mission through the Green Audit of its campus.

2.1 NAAC CRITERIA VII ENVIRONMENTAL CONSCIOUSNESS

The National Assessment and Accreditation Council, New Delhi (NAAC) has made it mandatory from the academic year 2019–20 onwards that all Higher Educational Institutions should submit an annual Green, Environment and Energy Audit Report. Green Audit is assigned to the Criteria 7 of NAAC, National Assessment and Accreditation Council which is a self-governing organization of India that declares the institutions as Grade A, Grade B or Grade C according to the scores assigned at the time of accreditation. Moreover, it is part of Corporate Social Responsibility of the Higher Educational Institutions to ensure that they contribute towards the reduction of global warming through Carbon Footprint reduction measures. Green Audit thus intends to upgrade the environmental condition inside and around the institution.

3. OBJECTIVES OF GREEN AUDIT

1. Assessment of water and soil quality in the VKM campus.

2. Quantification and management of the solid and liquid waste generated on campus.

3. To prepare a list of green practices adopted by the college and assess their performances on a yearly basis.

4. To provide a database for corrective actions and future development plans.

5. To identify the gaps and give recommendations to improve the Green Campus status of VKM.

4. AUDIT METHODOLOGY

Green auditing is the process of identifying and determining whether institutions practices are eco-friendly and sustainable.

The present Green Audit of the Institution comprises of the following stages:

I.   Pre-Audit Stage:

It involves the identification of target areas for auditing.

II.   Audit Stage:

Collection and collation of onsite data were made through:

1. Review of previous records and policies
2. Onsite physical inspection of the campus
3. Interaction with the stakeholders
4. Collection of data and observation
5. Focus Group Discussion

III.   Post-Audit Stage

It includes the data analysis, preparation of the final report, and recommendations to overcome the flaws and to keep a watch on the action plan.

4.1 MAJOR AREAS OF AUDIT REPORT

For Green Audit the following 5 major areas (including their subsections) were covered and compliance/ initiatives under these areas were verified/ validated.

(i)   Water Audit and its Management
(ii)   Energy Audit and its Management
(iii)   Waste Audit and its Management
(iv)   Carbon Footprint
(v)   Green Campus Management

5. WATER AUDITAND ITS MANAGEMENT

Water Audit can be defined as a qualitative and quantitative analysis of water consumption to identify the means of reducing, reusing and recycling water. Water auditing is conducted to evaluate the quality, availability and usage of water; the facilities available and methods adopted to revitalize and use it so that the resources are intact without leading to deterioration. As per the standards provided by National Building Code of India, 2016 Bureau of Indian Standards (NBC, 2016 BIS) water requirement for higher educational institute is 45L per capita.

The major water source on campus is ground water. The college has 4 borewell of which 3 are in working condition and are being used for water withdrawal. The daily water consumption by the students and staff of the college when operational in full strength is 102.7 KL per day in 2022-2023 and 95.49 KL per day in 2023-2024. In the campus water is largely used for drinking, toilets, office, canteen, garden and laboratory. The organisation does not have any automatic leak detection system however, all the leakages are prevented by manual observation and through regular maintenance of pipelines. No leakage of water from pipes was observed by the auditing team.

Storage of water is in 2 overhead tanks, each with capacity of 25KL of which 10KL capacity is reserved for use in firefighting system. There are 4 storage tanks of 1KL each in A.B. Block. Also, there is 1 storage tank of 1KL in Home science department, 1 storage tank of 500 litres in Geography department and 1 storage tank of 500 litres in Canteen. Water from overhead tanks is then distributed to washrooms, basins, laboratory and water purifiers/ coolers installed in the college building. Water coolers fitted with RO purifiers are provided in each building in the campus as a source of safe

drinking water. Third party contractor is appointed by the College for their annual maintenance.

Wastewater Management:

- Wastewater is mainly generated from washings, toilet flushing, canteen kitchen and washroom on each floor of all the buildings.

- Currently, sanitary wastewater generated is sent to municipal sewer line.

Table 3: Average water consumption by the staff and students of Vasant Kanya Mahavidyalaya from June 2022 – May 2023 as per NBC, 2016 BIS Report.

Per capita water consumption 45 liters /day

S.No.	Category	No. of individuals	Total water consumed (liters per day)
1.	Day Scholars	2183	98235
2.	Staff	100	4500
	Total	**2283**	**102735**

Table 4: Average water consumption by the staff and students of Vasant Kanya Mahavidyalaya from June 2023 – May 2024 as per NBC, 2016 BIS Report.

Per capita water consumption 45 liters /day

S.No.	Category	No. of individuals	Total water consumed (liters per day)
1.	Day Scholars	2014	90630
2.	Staff	108	4860
	Total	**2122**	**95490**

Figure 2: Water Cooler and RO installed in the college premises.

Water Conservation Initiatives:

1. No leakage of water from faucets and pipes were noticed by the audit team.

2. Collection of water dripping from Air Conditioners in the college in buckets and used for watering plants in garden area on campus.

3. Reuse of the effluents of the Home Science Laboratory by channelling for gardening purposes.

4. Rainwater harvesting is in place in the campus (under the scheme of Uttar Pradesh Government), which strengthens the water supply to the campus and maintains water level of wells through ground water recharging process. The rainwater is collected from the terraces of the 2 blocks and taken through pipes to the underground reservoir.

Figure 3: Rainwater harvesting plan in the college premises

4(a)

B21/16, Gurubagh, Bhelupur, Varanasi, Uttar Pradesh 221010, India

Lat 25° 18' 22.64555" N Long 82° 59' 43.06484" E

| Local | 04:23:54 PM | Altitude | 82 meters |
| GMT | 10:53:54 AM | Date | Sat, 18 May 2024 |

GPS Map
Camera Lite

4(b)

Figure 4 (a-b): Rainwater harvesting in places on the college premises

6. ENERGY AUDIT AND ITS MANAGEMENT

The energy audit is key to a systematic approach for decision making in the area of energy management. The major consumption of electricity by the college includes the electrical equipment listed in table 5.

