Rayat Shikshan Sanstha's

Chandrabai-Shantappa Shendure College

Hupari, Dis. Kolhapur

Green Audit Report

2017-18

Prepared by

DEPARTMENT OF ENVIRONMENTAL SCIENCE,
SHIVAJI UNIVERSITY, KOLHAPUR- 416004

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Certificate

This is to certify that the Department of Environmental Science, Shivaji University, Kolhapur has conducted detailed "Green Audit" of "Chandrabai-Shantappa Shendure College, Hupari, Tal. Hatkanagle, Dist. Kolhapur, Maharashtra" during the academic year 2017-2018. The green 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. In an opinion and to the best of our information and according to the information given to us, said green audit gives a true and fair view in conformity with environmental auditing principles accepted in India.

Department of Environmental Science, Shivaji University, Kolhapur

15/2/2019

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स्थापना : जून १९९१

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"स्वावलंबी शिक्षण हेच आमचे ब्रीद" – कर्मवीर
रयत शिक्षण संस्थेचे,
चंद्राबाई-शांताप्पा शेंडुरे कॉलेज,हुपरी
ता.हातकणंगले, जि.कोल्हापूर (महाराष्ट्र) पिन - ४१६२०३
(शिवाजी विद्यापीठ, कोल्हापूरशी संलग्न)
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दिनांक
४/१/२०१९

Principal Desk

Chandrabai –Shantappa Shendure college, Hupari is ,a skill based and meritorious educational institute and is one of the branches of Rayat Shikshan Sanstha. The college is started in 1991 to impart higher education to the students of Hupari and near by villages. The management of the college has shown its great commitment towards the Green Auditing. They have planned to promote all green activities.

The college has 3 acres campus of its own. Out of the total area, 20 Gunte (are) is allowed for building construction. The rest of areas is used as playground. There are near about 150 plants in college campus. These plants include banyan tree, lemon, mango, coconut, neem, polyalthia tree, shevaga, gulmohor, almond tree, tamarind tree, polialthia tree, guava etc. Besides to these, there are number of plants that add beauty of the college. The college has 244.53 sq. Mts. lawn in its open space.

It is both NSS and college Beautification Committee that take great care in watering plants and taking their great care. A separate worker is appointed to take care of these plants on remuneration basis.

Chandrabai-Shantappa Shendure College, Hupari. Tal - Hatkanangale Dist - Kolhapur

Principal
Chandrabai-Shantappa
Shendure College,
Hupari.

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Chapter - I

Introduction

1.1 Green 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.

Green 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 green audit one gets a direction as how to improve the condition of environment.

1.2 Benefits of Green Audit :

There are many advantages of green 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 built positive impression for the upcoming NAAC visit.

1.3 NAAC criteria VII Environmental Consciousness :

Green Audit is assigned to the criterion VII of NAAC. National Assessment and Accreditation Council which 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 green 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 more eco-friendly.

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 green clubs will make the student a good citizen of country.

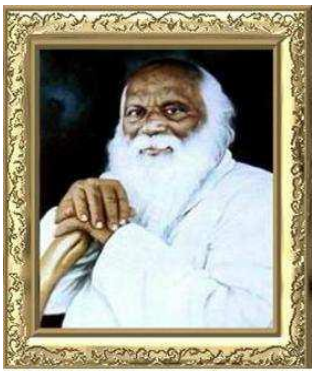
1.4 Profile of Rayat Shikshan Sanstha, Satara :

Dr. Karmaveer Bhaurao Patil was born on 22 September, 1887 at Kumbhoj, in the Kolhapur district of Maharashtra. He realized that the social ills could be remedied through the education of the masses alone and so laid the foundation of the Rayat Shikshan Sanstha by opening a Boarding House at Kale (Tal-Karad, Dist-Satara) in 1919. Soon, however, in1924 he shifted the head-quarters of his educational institution to Satara. In his view, education is the means to empower the masses to enjoy the fruits of freedom and to emancipate them from social, economic and cultural slavery. The value of its contribution to education in general is enormously great as it has, from the very beginning, tried all its best to lay emphasis on the education of the down-trodden, the poor and the ignorant who really form the major bulk of the society.

The Rayat Shikshan Sanstha, is one of the leading educational institutions in Asia. The institution works with a noble mission, and a noble cause with ‘Education through self help’ as its motto. ‘Earn and Learn’ scheme introduced by Karmaveer Bhaurao Patil has been widely accepted by other educational institutions. This scheme has supported many economically weaker students to pursue education. Today, Sanstha runs 709 branches involving 42 colleges, 438 secondary schools, 8 training colleges, 42 primary schools (English medium-20), 31 pre-

primary schools (English medium- 18), 80 cosmopolitan hostels, 7 administrative offices, 8 Ashramshalas, and 57 ancillary Branches. It has spread over 15 districts of Maharashtra and 1 district of Karnataka with 14990 (female 3717) employees belonging to 170 castes and communities and 4 lakh 59 thousand 729 students (female 2, 13,474). The statistics speak of the phenomenal progress and achievement of the Rayat Shikshan Sanstha as dream by the Karmaveer. Considering the contribution made by the sanstha in uplifting of the society especially rural, downtrodden and economically weaker strata through education, many GO's and NGO's have honoured the sanstha with prestigious awards.

Rayat Shikshan Sanstha, Satara
Establishment: 1919



Padmabhushan
Dr. Karmaveer Bhaurao Patil

1.5 College profile:

This college came in existence in 1991 as an outcome of visionary educational mission of Padmabhushan Dr. Karmveer Bhaurao Patil alias Anna. His life was the saga of unprecedented struggle for social reformation. His philosophy was nurtured on the teachings of Chh. Shivaji Maharaj, the seventeenth century reformative king through Mahatma Jotiba Phule, Rajarshi Chh. Shahu Maharaj, Maharshi Vitthal Ramaji Shinde, Sant Gadage Baba and Dr.Babasaheb Ambedkar.

Chandrabai-Shantappa Shendure College, Hupari is affiliated to Shivaji University, Kolhapur (Maharashtra). It is governed by Rayat Shikshan Sanstha, Satara, prominent educational institutions in Maharashtra established by late Padmabhushan Dr. Karmveer Bhaurao Patil Chandrabai-Shantappa Shendure College, Hupari college was established in 30th June 1991 in the memory of a visionary social reformer king Rajashri Chhatrapati Shahu Maharaj Kolhapur.

The college has initiated 48 skilled skilled development programmers including 10 career oriented courses, 12 financing courses and 8capsule courses to increase the employability of the students. Education through self help is the motto of institution. Goal of institution is to get education to all. Social justice, humanity and equality are the ideologies enchanting by the institution. Democratic and decentralized administration is the prominent feature of the institution for effective and efficient governance, leadership and management.

Chapter II

Methodology

The college has conducted Green Audit in the year 2017-18, on a yearly basis. The audit was carried out in three phases.

2.1 Questionnaire survey:

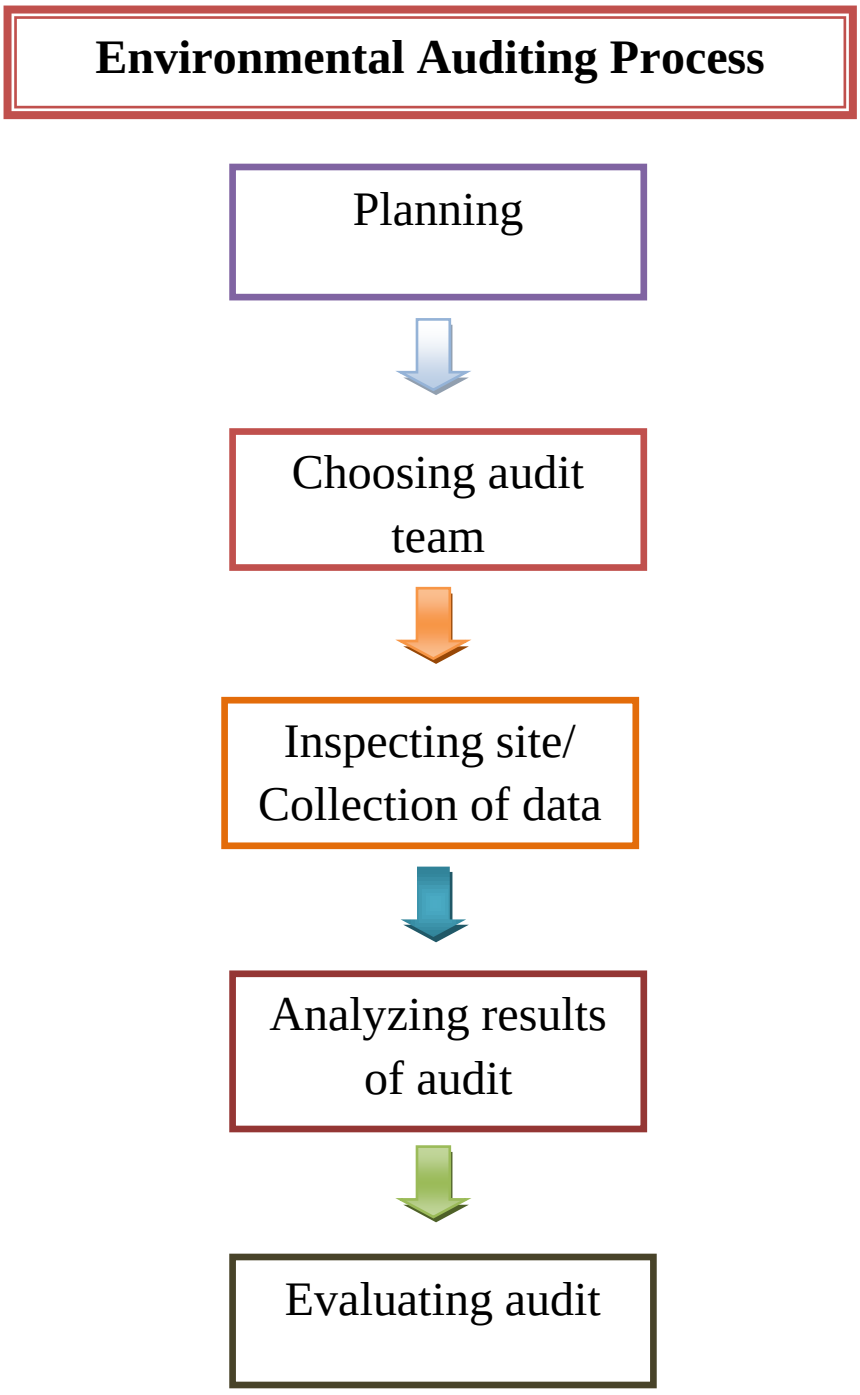
It includes administrative issues associated with the planning of audit, selecting the personnel for the audit team, preparing the audit protocol used by organization, obtaining background information, etc. The scope of the audit was defined at this step. It was decided that the information related to 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 green 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 Green Audit Report.


