



**Bharati Vidyapeeth's**

# **Dr. Patangrao Kadam Mahavidyalaya, Sangli**

Accredited with 'B++' Grade by NAAC, Bengaluru. (CGPA 2.96)

DST - FIST Funded College (Level - 0) | Affiliated to Shivaji University, Kolhapur



## **CRITERION - VII**

### **Institutional Values and Best Practices**

#### **Key Indicator 7.1- Institutional Values and Social Responsibilities**





"Social Transformation Through Dynamic Education"

Bharati Vidyapeeth's



Founder

**Dr. Patangrao Kadam**  
M.A., L.L.B., Ph.D.

**Dr. Patangrao Kadam Mahavidyalaya, Sangli**

(Affiliated to Shivaji University)

P.O. Box No. 74, Sangli - 416 416 Ph: 0233-2535229, Fax: 2535993

Principal

**Dr. D. G. Kanase**  
M.Sc., Ph.D.

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Accredited with 'B\*\*\*' Grade  
by NAAC (3<sup>rd</sup> Cycle)

## 7.1.6 Quality Audits on Environment and Energy regularly undertaken by the Institution

### Index

Sr. No.	Particulars
1.	Policy
2.	Green and Environment Audits
3.	Energy Audit
4.	Beyond the Campus Environmental Promotion Activities
5.	Certificates from the Auditing Agency



  
Principal,  
Dr. Patangrao Kadam Mahavidyalaya,  
Sangli.



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Founder Hon'ble Dr. Patangrao Kadam

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## Policy document for Green Campus Initiatives and Procedures

The College was established on 16<sup>th</sup> September 1985, as Arts, Science and Commerce College, Sangli, and it was renamed as Dr. Patangrao Kadam Mahavidyalaya, Sangli on 8<sup>th</sup> January 1999. The College is trying to bridge the disparity between the rural and urban cultures. The College is selected by DST, India to develop instrumentation facilities under the FIST scheme. We are the proud recipients of the Best NSS Unit Award of the Government of Maharashtra for our substantial work through the National Service Scheme.

### Green Campus Initiatives and Procedures:

#### 1. Restricted entry of automobiles:

The vehicles are restricted in the main campus; every third Saturday of each month is 'No Vehicle Day' emphasized on board which was placed on the outskirts of the front lawn.

#### 2. Use of Bicycles/ Electric Vehicles:

The students and faculty members are encouraged to use bicycles and electric vehicles.

#### 3. Pedestrian Friendly Pathways facility is implemented which provides an exclusive space for pedestrians to walk outside of the travel area, which can reduce crash risk by separating vehicles and pedestrians.

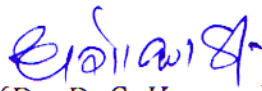
#### **4. Ban on the use of plastics:**

To avoid the harmful effects of plastic on health and the environment, the college has taken initiatives to make the campus plastic-free. Various boards were displayed like “No use of Plastic”. Separate dust bins to collect plastic waste, and this plastic waste is dispatched to local municipal corporation.

#### **5. Landscaping with trees and plants:**

To enhance the natural beauty of the campus and foster environmental benefits, a well-designed landscaping is created. Landscape planning of college yards is of much importance. A beautifully arranged college yard brings up a feeling of beauty in students, raises their spirits, positively influences the health of students, and contributes to the aesthetic education of students.



  
(Dr. D. G. Kanase)

Principal,  
Dr. Patangrao Kadam Mahavidyalaya,  
Sangli.





**Dr. Patangrao Kadam Mahavidyalaya, Sangli**

Affiliated to Shivaji University

## Environment Audit Report



Prepared by

**DEPARTMENT OF ENVIRONMENTAL SCIENCE,**

**SHIVAJI UNIVERSITY, KOLHAPUR- 416004**

**2022-23**



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**Dr. (Mrs.) Aasawari S. Jadhav**

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Prepared by  
**Department of Environmental Science,  
Shivaji University, Kolhapur.**



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Ref. No./SUK/ENV

Date: 12/08/2023

## Certificate

This is to certify that the Department of Environmental Science, Shivaji University, Kolhapur has conducted detailed "Environmental Audit" of " Dr. Patangrao Kadam Mahavidyalaya, Sangali" during the academic year 2022-2023. The Environmental audit was conducted in accordance with the applicable standards prescribed by Central Pollution Control Board, New Delhi and Ministry of Environment, Forest and Climate Change, New Delhi. The audit involves water, wastewater, energy, air, green inventory, solid waste etc and gives an 'Environmental Management Plan', which the institute can follow to minimize impact on the institutional working framework. The performance of college was found to have good quality. Eventhough there is more improvement needed with respect to sustainable Green practices in case of water resource management and Solid waste management. In an opinion and to the best of our information and according to the information given to us, said Environmental audit gives a true and fair view in conformity with environmental auditing principles accepted in India.



*A. Adhar*  
Head

Department of Environmental Science,  
Shivaji University, Kolhapur  
**Dr. (Mrs.) Aasawari Jadhav**  
**VC. Head & Assistant Professor**  
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Celebrating



BHARATI VIDYAPEETH  
Founder Hon'ble Dr. Patangrao Kadam

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Ref. No. : BV/PKMS/ 346/2022-2023

Date : 07 / 03 / 2023

### Principal's Message

In this modern era, environmental sustainability is very important because many environmental problems have been created due to human activities. In such a situation, it is our primary responsibility to preserve the environment by taking certain steps to reduce environmental pollution and develop environmental sustainability. The College, since its inception has taken several efforts to create a green campus through various initiatives such as landscaping, plant plantation, awareness programs etc.

Nature conservation has become very important in recent times. Green, Environmental and Energy audits have become very important in analyzing the institution's environmental performance and possible options to make the institution eco-friendly. These audits aim at improving the environmental conditions inside and outside the institute.

I am very happy that our college has carefully completed these audits under the supervision of the committee of Shivaji University Kolhapur. This will enable us to tolerate environmental issues in the future.

Thank You.



(Dr. D. G. Kanase)

**Principal**

**Bharati Vidyapeeth's**

Dr. Patangrao Kadam Mahavidyalaya, Sangli.

## INDEX

Sr. No.	Contents	Page No.
1.	<b>Introduction</b> 1.1 Environment Audit: Tool for Environmental Protection 1.2 Benefits of Environment Audit 1.3 NAAC Criteria VII: Environmental Consciousness	1-2
2.	<b>Methodology Used for Environment Audit</b> 2.1 Questionnaire for survey 2.2 Onsite visit and observations 2.3 Data analysis	3-4
3.	<b>Overview of Environment Audit</b> 3.1 Dr. Patangrao Kadam Mahavidyalaya, Sangli. 3.2 Water and Wastewater Management 3.2.1 Water Audit 3.2.2.a Water Consumption in Dr. Patangrao Kadam Mahavidyalaya, Sangli. 3.3 Ambient Air Quality Status 3.4 Ambient Noise Quality Status	5-17
4.	Conclusion and Recommendation	17-18
5.	Environment Management Plan	18-19



## Chapter - I Introduction

### 1.1 Environment Audit, a Tool for Environmental Protection:

The modernization and industrialization are the two important outputs of twentieth century, which have made human life more luxurious and comfortable. On the other hand, they are responsible for voracious use of natural resources, exploitation of forests and wildlife, producing massive solid waste, polluting the scarce and sacred water resources and finally making our mother Earth ugly and inhospitable. Today, people are getting more familiar to the global issues like global warming, greenhouse effect, ozone depletion and climate change and so on. Now, it is considered that this is the final call by mother Earth. The time has come to wake up, unite and combat together for sustainable environment.

Environment Audit is the most efficient ecological tool to solve such environmental problems. Such audit was invented in late 1970s with the motive for inspecting the work conducted within the organization. It is systematic identification, quantification, recording, reporting and analysis of components of ecological diversity and expressing the same in financial or social terms. Through Environment Audit one gets a direction as how to improve the condition of environment.

### 1.2 Benefits of Environment Audit:

There are many advantages of Environment Audit if is implemented properly:

- It would help to protect the environment in and around the campus.
- Recognize the cost saving methods through waste minimization and energy conservation.
- Find out the prevailing and forthcoming complications.
- Empower the organization to frame a better environmental performance.
- It portrays good image of institution through its clean and green campus.

Finally, it will help to build positive impression for the upcoming NAAC visit.

### 1.3 NAAC Criteria VII Environmental Consciousness:

Environment Audit is assigned to Eco-club. The criterion VII of NAAC. National Assessment and Accreditation Council that is a self-governing organization that declares the

institutions as Grade A, Grade B or Grade C according to the scores assigned at the time of accreditation of the institution. The intention of Environment Audit is to upgrade the environmental condition in and around the institution. It is performed by considering some environmental parameters like water and wastewater management, energy conservation, waste management, air monitoring, etc. for making the institution eco-friendlier.

Students are the major strength of any academic institution. Practicing green actions in any educational institution will inculcate the good habit of caring nature in students. Many environmental activities like plantation and nurturing saplings and trees, cleanliness drives, bird watching camp, no vehicle day, rain water harvesting visits to ecologically important places through Eco clubs will make the student a good citizen of country.

## Chapter II

### Methodology

The College has conducted Environment Audit in the year 2022-23, on a yearly basis. The audit was carried out in three phases.

#### **2.1 Questionnaire survey:**

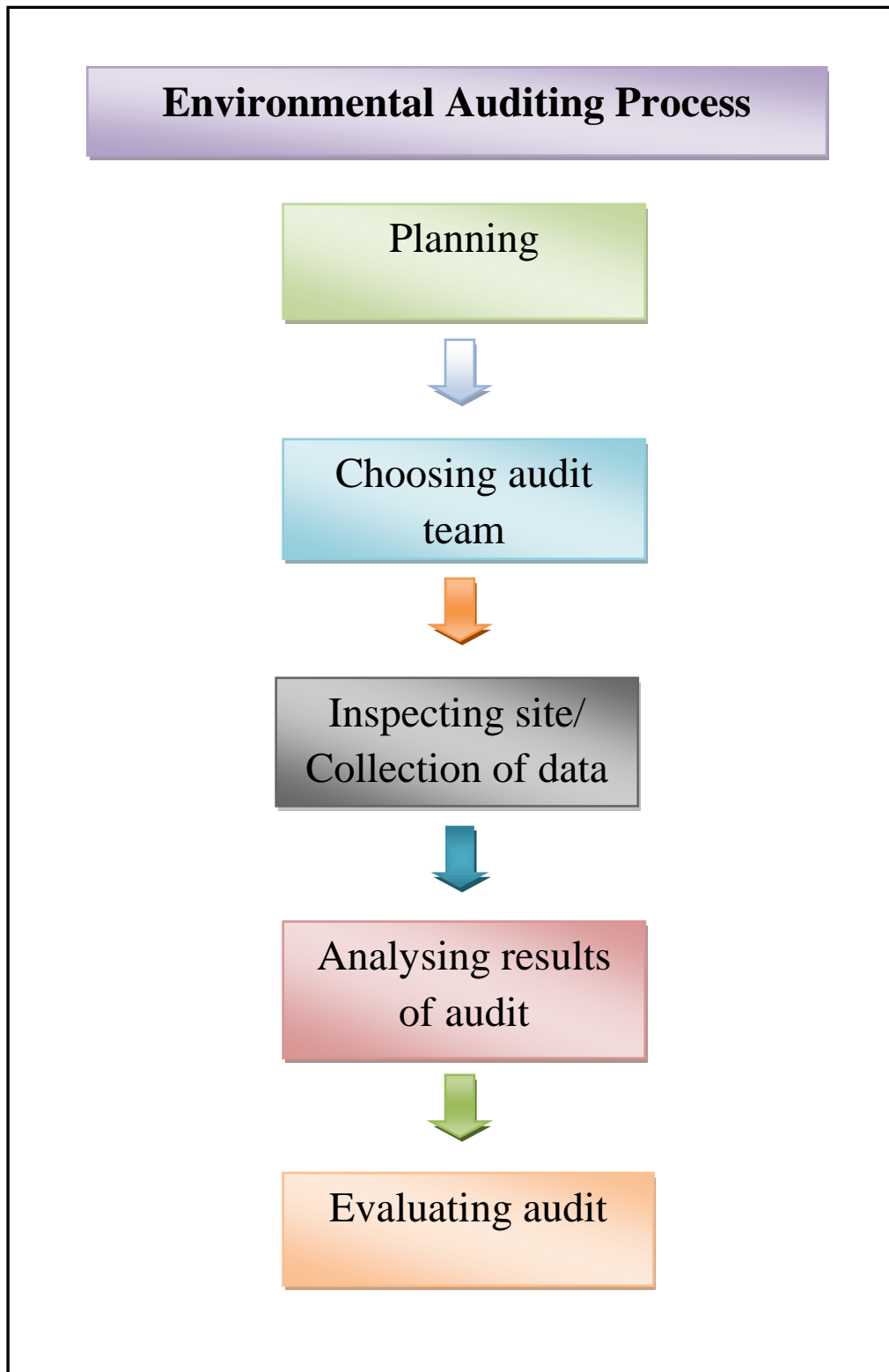
It includes administrative issues associated with the planning of audit, selecting the personnel for the audit team, preparing the audit protocol used by organization, obtaining background information, etc. The scope of the audit was defined at this step. It was decided that the information related to Water and Wastewater management, Energy conservation, Green belt, Carbon inventory, Solid waste management, Hazardous waste management, Air and noise quality status, activities of nature club, etc. should be gathered for the audit purpose. For collecting data related to these different areas, specific questionnaires were prepared.

#### **2. 2 Onsite visit and observations:**

The data related to above mentioned areas was collected by visiting each and every facility of College campus. The questionnaires were filled up according to the present situation. Photographic documentation was also done with the help of sophisticated camera.

#### **2.3 Data analysis:**

After collection of secondary data, the reviews related to each environmental factor were taken by the Environment Audit team. The data was tabulated, analyzed and graphs were prepared using computer. Depending upon the observations and data collected, interpretations were made. The lacunas and good practices were documented. The Environmental Management Plan (EMP) was prepared for the next academic year in order to have better environmental sensitization. Finally, all the information was compiled in the form of Environment Audit Report.



