Rayat Shikshan Sanstha's

Mahatma Phule Mahavidyalaya, Pimpri, Pune

Reaccredited with 'A' Grade by NAAC/ DST-FIST funded /An ISO 9001:2015 Certified College
Affiliated to Savitribai Phule Pune University, Pune (PU/PN/ACS/053)

2017-18

GREEN / ENVIRONMENT AUDIT

Rayat Shikshan Sanstha's

MAHATMA PHULE MAHAVIDYALAYA

PIMPRI, PUNE - 411 017. Establishment : 1983

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Affiliated to Savitribai Phule Pune University, Pune.

Reaccredited by NAAC : 'A' Grade with CGPA-3.16

GREEN AUDIT REPORT 2017-2018

Contents

A. INTRODUCTION

Green Audit is ultimately about corporate responsibility. Scientific research and scientific research and statistical analysis conducted by Green Audit uncovers the truth about statements made by national governments, large multinationals and the military with regard to the health effects of environmental pollution.

Green Audit was found in 1992 as environmental consultancy and review organization with the aim of monitoring the performance of the companies and organizations whose activities might threaten the environment and the health of the citizens. The aim of the Green Audit is to give citizens the information they need to be able to question the companies which are destroying the environment we all depend on.

Educational institutes are the leaders in pursuing environmentally sustainable solutions. Rayat Shikshan Sanstha's Mahatma Phule Mahavidyalaya, Pimpri expresses its commitment towards sustainability in variety of ways. The college has conducted the internal green audit for the academic year 2017-18.

The institution has taken initiatives towards Conservation of Energy and conducted Energy Audit separately in 2015-16 by an external agency (Separate Energy Audit Report).

Mahatma Phule Mahavidyalaya comprises of two campuses (Campus I and Campus II). Environment Protection Club of Mahatma Phule Mahavidyalaya has conducted green audit of the college campus I in the academic year 2017-18. The area under study of Campus I is about **6070** sq. meters and Campus II is about **8094** sq. meters.

1. Objectives of Green Audit:

1. To verify legislative and regulatory compliances for the green environment.
2. To find out the strengths and weaknesses of the environment systems available in the college campus.
3. To establish eco-friendly practices in the college campus and to identify environmental opportunities in the campus.

2. Methodology :

This is the first attempt to conduct Green Audit in the college campus. To get baseline data, questionnaires for use of water, hazardous wastes and paper waste were prepared as per the guidelines, rules, acts and formats set by Ministry of India, Central Pollution Control Board, New Delhi. The surveyors then visited all the departments of the college, interacted with the staff members, survey wastaken and then questionnaires were filled. The data generated was used for further analysis. From the outcome of the study, a final report was prepared and then the final conclusions were drawn. SWOT (Strengths, Weaknesses, Opportunities and Threats) unit analyses was carried out and finally recommendations were made.

2. The initiatives taken by the college to make the campus eco-friendly

- ✓ Energy conservation
- ✓ Awareness campaign
- ✓ Tree plantation (Campus I & Campus II)
- ✓ Efforts for carbon neutrality
- ✓ Hazardous waste management
- ✓ E-waste management
- ✓ Solar system installation for generation of electricity
- ✓ Vermi - compost and azolla culture units are run at the second campus
- ✓ Garbage collection bins are placed all over the campus to make the campus clean.

Energy Conservation:

- Implementation of energy saving technique
  - ❖ Lights and fans are switched off after completion of work.
  - ❖ Shutting down of computers, electrical appliances when not in use.
  - ❖ Use of LED bulbs to generate less heat and reduce carbon emission.
  - ❖ The coolant water from the distillation plant in the science laboratories is reused.
- Organization of awareness lecture/quiz conducted on **Energy Conservation** by agencies such as PCRA (Petroleum Conservation and Research Association).
- Design of our college is based upon the use of light and ventilation which saves power.
  The wooden window shutters in the classrooms, library and office have been replaced by sliding glass windows which helps natural light let in even when they are closed.
- Awareness on energy conservation is projected in models and exhibits prepared by students from the Science Exhibition organized every year.