Table 5: Major consumption of electricity by the VKM

Electrical Equipment	2022-2023	2023-2024
LED bulbs and tubes	522	522
Fans (ceiling + standing)	326	326
Computers and laptops	75 Desktop; 5 Laptops	227 Desktop; 5 Laptops
Projectors	10	10
Television	1	1
CCTV cameras	26	26
Photocopiers	03	03
Air Conditioners	7 Pcs. (5 Pcs. – 2 Ton; 2 Pcs. – 1.5 Ton)	8 Pcs. (6 Pcs. – 2 Ton; 2 Pcs. – 1.5 Ton)
Air Coolers	7	10
Water Pumps	4 Pcs. (1 Pcs. – 3 HP 2 Pcs. – 1.5 HP 1 Pcs. – 0.5 HP)	4 Pcs. (1 Pcs. – 3 HP 2 Pcs. – 1.5 HP 1 Pcs. – 0.5 HP)
Refrigerators	5 Pcs. (4 Pcs. – 185 L; 1 Pcs. – 300 L)	6 Pcs. (5 Pcs. – 185 L; 1 Pcs. – 300 L)
Flood lights	9	9
Street lights	3	3
Aquaguard water filters and coolers	5 Pcs. Aquaguard with Water Cooler 1 Pcs. Kent RO 1 Pcs. Aquaguard Water Purifier cum Water Cooler	5 Pcs. Aquaguard with Water Cooler 1 Pcs. Kent RO 1 Pcs. Aquaguard Water Purifier cum Water Cooler
Genset available and capacity	Diesel genset - 2 Pcs. (30 KVA each)	Diesel genset - 2 Pcs. (30 KVA each)
Elevator	1	1
Laboratory Instruments		
Portable Tachistoscope PT-123	02	02

Human Maze (electric)	**20**	**20**
Memory Drum Electric	**06**	**06**
Printer	**3**	**3**
UPS	**01**	**01**
Electric Sewing Machine	**11**	**11**
Tracing Table	**01**	**01**
Press	**03**	**03**
OTG	**01**	**01**
Microwave	**01**	**01**
Mixer grinder	**01**	**01**
Sandwich toaster	**1**	**1**
Slice Toaster	**1**	**1**
Laundry Meter	**1**	**1**
Bath Machines	**2**	**2**
Electric kettle	**1**	**1**
Food Processor	**1**	**1**
Object Camera	**1**	**1**

Energy sources utilized by all the departments and services of college include electricity. For 2022-2023, the average electricity consumption from June 2022 to May 2023 is 3836.33 KWH amounting to ₹ 37634.50 @ ₹9.81 per unit. Electricity peak load is in the month of August 2022. For 2023-2024, the average electricity consumption from June 2023 to May 2024 is 3055.54 KWH amounting to ₹ 29974.90 @ ₹9.81 per unit. Electricity peak load is in the month of August 2023. All the Electricity is supplied through "The Indian Section, The Theosophical Society". The major use of the energy is at administrative building, academic buildings, Library, and canteen. In addition to this, there are two sound free diesel generator (DG sets) of 30 KVA capacity each installed for meeting the energy requirements during power cuts. From June 2022 to May 2023, the average monthly consumption of diesel by the DG sets is 62.285 litre.

Also, from June 2023 to May 2024, the average monthly consumption of diesel by the DG sets is 66.513 litre. Conventional tube lights, LEDs and fans are installed in classrooms, halls and library. For efficient energy consumption and savings on electric bill, the college has initiated the process of replacing incandescent bulbs and tube lights with LEDs.

For the year 2022-2023 and 2023-2024, the LPG cylinder consumption is approximately 5 cylinder per month for the Department of Home Science. Also, 2 LPG cylinders per month are used in canteen kitchen for cooking.

Figure 5: New desktops installed in the computer lab.

Figure 6: DG sets for electricity backup

Table 6: Electricity consumption at VKM campus (2022-2023)

Electricity load (June, 2022 to May, 2023)												
Months	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May
Average Daily Energy Usage (kWh)	4336/30=144.53	5380/31=173.55	5416/31=174.71	4440/30=148.00	2934/31=94.95	3110/30=50.63	2479/31=103.67	3812/31=79.97	3133/28=111.89	2898/31=93.48	3465/30=115.5	4633/31=149.45

Months with peak load			**August 2022**
Average Electricity Usage			
Month	Units Consumed (KWH)	Bill Amount (₹) Unit@9.81	Deduction for solar energy injection	**Total Amount (Monthly Average) – ₹ 37634.50**
June 2022	4336.00	42536.00	-	
July 2022	5380.00	52778.00	-	**Total Units (Monthly Average) – 3836.33 KWH**
Aug 2022	5416.00	53131.00	-	
Sept 2022	4440.00	43556.00	-	
Oct 2022	2934.00	28783.00	-	
Nov 2022	3110.00	30509.00	-	
Dec 2022	2479.00	24319.00	-	
Jan 2023	3812.00	37396.00	-	
Feb 2023	3133.00	30735.00	-	
Mar 2023	2898.00	28429.00	-	
Apr 2023	3465.00	33992.00	-	
May 2023	4633.00	45450.00	-	

(Source: Electricity bill of the campus)

Table 7: Electricity consumption at VKM campus (2023-2024)

Electricity load (June, 2023 to May, 2024)												
Months	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May
Average Daily Energy Usage (kWh)	3227/30=107.57	5259/31=169.65	4669/31=150.61	3263/30=108.77	4100/31=132.26	2952/30=98.40	2478/31=79.94	2564/31=82.71	1524/29=52.55	906/31=29.23	2669/30=88.97	-/31= -

Months with peak load			**August 2023**
Average Electricity Usage			
Month	Units Consumed (KWH)	Bill Amount (₹) Unit@9.81	Deduction for solar energy injection	**Total Amount (Monthly Average) – ₹ 29974.90**
June 2023	3227.00	31657.00	-	
July 2023	5259.00	51591.00	-	**Total Units (Monthly Average) – 3055.54 KWH**
Aug 2023	4669.00	45803.00	-	
Sept 2023	3263.00	32010.00	-	
Oct 2023	4100.00	40221.00	-	
Nov 2023	2952.00	28959.00	-	
Dec 2023	2478.00	24309.00	-	
Jan 2024	2564.00	25153.00	-	

Feb 2024	1524.00	14950.00	-
Mar 2024	906.00	8888.00	-
Apr 2024	2669.00	26183.00	-
May 2024	-	-	-

(Source: Electricity bill of the campus)

Electricity Conservation Initiative:

1. **Centralized Solar Panels:** A 100KVA Photovoltaic Array has been installed on roof top of the college building which have been connected to the 600VA solar panel inverter. This is used in the lighting of the campus. This is the step forward for energy conservation reducing thereby the electricity consumption by the college.