## Chapter III

### Overview of Green Audit

#### 3.1 Dr. Patangrao Kadam Mahavidyalaya, Sangli, at a glance:

Dr. Patangrao Kadam Mahavidyalaya, Sangli is situated in Maharashtra at  $16^{\circ}51'52.57''N$  and  $74^{\circ}33'5.94''E$ , in the Kolhapur District. It covers an area of about 1.92 acres.

#### Satellite image of Campus of Dr. Patangrao Kadam Mahavidyalaya, Sangli at a glance



Source: Google Earth



**COLLEGE PROFILE IN BRIEF**

---

NAME OF THE COLLEGE:	Dr. Patangrao Kadam Mahavidyalaya, Sangli
ESTABLISHMENT:	1985
PIONEERS:	Dr. Patangrao Kadam
No. OF STUDENTS:	956
FACULTY:	43 + 21
FACILITIES:	The College has a spacious and beautiful building, with well-equipped laboratories, classrooms, ICT enabled classrooms, auditorium, two open stages, landscape garden and a playground.
RESEARCH AND EXTENSION	
ACTIVITY:	College conducts courses. The college has a good number of extension activities like NCC, NSS, Marathon, debate competition, Workshops, Conferences, plantation of trees, cleanliness drive, cleaning of public places and village, seminars, workshops, environmental awareness campaigns, etc.
AREA OF COLLEGE:	1.92 Acres

### **3.2 Water and Wastewater Audit:**

Water which is precious natural national resource available with fixed quantum. The availability of water is decreasing due to increasing population of nation, as per capita availability of utilizable water is going down. Due to ever rising standard of living of people, industrialization, urbanization, demand of fresh water is increasing day by day. The unabated discharge of industrial effluent in the available water bodies is reducing the quality of these ample sources of water continuously. Hence, the national mission on water conservation was declared by the then Prime Minister Hon. Manmohan Singh in 2003 and appealed to all citizens to collectively address the problem of water shortage, by conserving every drop of water and suggested for conducting water audit for all sectors of water use.

Water audit can be defined as a qualitative and quantitative analysis of water consumption to identify means of reducing, reusing and recycling of water. Water Audit is nothing but an effective measure for minimizing losses, optimizing various uses and thus enabling considerable conservation of water in irrigation sector, domestic, power and industrial as well. A water audit is a technique or method which makes possible to identify ways of conserving water by determining any inefficiencies in the system of water distribution. The measurement of water losses due to different uses in the system or any utility is essential to implement water conservation measures in such an establishment.

#### **Importance of Water Audit:**

- Systematic process
- May yield some surprising results
- Easier to work on solutions when the problems are identified.
- A tracking mechanism can be put into place.

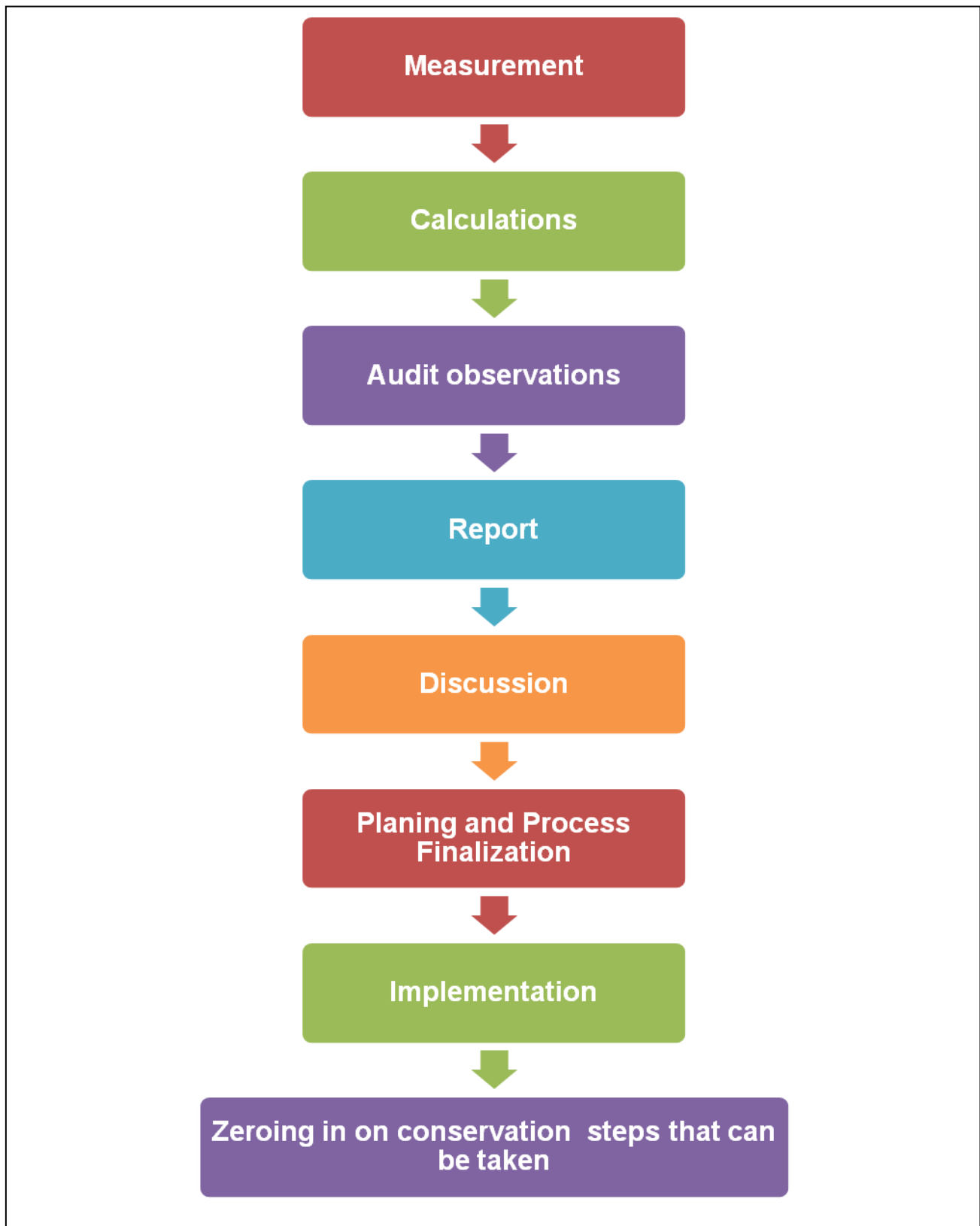
It is observed that a number of factors like climate, culture, food habits, work and working conditions, level and type of development, and physiology determine the requirement of water. The community which has a population between 20,000 to 100,000 requires 100 to 150 liters per person (capita) per day. The communities with a population can consume over 100,000 — 150 to 200 liters person (capita) per day. As per the standards provided by WHO Regional

office for South East Asia Schools require 2 liters per student; 10-15 liters per student if water-flushed toilets, Administration requires (Staff accommodation not included) 5150 liters per person per day, Staff accommodation requires 30 liters per person per day and for sanitation purposes it depends on technology.

### **3.2.1 Water Audit:**

Water usage can be defined as water used for all activities which are carried out on campus from different water sources. This includes usage in all residential halls, academic buildings, on campus and on grounds. Wastewater is referred as the water which is transported off the campus. The wastewater includes sewerage, residence, hall waters used in cooking, showering, clothes washing as well as wastewater from chemical and biological laboratories which ultimately going down in sink or drainage system.

**Water Audit Process:**



### 3.2.2 Overall water consumption in of Dr. Patangrao Kadam Mahavidyalaya, Sangli:

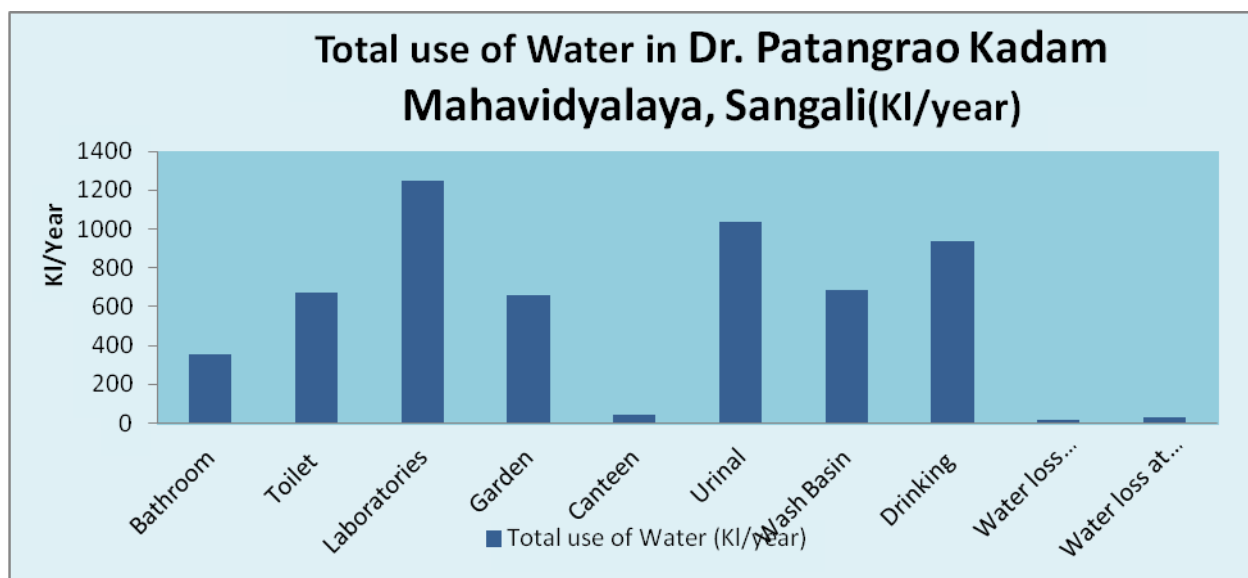
From the data collected for water audit of Dr. Patangrao Kadam Mahavidyalaya, Sangli the water distribution and water consumption pattern is noticed as follow. The college is having main building for administrative work as well for teaching work. The Courses present in the college are Arts included five department mainly English, Economics, Political Science , Geography and Physical education. Commerce faculty includes Account, Costing and Advance Banking department while Science includes Chemistry, Physics, Botany, Zoology, Maths, Statistics and Microbiology departments.

**3.2.2.a** In water audit study the water consumption by Dr. Patangrao Kadam Mahavidyalaya, Sangli, is found to be as follows.

**Table No. 3.1: Sector wise calculated use of water in Dr. Patangrao Kadam Mahavidyalaya, Sangli.**

Sr. No.	Sector	Total daily use (Kl/day)	Total yearly use (Kl/day)	Percentage (%)
1	Bathroom	2.81	351.75	6.20
2	Toilet	5.37	672.00	11.84
3	Laboratory	9.96	1245.75	21.95
4	Garden	5.49	659.28	11.62
5	Canteen	0.37	45	0.79
6	Urinal	8.28	1035	18.24
7	Washbasin	5.47	684.37	12.06
8	Drinking	7.50	937.5	16.52
9	Water loss during Filling	0.12	15	0.26
10	Water loss at Discharge	0.24	30.00	0.53
<b>Total</b>		<b>45.64</b>	<b>5675.65</b>	<b>100</b>

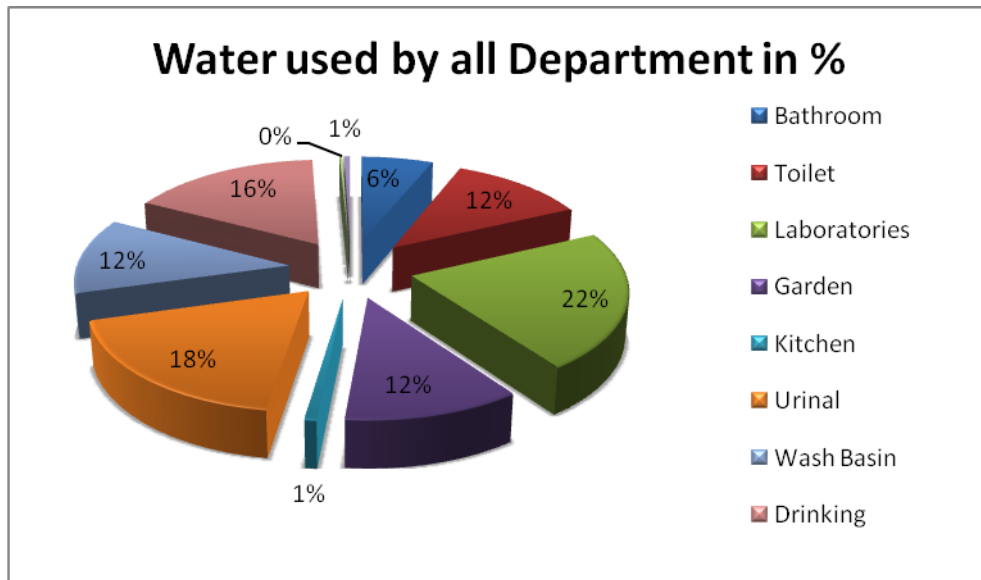




Graph No. 3.2.1 Dr. Patangrao Kadam Mahavidyalaya, Sangli(Kl/year)

It is revealed from the data given in Table No. 3.1 and Graph No. 3.2.1 that total 45.64 Kiloliter daily and yearly 5675.65 Kiloliter water is used. College includes Main Building, having Staff room and Principal room, Exam section and Ladies room. Also all Departments of Science, Arts and Commerce including languages. College has support services like Gymkhana, Auditorium, Garden, library, where water is used for bathrooms, toilet, drinking, wash basin and urinal purpose for daily and also calculated yearly. From above data, it is observed that the maximum water consumption was for Laboratory which is 9.96 Kilolitre/day i.e. 1245.75 Kilolitre/year and for Urinal 8.28 Kilolitre/day and yearly 1035 Kilolitre/year. Water loss during filling of water in tank was noted as 0.026 Kilolitre/day i.e. 15 Kilolitre/year and water losses at discharge were found to be 0.24 Kilolitre/day i.e. 30 Kilolitre/year.