Rain Water Harvesting and Water Conservation:

- ✓ Chemistry Laboratory of our college collects rain water and uses it as mineral free water for routine practical of UG Classes.
- ✓ Awareness lectures, Film show, etc.
- ✓ Students prepare models/miniatures on rain water harvesting.
- ✓ Conducted workshop on the theme 'Conservation of Natural Resources' (biodiversity, Energy, water, etc.)

Carbon Neutrality:

- ✓ Some of the efforts in this regard are as follows:
- ✓ Use of public transport by faculty/staff/students
- ✓ Car pooling
- ✓ Tree Plantation

- ✓ Offering saplings to greet the guests to honors
- ✓ No Bouquets but books
- ✓ Optimal use of paper by reusing

Hazardous Waste Management:

- ✓ Hazardous chemicals are used in micro quantity for the practical of chemistry and other science subjects where **Semi-Micro Analysis Technique** is used.
- ✓ Lab waste in chemical labs is disposed-off carefully by detoxifying.
- ✓ Bio-waste generated in Microbiology, Zoology and Botany Laboratories is destroyed by decontamination and incineration methods.
- ✓ The students of Add-on-course (Fashion Designing) stitch the bags from old *Sarees* and substitute them for plastic bags to avoid the use of plastic.

E- Waste management:

- ✓ The old versions of computers and electronic equipments hardware are re-used by donating it to the tribal schools in tribal areas.
- ✓ Outdated computers, printers and other ICT equipments are sold to the vendors for recycling.
- ✓ Interdepartmental sharing of electronic instruments.

Awareness Activities:

- Under the Environmental Awareness subject second year B.A./B.Com/B.Sc. students conducted a survey on use of firecrackers during festivals and persuaded people to **Say No to Firecrackers.**
- Participation of students in awareness activity Leadership Phase II (Involving Youth in sustainability initiative) in collaboration with TERI (The Energy Research Institute) Delhi at Fergusson College, Pune campus.
- Celebration of **Wildlife Week** every year (1–7 October) by organizing guest lectures, exhibition, poster exhibition etc. for the students of different colleges and schools.
- Participation of students in environmental awareness activities organized by TERI (The Energy Research Institute) Delhi at Fergusson College, Pune.
- All S.Y. students (B.A., B.Com., B.Sc.) were registered as members of Environmental protection club for the year 2017-18.
- All S.Y. students (B.A., B.Com. and B.Sc.) came out various environmental awareness projects as a compulsory academic activity.

Plantation Drive

at Campus - I

Plantation Drive

at Campus - I

Cleanliness Drive in

the College Campus

Vermi - Compost Unit at Campus – II

3. Overview of the Audit

A) Water Audit

Water audit in the college campus was conducted to determine quantity of water consumption by the institutions, the efficiency of water use and to develop recommendations for improving water use efficiently. Water audit process consists of a preparation of layout of water sources and its distribution through pipelines and finally its delivery points to water users.

Water audit was conducted in the college campus at various important sites, viz., Science laboratories (Chemistry, Physics, Microbiology, Botany and Zoology), Toilets, Staff room, Pantry etc.

Water Sources and its consumption:

1. Source of water is corporation supply and well within the campus.
2. Total 7000 liter capacity storage tanks on terrace.
3. 5 drinking water coolers and filters are there in the college campus which are in the working condition.
4. Microbiological testing of drinking water through Microbiology Laboratory is done.

Daily Water supply in Tank (Capacity of the Tank): There is a continuous water supply in all the storage tanks from the main source of PCMC storage tank.