Figure 7: Rooftop Solar Panels

2. **Signages:** The college campus has signages reminding people to turn off the light and fans in the rooms and laboratories.

3. **Energy efficient appliances**: The electrical appliances used in the college are star rated equipment which saves energy such as LED Bulbs, 4-5 star rated air conditioners and refrigerators.

Figure 8: Energy saving 5-star AC installed in the Hall

4. **Fuel Energy Audit:** The fuel energy audit determines the approximate use of petrol or diesel by the vehicles inside the College. It also includes the efforts taken by the college to conserve the fuel. The conventional source of fuel for the vehicle is petrol and diesel. Maximum students, teaching and non-teaching staff of college and visitors use two-wheeler and four-wheeler vehicles. Number of four wheelers is 12 and they consume 2100 litres of fuel/month whereas 100 are two wheelers and they consume 24,000 litres of fuel/month.

Details of Energy Audit are given in table 8 and table 9 below.

Table 8: Fuel Energy Audit (2022-2023)

1.	Total number of Students	2183
2.	Total number of Teachers	64
3.	Number of non-teaching staff	36
4.	Total number of vehicles used by the stakeholders of the college (per day)	800 (approx.)
5.	No. of cycles used	350
6.	No. of two wheelers used (average distance travelled and quantity of fuel and amount used per day)	100 (8 km/vehicle /day and 0.30 litre of fuel/vehicle /day)

7.	No. of cars used (average distance travelled and quantity of fuel and amount used per day)	12 (10 km/vehicle /day and 0.58 litre of fuel/vehicle /day)
8.	No. of persons using common (public) transportation (average distance travelled and quantity of fuel and amount used per day)	1400 approx. (8km per day)
9.	No. of parent-teacher meetings in a year? Parent turn up (approx.)	2 200 (approx.)
10.	No. of visitors with vehicles per day	10
11.	No. of generators used every day (hours). Give the amount of fuel used per day	02 generators 2 hours approx. 2 litre diesel
12.	No. of LPG cylinders used in the canteen in a year	24

Table 9: Fuel Energy Audit (2023-2024)

1.	Total number of Students	2014
2.	Total number of Teachers	68
3.	Number of non-teaching staff	40
4.	Total number of vehicles used by the stakeholders of the college (per day)	800 (approx.)
5.	No. of cycles used	350
6.	No. of two wheelers used (average distance travelled and quantity of fuel and amount used per day)	100 (8 km/vehicle /day and 0.30 litre of fuel/vehicle /day)
7.	No. of cars used (average distance travelled and quantity of fuel and amount used per day)	12 (10 km/vehicle /dayand 0.58 litre of fuel/vehicle /day)
8.	No. of persons using common (public) transportation (average distance travelled and quantity of fuel and amount used per day)	1400 approx. (8km per day)
9.	No. of parent-teacher meetings in a year? Parent turn up (approx.)	2 200 (approx.)
10.	No. of visitors with vehicles per day	10
11.	No. of generators used every day (hours). Give the amount of fuel used per day	02 generators 2 hours approx. 2 litre diesel
12.	No. of LPG cylinders used in the canteen in a year	24

5. **Fire Fighting System:** Seven (07) fire extinguishers (ABC MAP 90 type) are placed at VKM. In the newly constructed Leela Sharma block a fire hydrant system is installed. A 10KL of water in tank at the rooftop is reserved for the firefighting unit.

Table 10: Fire Safety Audit

Firefighting systems in main campus Details	**Fire Hydrant System (Complete Fire Fight System) installed in the Leela Sharma Block**
Fire extinguishers installed and their types	**7 Pcs. (ABC - MAP 90)**
Fire exists	**2**

Figure 9: ABC-MAP 90 type Fire Extinguisher installed at each floor of the campus building

Figure 10: Fire Fighting System installed in Leela Sharma Block of VKM

7. CARBON FOOTPRINT

The most common greenhouse gases are carbon dioxide, water vapour, methane, nitrous oxide and ozone. Among these greenhouse gases, carbon dioxide is the most prominent one, comprising of 416 ppm of the Earth's atmosphere. Each human being is contributing towards adding green-house gases to the atmosphere depending upon his day-to-day activities and usage of instruments and machineries for different purpose. A carbon footprint is the total sum of carbon dioxide emissions released into the Earth's atmosphere through by an organization, event, product, or a person.

An understanding about the same of any institute where large number of anthropogenic activities are happening is important to assess the contribution of emission of gases that are responsible for Green House Effect. Auditing for carbon footprint of VKM Campus was done using a detailed questionnaire, so that the impact of the community on environment can be assessed.

There are some standards and guidelines to measure GHG emissions like GHG protocol, ISO 14064, the more comprehensive one Life Cycle Assessment (LCA), market-based mechanisms like Clean Development Mission (CDM), and Voluntary Carbon Standards (VCS), etc. Out of them, ISO 14064 is an offset protocol and independent, voluntary GHG project accounting standard helps to quantify GHG emission of the organization, event, product, or person. From the provided data of annual electricity bill, annual fuel and LPG consumption of VKM College, the carbon footprint is calculated by multiplication with their emission factor which is about 66.83 tonnes CO_2 annually for 2022-2023 and 56.79 tonnes CO_2 annually for 2023-202. A small part of it is compensated by remedial measures adopted by the college which is 2.32 tonnes CO_2 for 2022-2023 and 2.31 tonnes CO_2 for 2022-2023. Therefore, the

effective carbon footprint is 64.51 Tonnes CO_2 and 54.48 Tonnes CO_2 for 2022-2023

and 2023-2024 respectively.