**3.2.2. Average daily water consumption by Dr. Patangrao Kadam Mahavidyalaya, Sangli**



**Graph No. 3.2.2 Average Daily Water consumption by Dr. Patangrao Kadam Mahavidyalaya, Sangli.**

Graph No. 3.2.2 shows the total percent of water consumed by Dr. Patangrao Kadam Mahavidyalaya, Sangli in the 2022-23. As per the graph Laboratories, Urinal, Drinking, Garden, Toilets, washbasin, Drinking, and Garden are the major sources of utilization comprising 22 %, 18 %, 16%, 12%, 12% and 12% respectively. The other uses namely Bath room and Canteen consume relatively less water with daily water requirement of 6 % and 1 % respectively in the year 2022-23.

### 3.2.3 Sustainable Water Practices (SWP):

#### 3.2.3 a Rain Water Harvesting:

Dr. Patangrao Kadam Mahavidyalaya is equipped with the rain water harvesting system and for the collection of harvested rain water has built one tank having capacity of 5,000 litres. The water collected in tank has been used for Garden purpose.



**Rain water collection pipe**



**Water collection tank**

### 3.2.3 B Rain water collection tank:

Dr. Patangrao Kadam Mahavidyalaya, Sangli has built rain water collection tank having capacity of 2000 litres. This collected water is used for laboratory work during rainy season.



### Collection of harvesting rain water coming from terrace of collage building

#### 3.2.3 C Distilled water collection tank:

Dr. Patangrao Kadam Mahavidyalaya, Sangli has Distilled water collection tank in Chemistry laboratory as in chemistry laboratory for analysis required huge amount of water. So during distillation 75 %of water gets wasted. Mahavidyalaya has done very excellent sustainable practices as they collect water which thrown away after distillation. Such water they use for other washing work.



### 3.2.3 D Sprinkalar irrigation in garden :

Dr. Patangrao Kadam Mahavidyalaya, Sangli has huge green campus. Sprinkler system has been installed at gardens. The goal is to place water directly into the root zone and minimize evaporation to save water also required less water which covers large area of garden.



### Sprinkalar irrigation



**Key Observations:**

- The calculation revealed that the highest water use is in Laboratory which consumes average 22 % water and remaining 78 % water consumption further divided into other sectors of Mahavidyalaya.
- College has Rain water harvesting plant which is good measure of water conservation. The college has sustainable practices such as reuse of water coming from distillation unit of laboratory.
- College has Sprinkler irrigation facility to save water.
- To enhance the operating efficiency and reduce the water wastage, College should include more sustainable water practices (SWP) such as to set goals to improve your water usage. Installation of small wastewater treatment plant and reuse of treated water, Water sub metering etc.

**3.3. Air Quality Status:**

**Indoor air quality status of college campus**

When contaminants are not present at unsafe concentrations and the majority of people report feeling satisfied, indoor air is deemed to be healthy. An average person breathes approximately 12,000 litres of air every day, which is essential for good health. Exposure to potentially cancer-causing airborne substances found in enclosed spaces has negative effects such as respiratory and cardiovascular disorders, allergies, and respiratory tract irritation.

The primary sources of indoor air pollution are outdoor air, indoor cooking (especially frying or cooking with biomass), tobacco use, contaminated ambient air, cleaning products, dust that is re-suspended during cleaning tasks, construction materials and paints, copier and printer use, and other human activities. Vehicle emissions, thermal power plants, biomass burning, construction activities, unattended waste, open sewage pipes, fossil fuel-based power production, numerous industrial processes, etc. are examples of sources of ambient air pollution.

In college campus, all lecture rooms have good ventilation. This air pollutant is harmful to human being. Therefore, proper ventilation is necessary.

**Table No. 3.5.2. Indoor air quality in Dr. Patangrao Kadam Mahavidyalaya, Sangli**

Sr. No.	Locations	SO <sub>2</sub> (PPM)	CH <sub>4</sub> (%)	O <sub>3</sub> (PPM)	NH <sub>3</sub> (PPM)
1	I <sup>st</sup>	BDL	5	0.17	BDL
2	II <sup>nd</sup>	BDL	5	0.16	BDL
3	III <sup>rd</sup>	BDL	4	0.17	BDL
4	Ground floor	BDL	5	0.16	BDL
5	Garden area	BDL	4	0.16	BDL
6	Parking area	BDL	4	0.15	BDL

**Key Observations:**

1. Prohibit burning mulch in the open area.
2. Avoid using diesel generator.

**3.4 Ambient noise monitoring status:**

Ambient noise monitoring was carried out in different areas of college campus like at classrooms, labs, and campus. The sampling was done using calibrated Sound Level Meter (AZ 8921) by logarithmic scale in Decibels (dB). The noise readings were collected in the college campus and calculated. The details of noise status in Dr. Patangrao Kadam Mahavidyalaya, Sangli are given Table No. 3.13 and Graph No. 3.12.

**Table no 3.13 Ambient Noise levels in Dr. Patangrao Kadam Mahavidyalaya, Sangli**

Sr. No	Site Name	dB (A)	Noise Std Day time
1	Department of Computer	<b>55.55</b>	50
2	Library	<b>51.60</b>	50
3	Stair	59.27	50
4	Dept of Microbiology	<b>57.10</b>	50
5	Classroom	<b>56.20</b>	50

6	Departemnt of Zoology	58.41	50
7	Incoming gate	<b>55.10</b>	50
8	Gate	<b>50.70</b>	50
9	Canteen	<b>54.26</b>	50

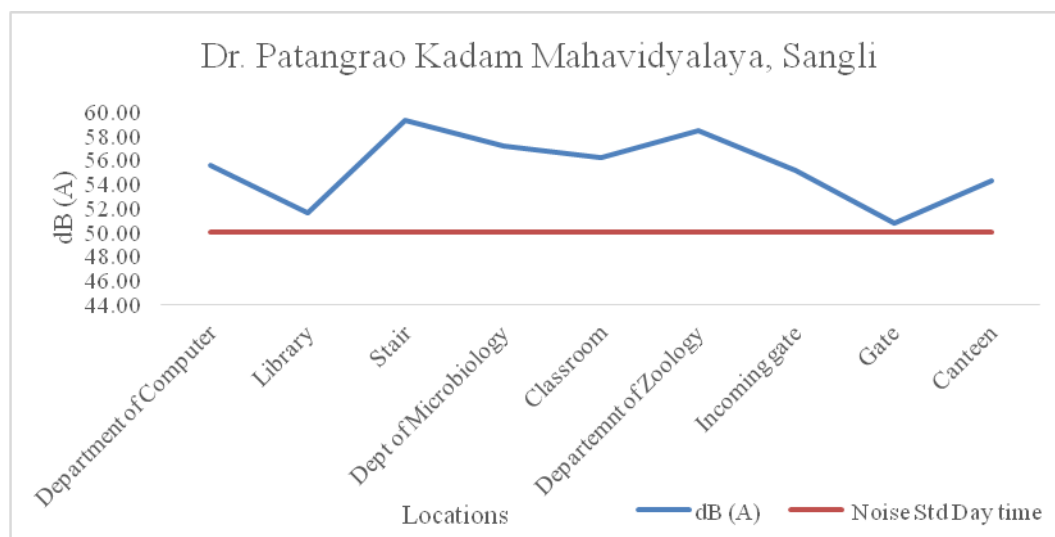
Note: - 1. All Parameters are in dB (A) Leq.

2. All Results are day time.

3. Day time shall mean from 6.00 a.m. to 10.00 p.m.

It is observed ambient noise levels in the Dr. Patangrao Kadam Mahavidyalaya, Sangli are on higher side as compared to the standards of Central Pollution Control Board for day time. This may be due to human communication in high sound in the college premises. Vehicles are generating the high-level sound. Echo generation in corridors is reason to monitor high levels of noise.

**Graph No.3.12 Ambient Noise levels in Dr. Patangrao Kadam Mahavidyalaya, Sangli.**



The graph shows that ambient noise levels in Dr. Patangrao Kadam Mahavidyalaya, Sangli. Ambient noise levels in mahavidyala are higher side.

### Conclusion

- Ambient air quality status of Dr. Patangrao Kadam Mahavidyalaya, Sangli is good.
- Over all ambient noise levels in Dr. Patangrao Kadam Mahavidyalaya, Sangli are higher than the noise standards.

### 3.5 Environmental protection through activities conducted in the year 2022-23.

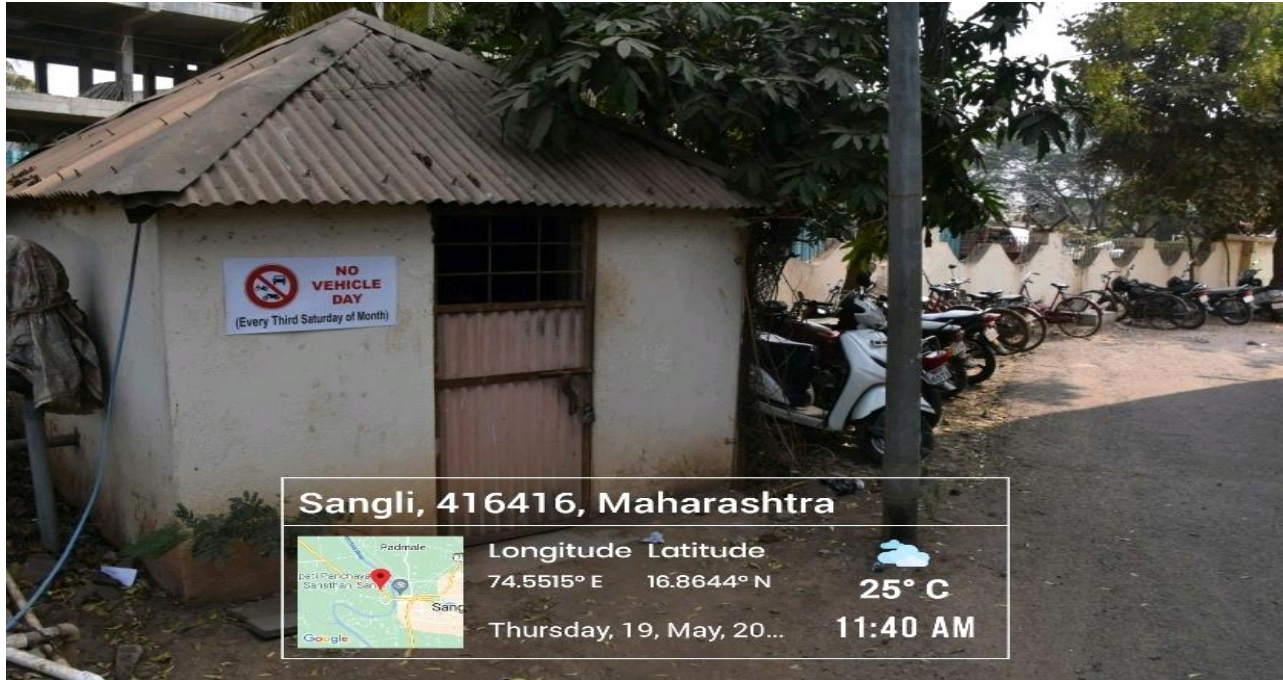


**Cleanliness drive**



**Plantation Drive**





**Green Campus initiatives include: No Vehicle Day on Every Third Saturday of Month**



**Use of Bicycles**

## Chapter IV

### CONCLUSION AND MANAGEMENT PLAN

The Department of Environmental Science, Shivaji University, Kolhapur has conducted a Environmental Audit of Dr. Patangrao Kadam Mahavidyalaya, Sangli in the academic year 2022-23. Auditing is the process of identifying and determining whether institution practices are eco-friendly and sustainable. The main objective of college to carry out Environment audit is to check green practices followed by college and to conduct a well formulated audit to understand where we stand on a scale of environmental soundness.

#### **Conclusions:**

From the Environment Audit conducted by team following are some of the conclusions, which can be taken for improvement of the college campus to become environment friendly campus:

1. Availability of water is not the actual problem but efficient management of water is major issue that needs to work on.
2. Water Audit helps to quantify all forms of losses and helps in reducing the non- revenue water.
3. Water consumption is more in Laboratories.
4. Roof top rainwater harvesting project is present in college which is useful for filling up of tanks on campus.
5. College can conduct more seminars, group discussions and eco-friendly activities on environmental education and awareness

#### **Recommendations:**

Following are some of the key recommendation for improving campus environment.

1. College should develop its own Environmental Policy by using guidelines given in Environment Audit document.
2. The data related to all measured environmental parameters should be monitored and recorded regularly and information be made available to administration.

3. The College should develop internal procedures to ensure its compliances with environmental legislation and responsibility be fixed to carry out it in practice.
4. Rainwater harvesting facility must be expanded and should be improvising through sand filtration system for better quality.
5. Waste Management practices should be applied for waste water coming from laboratories.
6. To meet EPA standards for safe drinking, water samples should be tested by a certified laboratory.

**ENVIRONMENT MANAGEMENT PLAN :**

By understanding the dynamics of present situation of resource utilization and current practices of waste disposal we have prepared an Environment Management Plan (EMP) for the Dr. Patangrao Kadam Mahavidyalaya, Sangli This plan not only will provide the strengths, weaknesses and remedies for the green and clean campus but also give priority of the sector where the college has to give more efforts to improve its environment.