Environmental Auditing Process
Planning
Choosing audit team
Inspecting site/ Collection of data
Analyzing results of audit
Evaluating audit

Chapter III

Overview of Green Audit

3.1 Chandrabai-Shantappa Shendure College, Hupari at a glance:

Chandrabai-Shantappa Shendure College, Hupari is situated in Maharashtra at 16°37’09.54” N and 74°24’23.77” E, in the Kolhapur District and it is at altitude of 760 fts above mean sea level. It covers an area of about 1.12 ha.

Satellite image of Chandrabai-Shantappa Shendure College, Hupari Campus

Source: Google Earth

COLLEGE PROFILE IN BRIEF

NAME OF THE COLLEGE:	Chandrabai-Shantappa Shendure College, Hupari
ESTABLISHMENT:	30th June 1991
PIONEERS:	Padmabhushan Dr. Karmveer Bhaurao Patil (Anna)
No. OF STUDENTS:	1067
FACULTY:	33
FACILITIES:	A well-resourced campus with a good infrastructure, Gymkhana, playground facilities and qualified staff. The college is fulfilled with the following facilities like Library, Health Centre; Competitive Exam guidance Centre, Skill development Centre, ladies hostel and Canteen
RESEARCH AND EXTENSION ACTIVITY:	College conducts different courses under the guidance of Rayat Shikshan Sanstha for the excellence of students. The college has a good number of extension activities like plantation of trees, cleanliness drive, cleaning of public places and village, seminars, workshops, environmental awareness campaigns, etc.
AREA OF COLLEGE:	3 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.

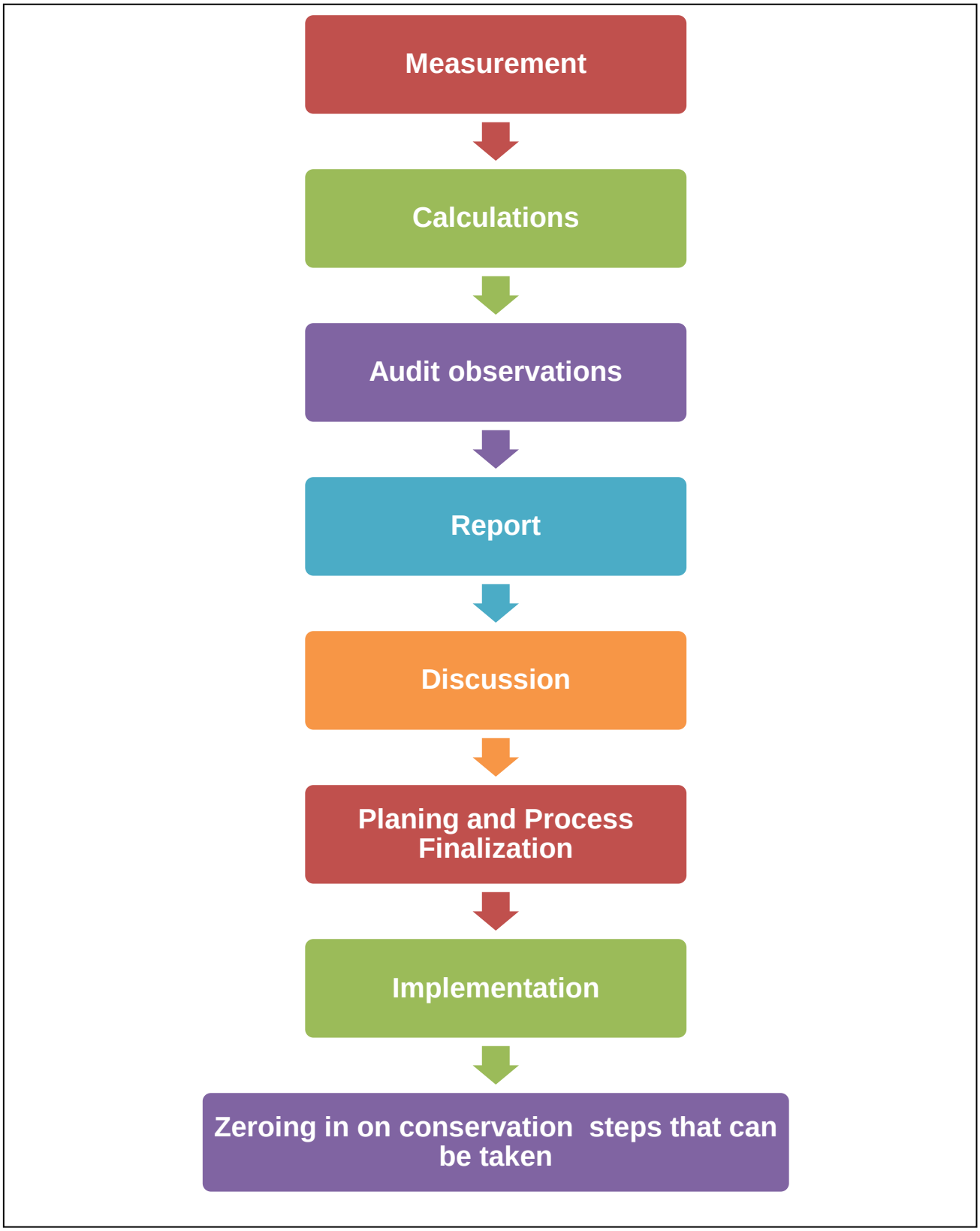
It is observed that a number of factors like climate, culture, food habits, work and working conditions, level and type of development, and physiology determine the requirement of water. The community which has a population between 20,000 to 100,000 requires 100 to 150 liters per person (capita) per 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: Water Audit Process:



3.2.2 Overall water consumption in Chandrabai-Shantappa Shendure College, Hupari:

From the data collected for water audit of Chandrabai-Shantappa Shendure College, Hupari, 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. For the water audit purpose we categorized the college campus area into two buildings namely as Building A (Main Building and office), Building B (Girls Hostel, Gymkhana, Garden).

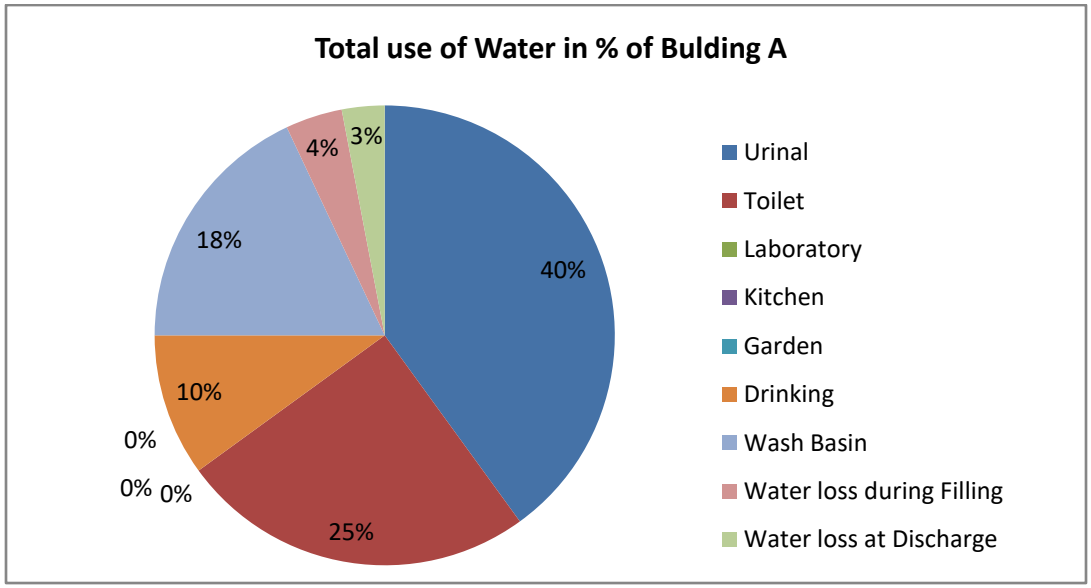
3.2.2.a In water audit study the water consumption by Building A is found to be as follows.