Table 11: Carbon Footprint Calculation for VKM for 2022-2023

S. No.	Source	Rate	Quantity Days/ Year	Total Quantity	Annual Equivalent CO_2
1.	Electricity	0.82 kgCO$_2$/kWh	3836.33 kWh/month × 12	46035.96 kWh	37.75 T CO_2
2.	Fossil fuel (LPG Cylinder)	1.9 kgCO$_2$/kWh	19 kg × 7 cylinders × 12	1596 kg	3.03 T CO_2
3.	Fossil fuel (2-wheeler)	2.3 kgCO$_2$eq/L	30 liter/day ×286 days	8.58 kL	19.73 T CO_2
4.	Fossil fuel (Cars)	2.3 kgCO$_2$eq/L	7 liter/day × 286 days	2.00 kL	4.6 T CO_2
5.	Fossil fuel (DG Set)	2.3 kgCO$_2$eq/L	62.285 liter/month ×12months	0.747 kL	1.72 T CO_2
				Total	**66.83 T CO$_2$**

No. of working days in 2022-23: 286 days

Table 12: Carbon Footprint Calculation for VKM for 2023-2024

S. No.	Source	Rate	Quantity Days/ Year	Total Quantity	Annual Equivalent CO_2
1.	Electricity	0.82 kgCO$_2$/kWh	3055.54 kWh/month × 12	36,666.48 kWh	30.07 T CO_2
2.	Fossil fuel (LPG Cylinder)	1.9 kgCO$_2$/kWh	19 kg × 7 cylinders × 12	1596 kg	1.05 T CO_2
3.	Fossil fuel (2-wheeler)	2.3 kgCO$_2$eq/L	30 liter/day ×280 days	8.4 kL	19.32 T CO_2
4.	Fossil fuel (Cars)	2.3 kgCO$_2$eq/L	7 liter/day × 300 days	1.96 kL	4.51 T CO_2
5.	Fossil fuel (DG Set)	2.3 kgCO$_2$eq/L	66.513 liter/month ×12months	0.798 kL	1.84 T CO_2
				Total	**56.79 T CO$_2$**

No. of working days in 2023-24: 284 days

The International Organization for Standardization (ISO) also provides some general standards for
- *Greenhouse gas emissions at Organization level (ISO 14064 - 1) and*
- *Greenhouse gas emissions at project level (ISO 14064 – 2)*

Specifications to validate and verify relevant accountings are documented in (ISO 14064 - 3)

Table 13: Remediation for Carbon Footprint for VKM for 2022-2023

S. No.	Source	Rate	Quantity Days/ Year	Total Quantity	Annual Equivalent CO_2
1.	Solar Electricity	0.82 kgCO$_2$/kWh	100 kWh/Month× 12	1200 kWh	0.98 T CO_2
2.	Cycles	2.68 kg/L	350 cycles ×286 days/50 × 4	0.50 T	1.34 T CO_2
				Total	**2.32 T CO_2**

Table 14: Remediation for Carbon Footprint for VKM for 2023-2024

S. No.	Source	Rate	Quantity Days/ Year	Total Quantity	Annual Equivalent CO_2
3.	Solar Electricity	0.82 kgCO$_2$/kWh	100 kWh/Month× 12	1200 kWh	0.98 T CO_2
4.	Cycles	2.68 kg/L	350 cycles ×284 days/50 × 4	0.497 T	1.33 T CO_2
				Total	**2.31 T CO_2**

8. WASTE AUDITAND ITS MANAGEMENT

Pollution from waste is aesthetically unpleasing and results in large amounts of litter in our communities which can cause health problems. Solid waste is the unwanted or useless solid material generated from all sorts of daily activities. Solid waste management averts the adverse impacts on the environment and human health.

Waste generation on campus

The solid waste data from the VKM was collected from all the buildings along with support services. Different kinds of solid waste including paper wastes, canteen wastes, plastic wastes and e-wastes are generated in the campus. These solid wastes have been classified into two categories- biodegradable and non-biodegradable. Waste bins were provided on each floor, in staff rooms, laboratories, washrooms, kitchen and in campus area. Liquid waste generation from the two labs (psychology and home science) has also been recorded. No issues regarding municipal dump yard, garbage heap, sewer line, open drainage, etc in the near vicinity of the campus were recorded.

Figure 11: Waste-bins at different locations in the college premise

Biodegradable wastes

Bio-degradable wastes comprising of food wastes, canteen waste, and other organic wastes are added to a compost pit that is dug out. The organic wastes filled in the pits are subjected to composting which forms a best practice in the campus. In addition to the organic waste generated from different units, large sources of organic wastes other than kitchen wastes (college canteen, etc) like leave litter, terrestrial weeds etc that are generated from maintain and cleaning the campus are also added to the compost pit. All the paper waste generated from the classrooms, libraries, offices, etc is collected and sold out to the scrap dealers. Human waste is disposed via sewage pipes of the municipal corporation. Dustbins are installed in good numbers in all the buildings of the college to avoid littering.

Non-biodegradable waste

Non-biodegradable waste consisting of e-waste is weeded out by the college weed-out committee on the regular basis and given to the scrap-dealers who further re-cycle the waste. Remaining non-biodegradable wastes including plastic wastes, glass wastes, unused equipment and sanitary napkins are disposed off with the help of the municipal department.

Liquid waste disposal

Liquid waste generated from home science lab is used to water the flower beds that is situated just outside the lab area. The manure from the compost is used to fertilize these plantations as well.

Hazardous waste

There is no generation of any hazardous waste in the college.

9. GREEN CAMPUS MANAGEMENT

Water Quality Assessment

Water samples from three different borewell which are the main water source of the college campus were collected and analysed for its physicochemical parameters. The samples were collected, preserved and transported to the laboratory and analysed for various physio-chemical parameters. The major parameters analysed include dissolved oxygen, acidity, alkalinity, chloride, hardness, pH, conductivity, total dissolved solids and salinity. The results are presented in the table 15 and table 16 below. The results are comparable with the values of drinking water standards prescribed by different agencies.