**Environment Management Plan 2022-23**

Sector	Strengths	Weakness	Suggestions	Priority
<b>Water</b>				
<b>Water utilization</b>	<ul style="list-style-type: none"> <li>• College has Rainwater harvesting project.</li> </ul>	<ul style="list-style-type: none"> <li>• Overflowing of tanks at some places</li> <li>• Overuse of water at in laboratories.</li> <li>• No waste water management for water coming from laboratories.</li> </ul>	<ul style="list-style-type: none"> <li>• Installation of automatic water pumps to avoid overflowing losses</li> <li>• Proper and timely maintenance of plumbing at all departments</li> <li>• Installation of sand filter to rain water harvesting assembly.</li> <li>• Soak pit should be constructed for laboratories waste.</li> </ul>	Medium
<b>Air and Noise</b>				
<b>Air and Noise</b>	Air quality is still in good condition	Noise levels overall in college is on higher side	The plantation can be increased by vertical gardening	Medium





**Environmental Audit Team with Principal of Dr. Patangrao Kadam  
Mahavidyalaya, Sangli.**

**Prepared by**  
**Department of Environmental Science,**  
**Shivaji University, Kolhapur-416 004**



**Dr. Patangrao Kadam Mahavidyalaya, Sangli**

Affiliated to Shivaji University

**Clean and Green Campus Initiatives**



**Prepared by**

**DEPARTMENT OF ENVIRONMENTAL SCIENCE,**

**SHIVAJI UNIVERSITY, KOLHAPUR- 416004**

**2022-23**



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**Certificate**

This is to certify that the Department of Environmental Science, Shivaji University, Kolhapur has assessed detailed "Clean and Green Campus Initiatives" of "Dr. Patangrao Kadam College" during the academic year 2022-2023. This report was evaluated in accordance with the applicable standards prescribed by the Indian of Remote Sensing, Dehradun, India, Ministry of Environment, Forest and Climate Change, New Delhi and Intergovernmental Panel on Climate Change (IPCC) and Central Pollution Control Board (CPCB), New Delhi. The report involves solid waste generation, safe waste disposal practices, green inventory, biomass estimation, carbon sequestration potential of the campus. "Environmental Management Plan", is also included in the report which can be followed to minimize environmental impacts. The performance of college was found to have good quality with respect to sustainable Clean and Green Practices however; ample amount of work can be done in this area.

The opportunities of sustainable green practices and well consideration of suggested Environmental Management Plan can make the college role model to other institutions as well. In an opinion and to the best of our information and according to the information given to us, said Clean and Green Initiative gives a true and fair view in conformity with environmental auditing principles accepted in India.



Head

*Aasawari*

Dr. (Mrs.) Aasawari Jadhav  
C. Head & Assistant Professor  
Department of Environmental Science  
Shivaji University, Kolhapur



"Social Transformation Through Dynamic Education"

Bharati Vidyapeeth's

**Dr. Patangrao Kadam Mahavidyalaya, Sangli**

Founder :

**Dr. Patangrao Kadam**  
M.A., LL.B., Ph.D.

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Accredited with 'B' Grade  
by NAAC (3rd Cycle)

Ref. No : BVPKMS/ 346/2022-2023

Date 07/08/2023

### Principal's Message

In this modern era, environmental sustainability is very important because many environmental problems have been created due to human activities. In such a situation, it is our primary responsibility to preserve the environment by taking certain steps to reduce environmental pollution and develop environmental sustainability. The College, since its inception has taken several efforts to create a green campus through various initiatives such as landscaping, plant plantation, awareness programs etc.

Nature conservation has become very important in recent times. Green, Environmental and Energy audits have become very important in analyzing the institution's environmental performance and possible options to make the institution eco-friendly. These audits aim at improving the environmental conditions inside and outside the institute.

I am very happy that our college has carefully completed these audits under the supervision of the committee of Shivaji University Kolhapur. This will enable us to tolerate environmental issues in the future.

Thank You.



(Dr. D. G. Kanase)

Principal

Bharati Vidyapeeth's

Dr. Patangrao Kadam Mahavidyalaya, Sangli

## INDEX

<b>Sr. No</b>	<b>Contents</b>	<b>Page No</b>
1	1.1 Clean campus initiatives:	01
	1.1.1 Generation of solid waste in college:	02
	1.1.2 Status of solid waste generation in College	02
	1.1.3 Plastic waste generation in the college	03
	1.1.4 Hazardous waste audit of the college	03
	1.1.5 E-waste generation in the College	04
	1.4 Eco-friendly solid waste management practices	04
2	Green Campus Initiatives of Patangrao kadam collge.sangali	07
	2.1.1 Total No. of trees enumerated on Patangrao kadam collg.sangali r Campus	08
	2.1.2 Total No. of species identified on Patangrao kadam collg.sangali Campus	08
3	Species with the highest population	08
4	Total Biomass	09
5	Carbon stock	10
6	Carbon Sequestration	11
7	Oxygen Released	11
8	List of tree species observed on campus	12
9	Conclusion and Recommendations	15
10	Environmental Management Plan	16

## 1.1 Clean campus initiatives:

Waste management is very important issue to solve many 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 is the regularly monitored within and outside of the concerned sites which have direct and indirect impact on surroundings. It can be one of the initiative for such institutes to account their energy, water resource use as well as wastewater, solid waste, E-waste, hazardous waste generation.

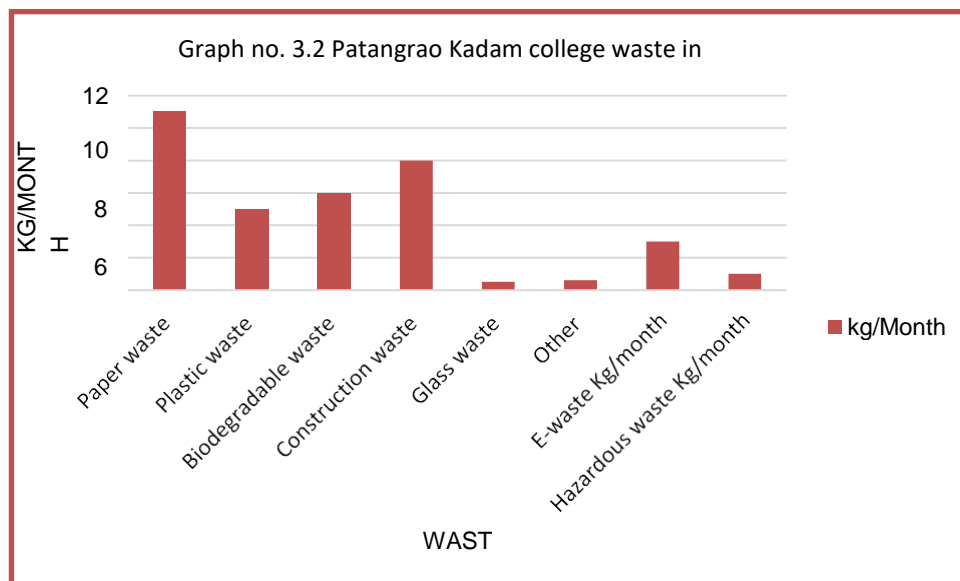
Solid waste management is a term that refers to the process of collecting and treating solid wastes. As long as people have been living in settlements, garbage and solid waste has been an issue. In recent years, it is observed that per capita waste generation has increased due to the changing life style. Improper disposal of solid waste is responsible for pollution of air, water and soil. Disposal of solid waste on open area leads to develop bad odour in the surrounding also it may develop unhygienic conditions. Improper waste disposal is root cause for spreading the infectious diseases among the human and animal. So, it is important to take some steps for the proper management of solid waste followed by reduce, reuse and recycle 3R principle. The intention of this inventory is to find out the quantity of waste generation and disposal methods which are currently followed at Pantagrao kadam college ,Sangali..

Solid waste audit of college was conducted by grouping the college into Main building and college premises. Different types of waste are generated in the college campus. Dustbins are fixed in the building which is used for collection of waste.

### 1.1.1 Generation of solid waste in college:

**Table No.1.1.1: Category wise solid waste generation in college (kg/month)**

Waste type	Paper Waste	Plastic Waste	degradable Waste	Construction Waste	Glass waste	Other Waste	E-Waste	Hazardous Waste
Quantity (Kg/Month)	11	05	06	08	0.5	0.6	03	01
Quantity (Kg/ Year)	110	50	60	80	05	06	30	10



**Graph No. 1.1.1: Category wise solid waste generation in college (kg/month)**

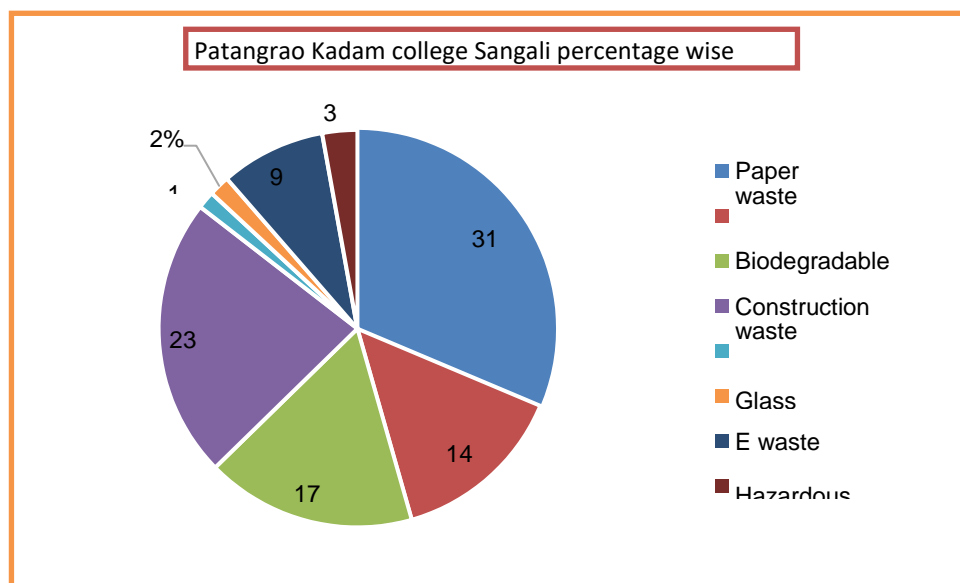
The average amount of solid waste generated per month in Patangrao Kadam college Sangali is approximately 35.1 kg/month. On the basis of observations, the highest quantity of solid waste generated is paper waste which is about 11 kg/month.

Besides, the above mentioned waste, plastic waste is generated in the form of plastic wrappers of food items. Approximately 5 kg/ month paper waste is generated in the institution and that is given to the vendor.

**Table No. 1.1.2: Percentage of category wise solid waste in the college (kg/month)**

Category	Paper Waste	Plastic Waste	Biodegradable Waste	Construction Waste	Glass waste	Other waste	E-Waste	Hazardous Waste
Percentage (%)	31.33	14.23	17.09	22.79	1.42	1.07	8.54	2.84





**Graph No. 1.1.2: Percentage of solid waste generation in the college (kg/month)**

Percentage wise distribution of different sources of solid waste is shown in the above graph. The maximum percentage of solid waste generated is of paper waste which is approximately 31.33% and minimum percentage of hazardous waste generated is about 2.84%.

**1.1.3 Plastic Waste:**

**Table No. 1.1.3: Plastic waste generation and its distribution in the college**

Category	Plastic Kg/month				Total
	Hard	Soft	Carry Bags and Water bottles	Other	
Quantity	0.5	1.5	2.5	0.5	5
Percentage	10	30	50	10	100

Plastic waste in the form of packaged food wrappers, carry bags etc. is approximately 2.5 kg/ month. Plastic wastes are difficult to dispose because it is non-biodegradable waste or it takes many years to degrade naturally. It can cause adverse impacts on environment.

**1.1.4 Hazardous waste audit of the college:**

Hazardous waste is waste that has substantial or potential threats to public health and environment. The sources of hazardous waste in the college are very less. Very less quantity of

hazardous waste generated through Chemistry dept. laboratory .

#### **1.1.5 E-waste generation in the college:**

Generation of e-waste is found in every educational institute. All discarded electronic appliances are called as E-waste. This waste requires special treatment for disposal. So it is also called as special waste. It is observed that the e-waste generated at College is of Schedule II category. Computers, printers, scanners, CPU's, UPS, fused bulbs and tubes are used for administrative work. The wire required for the network connectivity and for electricity also gets included in the E-waste.

#### **1.4 Eco-friendly solid waste management practices:**

The college follows following eco-friendly solid waste management practices.

##### **1. Paper waste recycling:**

Paper waste is handed over to the vendor for recycling. This waste includes newspapers as well as office work paper.

##### **2. Collection of waste:**

For waste collection dustbins are provided wherever required on the campus, different dustbins are provided according to nature of waste such as, dry waste, wet waste and biomedical waste. In classrooms also dustbins are provided.



Fig No.1

*Figure1: Dustbins are provided for waste collection*

### 3. Hazardous waste disposal:

For the disposal of hazardous waste pit chamber in college.

Garden waste is utilized in composting unit which is present on campus. Leaf litter mixed with cow dung and it is allowed for composting in beds. Produced compost is again used in the garden.

*Figure 3: Vermicomposting unit*



Fig. 2 vermicomposting pit



Fig.3 vermicomposting pit



Fig No.4 Paper packing used as dustbin



**key Observations:**

- The average waste generated in the college is app.35.1 Kg /month
- Highest quantity of solid waste is paper waste which is around 11 Kg/montOver all the waste generated in the college is handed over to Municipal Corporation.
- Paper waste is given to the vendor for recycling to Nilesh Traders.
- Cleanliness is maintained at college.
- E-waste is stored at site.
- Solid waste is disposed instead of burning it on campus.

## CONCLUSION

In the academic year 2022-23, Dr. Patangrao Kadam College had a Green Audit by the Department of Environmental Science at Shivaji University, Kolhapur. The process of discovering and evaluating whether institutional policies are sustainable and environmentally friendly is known as "green audits." The major goal of the college's green audit is to examine the green practices that are being used in the institution and to carry out a well-planned audit to determine where we stand on a scale of environmental soundness.

### **Conclusions:**

The following are some findings from the team's green audit that can be used to improve the college campus and make it more environmentally friendly:

The institute has made attempts to keep the campus green.

The campus's tree biodiversity is particularly strong.

### **Recommendations:**

The primary recommendations for enhancing the campus environment are listed below.

1. The institute needs to put up a report on flora.
2. It is possible to start drip irrigation for gardens and botanical gardens.
3. Events involving human-made fire should be avoided on campus.
4. In order to prevent fire occurrences on campus, fire lines should be getting ready.