Table No. 3.1: Sector wise calculated use of water in Building A

Sr. No.	Sector	Total daily use (litres)	Total yearly use (litres)	percentage
1	Urinal	5,520	13,24,800	40
2	Toilet	3,450	8,28,000	25
3	Laboratory	00	00	00
4	Kitchen	00	00	00
5	Garden	00	00	00
6	Drinking	1,380	3,31,200	10
7	Wash Basin	2,484	5,96,160	18
8	Water loss during Filling	552	1,32,480	04
9	Water loss at Discharge	414	99,360	03
	Total	**13,800**	**33,12,000**	**100**

It is revealed from the data given in table no. 3.1 that total 13,800 litres water is used daily and yearly it is used as 33,12,000 litres. In the Building A use of water for Urinals, toilet, drinking, wash basin, laboratory etc purpose for daily and also calculated yearly. From above data it is observed that the maximum water consumption was for urinal purpose which is 5,520 litres. / day i.e. 13,24,800 litres/year. Water loss during filling of water in tank was noted as 552

lit/day i.e. 132480 litres/year and water losses at discharge were found to be 414 litres. /day i.e . 99,360 litres/ year.



Graph No. 3.1 percentage of water consumption by A building

.Graph No. 3.1 shows the total percent of water consumed by the Building A out of total water Urinals and Toilet is the major source of utilization comprising 40 % and 25 % respectively. The other uses namely wash basin, Drinking, kitchen and garden consume relatively less water with daily water requirement of 18 % (wash basin), 10% Drinking, 00% (Kitchen) and 00% (Garden) respectively.

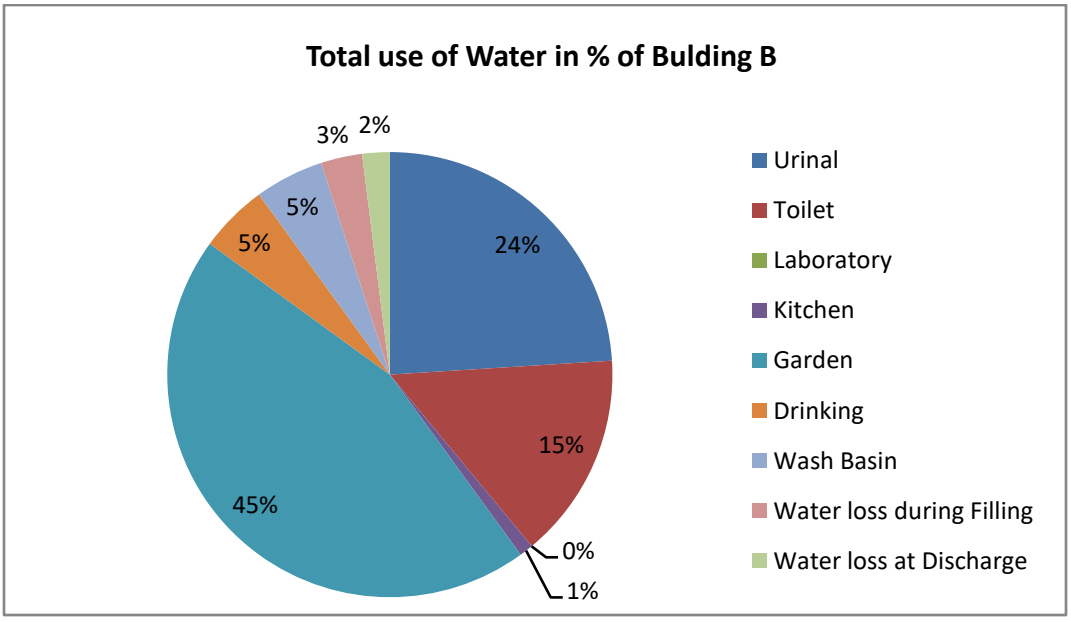
3.2.2.b. Water consumption by Building B is found to be as follow: Building B includes (Girls Hostel, Gymkhana and Garden).

Table No. 3.2 Sector wise calculated use of water by Building B

Sr. No.	Sector	Total daily use (litre)	Total yearly use (litre)	percentage
1	Urinal	6602	1584576	24
2	Toilet	4126	990360	15
3	Laboratory	00	00	00
4	Kitchen	275	66024	01

5	Garden	12379	2971080	45
6	Drinking	1375	330120	05
7	Wash Basin	1375	330120	05
8	Water loss during Filling	825	198072	03
9	Water loss at Discharge	550	132048	02
total		**27510**	**6602400**	**100**

It is shown from the data given in table no. 3.2 that total 27,510 litres water is used daily in building B while yearly it is used as 66,02,400 litres. In the Building B use of water for Urinals, toilets, drinking, wash basin, laboratory and garden etc purpose for daily and also calculated yearly. From above data it is observed that the maximum water consumption was for Garden purpose which is 12,379 litres. / day i.e. 29,71,080 litres/year. For kitchen only 275 litres of water required daily while yearly 66,024 litres respectively. In case of drinking purposes only 1,375 litres while yearly require 33,0120 out of total. Water loss during filling of water in tank was noted as 825 litres/day i.e. 19,8072 litres/year and water losses at discharge were found to be 550 litres /day i.e . 13,2048 litres/ year.



Graph No. 3.2 percentage of water consumption by B building

.Graph No. 3.2 shows the total percent of water consumed by the Building B. Out of total water; Garden is the major source of utilization comprising 45 %. After garden the next sector which shows more water consumption is Urinal which comprises 24 % water utilization. The other uses namely wash basin, Drinking, kitchen and Toilet consume relatively less water with daily water requirement of 05 % (wash basin), 05% Drinking, 01% (Kitchen) and 15 % (Toilet) respectively.

Key Observations:

- The calculation reveled that the highest water use sector was Urinal which consumes average 40% water and remaining 60% water consumption further divided into other sectors in Building A.
- In case of building B shows 45% of water consumption for gardening purposes while 55 % water consumption further divided into other sectors.
- To enhance the operating efficiency and reduce the water wastage, College should include sustainable water practices (SWP) such as Rain Water Harvesting, Landscape Areas, and Water Sub Metering etc.

3.3 Solid waste audit:

Solid waste management is becoming a major public health and environmental concern world over. Improper solid waste disposal leads to substantial negative environmental impacts e.g., pollution of air, soil, water and generation of greenhouse gases from landfills. Many insect borne diseases are spread through garbage. Therefore, it is necessary to manage the solid waste appropriately to reduce the load on waste management system. The intention of this inventory is to find out the quantity, volume, type and current management practice of solid waste generation in Chandrabai-Shantappa Shendure College, Hupari (CSS).

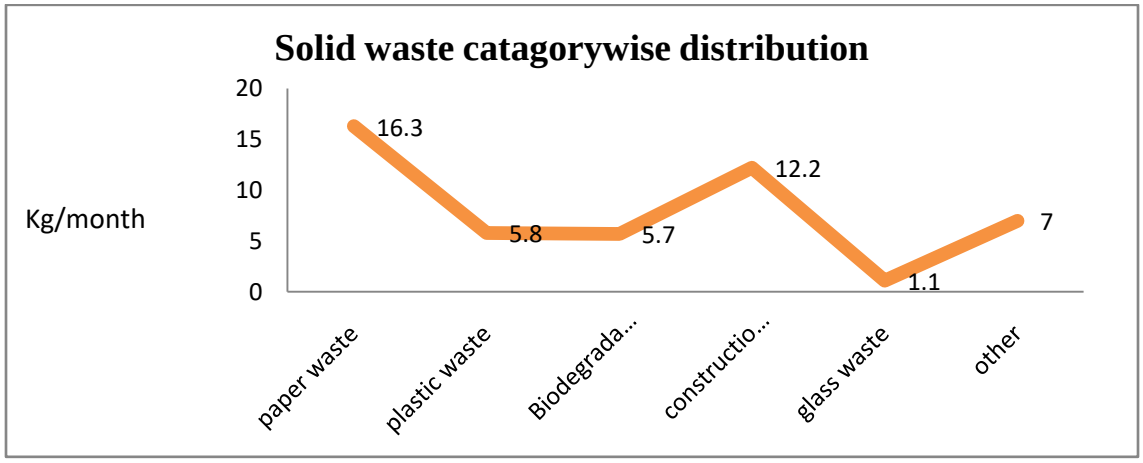
This survey related to solid waste generation would be helpful for making the college more environments friendly.