Table 15: Physicochemical parameters of water samples (2022-2023)

S.No.	Parameters	Sample1	Sample 2	Sample 3	Standard value (BIS)
1.	pH	7.3	7.4	7.5	6.5-8.5
2.	Total Dissolved Solids (ppm)	590	620	630	500
3.	Dissolved Oxygen (mg/l)	6.6	6.4	7.0	6-8
4.	Turbidity	Nil	Nil	Nil	1 NTU
5.	Conductivity (µs)	150	140	145	-
6.	Acidity (mg/l)	35	30	30	200
7.	Alkalinity (mg/l)	20	23	20	200
8.	Salinity (ppt)	0.75	0.70	0.72	-
9.	Hardness (Total)	164	163	163	200
10.	Total coliform	Nil	Nil	Nil	0
11.	Fecal coliform	Nil	Nil	Nil	0

Table 16: Physicochemical parameters of water samples (2023-2024)

S.No.	Parameters	Sample1	Sample 2	Sample 3	Standard value (BIS)
1.	pH	7.2	7.3	7.2	6.5-8.5
2.	Total Dissolved Solids (ppm)	600	620	610	500

S. No.	Parameter				
3.	Dissolved Oxygen (mg/l)	6.7	6.6	6.5	6-8
4.	Turbidity	Nil	Nil	Nil	1 NTU
5.	Conductivity (µs)	160	155	150	-
6.	Acidity (mg/l)	40	35	40	200
7.	Alkalinity (mg/l)	20	23	20	200
8.	Salinity (ppt)	0.73	0.70	0.72	-
9.	Hardness (Total)	165	167	165	200
10.	Total coliform	Nil	Nil	Nil	0
11.	Fecal coliform	Nil	Nil	Nil	0

Soil Quality Assessment

Soil samples were collected from two different locations of the campus and analysed for the basic parameters. The results are tabulated and presented in the table 17 and table 18 below.

Table 17: Soil Quality Assessment (2022-2023)

S. No.	Parameter	Location 1 (Garden)	Location 2 (Ground)
1.	pH	7.5	7.1
2.	Total Kjeldhal Nitrogen (mg/kg)	3.0	2.8
3.	Total organic carbon (%)	1.6	1.3
4.	Phosphate (mg/kg)	0.4	0.3

Table 18: Soil Quality Assessment (2022-2023)

S. No.	Parameter	Location 1 (Garden)	Location 2 (Ground)
1.	pH	7.4	7.1
2.	Total Kjeldhal Nitrogen (mg/kg)	2.9	2.7
3.	Total organic carbon (%)	1.6	1.4
4.	Phosphate (mg/kg)	0.4	0.2

Air Quality Assessment

Pollutant	Timeline	Avg	Min	Max
PM2.5		49	37	71
PM10		95	63	134
NO2		8	8	8
NH3	1	1	1	1
SO2		61	56	66
CO		15	12	99
OZONE		21	7	108

12PM, Mon   6PM, Mon   12AM, Tue   6AM, Tue
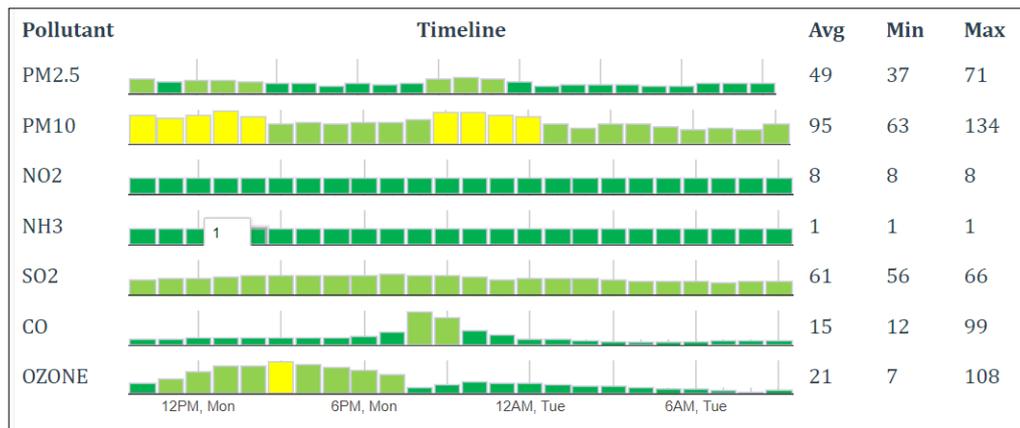
Figure 12: Concentration of air pollutant on the day of audit (23/05/2023) for 2022-2023

Satisfactory

95

0   AQI   500
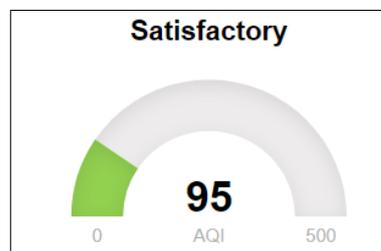
Figure 13: Air Quality Index on the audit day (23/05/2023) for 2022-2023

Pollutant	Timeline	Avg	Min	Max
PM2.5		8	5	11
PM10	34	23	13	35
NO2	8	8	8	8
NH3		1	1	1
SO2		28	28	29
CO	20	16	15	28
OZONE		3	1	26

12PM, Wed   6PM, Wed   12AM, Thu   6AM, Thu
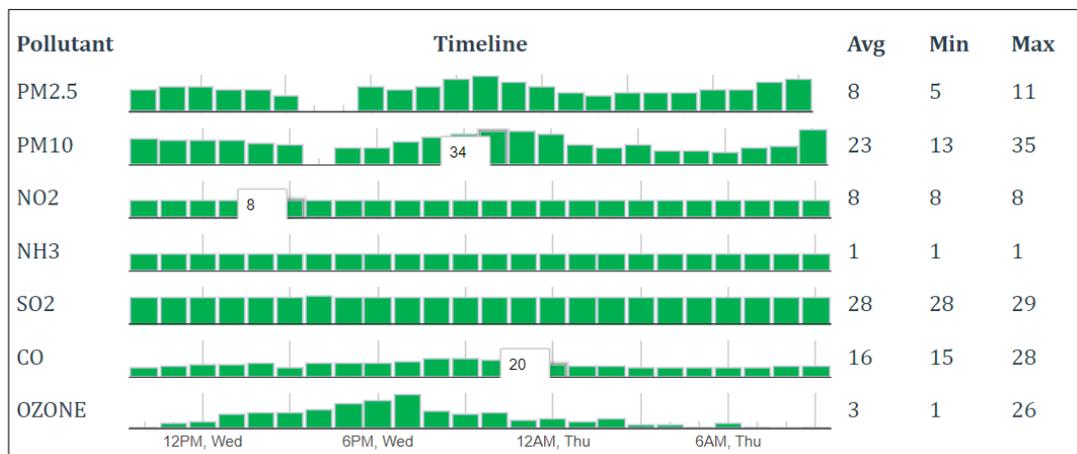
Figure 14: Concentration of air pollutant on the day of audit (09/05/2024) for 2023-2024