Table 1. Water Storage tanks in the college

Sr. No.	Storage Tanks	Capacity (Lit.)	Number of times it is topped (Filled)	Average time of water overflow
1.	Tank 1	2000	Continuously filled with a self-control float valve system to prevent overflow	Nil
2.	Tank 2	1000	Continuously filled with a self-control float valve system to prevent overflow	Nil
3.	Tank 3	1000	Continuously filled with a self-control float valve system to prevent overflow	Nil

4.	Tank 4	500	Continuously filled with a self-control float valve system to prevent overflow	Nil
5.	Tank 5	500	Continuously filled with a self-control float valve system to prevent overflow	Nil
6.	Tank 6	2000 (for Science wing)	Continuously filled with a self-control float valve system to prevent overflow	Nil

Department wise water consumption

Department: Chemistry

1. Total number of water users: 375 (Students, Teaching Staff, Non-teaching Staff, Visitors)
2. Total number of Employees:
   Teaching Staff : 09
   Non-teaching Staff : 02
3. No. of Students : 350
4. Average Working Days : 180/yr
5. College Working Days : 25 days/month
1. College working Hours : 10 hr./day
6. Science Timing : 7.50 am to 6.10 pm
7. Purpose of use of water : For washing glass wares, cleaning apparatus and for preparing various solutions.

Table 2.Consumption of water by chemistry department

Sr. No.	Site	Source of water	Rate of Discharge Lit./min.	Average Quantity per use (Lit.)	No. of Users	Total use Lit./Week
1.	Chemistry Department	Storage Tank	9	15	360	5400

Per month: 5,400*4 = 21,600 Lit. /month, Per six months: 21,600*6 = 1, 29,600 Lit./six months

Department: Microbiology

1. Total number of water users: 135 (Students, Teaching Staff, Non-teaching Staff, Visitors)
2. Total number of Employees:
   Teaching Staff : 04
   Non-teaching Staff : 02
3. No. of Students : 128
4. Average Working Days : 180/yr
5. College Working Days : 300/yr
6. College working Hours : 10 hr/day
7. Science Timing : 7.50 am to 6.10 pm
8. Purpose of use of water : Washing of glass wares, laboratory media and reagents preparations

Table 3.Consumption of water by microbiology department

Sr. No.	Site	Source of water	Rate of Discharge lit./ min.	Glassware washing Lit./ Week	Average Quantity per use (Lit.)	No. of Users	Total Daily use Lit./ Week
1.	Microbiology Department	Storage Tank	9	2000	9	135	3,215

Per month: 3,215*4 = 12,900 Lit./month, Per six months: 12,900*6 = 77,400 Lit./six months

Department: Zoology

1. Total number of water users: 115 (Students, Teaching Staff, Non-teaching Staff, Visitors)
2. Total number of Employees:
   Teaching Staff : 02
   Non-teaching Staff : 02
3. No. of Students : 111
4. Average Working Days : 180/yr
5. College Working Days : 300/yr
6. College working Hours :10 hrs/day
7. Science Timing :7.50 am to 6.10 pm
8. Purpose of use of water : For laboratory purpose, for washing and cleaning of glass wares

Table 4.Consumption of water by Zoology department

Sr. No.	Site	Source of water	Rate of Discharge lit./min.	Average Quantity per use (Lit.)	No. of Users	Total Daily use Lit./Week
1.	Zoology Department	Storage Tank	9	5	115	575

Per month: 575*4 = 2,300 Lit. /month, Per six months: 2,300*6 = 13,800 Lit. /six months

Department: Botany

1. Total number of water users: 115 (Students, Teaching Staff, Non-teaching Staff, Visitors)
2. Total number of Employees:
   Teaching Staff : 02
   Non-teaching Staff : 02
3. No. of Students : 111
4. Average Working Days : 180/yr
5. College Working Days : 300/yr
9. College working Hours :10 hr./day
6. Science Timing : 7.50 am to 6.10 am
7. Purpose of use of water : Washing and cleaning of glassware, for practical work

Table 5. Consumption of water by Botany department

Sr. No.	Site	Source of water	Rate of Discharge Lit./min.	Average Quantity per use (Lit.)	No. of Users	Total Daily use Lit./Week
1.	Botany Department	Storage Tank	9	5	115	575

Per month: 575*4 = 2,300 Lit./month, Per six months: 2,300*6 = 13,800 Lit./six months

Department: Physics

1. Total number of water users: 163 (Students, Teaching Staff, Non-teaching Staff, Visitors)

2. Total number of Employees:
   Teaching Staff : 05
   Non-teaching Staff : 02
3. No. of Students : 156
4. Average Working Days : 180 days/yr
5. College Working Days : 300 days/yr
6. College working Hours :10 hours/day
7. Science Timing : 7.50 am to 6.10 pm
8. Purpose of use of water : For practical and research purpose, for washing purpose