3.3.1 Generation of solid waste in Chandrabai Shantappa Shendure College, Hupari:

Table No. 3.3: Category wise solid waste generation at Chandrabai Shantappa Shendure College, Hupari (kg/month)

Category of waste	Paper waste	Plastic	Biodegradable-waste	Construction waste	Glass waste	Other	Total solid waste
Quantity kg/month	16.3	5.8	5.7	12.2	1.1	7	48.1

Graph No. 3.3: Category wise solid waste generation at Chandrabai Shantappa Shendure College, Hupari (kg/month)

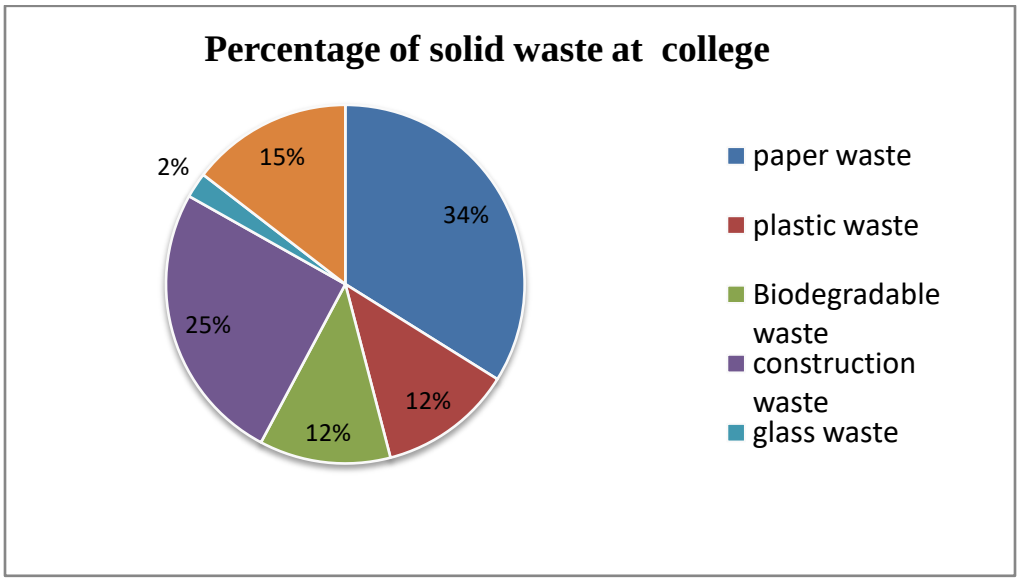


The average amount of solid waste generated per month in Chandrabai Shantappa Shendure College, Hupari was 48.1 kg/month. On the basis of observations the highest quantity of solid waste generated is paper waste which is about 16.3 kg/month and construction waste is about 12.2 kg/month respectively. The examination department generated paper waste in large quantity in the college. The glass waste is produced in minimum quantity i.e. 1.1 kg/month. Besides, the above mentioned wastes, plastic waste is generated in the form of plastic wrappers of food items, old broken chairs, old broken water tank, etc.

Table No. 3.4: Percentage of category wise solid waste generation at Chandrabai Shantappa Shendure College, Hupari (kg / month)

Category	Paper waste	Plastic	Biodegradable-waste	Construction waste	Glass waste	Other	Total solid waste
Percentage (%)	33.88	12.05	11.8	25.3	2.28	14.5	100

Graph No. 3.4: Percentage of solid waste generation at Chandrabai Shantappa Shendure College, Hupari (kg/month)



Percentage wise distribution of different sources of solid waste is shown in the above graph. Here the maximum percentage of solid waste generated is of construction waste which is 34 % and minimum percentage of glass waste is generated which is about 2 %. The biodegradable waste is produced mostly through building B which is Hostel building.

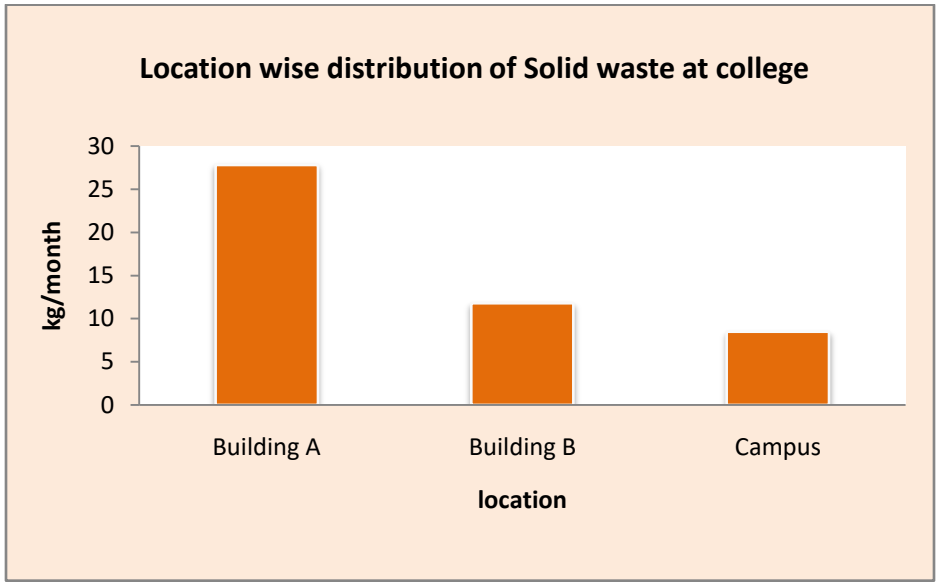
3.3.2 Status of solid waste generation at Chandrabai Shantappa Shendure College, Hupari (kg / month):

Table No. 3.5: Category wise solid waste of generation at various floors and rooms on college campus (kg /month)

This college has two buildings. Therefore, it is divided into the building A and building B and campus was taken into account separately.

	Paper waste	Plastic waste	Biodegradable waste	Construction waste	Glass waste	Other
Building A	12	3.2	2.1	6	0.6	4
Building B	3.8	1.8	0.7	3.2	0.3	2
Campus	0.5	0.8	3	3	0.2	1

Graph No. 3.5: Building wise distribution of solid waste Chandrabai- Shantappa Shendure College, Hupari (kg / month)

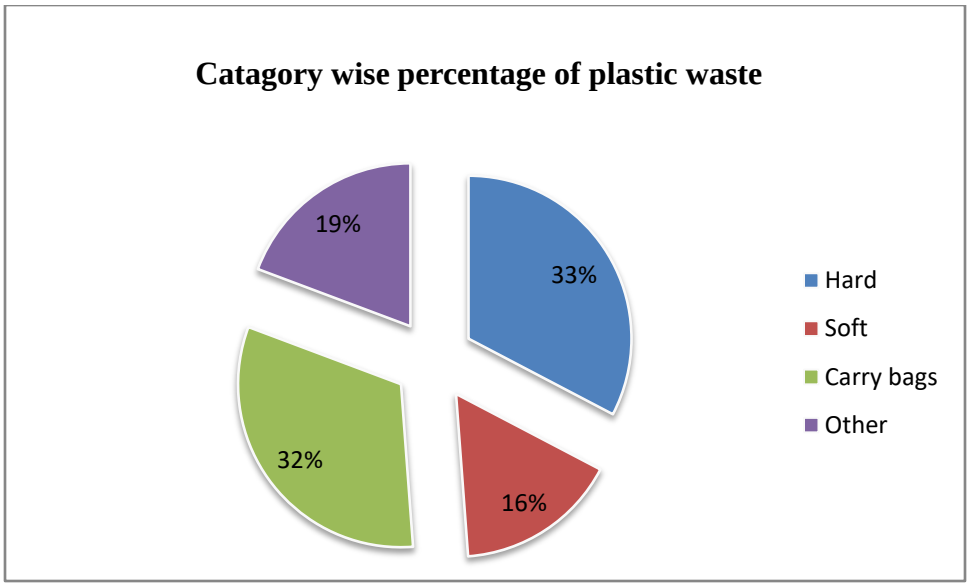


Considering the different locations in college, the average amount of solid waste generated is 48.1 kg. from Building A which consist of administrative office, Principals cabin, B.A. and B.Com class rooms, Computer laboratory Library generates 27.8 kg/month solid waste. The classrooms showed high amount of dust on the floor and benches. The cardboard waste is also noticed in considerable quantity. It is advisable to sweep the classrooms regularly. One the other hand, Building B which is Hostel cum Study Centre for competitive exams generates solid waste around 11.8 kg/ month. On the campus i.e. outside the building the Solid waste generated is in the form of paper, wooden twigs, plastic food wrappers are in minimum quantity which is 8.5 kg/month.

Table No.3.6: Plastic waste generation and its distribution in college campus

	Plastic kg/ month				Total
Category	Hard	Soft	Carry bags	Other	
Quantity	0.98	0.82	1.62	1.66	5.8
Percentage	16.89655172	14.1379	27.931	28.6207	100

Graph No. 3.6: Categorization of plastic waste at Chandrabai Shantappa Shendure College, Hupari (kg / month):



The Graph No. 3.6 shows that the hard plastic and carry bag waste is generated in higher amount which is 33% and 32% respectively. The soft plastic and other plastic waste also generated in the college is 16% and 19% respectively

Cardboard waste generated in the college

Soak pit prepared for wastewater treatment on the college campus

3.4 Hazardous waste audit:

Chandrabai Shantappa Shendure College, Hupari is one of the well known educational institute having 1067 student strength. This college caters the facility for Arts and Commerce faculties' students in their campus. Since there is no science faculty in this college, there is no use of chemicals and electrical equipments which are hazardous. Therefore, the hazardous waste generation problem does not arise in this college. College campus is free from hazardous waste.

3.4.1 E-waste:

Generation of e-waste is found on every educational institute. It is observed that the E-waste generated at Chandrabai Shantappa Shendure College, Hupari is of Schedule II category. Computers, Printers, Laptops, Scanners, Internet Routers and Xerox machines are used for administrative work. . The wire required for the connectivity also gets included in the e waste. The college has its own computer laboratory of 50 computers. The library uses some electronic scanners which after its use can become e-waste. Presently, the college is dispatching the e waste to Rayat Shikshan Sanstha main office where the waste is collected centrally from all other branches of Rayat and by tenders it is given to authorised e waste collector.