Good

28

0   AQI   500
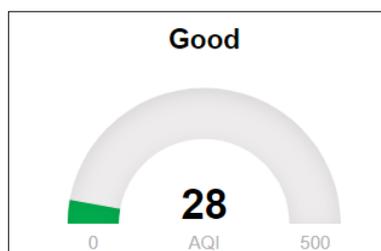
Figure 15: Air Quality Index on the audit day (09/05/2024) for 2023-2024

Green cover

VKM garden is highly biodiverse and contains almost 100 species of plants, shrubs and trees. The garden area is spread in about 2087.46 sq.mtr., where students spend their free time during lunch and for reading books during lecture break. The college campus is divided into 4 blocks A, B, C, D and theosophical society area. All the blocks are full of greenery having diverse type of plant species, comprising mainly of ornamental plants and fruit bearing plants. Every year the college organizes 2 plantation campaign for the students. The first plantation drive of the year is conducted during the month of July as "Varsha Mangal" program and later on a 7 days NSS camp is conducted in which an average 100 plants are planted by the students altogether. College does not have separate botanical, medicinal and vegetable garden. All the plants are randomly planted in the college premise and scientific names are not displayed. A small patch of mango and jackfruits trees are present in the theosophical society premise. Irrigation is performed mainly by groundwater borewell and by overflow water from the rooftop. The stakeholders in-charge of the garden area informed that instead of chemical fertilizers and pesticides, organic manures are used which is prepared from the compost pit of the college. The garden area also conserves rare and threatened species of plants, *Santalum album* (Chandan) in the college premises.

Green Initiatives by the College

1. **Tree plantation**

From time to time, College organizes programmes to spread awareness about environmental issues. NSS programmes focus on tree plantations wherein volunteers encourage people to plant new trees. All the five units of NSS conduct cleanliness drives in the college campus and classrooms. VESS India in collaboration with the Go

Green Committee of the college planted 20 plants in the college campus on 29.07.2022. The plants were of mango, jamun, arjun and lemon. The programme was a part of a plantation drive of two months. The target of the drive was to plant 550 saplings across the city.

The College has registered itself in the Unnat Bharat Abhiyan in March 2018, a programme launched by the Ministry of Human Resources Development (MHRD) for enabling the villages in India to achieve sustainable development and better quality of life. The College has adopted 5 villages to conduct the programme - Badagaon, Khushipur, Kukaraha, Badiasanpur and Paharigaon. The students carry an awareness programme among the villagers about environment conservation, non-use of polythene bags and evils of excessive use of mobile.

2. Annual village camp

UBA is an ambitious outreach programme launched by Ministry of Human Resource Development in 2014. Vasant Kanya Mahavidyalaya joined the programme in 2018 and since then has been making significant contributions in uplifting and empowering the village life.

The UBA Cell of VKM conducted the following programmes during the session 2022-2023:

- A household survey, Plantation drive along with Rural wellness and Awareness Programme was organized in collaboration with UBA and NSS on 16.07.2022, Resource Persons were Mr. Abhay Sonker 'Rachan', Gram Pradhan, Khushipur Village and Dr. Laxman Ji Yada, Psychiatric Counselor, IIT-BHU.

- One day workshop on 'Water Positive Carbon Neutral Village RCI' was organized on 04.03.2023.

- A lecture on 'Carbon Neutral and Water Positive' was organized on 23.03.2023 Resource person was Dr. Vishal Mishra, Assistant Professor, Chemical Engineering, IIT-BHU

The UBA Cell of VKM conducted the following programmes during the session 2023-2024:

- The volunteers were taken to villages Khushipur on 15.08.2023 and Kukudah on 22.08.2023 respectively to organize awareness programmes and plantation drives. Volunteers helped the village to take oath under 'Meri Maati Mera Desh' and conducted a house hold survey for the village.

- A lecture on "Challenges of Population in India" was organized on 11.07.2023 on the occasion 'World Population Day', resource person was Prof. Bharti Rastogi, Department of Sociology, MGKVP

3. **Eco-club**

The college has a Go-Green Committee which takes care of the greenery in the college campus. A trained gardener takes good care of gardening and plantation. Medicinal and fruit bearing plants are grown at various points in the college and flowering plants are grown in pots to beautify the campus. Additionally, the waste shell of coconut are being reused to make boundaries of plants instead of bricks.

Figure 16: Minimising the usage of bricks by reusing waste coconut shells in gardening.

4. Plastic free campaign

The college campus is declared as no polythene zone. Signage for promoting no polythene zone has been put up in the college premises.

Figure 17: Initiatives taken to promote plastic free campus

- The bio-degradable waste is regularly buried in the earth. It not only supports carbon-neutrality but also produces excellent manure for plants.

- Non-biodegradable waste including e-waste is weeded out by the college weed-out committee and given to the scrap-dealers who re-cycle the waste.

Flora in the VKM campus:

The campus of Theosophical society and VKM is rich in biodiversity. The campus boasts of 88 species of flora in the campus which are listed in the table 19.