Table 6. Consumption of water by Physics department

Sr. No.	Site	Source of water	Rate of Discharge	Average Quantity per use (Lit.)	No. of Users	Total Daily use Lit./Week
1.	Physics Department	Storage tank	9 lit./min.	03	75	300

Per month: 300*4 = 1,200 Lit./month, Per six months: 1,200*6 = 13,800 Lit./six months

Total water consumption in the college campus

1. Total number of water users: (Students, Teaching Staff, Non-teaching Staff, Visitors)

A) Total number of Employees:
B) Teaching Staff : 81
C) Non-teaching Staff : 29
2. No. of Students : 3186
A) Total number of Boys : 1521
B) Total number of Girls : 1665
3. Number of Visitors : 50-60 / day
4. Average Working Days : 180
5. College Working Days : 300
6. College working Hours : 10 hr/day

7. College Timing:

A) Arts and Commerce : 7.50 am to 1.30 pm

B) Science : 7.50 am to 6.10 pm

C) Office : 9.00 am to 6.30 pm

8. Is there Rain Water Harvesting System in the college campus: there is no proper rain water harvesting system in the premises, but in the chemistry department rain water from the roof tops is collected in storage containers

Daily Water supply in Tank (Capacity of the Tank): There is a continuous water supply in all the storage tanks from the main source of PCMC storage tank.

Table 7. Total Water consumption by various sites in the college campus

Sr. No.	Site	Source of water	Rate of Discharge Lit./Min	Average Quantity per use (Lit.)	No. of Users	Total use Lit. / Week
1.	Gents Toilet 1(Ground floor)	Storage tanks 1 to 5	09	10	800	8000
2.	Gents Toilet 2(First floor)	Storage tanks 1 to 5	10	10	600	6000
3.	Ladies Toilet 1(Ground floor)		07	15	800	12000
4.	Ladies Toilet 2 (First Floor)	Storage tanks 1 to 5	09	15	700	10500
4.	Pantry (Tea making and washing utensils)	Storage tanks 1 to 5	12	20	1000	2000
5.	Staff room	Storage tanks 1 to 5	05	05	65	532
6.	Campus trees and Plants	Storage tanks 1	06	350	60	2100

		to 5				
7.	Chemistry Lab.	Storage tanks 1 to 5	09	15	360	5400
8.	Botany Lab.	Storage Tank 6	09	05	115	575
9.	Physics Lab.	Storage Tank 6	09			
10.	Microbiology Lab.	Storage Tank 6	09	09	135	3215
11.	Zoology Lab.	Storage Tank 6	09	05	115	575
Total water consumption						**1,58,897**