Key Observations:

- The average waste generated in the college is. 48.1 Kg/month
- Highest quantity of solid waste is of paper waste 16.3 Kg/month
- Biodegradable waste is 14.68 Kg/month.
- Plastic waste is about 12.05 % to the total solid waste on the college campus.
- Some of the classrooms were found without solid waste baskets.
- There is need of some improvements into the collection of solid waste.
- Solid waste is to be segregated at the source.

3.5Ambient air quality status:

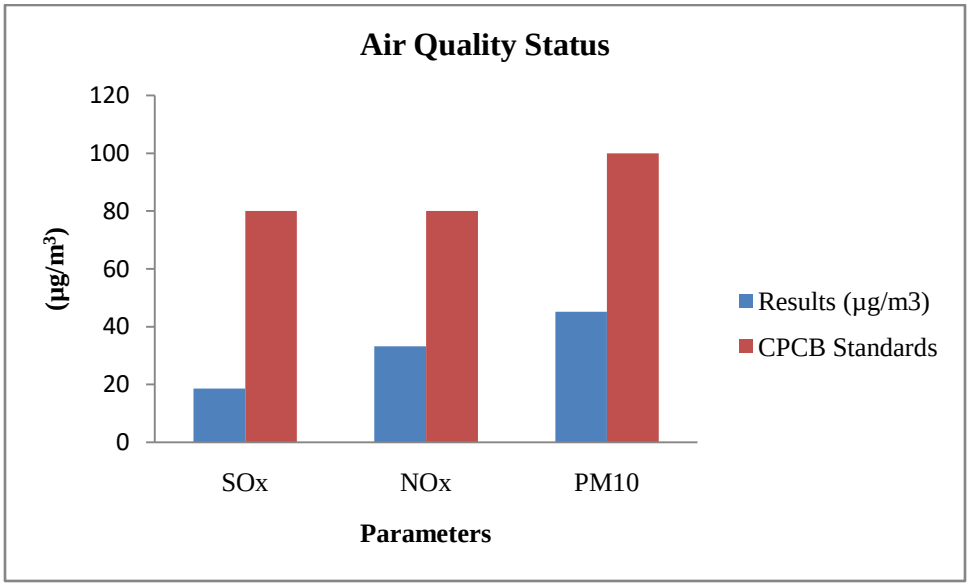
Ambient air sampling is important part of environmental monitoring. Particulate matter and trace gases sampling were carried out on the college campus. The sampling was carried out using calibrated Handy Dust Sampler APM 821 with flow rate 1 lit/min equipped with glass fibre filter paper (size 25 mm). The sampling period was 2 hrs.

Sulphur dioxide (SO_2) and Oxides of Nitrogen (NOx) in the air were estimated with West and Gaeke method and Jacob and Hochheiser modified method respectively. Particulate matter (PM_{10}) was measured gravimetrically. The samples were collected and analyzed in the laboratory of Department of Environmental Science, Shivaji University, Kolhapur. The details of air quality status in the college are given in the Table no. 3.7 and Graph No. 3.7.

Table no. 3.7 Ambient air quality status of Chandrabai-Shantappa Shendure College, Hupari.

Sr. No.	Parameters	Results (µg/m^3)	CPCB Standards (µg/m^3)
1	SOx	18.57	80
2	NOx	33.21	80
3	PM_{10}	45.19	100

It was observed that all the air quality parameters analyzed were within the Ambient Air Quality Standards of Central Pollution Control Board, India. The air quality is good in the college campus as well as surrounding.



Graph No. 3.7 Ambient air quality status of Chandrabai-Shantappa Shendure College, Hupari.

3.6 Ambient noise monitoring status:

Ambient noise monitoring was carried out in different areas of college campus like at college campus entry, college gate, corridor, first floor and ladies hostel. The sampling was carried out 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 college campus are given below in the Table No. 3.8 and Graph No. 3.8

Table no. 3.8 Ambient Noise levels in Chandrabai - Shantappa Shendure College, Hupari.

Sr. No.	Site Name	Results dB (A) Leq	Standards (Day Time) dB (A) Leq
1	College Campus Entry	64.55	50
2	College Gate	53.89	50
3	Corridor	52.73	50
4	First Floor	53.62	50
5	Ladies Hostel	43.49	50

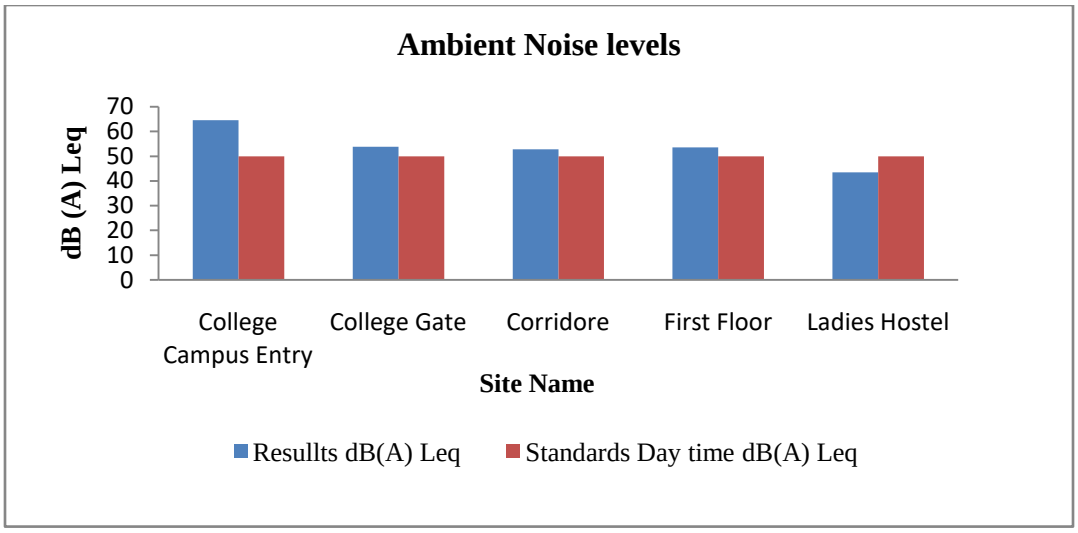
Note: - 1. All parameters expressed in dB (A) Leq.

2. Monitoring is carried during day time.

3. Day time is from 6.00 a.m. to 10.00 p.m.

It is observed from the table that the Ambient Noise levels overall in college is on higher side except ladies hostel as compared to the standards of Central Pollution Control Board for the day time.

Since the college is located adjacent of state highway 177 and therefore, the major source of noise is automobile noise, rolling noise. The human communication and transportation are causing high level sound. It is advisable to increase the green cover in the surrounding to avoid noise.



Graph No. 3.8 Ambient Noise levels in Chandrabai - Shantappa Shendure College, Hupari.

3.7 Details of tree census in College campus:

The beginning of the 21st century brought growing concern about global warming, climate change, food security, poverty, and population growth. CO_2 is a principle component causing global warming. Atmospheric carbon dioxide levels have increased to 40% from preindustrial levels to more than 390 parts per million CO_2. On this background it is a need of time to cover the educational campuses with green cover interrelated with climate change.

The current is a present status of tree cover, vegetation and carbon storage assessment of area under Chandrabai-Shantappa Shendure College, Hupari Campus. In an era of global warming and climate change; carbon emission, carbon sequestration, mitigation, adaptation are the keywords in academia. Carbon sequestration is a phenomenon of converting atmospheric carbon i.e. CO_2 in to other pools of carbon such as vegetation, soil, ocean etc. in various forms to mitigate global warming. It is one of the important clauses of Kyoto Protocol. Current tree census methodology has been adopted from the guidelines set by Indian Institute of Remote Sensing, Dheharadoon, Govt. of India.

3.7.1 Total number of trees enumerated on Chandrabai-Shantappa Shendure College, Hupari campus:

All the collected data was tabulated and analyzed with the help of MS- Excel spreadsheets and objected findings were extracted by using various factors given by Inter governmental Panel on Climate Change (IPCC).

3.7.2. Total number of trees enumerated on Chandrabai-Shantappa Shendure College, Hupari campus:

Total 69 numbers of trees with more than 10 cm girth and height more than 4 ft have been enumerated. Girth and height of every tree has been measured.

3.7.3 Total No. of species identified in Chandrabai-Shantappa Shendure College, Hupari campus: 15

About 15 species have been identified during the census. It shows a comparatively less diversity of tree species on the campus.

3.7.4 Species with highest population

Table No-3.9 Species with Highest population

Sr. No.	Botanical Name	Common Name	Number
1	*Cocos nucifera L.*	Naral	16
2	*Azadirachta indica*	Neem	13
3	*Terminalia catappa*	Badam	10
4	*Casia fistula*	Bahava	5
5	*Delonix regia*	Gulmohar	4

The species with highest population is *Cocos nucifera L.* followed *Azadirachta indica* by and *Terminalia catappa.*

3.7.5 Total biomass :

Biomass, in ecology, is the mass of living biological organisms in a given area or ecosystem at a given time. Biomass can refer to *species biomass*, which is the mass of one or more species, or to *community biomass*, which is the mass of all species in the community. It can include microorganisms, plants or animals. The mass can be expressed as the average mass per

unit area, or as the total mass in the community. 0.378 tons of total biomass of woody vegetation have been recorded in Chandrabai-Shantappa Shendure College, Hupari campus during the current tree census.

Cocos nucifera L shows the highest biomass on the campus. Followed by *Delonix regia* and *Azadirachta indica* are ranked at second and third place.