Table 19: Flora in the VKM campus

S. No.	Name	Botanical Name	Category	Quantity
1.	Acalypha	*Acalypha Wilkesiana*	Shrub	01
2.	Adenium (desertroses)	*Adenium*	Tree	**01**
3.	Alchornea	*Alchornea cordifolia*		12
4.	Allamanda	*Allamanda cathartica*	Shrub	01
5.	Almond tree	*Prunus dulcis*	Tree	01
6.	Alpinia	*Alpinia galanga*	Herb	08
7.	Amaltas	*Cassia fistula*	Tree	01
8.	Anjeer	*Ficus carica*	Tree	02
9.	Areca Palm	*Dypsis lutescens*	Tree	04
10.	Ashok	*Saraca indica Linn*	Tree	18
11.	Ashoka	*Polyalthia longifolium*	Tree	15
12.	Bamboo	*Bambusoideae*	Grass	02
13.	BananaPalm	*Musa*	Tree	01
14.	Begonia'Vista	*King begonia*	Tree	01
15.	Bela (Mogra)	*Jasminum sambac*	Shrub	02
16.	Bottle Palm	*Hyophorb eleganicaulis*	Tree	03
17.	Bottlebrushes	*Callistemon citrinus*	Tree	**01**
18.	Cat Palm	*Chamaedorea cataractum*	Tree	02
19.	Champa	*Michelia*	Shrub	**03**
20.	Chandan	*Santalum album*	Tree	01
21.	Chandni	*Tabernalmontana divaricata*	Shrub	02
22.	China Palm	*Liuistona chinesis*	Tree	05
23.	Christmas Tree	*Araucaria hetrophylla*	Tree	05
24.	Coleus	*Coleus*	Shrub	01
25.	Croton	*Codiaeum variegatum*	Shrub	07
26.	Crown-of-thorns	*Euphorbia milii*	Shrub	04
27.	Cycas Zamia	*Zamia*	Shrub	01
28.	Dabal Bonchi			13
29.	Dahlia	*Dahlia*	Herb	**05**
30.	Dracaena	*Dracaena fragrans*	Shrub	05
31.	Dracaena Reflexa	*Dracaena reflexa*	Shrub	01
32.	Dumb Cane Plant	*Dieffenbachia bowmannii*	Herb	01

33.	Duranta	*Duranta erecta*	Shrub	Hedge
34.	Fan Palm	*Livistona chinensis*	Tree	04
35.	Fern	*Tracheophyta*	Fern	02
36.	Fig (Anjeer)	*Ficuscarica*	Tree	02
37.	Fishtail Palm	*Caryota*	Tree	09
38.	Forbia			04
39.	Gandhraj	*Gardenia jasminoides*	Shrub	01
40.	Giant Bamboo	*Dendrocalamus giganteus*	Grass	01
41.	Guava Plant	*Psidium guajava*	Tree	02
42.	Gudhal	*Hibiscus*	Shrub	11
43.	Guldaudi	*Chrysanthemum*	Herb	02
44.	Henna	*Lauesonia inermis*	Tree	01
45.	Hibiscus	*Malvaviscus*	Shrub	03
46.	Ixora	*Ixora coccinea*	Shrub	01
47.	Jackfruit Tree	*Artocarpus heterophyllus*	Tree	01
48.	Jasmine	*Tabernaemontana divaricata*	Tree	09
49.	Kachnar tree	*Bauhinia variegata*	Tree	01
50.	Kalanchoe Pinnata	*Bryophyllum pinnatum*	Herb	03
51.	Kamini	*Murraya paniculata*	Shrub	05
52.	Kaneiror Kane	*Cascabela thevetia*	Shrub	01
53.	Kochia Grass	*Bassia scoparia*	Herb	17
54.	Kohler Denta			01
55.	Peace Lily	*Spathiphyllum*	Herb	Hedge
56.	Koyaliya			Hedge
57.	Lalpatti	*Iresineherbstii*	Shrub	01
58.	Lily	*Lilium*	Herb	01
59.	Mango	*Mangifera indica*	Tree	02
60.	Marigold	*Tagetes minuta*	Tree	22
61.	Money Plant	*Epipremnum aureum*	Climber	01
62.	Monstera Plant	*Monstera deliciosa*	Shrub	01
63.	Morpankhi	*Platycladus orientalis*	Tree	**02**
64.	Moulsari Tree	*Mimusops elengi*	Tree	01
65.	Naagdon	*Euphorbia tithymaloides*	shrub	**04**
66.	Neem Tree	*Azadirachta indica*	Tree	02
67.	Night-blooming jasmine (RatRani)	*Cestrum nocturnum*	Shrub	01
68.	Night-flowering Jasmine (Parijat)	*Nyctanthes arbor-tristis*	Shrub	02
69.	Parlour Palm	*Chamaedorea elegans*	Tree	04
70.	Petunia	*Petunia*	Herb	02
71.	PonytailPalm (Lolina)	*Beaucarnea recurvata*	Tree	01

| 72.	Prass			01
73.	Raphis Palm	*Rhapis excelsa*	Tree	01
74.	RedHedge			Hedge
75.	Rose	*Rosa rubiginosa*	Shrub	02
76.	Rubberplant	*Ficus elastica*	Tree	01
77.	Sadabahar	*Catharanthus roseus*	Shrub	**01**
78.	ShirishaTree	*Albizia nedbeck*	Tree	02
79.	Sleeping Hibiscus/ Mirchi Gudhal	*Malvaviscus*	Shrub	01
80.	Snake Plant	*Sansevieria trifasciata*	Shrub	01
81.	Swarnachampa	*Magnolia champaca*	Tree	01
82.	Tecoma	*Tecoma stans*	Shrub	01
83.	Tengri			04
84.	Tree Ferns	*Cyatheaceae*	Fern	**00**
85.	Tulsi	*Ocimum tenuiflorum*	Herb	**01**
86.	Wela			03
87.	White Hibiscus	*Hibiscus rosa-sinensis*	Shrub	01
88.	Yellow Kaner	*Cascabela thevetia*		01
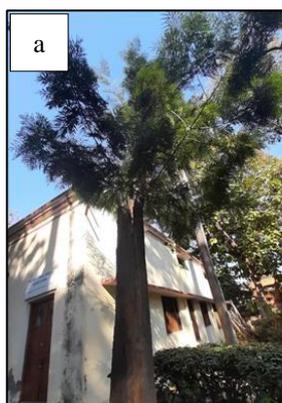
Hyophorbe lagenicaulis
Bottle palm

