FOREWORD

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

Energy is one of the major inputs for the economic development of any country. The fundamental goal of energy management is to produce goods and provide services with the least cost and least environmental effect. Also it can be said as "the strategy of adjusting and optimizing energy, using system and procedure so as to reduce energy requirements per unit of output while holding constant or reducing total costs of producing the output from these systems". The energy audit is key to a systematic approach for decision making in the area of energy management. It attempt to balance the total energy inputs with its use, and serve to identify all the energy streams in the facility.

Maratha Mandal's Arts and Commerce College have implemented eco-friendly practices to manage the available resources. As a part of such voluntary practices, internal environmental audit is conducted to evaluate the actual scenario on the campus. Such an audit will assist us to find out ecofriendly and non-ecofriendly practices on the campus

I am very happy to present this Energy Audit Report 2022-23 of Maratha Mandal's Arts and Commerce College Khanapur. My sincere thanks to IQAC coordinator Prof. R. M. Teli sir for their constant support and all teaching and non-teaching staff members for cooperation. I am hopeful that the report will be of great help to everyone concerned and will motivate all of us to take green steps ahead in future. I take this opportunity to thank the management of the college for their constant support in maintaining this campus 'Clean and Green'.

Dr. (Smt.) J. K. Bagewadi
Principal
M. M. Arts. & Commerce College

EDITORIAL…….

The objectives of conducting energy audit were to identify, prioritize, and recommend a set of cost-effective energy conservation schemes in various sections of the plant, which would reduce energy consumption and improve working conditions at workplace. Implementation of the recommended energy conservation measures would lead to reduced energy bills, thereby reducing the energy cost and improving the energy efficiency.

There are three parts to an energy audit: evaluation, testing, and efficiency recommendations. At first conduct a walk-through of the inside and outside to determine your energy usage and problem areas. While conducting their walk-through, audit team analysed specific elements that contribute to overall energy efficiency. In second step by various energy usage equipment items to measure energy consumption by calculating no of fans, tubes, LEDs, LCDs, Projectors, Sound systems and other instruments energy consumption is calculated. Once building has been evaluated and testing has been completed, the report is provided.

A questionnaire was prepared for this purpose. The questionnaire included the total number of students and employees, the work environment, etc. The information related to the consumption of resources like water, electricity, and handling of solid and hazardous waste was collected from various departments. The data collected were tabulated in Excel sheets and analyzed. Graphs of the analyzed data were prepared for getting a clear and quick idea of the status.

During the preparation of the “Energy Audit Report 2022-23" the team received support andencouragement from Principal Dr. J. K. Bagewadi and Prof. R. M. Teli IQAC coordinator We thank all teaching and non-teaching staff of the various Departments of our college without whose participation this report could not have been completed. We hope this report will be of some help to the college in taking one greener step ahead.

Prof. R. S. Sawant.

Mr. Neeraj Shirivastav.

Date:

ENERGY AUDIT

Energy is one of the major inputs for the economic development of any country. The fundamental goal of energy management is to produce goods and provide services at the least cost and the least environmental impact. Also, it can be said to be "the strategy of adjusting and optimizing energy, using the system and procedure to reduce energy requirements per unit of output while holding constant or reducing total costs of producing the output from these systems". The energy audit is key to a systematic approach for decision-making in the area of energy management. It attempts to balance the total energy inputs with its use and serves to identify all the energy streams in a facility.

Aim and objective:

1) To save conventionally produced electric energy
2) Use of non-conventional sources of energy
3) Minimization of electricity expenses

Observations:

The following Energy Sources are used in the college:

1. Solar
2. Electrical
3. Diesel
4. Petrol
5. LPG

Electricity Audit: An Energy resource utilized by all the departments, support services, and the administrative buildings of Maratha Mandal's Arts and Commerce College, Khanapur. The campus includes electricity and liquid petroleum as energy sources. The major use of the energy is in the Office, Canteen, hostels and lab, for purpose of lighting, cooking, and workshop instruments.

There are not many issues in the demand and supply chain of the overall energy-electricity management. Campus gets its electricity supply from the urban feeder of HESCOM, Karnataka.

Table no. 1.1 Electrical Energy consumption details:

SR. NO.	APPLIANCES	TOTAL	WORKING	NON -WORKING
1	Tube lights	45	27	18
2	Tube lights (LED)	22	22	
3	LED bulbs	4	4	
4	Led lamps	5	4	1
5	CFL bulbs	4	4	
6	Computers	67	50	17
7	Projectors	6	6	
8	Water Filters	1	1	
9	CCTV Cameras	25	23	2
10	Smart Boards	7		7
11	Printers	8	7	1
12	Air conditioner	1		1
13	Biometric	1		1
14	Exhaust Fan	2	2	
15	Podium cum Speaker	1	1	
16	UPS	2	2	
17	Amplifiers	1	1	
18	Speakers	4	4	
19	Electric bell	1	1	
20	Fountain	1	1	
21	Fan	31	30	1
22	Water pump	2	2	