Table No-3.10 Total Biomass of trees in tons on the campus

Sr.No.	Botanical Name	Common Name	Total Biomass (Tons)
1	*Cocos nucifera L.*	Naral	0.1563
2	*Delonix regia*	Gulmohar	0.0526
3	*Azadirachta indica*	Neem	0.0501
4	*Ficus religiosa*	Pimpal	0.0300
5	*Leucaena Leucocephala*	Subabhul	0.0100

3.7.6 Carbon stock:

Forests and trees act as natural carbon stores, but this carbon is released when the trees are felled and the area deforested. The amount of carbon stored within an area of land varies according to the type of vegetation cover. 0.1891 tons of total carbon stock are present on the campus.

Table No- 3.11 Carbon stock of Trees in tones on the Campus

Sr.No.	Botanical Name	Common Name	Carbon stock (Tones)
1	*Cocos nucifera L.*	Naral	0.0781
2	*Delonix regia*	Gulmohar	0.0263
3	*Azadirachta indica*	Neem	0.0251
4	*Ficus religiosa*	Pimpal	0.0150
5	*Terminalia catappa*	Badam	0.0130

3.7.7 Carbon Sequestration:

Carbon sequestration describes long-term storage of carbon dioxide or other forms of carbon to either mitigate or defer global warming and avoid dangerous climate change. It has been proposed as a way to slow the atmospheric and marine accumulation of greenhouse gases,

which are released by burning fossil fuels. Vegetation carbon pool having the potential of 560 Pg (Pg: Petagram= billion ton) of carbon storage globally. In the current study the focus is given on the assessment of existing carbon stock stored Chandrabai-Shantappa Shendure College, Hupari campus in the form of woody vegetation by enumerating every tree species. Overall 0.694 tons of CO_2 has captured and stored by the woody plants present in the college campus. A single tree consumes 0.0218 tons of CO_2 approximately annually consequently, as the campus possess 69 mature woody plants 1.5042 tones of CO_2 is consumed yearly by all woody vegetation on the college campus.

3.7.8 Oxygen released :

Woody vegetation on Chandrabai-Shantappa Shendure College, Hupari campus has released 1.85 tons of oxygen in their lifetime till date. Released oxygen is directly proportional to CO_2 sequestrate in the ratio of 32/12. Thus, it is supposed to release of oxygen annually. It is assumed that a single tree supports oxygen demand of two people for their life. Thus, 69 woody vegetation in college campus are supporting 138 people around the campus.

Key Observations:

- There is huge area on campus for plantation.
- As the area comes under water scarcity or dry monsoon area at least maintained all the plants on campus.

3.8 Electricity and energy audit:

Chandrabai - Shantappa Shendure college , Hupari is having Arts and Commerce faculty in their campus. Energy sources utilized by all the buildings, departments and services of college include electricity, liquid petroleum and LPG. Major use of the energy is at main building for lighting. Electricity is supplied to the college campus by Maharashtra State Electricity Board. There is provision of generating electricity on site.

Fuel consumption by vehicles on campus is also an important criterion for energy audit. Count of two wheelers is 70 and of four wheelers are 6. But vehicles are not running on college campus but only parked on the campus.

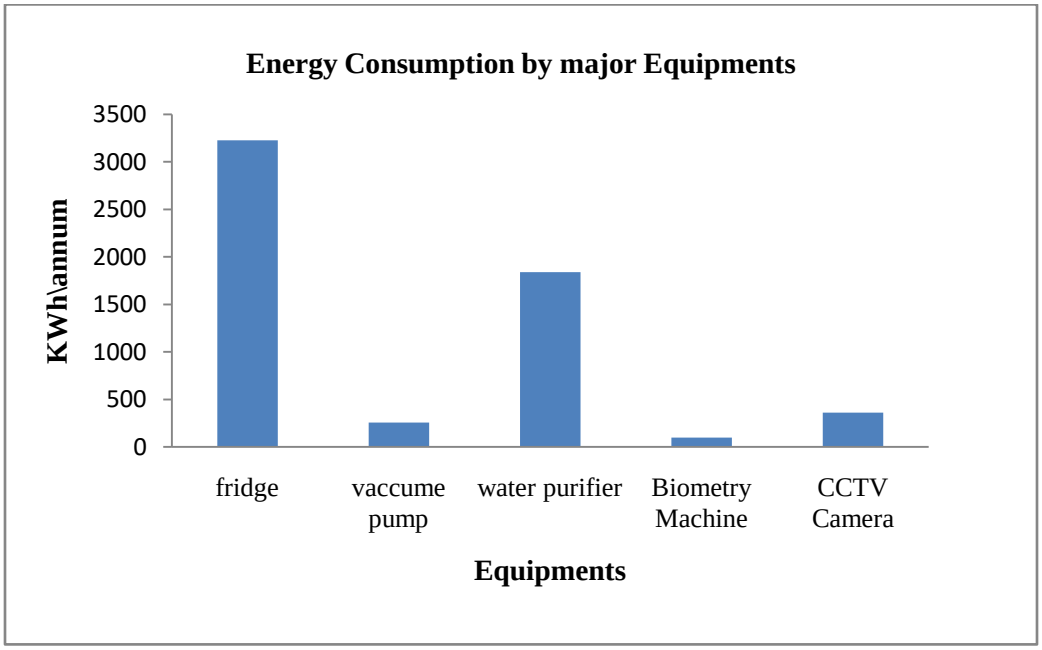
3.8.1 Energy consumption at Building A:

It includes all Departments, office, classrooms and Principal cabin.

The collected data shows the Building A has maximum number of major energy consuming equipments and energy consumption is 5778.56 KWh/ **annum**.

Table No.3.12: Energy consumed per annum by major instruments at building A

Sr. No.	**Equipment**	**Number**	**KWh/annum**
1	Fridge	1	3225.6
2	Vacuum pump	1	256
3	Water purifier	1	1840
4	Biometry Machine	1	96.768
5	CCTV Camera	7	360.192
	Total	**11**	**5778.56**



Graph No.3.9: Energy consumed per annum by major instruments at Building A

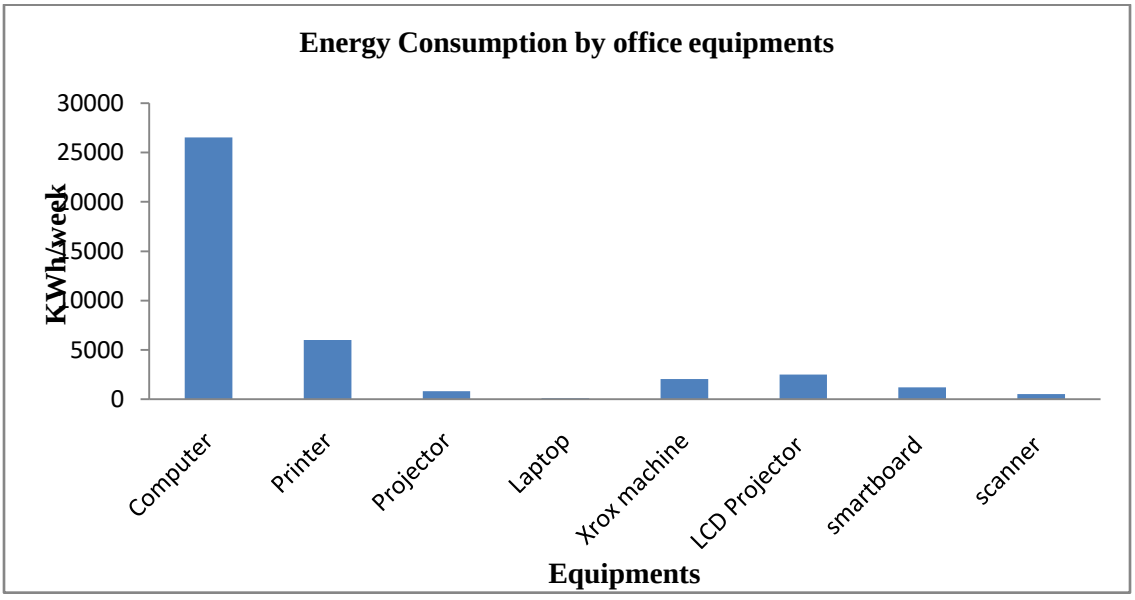
Total number of major energy consuming equipments at building A is 11 and energy consumption is 5778.56 KWh/annum. As major energy consuming equipments, number of CCTV Camera is (7) than other equipments and hence also the energy consumed by major energy consuming equipments is also maximum i.e. 5778.56 KWh/ annum. Number of fridge is 1 at

building A but the energy consumption is highest i.e. 3225.6 KWh/ annum. Followed by water purifier, vaccum pump i.e. 1840KWh/ annum, 256 KWh/ annum respectively. (Graph No.3.9).

Similarly, to analyze the electricity consumption of office equipments computers, printers, laptops were also considered.