## **2.1 Green Campus Initiatives of Dr. Patangrao Kadam, Mahavidyalaya College, Sangli**

The region is quite diverse, with numerous tree species serving a number of purposes. The majority of these tree varieties were planted throughout a range of time periods through various plantation programs run by the authorities, and they now form a vital component of the college. By improving air quality, reducing climate change, conserving water, preserving soil, supporting wildlife, and regulating climate by reducing the effects of the sun, rain, and wind, the college's trees have improved the quality of life for not only the college fraternity but also the surrounding community. The radiant energy of the sun is absorbed and filtered by leaves, keeping things cool in the summer. Many species of birds are dependent on these trees mainly for food and shelter. Birds and numerous insects enjoy the nectar of flowers and plants. Numerous creatures, including birds and squirrels, are protected from predators by the leaf-covered branches. Numerous species exhibit an almost infinite range of shapes, forms, textures, and vivid colours. Even individual trees alter in appearance as the seasons change throughout the year. The durability, longevity, and regal grandeur of trees give them the appearance of monuments. They also serve as a reminder of the institution's particularly illustrious past. It has been observed that a dense belt of big, shady trees around the college's perimeter reduces noise, dust, and storms. As a result, the college has been essential in preserving the Sangalwadi village's ecosystem and that of its surroundings.

Dr. Patangrao Kadam, Mahavidyalaya College, Sangli is situated in Sangli district Maharashtra at longitude 74°33'5.94"E and latitude 16°51'52.57"N the elevation of the institute from the sea level is 549 m.

The climate in the area is ideal for the cultivation of a wide variety of plants. A total of 176 trees were counted, each having a girth of more than 10 cm and a height of more than 4 ft. Based on data supplied by the Institution, a total of 35 species of woody trees were recognized during the visit. The campus has a higher concentration of native woody tree species, which is good for biodiversity. During the inventory, *Azadirachta indica* and *Areca catechu* was discovered the most on campus. Dr. Patangrao Kadam, Mahavidyalaya College, Sangli has planted trees that have a better capability for carbon sequestration. The Institute took the initiative to plant native plants, which is the best way to protect the area's biodiversity.





**Figure 2.1: Google Earth Image Dr. Patangrao Kadam, Mahavidyalaya College, Sangli**  
(Source: Google Earth)

**2.1.1 Total number of trees enumerated on Dr. Patangrao Kadam, Mahavidyalaya College, Sangli campus: 176**

Total 176 numbers of trees with more than 10 cm girth and height more than 4 feet have been enumerated. Girth and height of every tree has been measured.

**2.1.2 Total No. of species identified on Dr. Patangrao Kadam, Mahavidyalaya College, Sangli campus: 35**

About 35 species have been identified during the census. It shows a comparatively good diversity of tree species on the campus.

**2.2 Species with the highest population:**

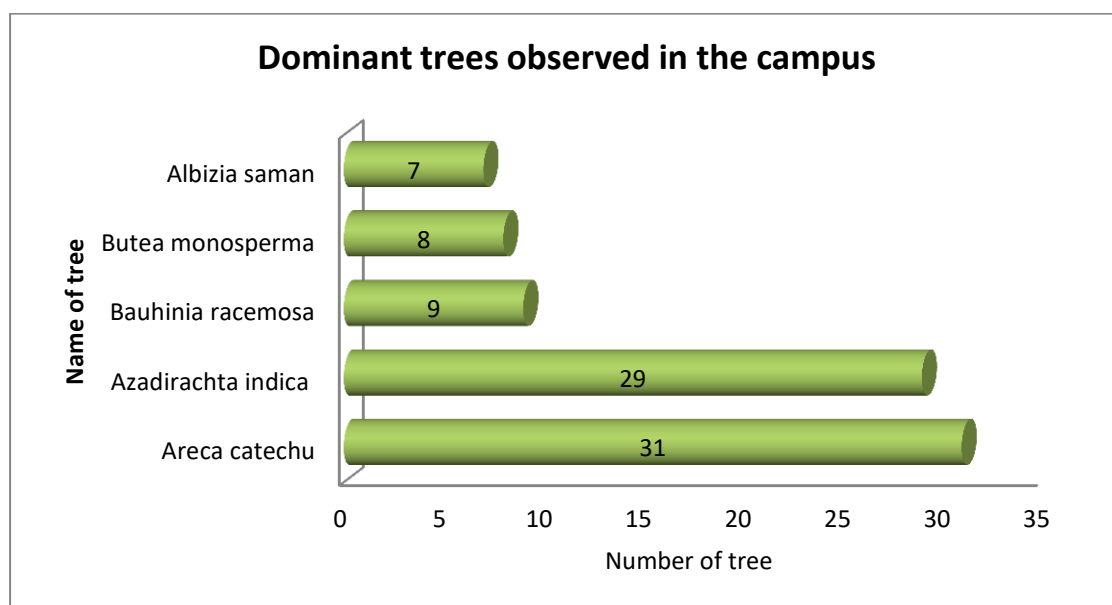
**Table No.2.1: Species with the Highest Population**

Sr.No.	Species name	Common Name	No. of trees observed
1	<i>Areca catechu</i>	Supari	31
2	<i>Azadirachta indica</i>	Neem	29
3	<i>Bauhinia racemosa</i>	Apata	9
4	<i>Butea monosperma</i>	Palas	8
5	<i>Albizia saman</i>	Rain tree	7

During the inventory, *Areca catechu* and *Azadirachta indica* were observed to have the greatest population on campus, followed by *Bauhinia racemosa* and *Butea monosperma*.



The species *Areca catechu* and *Azadirachta indica*, which has a population of 60 individuals, is the most populous species on campus. The *Bauhinia racemosa* contributes 9 trees on the campus. *Butea monosperma* and *Albizia saman* make a total of 15 trees and contributed with 8 and 7 trees respectively on the campus.



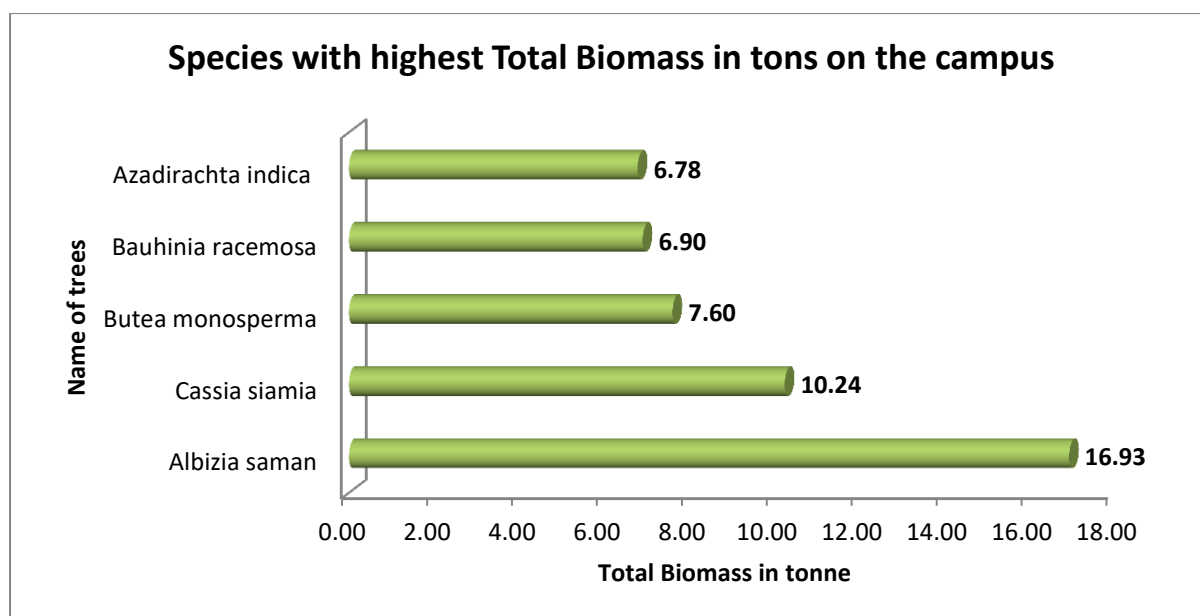
**Graph No.2.1: Dominant tree species on campus**

### 2.3 Total Biomass:

The mass of biological organisms that are alive and moving around in an environment at any particular time is known as biomass in ecology. Species biomass, which is the mass of one or more species, or community biomass, which is the mass of all the species in a community, is both examples of biomass. Microorganisms, plants, and animals can all be a part of it. The mass can be expressed as the overall mass in the community or as the average mass per unit area. During the most recent tree census, the Dr. Patangrao Kadam, Mahavidyalaya College, Sangli campus recorded a total biomass of woody vegetation of 66.86 tons.

**Table No.2.2: Total biomass of trees in tons on the campus**

Sr. No.	Botanical Name	Common Name	Total Biomass in tons
1	<i>Albizia saman</i>	Rain tree	16.9332
2	<i>Cassia siamia</i>	Kassod Tree	10.2403
3	<i>Butea monosperma</i>	Palas	7.6021
4	<i>Bauhinia racemosa</i>	Apata	6.9006
5	<i>Azadirachta indica</i>	Neem	6.7829



**Graph No.2.2: Species with highest total biomass in tons on the campus**

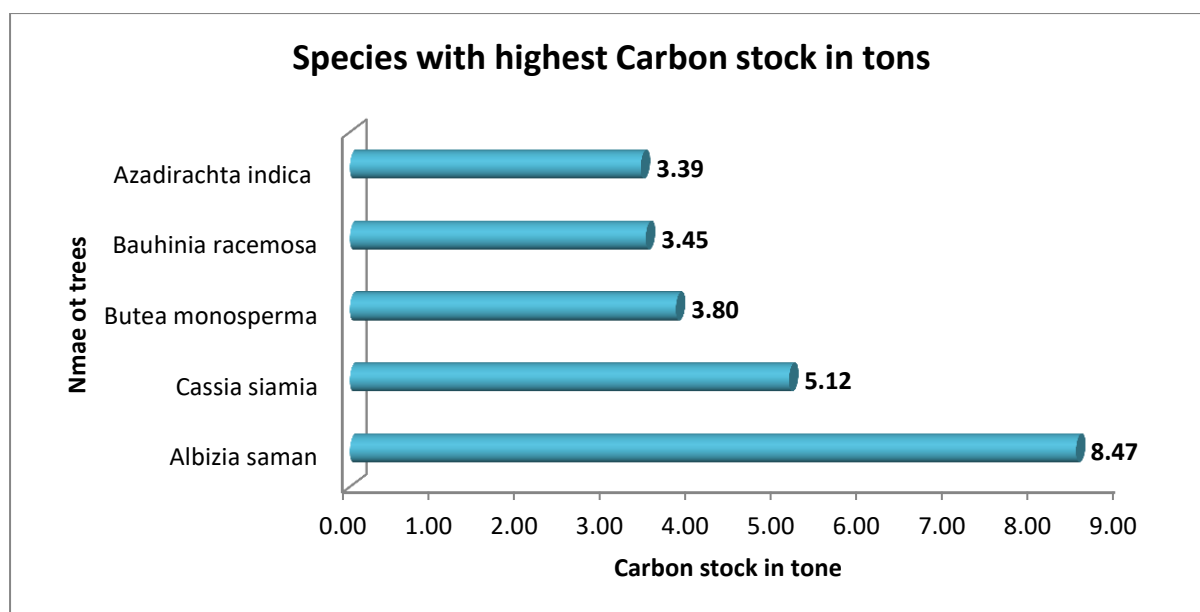
*Albizia saman* shows the highest biomass on the campus. Followed by *Cassia siamia* and *Butea monosperma* are ranked at second and third place.

#### 2.4 Carbon stock:

Forests and trees act as natural carbon stores, but this carbon is released when the trees are fallen and the area deforested. The amount of carbon stored within an area of land varies according to the type of vegetation cover. 33.43 tons of total carbon stock is present on the campus.

**Table No.2.3: Carbon stock of trees in tons on the campus**

Sr. No.	Botanical Name	Common Name	Carbon stock in tons
1	<i>Albizia saman</i>	Rain tree	8.4666
2	<i>Cassia siamia</i>	Kassod Tree	5.1202
3	<i>Butea monosperma</i>	Palas	3.8010
4	<i>Bauhinia racemosa</i>	Apata	3.4503
5	<i>Azadirachta indica</i>	Neem	3.3915



**Graph No.2.3: Species with highest carbon stock in tons on the campus**

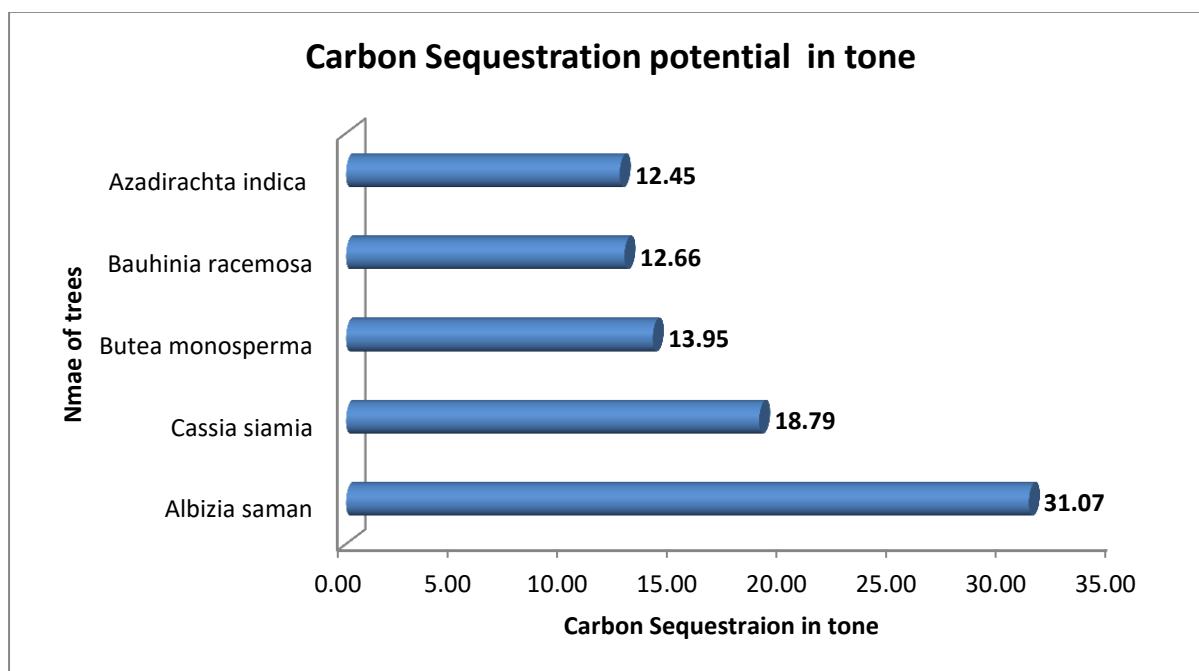
## 2.5 Carbon Sequestration:

Long-term storage of carbon dioxide or other types of carbon is referred to as carbon sequestration, and it is done to either delay or mitigate global warming and prevent disastrous climate change. It has been suggested as a strategy to reduce the amount of greenhouse gases that are released when fossil fuels are burned and accumulate in the atmosphere and ocean. The worldwide storage capacity of the vegetation carbon pool is 560 Pg (Pg: Petagram = billion tons). The current study focuses on evaluating the amount of carbon that is currently stored on the campus of 111.33 tonnes of oxygen have been released by the vegetation on the campus of Dr. Patangrao Kadam, Mahavidyalaya College, Sangli. Released oxygen and CO<sub>2</sub> sequestration are compared 32:12, which shows a direct correlation. Therefore, it will only emit oxygen once each year. One tree is said to be able to meet the oxygen demands of two people for the rest of their lives. In this way, the 176 trees on the college campus give shade for the nearly 352 residents of the area, in the form of woody vegetation by listing every type of tree that grows there. Overall, the woody plants on the college campus have been able to trap and store 122.7 tons of CO<sub>2</sub>. Since the campus has 176 mature woody trees, each of which consumes about 0.0218 tons of CO<sub>2</sub> annually, the total annual CO<sub>2</sub> consumption of all the woody plants on the college campus is 2.67 tons.