Figure 1. Total water consumption by various sites and departments per day

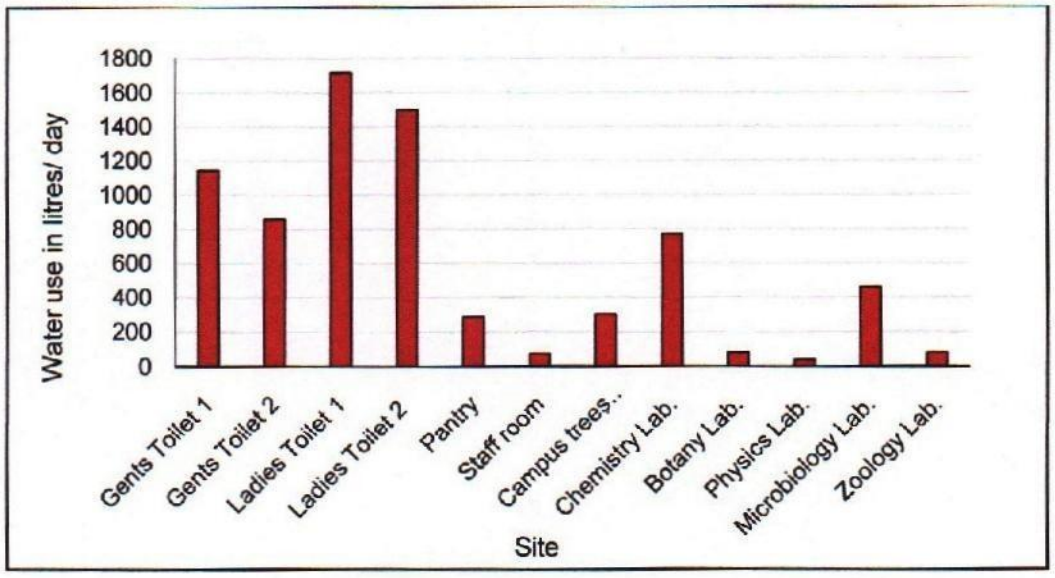
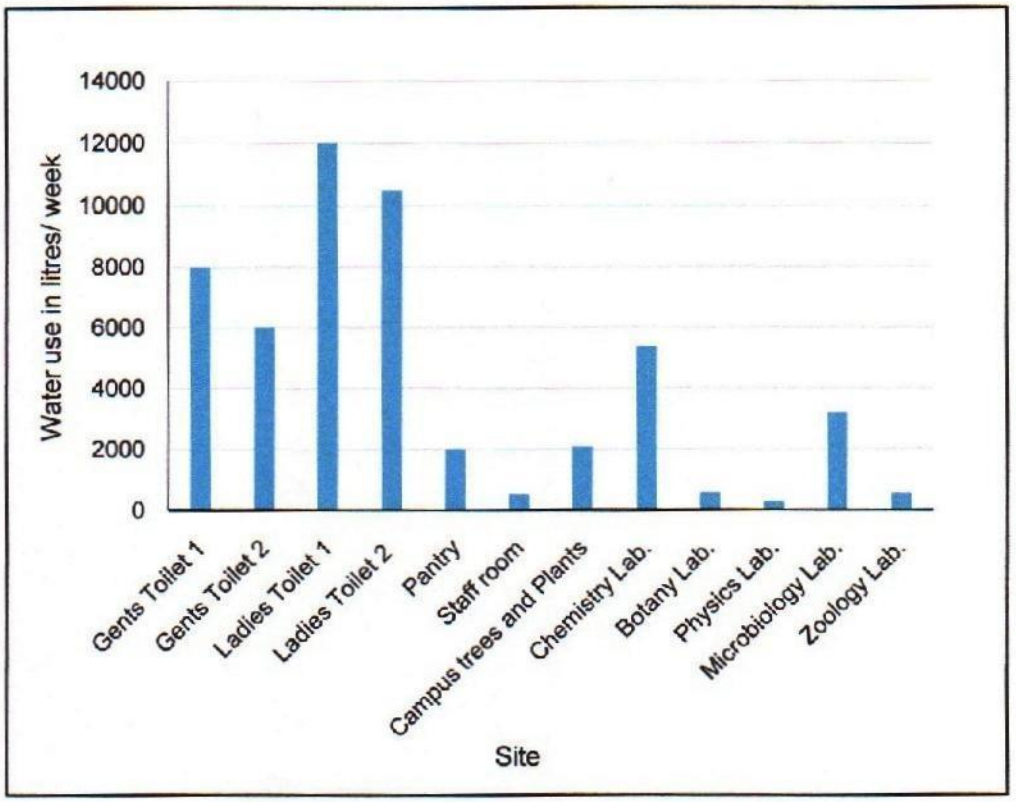


Figure 2. Total water consumption by various sites and departments per Week



Total water consumption by the college campus I is 1,58,897 Lit./week and 26,482 Lit./day with maximum consumption by ladies toilets followed by gents toilets. In the science laboratories, maximum water consumption is by the chemistry department followed by microbiology department. The problem of water loss can be prevented by replacing the taps with the new taps.

B) Hazardous waste audit

A "Hazardous Waste" is a used or discarded material that can damage the environment and be harmful to health. A hazardous waste is a solid, liquid or gaseous material that displays either a "Hazardous Characteristics", viz., Ignitability, Corrosively, Toxicity, Carcinogenicity and Infectivity. Hazardous chemicals and biological wastes are generated by science departments only.