Table No3.13: Office equipments and their energy consumption (KWh/annum) at Building A

Sr. No.	Instruments	Number	KWh/ annum
1	Computer	79	26544
2	Printer	15	6000
3	Projector	5	816
4	Laptop	2	89.6
5	Xrox machine	1	2048
6	LCD Projector	1	2496
7	Smartboard	1	1200
8	Scanner	2	512
	Total	**106**	**39705.6**



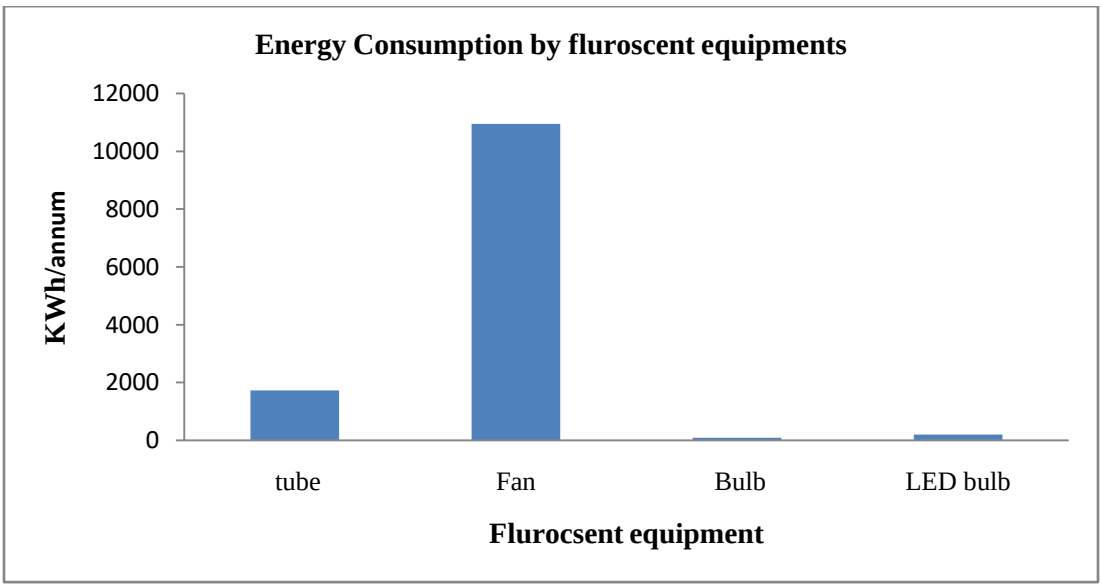
Graph No. 3.10: Office equipments and their energy consumption (KWh/ annum) at Building A

Total number of office equipments at building A is 106 and energy consumption is **39705.6** KWh/annum. As office equipment, number of computers is maximum (79) than Printers, Laptops, LCD projectors and Xerox machine hence also the energy consumed by computers is also maximum i.e. 26544 KWh/annum followed by X-rox machine, LCD Projectors, Printers and projectors i.e. 2048 KWh/ annum, 2496 KWh/ annum, 6000KWh/ annum respectively (Graph No. 3.10).

Similarly, to analyze the electricity consumption, lights and fans were also considered.

Table No. 3.14: Number of fluorescent tubes, bulbs and fans and their energy consumption (KWh/ annum) at Building A

Sr. No.	Instruments	Number	KWh/annum
1	Tube	77	1724.8
2	Fan	76	10944
3	Bulb	3	92.16
4	LED bulb	7	201.6
	Total	**163**	**12962.56**



Graph No.3.11: Number of fluorescent tubes, bulbs and fans and their energy consumption (KWh/ annum) at Building A

Maximum use of energy for lightning and fans is in the building A.

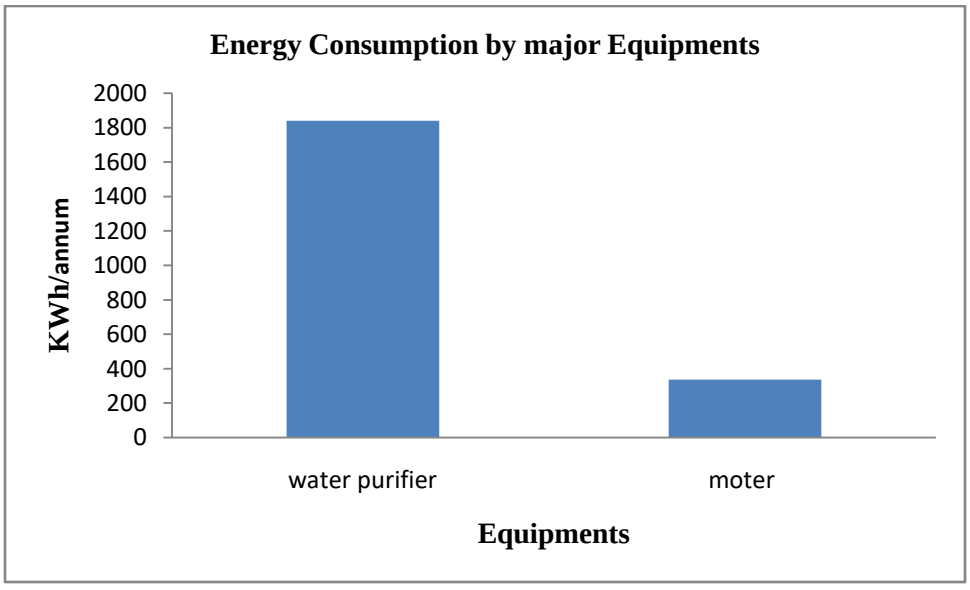
The total number of fluorescent Tubes is 77 and their electricity consumption is 1724.8KWh/annum. In the building A total number of ceiling fans and LED bulbs are 76 and 7 and their electricity consumption were respectively i.e. 10944 KWh/annum and 201.6KWh/annum. (Graph No.3.11).

3.8.2 Energy Consumption at Building B:

It includes Ladies Hostel and Campus. The collected data shows that the building B has maximum number of major energy consuming equipments and energy consumption is 68 KWh/annum.

Table No.3.15: Energy consumed per annum by major instruments at Building B

Sr. No.	**Equipment**	**Number**	**KWh/annum**
1	Water purifier	1	1840
2	Moter	1	336
	Total	**2**	**2176**



Graph No3.12: Energy consumed per annum by major instruments at Building B

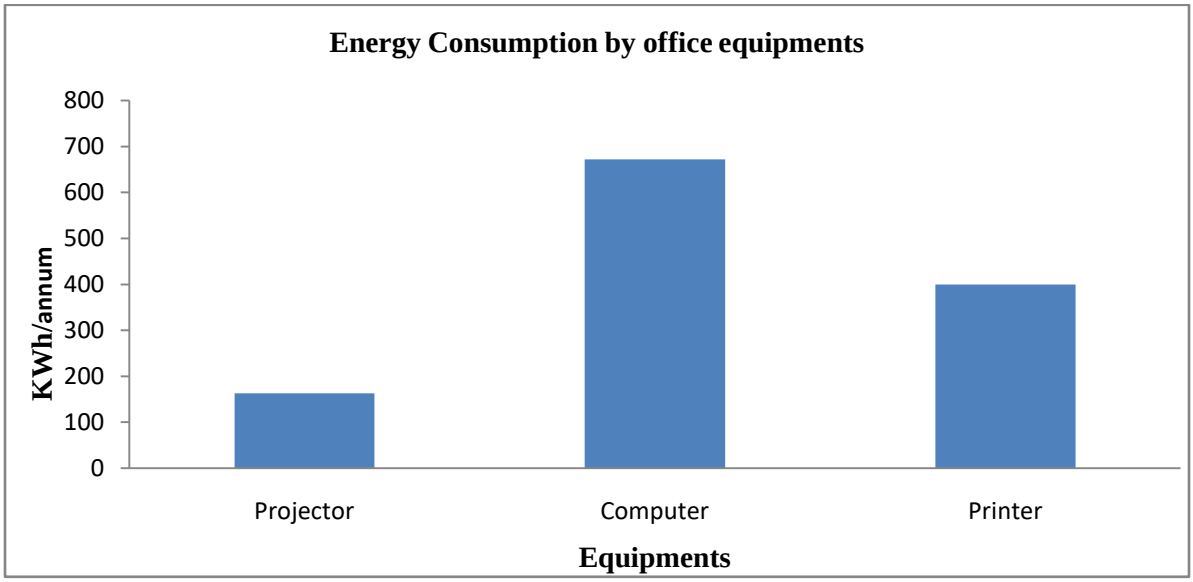
Total number of major energy consuming equipments at building B is 2 and energy consumption is 2176 KWh/annum. As major energy consuming equipments, number of water

purifier is 1 also the energy consumed by major energy consuming equipments is also maximum i.e. 2176 KWh/annum. Followed by electric motor pump i.e. 336 KWh/annum 336 KWh/annum (Graph No.3.12).

Similarly, to analyze the electricity consumption of office equipments computers, printers, laptops were also considered.