**Table No.2.4: Carbon sequestration of trees in tons on the campus**

Sr. No.	Botanical Name	Common Name	Carbon Sequestration in tons
1	<i>Albizia saman</i>	Rain tree	31.07

2	<i>Cassia siamia</i>	Kassod Tree	18.79
3	<i>Butea monosperma</i>	Palas	13.95
4	<i>Bauhinia racemosa</i>	Apata	12.66
5	<i>Azadirachta indica</i>	Neem	12.45



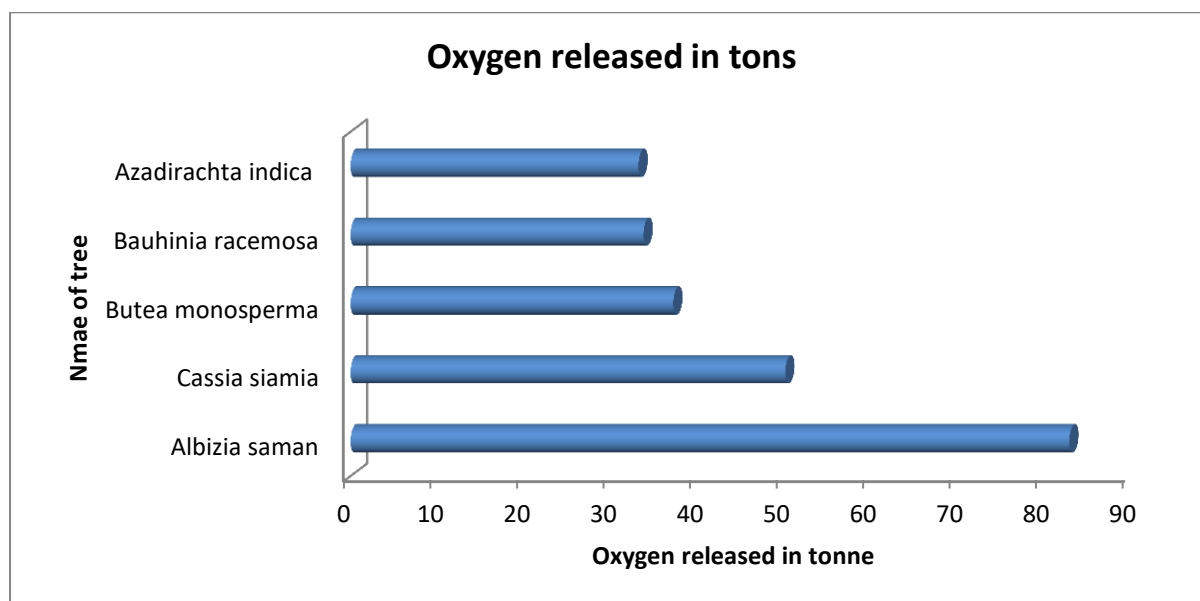
**Graph No. 2.4: carbon sequestration potential in the campus**

### 2.6 Oxygen released :

327.20 tonnes of oxygen have been released by the vegetation on the campus of Dr. Patangrao Kadam, Mahavidyalaya College, Sangli. Released oxygen and CO<sub>2</sub> sequestration are compared 32:12, which shows a direct correlation. Therefore, it will only emit oxygen once each year. One tree is said to be able to meet the oxygen demands of two people for the rest of their lives. In this way, the 176 trees on the college campus give shade for the nearly 352 residents of the area.

**Table No.2.5: oxygen released in tons on the campus**

Sr. No.	Botanical Name	Common Name	Oxygen released in tons
1	<i>Albizia saman</i>	Rain tree	82.85972966
2	<i>Cassia siamia</i>	Kassod Tree	50.10935353
3	<i>Butea monosperma</i>	Palas	37.19948653
4	<i>Bauhinia racemosa</i>	Apata	33.7668051
5	<i>Azadirachta indica</i>	Neem	33.19103016



Graph No. 2.5: oxygen released in the campus

2.7 List of tree species observed on campus:

Table No.2.6: List of tree species observed on campus

Sr. No.	Name of species
1	<i>Albizia saman</i>
2	<i>Cassia siamia</i>
3	<i>Butea monosperma</i>
4	<i>Bauhinia racemosa</i>
5	<i>Azadirachta indica</i>
6	<i>Peltophorum pterocarpum</i>
7	<i>Areca catechu</i>
8	<i>Delonix regia</i>
9	<i>Alstonia Sclaris</i>
10	Melia azedarach
11	<i>Ficus religiosa</i>
12	<i>Mimusops elengi</i>
13	<i>Syzygium cumini</i>
14	<i>Lagerstroemia speciosa</i>
15	<i>Spathodea campanulata</i>

16	<i>Millingtonia hortensis</i>
17	Sterculia
18	<i>Adina cordifolia</i>
19	<i>Polyalthia Longifolia</i>
20	<i>Muntingia Calabura</i>
21	<i>Cocos nucifera L.</i>
22	<i>Tabebuia rosea</i>
23	<i>Callistmon</i>
24	<i>Terminalia catappa</i>
25	<i>Tamarindus indica</i>
26	<i>Mangifera Indica</i>
27	Thespesia
28	<i>Casia fistula</i>
29	<i>Terminalia arjuna</i>
30	<i>Psidium Guajava</i>
31	<i>Carica papaya</i>
32	<i>Leucaena Leucocephala</i>
33	podocarpus macrophullus
34	Bismarckkia nobilis Hildebr
35	<i>Couroupita guianensis</i>



**Key Observation:**

- Institute has a green campus.



Figure 2.2: Dr. Patangrao Kadam, Mahavidyalaya College, Sangli

- The Institute takes good initiative for green cover by planting trees on the campus as well as outside the campus.
- Well-maintained vegetation on campus.



Figure 2.3 :Well maintained campus

## CONCLUSION

Dr. Patangrao Kadam, Mahavidyalaya College, Sangli had a Green Audit during the academic year 2022–2023 by the Department of Environmental Science at Shivaji University, Kolhapur. "Green audits" are procedures used to identify and assess whether institutional policies are ecologically responsible and sustainable. Examining the green practices being implemented at the college and conducting a well-planned audit to ascertain where we are on an environmental soundness scale are the main objectives of the college's green audit.

- **Conclusions:**

The following are some findings from the team's green audit that can be used to improve the college campus and make it more environmentally friendly:

1. The campus's tree biodiversity is particularly strong.
2. The institute has made attempts to keep the campus green.

- **Recommendations:**

The primary recommendations for enhancing the campus environment are listed below.

1. It is possible to start drip irrigation for gardens and botanical gardens.
2. Events involving human-made fire should be avoided on campus.
3. In order to prevent fire occurrences on campus, fire lines should be getting ready.

**ENVIRONMENT MANAGEMENT PLAN:**

For the Dr. Patangrao Kadam, Mahavidyalaya College, Sangli , Maharashtra, we have developed an Environment Management Plan (EMP) by understanding the dynamics of the current scenario of resource usage and current practices of green inventory. This plan will prioritize the areas where the institution needs to make further environmental improvements while outlining the benefits, drawbacks, and solutions for maintaining a clean, green campus.

**Environment Management Plan 2022-23**

<b>Sector</b>	<b>Strengths</b>	<b>Weakness</b>	<b>Suggestions</b>	<b>Priority</b>
<b>Tree Vegetation</b>	There is lots of space for plantation	-	Avoid monoculture, variety of species should be planted in campus area	Medium
<b>Paper waste</b>	Paper waste is disposed through vendor.	-	Use paper less policy	Medium
<b>Plastic waste</b>	-	-	Segregation of plastic waste should be done at source by using designated dustbin.	Medium
<b>Garden waste</b>	Garden waste is used for the composting.	-	-	High
<b>E-waste</b>	-	There is no authorized vendor for disposal of E-waste	E-waste should be disposed properly through authorized vendor only.	High



**Environmental Audit Team with Principal of Dr. Patangrao Kadam  
Mahavidyalaya, Sangli.**

**Prepared by**  
**Department of Environmental Science,**  
**Shivaji University, Kolhapur-416 004**





**Dr. Patangrao Kadam Mahavidyalaya, Sangli**  
Affiliated to Shivaji University

## Energy Audit Report



Prepared by

**DEPARTMENT OF ENVIRONMENTAL SCIENCE,**

**SHIVAJI UNIVERSITY, KOLHAPUR- 416004**

**2022-23**



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Ref. No./SUK/ENV

Date: 12/03/2023

## Certificate

This is to certify that the Department of Environmental Science, Shivaji University, Kolhapur has conducted detailed "Energy Audit" of "Bharati Vidyapeeth's Dr.Patangrao Kadam Mahavidyalaya, Sangli." during the academic year 2022-2023. The Energy audit was conducted in accordance with the applicable standards prescribed by 'Bureau of Energy Efficiency, Government of India'. Their audit involve code compliance, operations, maintenance, occupancy, and building systems etc and gives an 'Energy Management Plan', which the institute can follow to minimize impact on the institutional working framework. The analysis was based on a review of the rules governing energy efficiency and conservation, on data analysis, and on the findings of survey with key personnel in the campus's administrative management. The performance of college was found to have good quality even though some important aspects like increasing the use of solar energy and energy efficient equipments are to be considered seriously. In an opinion and to the best of our information and according to the information given to us, said Energy audit gives a true and fair view in conformity with energy auditing principles accepted in India.



*Aasawari Jadhav*  
Head

**Dr. (Mrs.) Aasawari Jadhav**  
**I/C. Head & Assistant Professor**  
**Department of Environmental Science**  
**Shivaji University, Kolhapur**



"Social Transformation Through Dynamic Education"

Bharati Vidyapeeth's

**Dr. Patangrao Kadam Mahavidyalaya, Sangli**

Founder :  
**Dr. Patangrao Kadam**  
M.A., LL.B., Ph.D.

Principal  
**Dr. D.G. Kanase**  
M.Sc., Ph.D.

(Affiliated to Shivaji University)  
P.O. Box No. 74, Sangli - 416 416 Ph. : 0233-2535229, Fax : 2535993  
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Founding Hon'ble Dr. Patangrao Kadam

Accredited with 'B<sup>++</sup>' Grade  
by NAAC (3<sup>rd</sup> Cycle)

Ref. No. : BV/PKMS/ 346/2022-2023

Date : 07/03/2023

### Principal's Message

In this modern era, environmental sustainability is very important because many environmental problems have been created due to human activities. In such a situation, it is our primary responsibility to preserve the environment by taking certain steps to reduce environmental pollution and develop environmental sustainability. The College, since its inception has taken several efforts to create a green campus through various initiatives such as landscaping, plant plantation, awareness programs etc.

Nature conservation has become very important in recent times. Green, Environmental and Energy audits have become very important in analyzing the institution's environmental performance and possible options to make the institution eco-friendly. These audits aim at improving the environmental conditions inside and outside the institute.

I am very happy that our college has carefully completed these audits under the supervision of the committee of Shivaji University Kolhapur. This will enable us to tolerate environmental issues in the future.

Thank You.



*(Handwritten signature)*

(Dr. D. G. Kanase)

Principal

Bharati Vidyapeeth's

Dr. Patangrao Kadam Mahavidyalaya, Sangli.

# INDEX

<b>Sr. No.</b>	<b>Contents</b>	<b>Page No.</b>
	<b>Introduction</b>	
1.	1.1 Energy Audit, a Tool for Environmental Protection and Conservation	1
	<b>Methodology</b>	
2.	2.1 Background of Dr.Patangrao Kadam Mahavidyalaya, Sangli Energy Audit preparation 2.2 Survey by Questionnaire	2-3
	<b>Observation and Result</b>	
3.	3.1 Electricity and energy audit 3.2 Energy consumption at building 3.3 Key Observations	4-8
4.	Summary and Conclusion Recommendations	9-10
5.	Environment Management Plan	11

## Table

<b>Table. No.</b>	<b>Contents</b>	<b>Page No.</b>
3.1	Energy consumed per annum by equipments in Building	5
3.2	Energy consumed per annum by equipments in Laboratory	6
3.3	Energy consumed per annum by support services in Building	7

## Graph

<b>Graph. No.</b>	<b>Contents</b>	<b>Page No.</b>
3.1	Energy consumed per annum by equipments in Building	5
3.2	Energy consumed per annum by equipments in Laboratory	6
3.3	Energy consumed per annum by support services in Building	7

## **Chapter I**

### **Introduction**

#### **1.1 Energy Audit, a Tool for Environmental Protection and Conservation**

An energy audit is a survey that looks at how an organization uses its energy and looks for ways to conserve it. It refers to a method or system designed to lower the organization's energy consumption without lowering output. The audit offers recommendations for additional strategies and techniques for maximizing energy savings. Traditionally, fossil fuels, water, and wind have been used to produce electrical energy. The abundance of fossil fuels and their rates of depletion reinforce the need for alternative energy sources and electric energy conservation. Offering goods or services at the lowest cost and with the least degree of environmental damage is often the main goal of an energy audit and the control of energy consumption (Backlund and Thollander, 2015). Energy audits are required to identify areas for improvement, cost-saving opportunities, understand how fuel is used, where waste occurs, and identify potential savings.