Hazardous waste includes various chemicals and biological wastes generated in the laboratories of the science departments in the form of liquid as well as solid states. Chemistry department generates solid and liquid chemicals. Microbiology department also generates biohazardous wastes that includes pathogen-contaminated disposable culture dishes, and disposable devices used to

transfer, inoculate, and mix pathogenic cultures. Along with the biohazard us waste, less amount of chemical waste is also generated.

Table 8. Hazardous waste generated and its disposal

Sr. No.	Department	Type of hazardous waste	Quantity of Hazardous waste generated per month	Method used to destroy the hazardous waste
1.	Chemistry	Laboratory chemical and other	7-8 Kg	Sufficiently diluted and drained off
2.	Microbiology	Chemical and Biological (Solid and Liquid)	4-5 kg	Decontamination of biological hazardous waste materials followed by incineration
3.	Physics	Nil	Nil	--
4.	Botany	Nil	Nil	--
5.	Zoology	Nil	Nil	--

Chemistry department generated maximum amount of chemicals and hazardous wastes from laboratory and is about 8 kg. in the month of December 2015. Lab waste in the chemistry lab is disposed off carefully by detoxifying. .It is followed by the department of Microbiology which generated about 5 kg. Hazardous chemical and biological wastes. Departments. viz., Physics, Botany and Zoology generated no hazardous wastes.

Following are some of the guidelines for the effective disposal of non-hazardous biological wastes:

Guidelines for non-hazardous biological waste Disposal:

- Solids must be thermally or chemically treated and placed in a properly labeled, leak-proof container for disposal. Liquids must be thermally or chemically treated and then discharged into the sanitary sewer system.
- Most biological waste that is not infectious or otherwise hazardous to humans, animals, plants, or the environment may be discarded as regular waste or sewage.
- In addition, there are no record-keeping requirements for nonhazardous biological waste.

- It is recommended to autoclave or disinfect all microbial products, even if they are not biohazardous

Record keeping Requirements

Each department that generates biohazardous waste must comply with the record keeping requirements. Written records must contain the following information:

- Date of treatment
- Amount of waste treated
- Method/conditions of treatment
- Name (printed) and initials of person performing the treatment

C) E-Waste:

Generation of E-waste is apparent at every educational institute. Computers, Printers and Xerox machines are must in the administrative work. The wire required for the connectivity also gets included in the E-waste. Similarly, various scientific equipment's and instruments are worn out with time. These too contribute to the E-waste. The amount of E-waste generated in the college by various departments is less. The institution has taken following initiative to tackle the problem of E-waste.

- ✓ The old versions of computers and electronic equipment's, hardware are reused by donating to the schools in the tribal areas.
- ✓ Interdepartmental sharing of electronic instruments.
- ✓ Outdated computers, printers and other ICT equipment's are sold to the vendors for recycling.

D) Solid Waste Management:

Solid waste management is a burning issue now a days all over the world. Solid waste should be handled scientifically. Solid waste audit focuses on type, amount and its management practice.

The solid waste collected was paper waste, reagent bottles in the form glass wastes in the science laboratories, sanitary napkin wastes in the ladies toilets. Among all these types of wastes, paper waste is a major solid waste generated by all the departments. Answer papers were preserved for five years period. After every five year period, answer papers are destroyed. Remaining paper waste (question papers, bills, used papers) are sent to scrap collector. Used reagent bottles (mainly glass bottles) are generated only by chemistry and microbiology departments. These reagent bottles are reused by both the departments. Therefore,