Table No3.16: Office equipments and their energy consumption (KWh/annum) at Building B

Sr. No.	Instruments	Number	KWh/annum
1	Projector	1	163.2
2	Computer	2	672
3	Printer	1	400
	Total	**4**	**1235.2**



Graph No. 3.13: Office equipments and their energy consumption (KWh/annum) at Building B

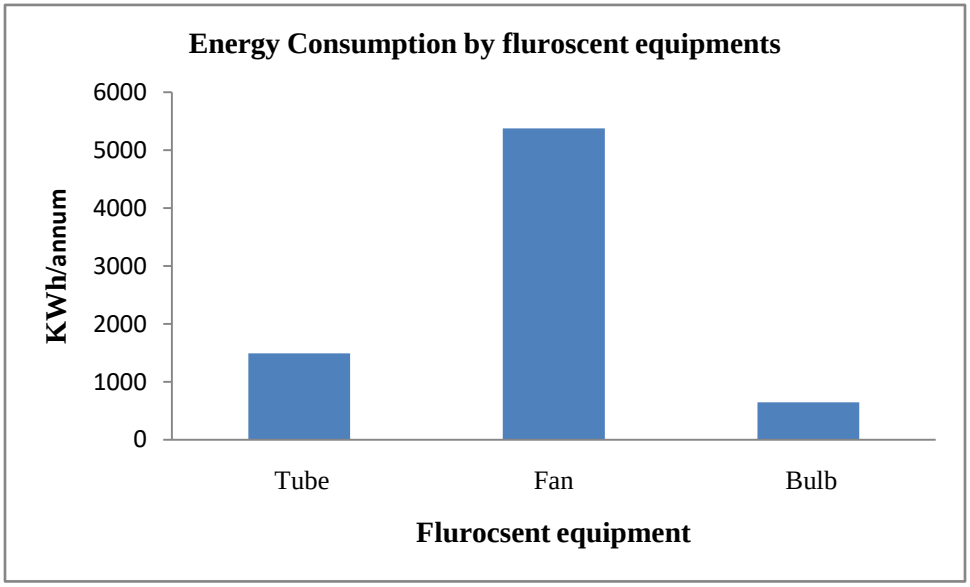
Total number of office equipments at building B is 4 and energy consumption is 1235.2 KWh/annum. As office equipment, number of computers is maximum (2) than Printers, projectors. The energy consumed by computers is also maximum i.e. 672 KWh/ annum followed

by Printers and projectors i.e.400KWh/ annum, 163.2KWh/ annum respectively (Graph No. 3.13).

Similarly, to analyze the electricity consumption, lights and fans were also considered.

Sr. No.	Instruments	Number	KWh/annum
1	Tube	37	1491.84
2	Fan	28	5376
3	Bulb	21	645.12
	Total	**86**	**7512.96**

Table No. 3.17: Number of Fluorescent Tubes, Bulbs and Fans and Their Energy Consumption (KWh/annum) at Building B



Graph No.3.14: Number of fluorescent tubes, bulbs and fans and their energy consumption (KWh/ annum) at Building B

The total number of fluorescent tube is 37 and their electricity consumption is 1491.84 KWh/annum. In the building B total number of fans and is 28 and their electricity consumption is maximum i.e. 5376 KWh/annum (Graph No.3.14).

Key Observations:

- The total energy consumption of college is 70394.88
- Highest consumption of energy is by office equipments i.e. 40940.8KWh/annum.
- College does not have science departments or any laboratory because of that energy consumption of major equipment is lower than office equipment i.e. 7954 KWh/annum

3.9 Environmental protection through activities conducted

Front view of the College

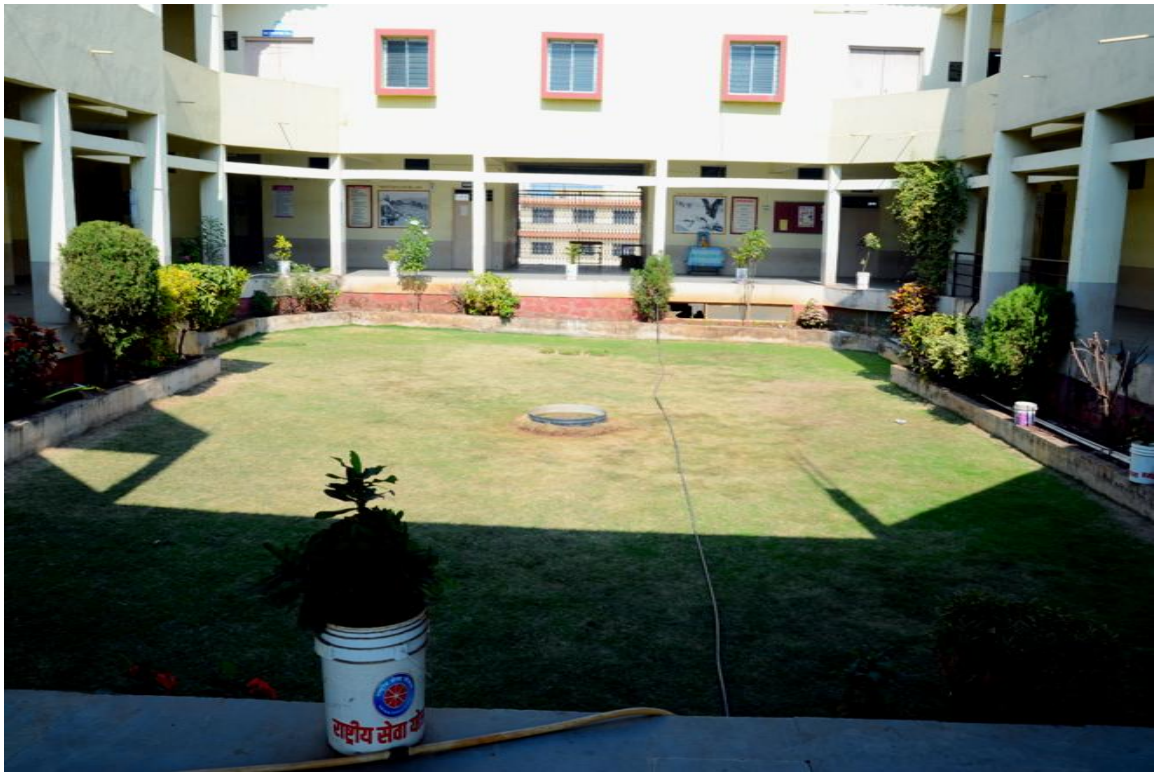
Campus Two wheeler and Four wheeler Parking

Trees on the Eastern side of Main building

Women's hostel building

Two wheeler parking

College office



Central space lawn at the of the main building

Geography laboratory

4

Computer laboratory

Drinking water facility

Computer laboratory

Composting peat

Chapter IV

CONCLUSION AND MANAGEMENT PLAN

The Department of Environmental Science, Shivaji University, Kolhapur has conducted a Green Audit of Chandrabai-Shantappa Shendure College, Hupari in the academic year 2017-18. Green auditing is the process of identifying and determining whether institution practices are eco-friendly and sustainable. The main objective of college to carry out green 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 green audit conducted by college following are some of the conclusions which can be taken for improvement of the college campus to become environment friendly college campus.

1. College takes efforts to dispose majority waste by using proper methods.
2. Confidential paper waste is disposed properly.
3. Glass waste is to be disposed properly.
4. Electricity consumption is more at some departments.
5. Use of CFL lamps in the college is minimum. Its use should be encouraged and now converted to LED lights.
6. Toilets and bathrooms are consuming more water.
7. Roof top rain water harvesting should be planned which is useful for filling up of tanks on campus.
8. E-waste segregation, handling and disposal are properly done.
9. Practice of waste segregation to be initiated.
10. Air quality on the campus is good.
11. Conduct more seminars and group discussions 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 Green 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. Wherever possible the waste should be reused or recycled.
5. All street lighting should be changed to LED lights to save electricity.
6. Rain water harvesting must be installed.
7. Drip irrigation for gardens and vegetable cultivation can be initiated.
8. Practice of waste segregation to be initiated.

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 Chandrabai-Shantappa Shendure College, Hupari Dist. Kolhapur. 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 2017-18

Sector	Strengths	Weakness	Suggestions	Priority
Solid Waste				
1. Paper	• Pulping of major portion of papers i.e. answer sheets, bills and other administrative papers. • Use of one sided papers in many departments and main building	• Multiple numbers of copies required for office work.	• Towards paperless office: More use of e-mails, e-money transfer and advance IT technology for communication	Medium
2. Plastic	• Reuse of plastic at some departments	• Plastic thrown with general waste in many departments	• Segregation of waste at the source and sending plastic waste for recycling • Ban on Plastic carry bags in College premises	Medium
3. Biodegradable waste	• Solid waste generated	Solid waste is to be segregated at the source	• Segregation of solid waste help in composting process	Medium

		Energy		
1. Electricity		• Unnecessary use of lights, fans and computers at some places when no one is using it.	• Employment of more solar panels and other renewable energy sources. • Electrification of street lights by solar power. • Use of solar pumps for water tanks. • General awareness about electricity saving.	Medium
2. Fuel	• Use of public Transport system is comparatively more by staff and students.	• More awareness is required among students.	• 'Cycle on rent' service for student • General awareness about efficient use of fuel.	Medium
		Water		
1. Water utilization	• College has potential of Rain water harvesting.	• Overflowing of tanks at some places • Overuse of water at bathrooms and toilets due to leakage	• Installation of automatic water pumps to avoid overflowing losses • Proper and timely maintenance of plumbing at all departments • Installation of rain water harvesting assembly.	Medium
2. Waste water	• Septic tanks present for sewage	• Untreated laboratory effluent and other waste -	• Installation of small scale STP to	

	treatment	water. It percolates into soil and may contaminate ground water.	treat laboratory waste and toilet flushing.	High
Hazardous Waste				
2. E-waste	• E waste is sent to E waste collection center at Kolhapur.	• E waste related to computer and its parts are only collected.	• There must be segregation of e-waste from regular waste and also among the e-waste. • E-waste in all forms not only computers, should be collected properly	High
Air and Noise				
1. Air and Noise	• air quality is still in good condition but	• Noise levels overall in college is on higher side	• The plantation can be increased by vertical gardening.	Medium
Tree Census				
1.Tree Vegetation	There is lots of space for plantation	Less plantation on campus	• Avoid monoculture, variety of species should be planted in campus area	Medium

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