Bougainvillea
Booganbel

Citrus limon
Lemon

Polyalthia longifolium
False Ashoka
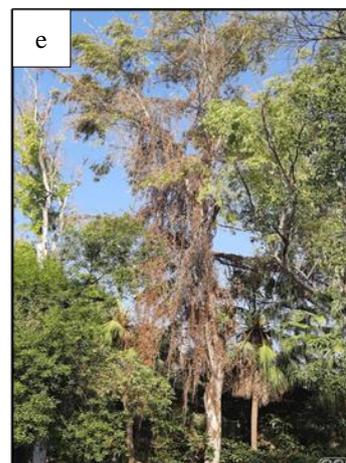
Eucalyptus
Gum tree

Manilkara zapota
Chikoo
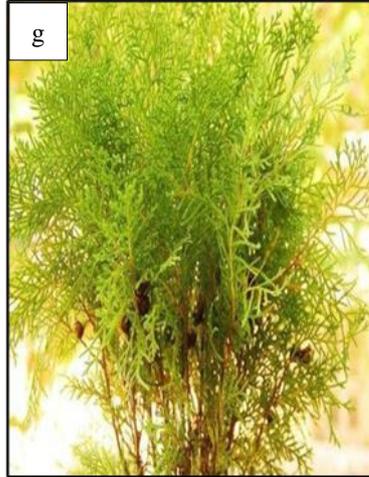
Platycladus orientalis
Morpankhi

Ficus elastica
Rubber fig

Arlaleotrys odoratissimus
Nag champa

Bombax ceiba
Semal
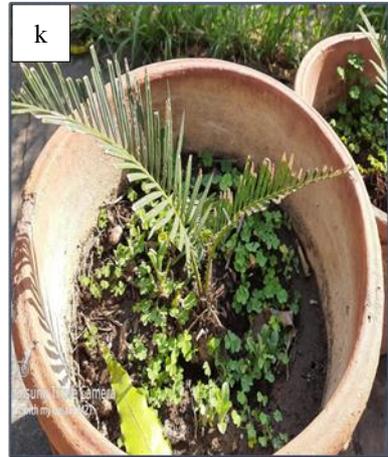
Zamia
Cycas Zamia

Liuistona chinesis
China palm

Ficus carica
Anjeer
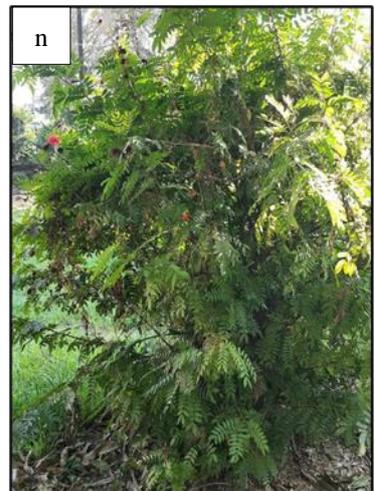
Calliandra haematocephala
Red powder puff

Terminalia caloppa
Kaath badaam

Cordia dichotoma
Lasoda

Santalum album
Chandan

Rosa
Rose
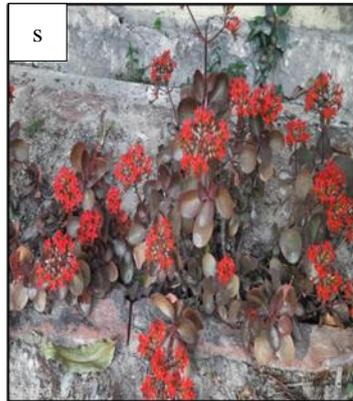
Kalanchoe pinnata
Ajooba

Murraya koenigii
Curry Leaf
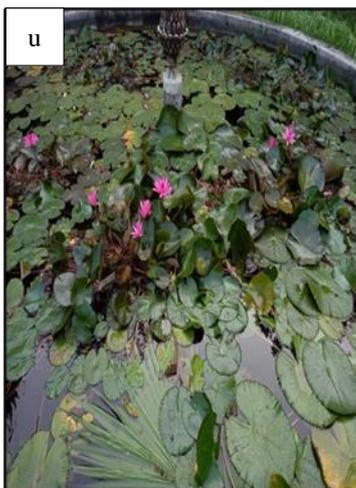
Nelumbo nucifera
Kamal/Lotus

Nyctanthes arbor-tristis
Parijat/ Harsingar

Bauhinia variegata
Kachnar

Figure 18: Major flora (a-w) in the Vasant Kanya Mahavidyalaya

CONCLUSION AND RECOMMENDATIONS

Green audit "adds value" to the management approaches being taken by the college and is a way of identifying, evaluating, and managing environmental risks (both known and unknown). The green audit reports assist in the process of attaining an eco-friendly approach to the development of the college. The results presented herein shall serve as a guide for educating the college community on the existing environment related practices, judicious and apt use of resources and address the gaps in the green campus report spawning innovative practices in line with sustainable campus.

Following are the findings and recommended actions to support the management practices of VKM:

- **Construction of Ropeway along the boundary of the college campus**

  Urban ropeway is being constructed by the Government after acquiring land from the Theosophical society within which the VKM college is situated. Due to the construction, tree falling and reduction in green cover has occurred. Therefore, it is recommended that green cover needs to be restored subsequent to completion of construction work by tree plantation in the area.


Figure 19: Construction of Ropeway along the boundary of the college campus.

- Average water consumption decreased by 7 % in 2023-2024 than in 2022-2023 due to less number of students enrolled in the session 2023-2024.

- New electrical equipments are installed – one refrigerator, one air conditioner, three air coolers and 152 desktops.

- There is also reduction in the electricity consumption in 2023-2024 as compared to 2022-202. This may be perhaps due to the non-inclusion of electricity bill for May 2024 and less number of working days in 2023-2024 as compared to previous session. Moreover, the installed electrical appliances are energy efficient and of 5 star rating.

- Carbon footprint increased from 56.79 T CO_2 in 2021-2022 to 66.83 T CO_2 in 2023-2022. But there is decrease in the carbon footprint by 15 % in 2023-2024. This may be due to fewer working days and energy efficient electrical equipment.

- Waste segregation and separate waste-bins with lids should be installed for the disposal of different kinds of solid waste.

- "Switch off" drills, "Fire" drills are needed in the campus to create awareness among the students for energy conservation.

- Scientific names of the plants and trees in the campus premises be displayed to portrait the rich biodiversity of the institution.

- Waste water from RO be used for irrigating plants in pots.