The Energy Conservation Building Code (ECBC), introduced in 2017, establishes minimal standards for the design and construction of energy-efficient buildings throughout India. Additionally, it offers two extra sets of incremental specifications that buildings must meet in order to reach higher than necessary levels of energy efficiency (Gnanamangai *et al.*, 2021). In an effort to adopt energy-saving procedures in an organisation; the Bureau of Energy Efficiency (BEE) was established in 2002. Affixed to manufactured goods, energy-efficiency labels provide information on the products' energy efficiency (Ingle, 2014). In order to speed up energy efficiency efforts, BEE has created a system for labelling buildings' energy efficiency that corresponds with their star ratings. The BEE Star Rating Scheme is based on the real performance of the building and equipment in terms of specific energy usage, or "Energy Performance Indicator," by using star ratings to designate products that will be helpful for energy savings in a sustainable manner (Mishra and Patel, 2016).



## Chapter II Methodology

### 2.1 Background of Bharati Vidyapeeth's Dr. Patangrao Kadam Mahavidyalaya, Sangli:



**Satellite image of Bharati Vidyapeeth's Dr. Patangrao Kadam Mahavidyalaya, Sangli (Source: Google Earth)**

Considering all this situation and adding national holidays in the total days, the audit process was carried out in three phases. For preparation of audit, the earlier data was compared with the present. At first, all the secondary data required for the study was collected from various sources, like concerned departments. A broad reference work was carried out to clear the idea of Energy Auditing. Different case studies and methodologies were studied and the following methodology was adopted for present audit. The methodology of present study is based on onsite visits, the personal observations and questionnaires survey tool. Initially, based on data requirement, sets of questionnaires were prepared. The surveyors then visited all the departments of the college and the questionnaires were filled. The generated data is subsequently gathered through various sections of college and used for further analysis. From the outcome of the overall study, a final report is prepared.

- Energy Auditing Process
- Planning
- Choosing audit team
- Inspecting site/ Collection of data
- Analysing results of audit

- Evaluating audit

### **2.2 Survey by Questionnaire:**

Baseline data for Energy Audit report preparation was collected by questionnaire survey method. Questionnaires prepared to conduct the Energy Audit in the college campus is based on the guidelines, rules, acts and formats prepared by Ministry of Environment, Forest and Climate Change, New Delhi, Central Pollution Control Board and other statutory organizations. Most of the guidelines and formats are based on broad aspects and some of the issues or formats were not applicable for college campus. Therefore, using these guidelines and formats, combinations, modifications and restructuring was done and sets of questionnaires were prepared for energy audit. All the questionnaires comprise of group of modules. The first module is related to the general information of the concerned department, which broadly includes name of the department, month and year, total number of students and employees, visitors of the department, average working days and office timings etc. The next module is related to the present consumption of resources energy. There are possibilities of loss of resources like water, energy due to improper maintenances and assessment of this kind of probability is necessary in Energy Audit. One separate module is based on the questions related to this aspect. Another module is related to maintaining records, like records energy bill, equipment warranty specification, etc. For better convenience of the surveyor, some statistics like, basic energy consumption characteristics for electrical equipment etc. was provided with the questionnaires itself.



## **Chapter III**

### **Observation and Result**

#### **3. Electricity and energy audit:**

Energy auditing is a tool for identifying energy efficiency potential and measures. Proper management of energy efficient systems can lead to significant cost savings and energy savings as well as increased comfort, lower repair costs, and extended machine life. An effective energy management program begins with a thorough energy audit. Energy audit evaluates the efficiency of all building and process systems that use energy. The auditor of the power starts at the meter used, finding all the energy sources that go into space. The auditor then identifies the streams of energy in each fuel, balances the distribution of energy into different functions, evaluates the efficiency of each of those functions, and identifies energy efficiency and cost-effectiveness.

❖ Audit activities, in general order, include:

- Identify all energy systems
- Check system status
- Analyse the impact of improvements to those systems
- Write up an energy audit report

The report documents the use and occupancy of the building and building systems equipment. The report also recommends ways to improve efficiency through improvements in operation and maintenance items, and through installation of energy conservation measures.

An energy source utilized by all the departments, support services of *Bharati Vidyapeeth's Dr.Patangrao Kadam Mahavidyalaya, Sangli* campus includes use of electricity and liquid petroleum. Major use of the energy is at office, laboratories, ICT enabled classrooms, auditorium and support services for lighting, transportation, and instruments. Electricity is supplied to the college campus by Maharashtra State Electricity Board.

#### **Energy consumption of building:**

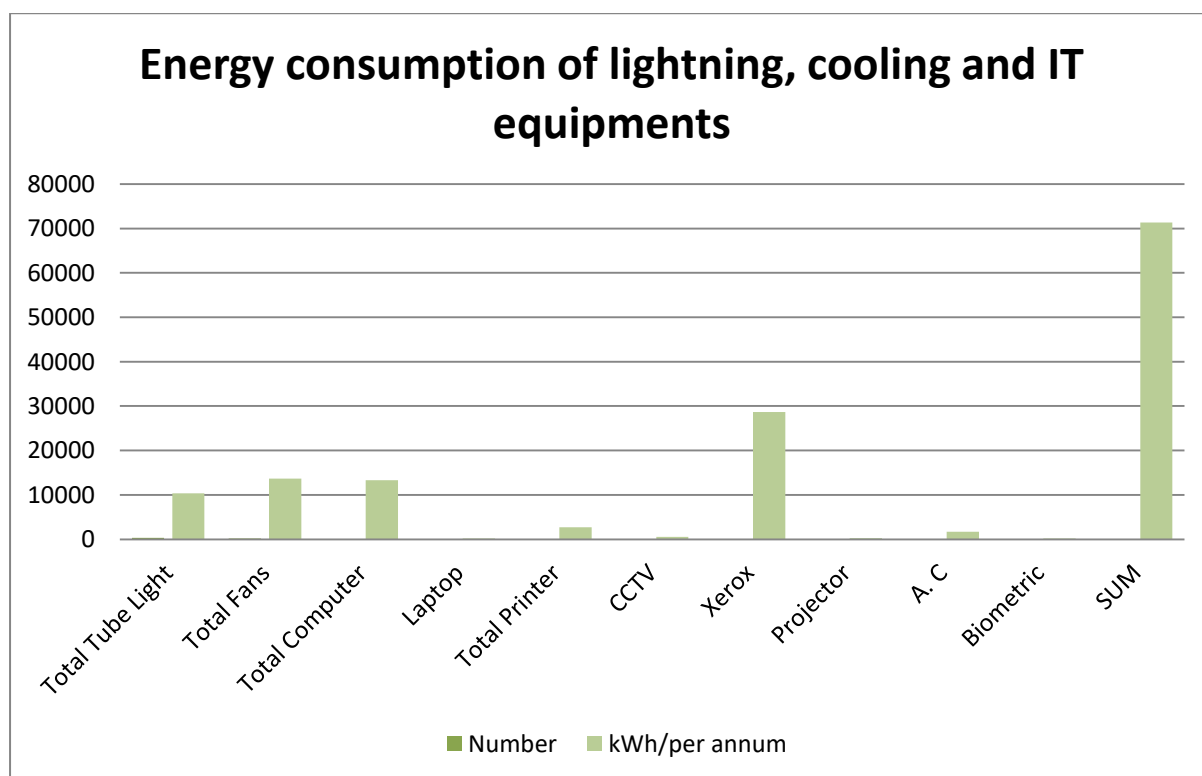
College Building of Dr. Patangrao Kadam Mahavidyalaya, Sangli includes the college has a spacious and beautiful building, with well-equipped laboratories, classrooms, ICT enabled classrooms, auditorium, two open stages, Landscape garden and a playground. The calculations are based on the data provided by the college and actual observations taken at the

site. The collected data shows all departments in the college have maximum number of major energy consuming equipments and energy consumption is 103656.32 kWh/ Annum.

**3.1 Energy consumption of lightning, cooling and IT equipments:**

**Table No.3.1: Energy consumed per annum by equipments in Building**

Sr. No.	Equipments	Number	kWh/per annum
1	Total Tube Light	299	10333.44
2	Total Fans	203	13641.6
3	Total Computer	79	13272
4	Laptop	4	161.28
5	Total Printer	14	2688
6	CCTV	11	554.4
7	Xerox	2	28672
8	Projector	1	272
9	A. C	3	1728
10	Biometric	1	204.8
	<b>SUM</b>		<b>71322.72</b>



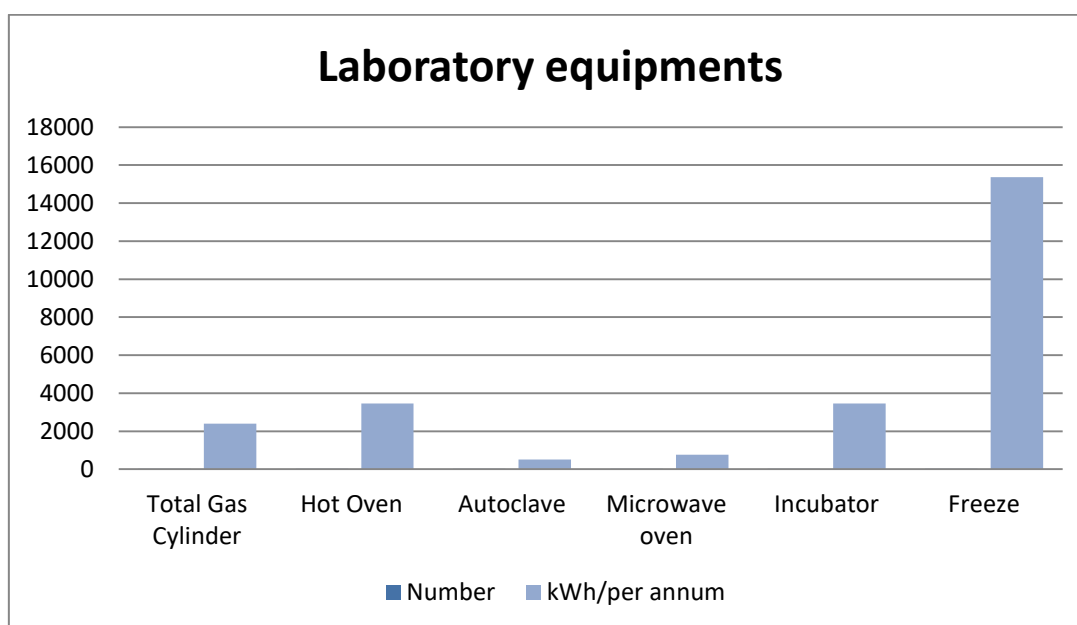
**Graph No.3.1: Energy consumed per annum by equipments in Building**

The energy-consuming equipment throughout the building uses 71366.24 kWh/Annum of power annually. Since there was maximum use of energy 28672 kWh/Annum for Xerox machine. Also 14 printers consume 2688 kWh/Annum energy. Moreover, in the assessments it was found that there are 299 LED Tubes, which consumes energy i.e. 10333.44 kWh/Annum. 203 Ceiling Fans use 13641.6 kWh/Annum and 11 CCTV cameras use 554.4 kWh/Annum, 79 computer and 4 laptops consume 13272 kWh/Annum and 161.28 kWh/Annum energy respectively. Also there is 1 biometric machine which uses energy of 204.8 kWh/Annum. (Graph No. 3.1)

### 3.2 Energy consumption of Laboratory equipments:

**Table No.3.2: Energy consumed per annum by equipments in Laboratory**

Sr. No.	Equipments	Number	kWh/per annum
1	Total Gas Cylinder	11	2393.6
2	Hot Oven	9	3456
3	Autoclave	1	512
4	Microwave oven	1	768
4	Incubator	3	3453
5	Freeze	8	15360
	<b>SUM</b>		<b>25942.6</b>



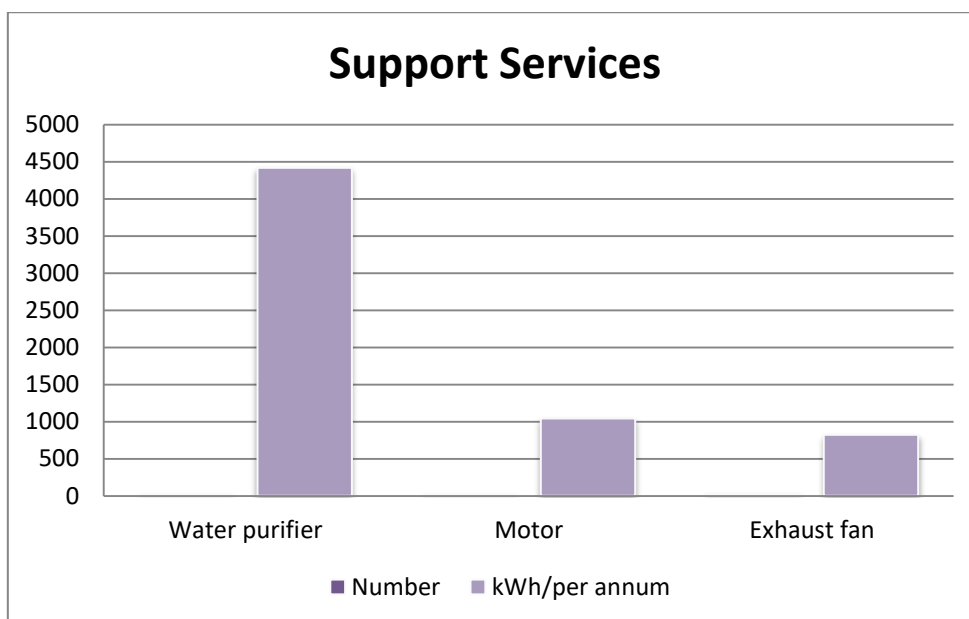
**Graph No.3.2: Energy consumed per annum by equipments in Laboratory**

The energy-consuming equipments in laboratory uses 25942.6 kWh/Annum of power annually. Since there was maximum use of energy 15360 kWh/Annum for 8 freeze which are used in laboratory for storage purpose . After that Hot oven consume 3456 kWh/Annum energy and incubatory can consume nearby to that is 3453 kWh/Annum. Microwave has consumed 768 kWh/Annum as well as autoclave has consumed 512 kWh/Annum of energy. Total 11 gas cylinders are used for laboratory which has consumed 2393.6 kWh/Annum. (Graph No. 3.2)

**3.3 Energy consumption of Support services:**

**Table No.3.3: Energy consumed per annum by support services in Building**

Sr. No.	Equipments	Number	kWh/per annum
1	Water purifier	3	4416
2	Motor	1	1040
3	Exhaust fan	16	820
	<b>SUM</b>		<b>6276</b>



**Graph No.3.3: Energy consumed per annum by Support services in Building**

Other facility of college campus includes pure drinking water facility as well motor which is used for water uplifting. Water purifier has been utilized 4416 kWh/Annum energy and motor has been used 1040 kWh/Annum of energy. Exhaust fans used for proper air conditioning consume up to 820 kWh/Annum of energy. Total amount of energy used for other facility is 6276 kWh/Annum.