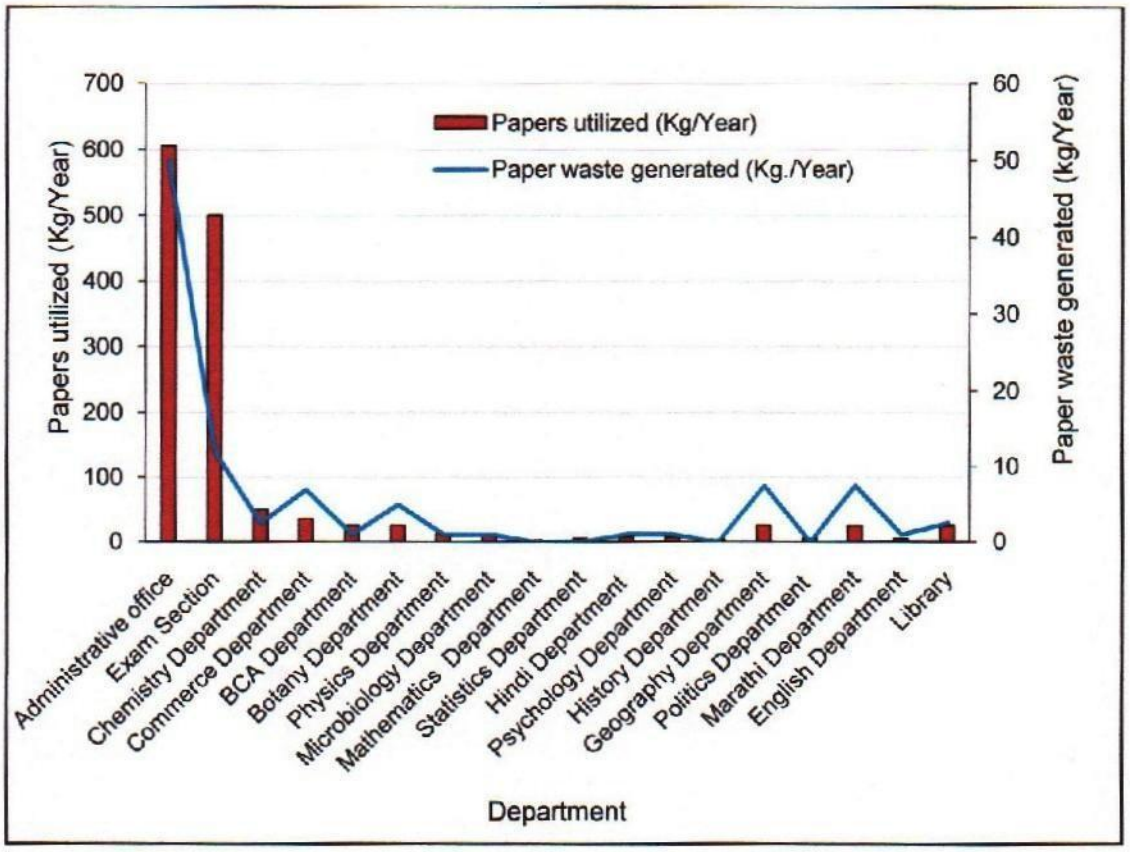
very less amount of glass waste is generated by the departments. In other science departments, negligible amount of glass waste is generated. In language department also, no glass waste is generated. In both the ladies toilets, in all approximately, 1-2 kg/day of solid waste in the form of sanitary napkins are generated and are taken away and incinerated outside by the appointed toilet cleaner.

Therefore, the major solid waste generated in the college campus is paper waste. This report will help for further solid waste management in the campus to go for green environment.

Table 9. Generation of Paper wastes in various departments

Sr. No.	Department	Papers utilized (Kg/Year)	Paper waste generated (Kg./Year)	Use of one sided paper (Y/N)
1.	Administrative office	605	50	Y
2.	Exam Section	500	12	N
3.	Chemistry Department	50	2.5	Y
4.	Commerce Department	35	07	Y
5,	BCA Department	25	01	Y
6.	Botany Department	25	05	Y
7.	Physics Department	12.5	01	Y
8.	Microbiology Department	12.5	01	Y
9.	Mathematics Department	2.5	00	Y
10.	Statistics Department	05	00	Y
11.	Hindi Department	7.5	01	Y
12.	Psychology Department	7.5	01	Y
13.	History Department	2.5	00	Y
14.	Geography Department	25	7.5	Y
15.	Politics Department	05	00	Y
16.	Marathi Department	25	7.5	Y
17.	English Department	05	01	Y
18.	Library	25	2.5	Y

Figure 3.Papers utilized and paper waste generated in various departments of college



Utilization of papers by is highest by the administrative office (605 Kg/year) followed by the exam section (500Kg/year). Maximum paper waste is generated by the administrative office followed by exam (50 Kg/year).In rest of the departments use of papers are limited and therefore paper waste generated is also limited. From Table no.10 it is clear that all the departments use one sided papers for printing and writing purposes.