### **Key Observations:**

- The total energy consumption of college is 103656.32 kWh/Annum
- Highest consumption of energy is by lightning, cooling and IT equipments i.e. 71322.72 kWh/Annum.
- The energy consumption of Laboratory equipments is also more than support services.
- Installation of sensor based electrification items like fans, lights, etc. can save electricity.
- Solar panels are installed to terrace of building which is useful in conserving the natural resources.
- Unnecessary use of lights, fans and computers at some places when no one is using.

## **Chapter IV**

### **Summary and Conclusion**

#### **Summary:**

Energy Audit is one of the important tools to check the balance of natural resources and its judicious use. Energy auditing is the process of identifying and determining whether institutional practices which are eco-friendly and sustainable. It is a process of regular identification, quantification, documenting, reporting and monitoring of environmentally important components in a specified area.

The Department of Environmental Science, Shivaji University, Kolhapur has conducted an “Energy Audit” of Bharati Vidyapeeth's Dr. Patangrao Kadam Mahavidyalaya, Sangli in the academic year 2022-23. The main objective to carry out energy audit is to check the Energy Audit practices followed by college and to conduct a well-defined audit report to understand whether the college is on the track of sustainable development.

After completing the audit procedure of college for Energy Audit practices, there are following conclusions, recommendations and Energy Management Plan (EMP) which can be followed by college in future for keeping campus environment friendly.

#### **Conclusion:**

From the Energy Audit, following are some of the conclusions which can be taken for improvement in the campus.

1. Installation of solar panels provides ample amount of electricity. Such solar modules are already installed wherever possible in the campus.
2. Use of LED lamps and Tube Lights is maximum.
3. Laboratories equipment is consuming more energy in the departments. The replacement of old equipment can be beneficial for solving this issue.
4. The replacement of florescent tube can be beneficial for solving electricity consumption issue.



### **Recommendations:**

Following are some of the key recommendation for improving campus environment:

1. An environmental policy document has to be prepared with all the recommendations and current practice carried by college.
2. The college should develop internal procedures to ensure its compliances with environmental legislation and responsibility should be fixed to carry out it in practice.
3. Electrification of street lights by solar power should be encouraged.
4. Installation of sensor based electrification items like fans, lights, etc. can save electricity.
5. Regular checkups and maintenance of wire, and Electricity meter system should be done by engineering section to reduce over use, short circuit.
6. Science laboratories and support services using large amount of energy consumption; the system should develop energy conservation practices.

**Chapter V**  
**Energy Management Plan (EMP)**

By understanding the dynamics of present situation of resource utilization and current Energy Audit practices, the Department of Environmental Science has prepared an „Energy Management Plan“ for the Bharati Vidyapeeth's Dr. Patangrao Kadam Mahavidyalaya, Sangli in the academic year 2022-23. This plan will reveal the strengths and weaknesses and suggests remedies to develop Energy Audit campus. The EMP also gives suggestion for the priority of work to carry out.

<b>Energy Management Plan Sector</b>	<b>Strengths</b>	<b>Weakness</b>	<b>Suggestions</b>	<b>Priority</b>
<b>1. Electricity</b>	Different types of the instrument is available	Unnecessary use of lights, fans and computers at some places when no one is using.	Electrification of street lights by solar power.  Installation of sensor based electrification for fans, lights, etc. Use of solar pumps for water tanks.	Medium



**Environmental Audit Team with Principal of Dr. Patangrao Kadam  
Mahavidyalaya, Sangli.**

**Prepared by**  
**Department of Environmental Science,**  
**Shivaji University, Kolhapur-416 004**

**Bharati Vidyapeeth's**  
**Dr. Patangrao Kadam Mahavidyalaya, Sangli**

**Department of Botany**

**Report**

One day study tour was organized to Radhanagari Wildlife Sanctuary and nearby areas on 11<sup>th</sup> Dec. 2022 by department of Botany, Bharati Vidyapeeth's Dr. Patangrao Kadam Mahavidyalaya, Sangli.

Main objective of the tour was to familiarize the students with the plant wealth and ecological aspects of the study area. Students observed various plants like herbs, shrubs, trees, and climbers growing in natural habitats as a part of B.Sc. curriculum of Shivaji University, Kolhapur.

During this study tour, we also visited Rautwadi Waterfall, which is present near to Radhanagari Dam in Wildlife sanctuary. It's a tourist place so, many people visits over there and throw plastic waste like water bottles, Chips wrappers etc. and make plastic pollution at this lace.

We collected plastic waste and disposed away from Waterfall. This activity helps to make awareness about plastic waste and their hazardous effect among students.



(Mr. H. V. Wangikar)

Tour In-Charge



(Dr. V. B. Awale)

**HEAD**

**Department of Botany**  
**Dr. Patangrao Kadam Mahavidyalaya,**  
**SANGLI-416 416.**



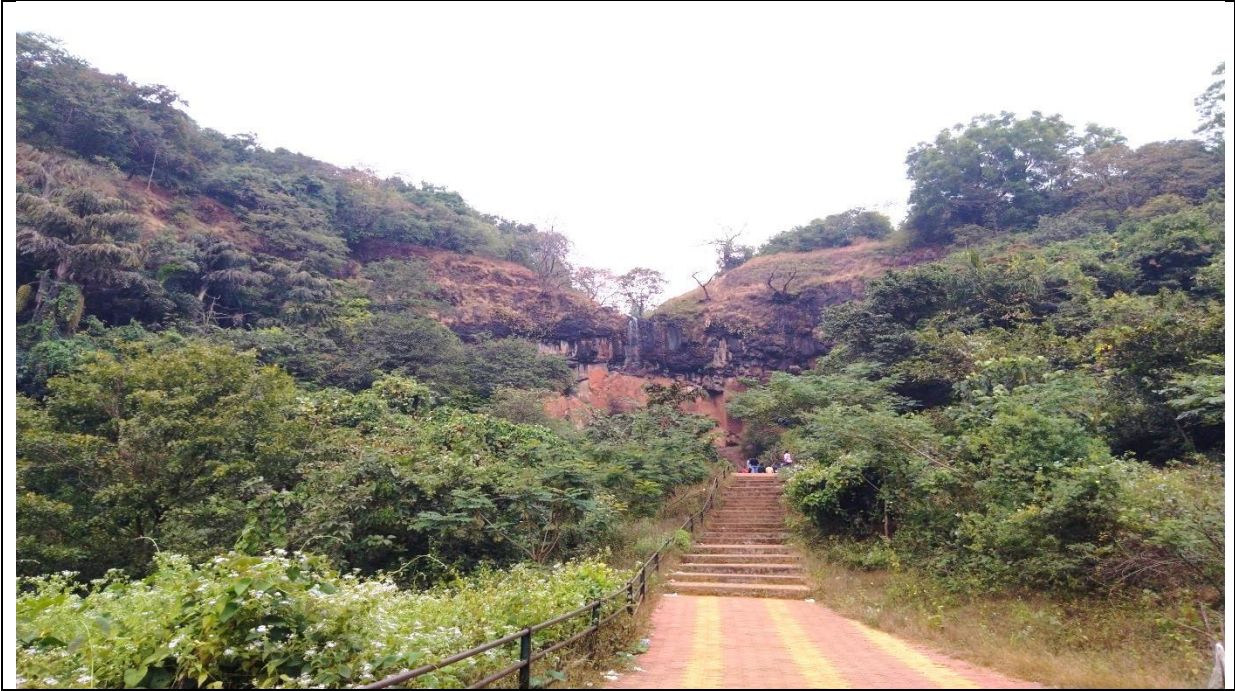
(Dr. D. G. Kanase)

**Principal,**

**Dr. Patangrao Kadam Mahavidyalaya,**  
**Sangli.**







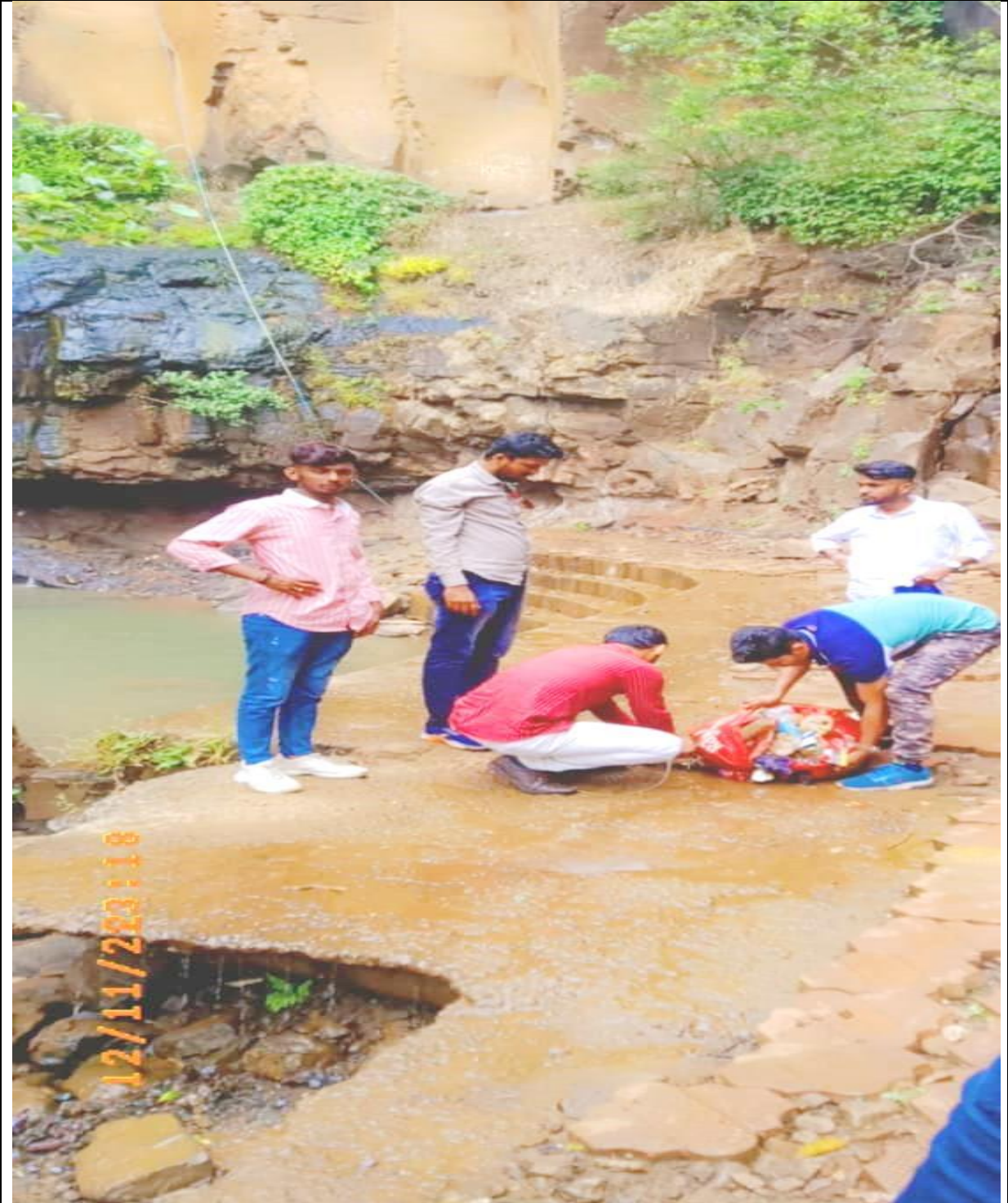
**Rautwadi Waterfall**



**Plastic Collected by Students**







**Disposing Collected Plastic**





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Ref. No./SUK/ENV

Date: 12-03-2023

**Certificate**

This is to certify that the Department of Environmental Science, Shivaji University, Kolhapur has assessed detailed "Clean and Green Campus Initiatives" of "Dr. Patangrao Kadam College" during the academic year 2022-2023. This report was evaluated in accordance with the applicable standards prescribed by the Indian of Remote Sensing, Dehradun, India, Ministry of Environment, Forest and Climate Change, New Delhi and Intergovernmental Panel on Climate Change (IPCC) and Central Pollution Control Board (CPCB), New Delhi. The report involves solid waste generation, safe waste disposal practices, green inventory, biomass estimation, carbon sequestration potential of the campus. "Environmental Management Plan", is also included in the report which can be followed to minimize environmental impacts. The performance of college was found to have good quality with respect to sustainable Clean and Green Practices however; ample amount of work can be done in this area.

The opportunities of sustainable green practices and well consideration of suggested Environmental Management Plan can make the college role model to other institutions as well. In an opinion and to the best of our information and according to the information given to us, said Clean and Green Initiative gives a true and fair view in conformity with environmental auditing principles accepted in India.



Head

*A. Jadhav*

Dr. (Mrs.) Aasawari Jadhav  
C. Head & Assistant Professor  
Department of Environmental Science  
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*A. Adhar*

Head

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Shivaji University, Kolhapur  
**Dr. (Mrs.) Aasawari Jadhav**  
**VC, Head & Assistant Professor**  
Department of Environmental Science  
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