4. Conclusions

1. Environmental Awareness programs are organized to create awareness among students and teachers.
2. Glass waste generated is reused by some departments.
3. Reuse of one sided papers by almost all the departments'.

5. SWOT Analyses

Table 11. Strengths, Weaknesses, Opportunities, Threats (SWOT) Analysis

Domain	Strengths	Weaknesses	Opportunities	Threats
Green Office/Environment protection club (Environment Awareness Program)	• Well established Environment Protection Club in the campus • College engaged in various environmental awareness programs for teachers and students by delivering experts' lectures, workshops, street plays, posters, models, oral presentations etc. through Environment Protection Club. • Tree Plantation drive at Campus I and Campus II	Non conduct of extensive training programs for teachers and students for environment management	• Green Audit can be done every year. • The blue print of five years eco-friendly campus plan to be prepared	• Location of the college is in the industrial belt. • Growing traffic around the college • Lack of environmental awareness among people
Legislation / Laws	Institution is performing well under existing guidelines.	There are no laws or guidelines in the Indian legal system for environmental management in educational system.	Green Office concept may help in this regard.	Absence of any prescribed format of guidelines for educational institutes may result in lack of proper running of Green office in the college.
Solid waste Management	• Reuse of reagent bottles at some departments • Use of one side paper in almost all the departments • There is Sanitary nappy vending machine and proper incineration system in the ladies toilet			
Hazardous waste management	Hazardous Microbial wastes are decontaminated and then incinerated properly at microbiology department	Improper disposal of hazardous chemical	Proper waste disposal management with Maharashtra waste disposal vehicle	
Water	College students perform street plays on **Scarcity of Water and its Conservation** at various public locations for public awareness			

6. Recommendations

- ✓ Establishment of Green office concept.
- ✓ Green audit should be conducted every year
- ✓ A proper method to be followed for hazardous waste treatment.
- ✓ To reduce chemical waste formation, principles of green chemistry should be used.
- ✓ Waste management program
  - Proper E-waste management program should be followed.
- ✓ Water management program
  - Monitoring system for consumption of water may be installed at every node.
  - Rain water harvesting mechanism may be implemented at large scale in the campus.
- ✓ Quantification of carbon foot print should be conducted in the college campus.
- ✓ No vehicle day should be celebrated in every month to make the campus environment pollution free.

TREE SPECIES IN OUR CAMPUS II

Sr. No.	Common Name	Botanical Name	Family	Total No.
1.	Mango	*MangiferaIndica*	*Anacardiaceae*	50
2.	Coconut	*CocusNucifera*	*Palmae*	50
3.	FistailPlam	*CaryotaUrens*	*Palmae*	02
4.	Royal Palm	*RoystoneaRegia*	*Palmae*	02
5.	Subabul	*LeucaenaLeucocephala*	*Fabaceae*	02
6.	Banayan Tree	*FicusBenghalensis*	*Moraceae*	02
7.	Pimpal	*FicusReligiosa*	*Moraceae*	02
8.	Umber	*FicusGlomeruta*	*Moraceae*	01
9.	Nirgudi	*VitexNigundo*	*Verbanaceae*	01
10.	Silver oak	*Grevillea Robusta*	*Protaceae*	01
11.	Neem	*AzardirachtinIndica*	*Meliaceae*	02
12.	Gulmohar	*DelonixRegia*	*Fabaceae*	01
13.	Suru	*CasuarinaEquisetifolia*	*Casuahnaceae*	01
14.	Ashok	*PolyalthiaLongifolia*	*Annonaceae*	01
15.	Australian Babhul	*Acacia Auriculiformis*	*Fabaceae*	01

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