Graph no.1.1 Energy Consumption Details

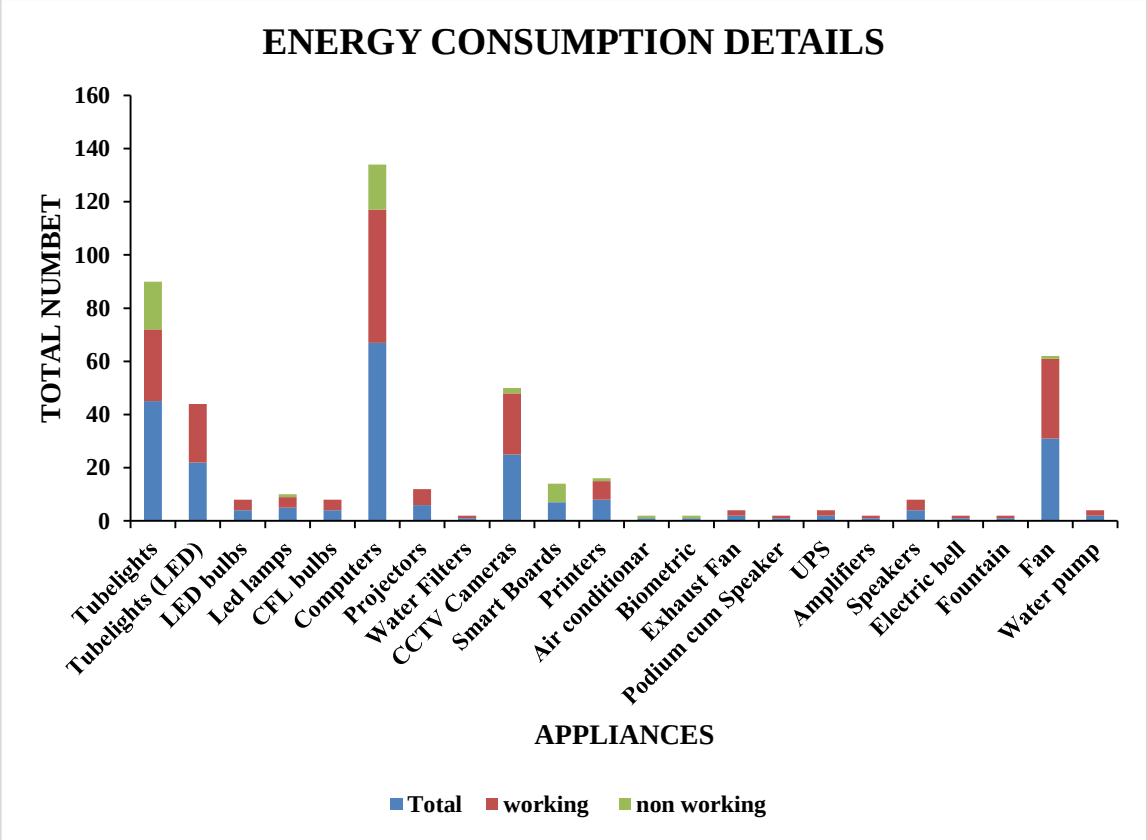


Table no. 1.2 Energy Consumption Details other than Electrical

SL.NO	TYPE	QUANTITY
1.	L.P.G. Cylinders	2

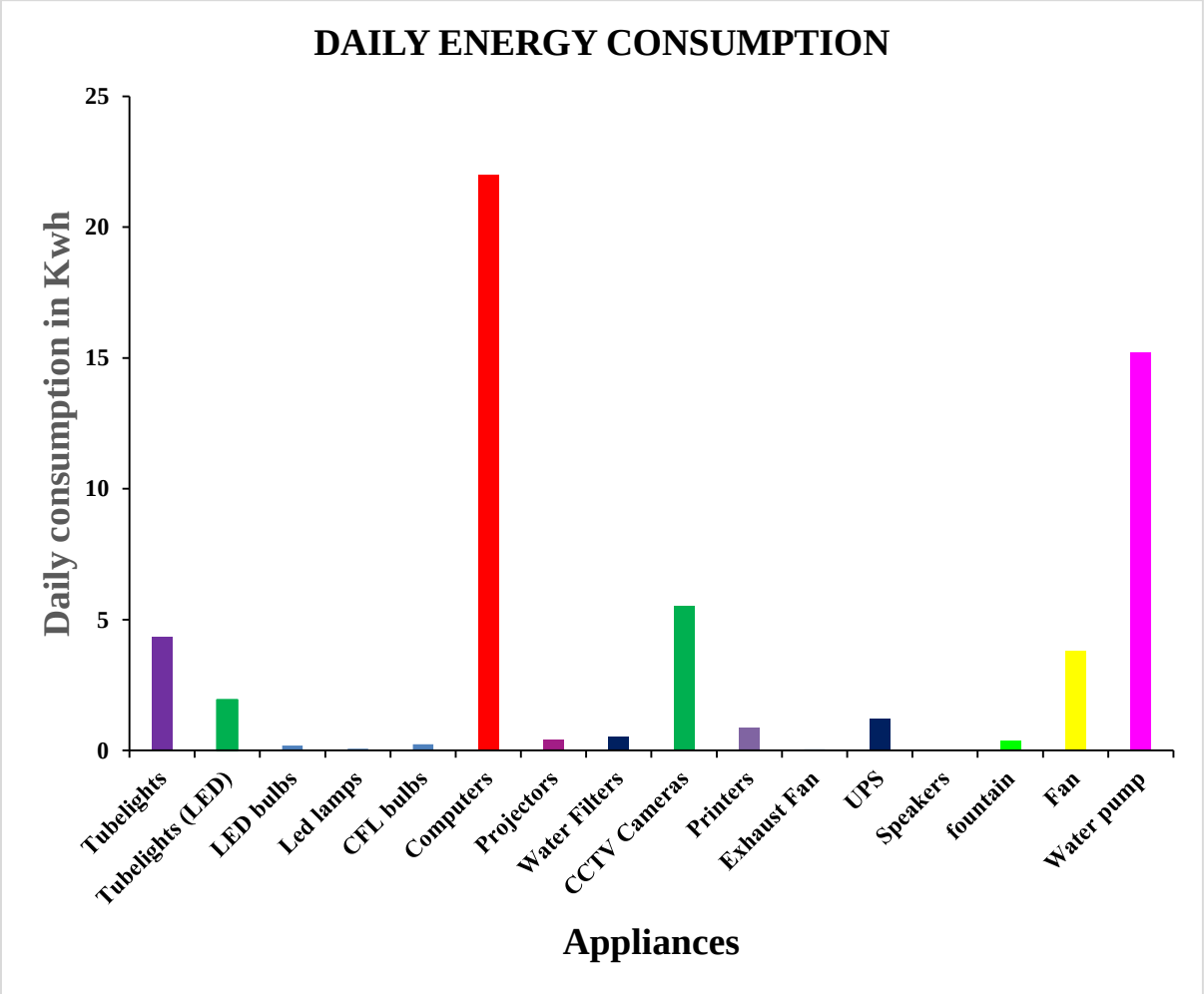
	
1HP Motor pump	**Bore well**

	
Computer Lab	**Classroom with adequate lighting**

Table no. 1.2 Energy Consumption in Various Buildings of the Campus.

Sr. No.	Appliances	Kwh
1.	Tube lights	4.32
2.	Tube lights (LED)	1.93
3.	LED bulbs	0.192
4.	Led lamps	0.07
5.	CFL bulbs	0.24
6.	Computers	36
7.	Projectors	0.4
8.	Water Filters	0.5
9.	CCTV Cameras	5.52
10.	Printers	0.875
11.	Exhaust Fan	0.04
12.	UPS	1.2
13.	speakers	0.03
14.	fountain	0.373
15.	Fan	3.788
16.	Water pump	15.2
Total		70,678 Kwh

Graph no.1.2 Energy Consumption of Various Appliances in the Campus.



To analyze electricity consumption, lights, fans, and other illumination equipment were taken into consideration. The maximum use of electricity is for lighting and fans in all the buildings. The electricity consumption is maximum due to more usage of computers and Water pump. The bar diagram of fig. 1.2 illustrates graphically the energy load of the various Appliances. Fig. 1.2 is constructed based on the data given in table 1.2.

Energy conservation efforts:

1. The building is designed with windows on both the sides' i.e. east and west that allows sunlight to enlighten the classrooms, reducing the use of tube lights.
2. Windows also helps to aerate the classrooms, hence reducing the use of fans.
3. Only during extreme bad light, tube lights are being used and during summer fans are used.

	
Save Energy Message Should be Displayed on Each Board	**Proper safety precautions should be taken for panel board**

Energy management - efficiency & alternatives:

There are not much issues in the demand and supply chain of the overall energy-electricity management. Campus gets its electricity supply from the Urban feeder of HESCOM, Karnataka. Due to urban feeding the energy shut downs are very seldom.

Yearly expenditure on the electrical energy.		
Particular	**2022-23**	**2023-24**
Electricity expenditure	96,000-/	1,10,000/-

*All electricity bills are available in college office as per month.

Existing energy requirement:

On average the entire campus requires approximately about 135 kWh of electrical energy every month. Lowest consumption being 98 kWh and highest up to 180 kwh. This variation is due to the weather season, full fledge practical laboratory sessions, examination schedule in the academic year.

Per capita electricity consumption (Campus population = 525)
*Whole number values are taken to ease the calculations

Monthly Minimum consumption = 70.00 kWh
= 700000 wh / 452
= **154 wh / individual**

In general per capita energy consumption needs to be reduced by implementing efficient conservation measures, using advanced technology, By installing solar pannels, electronic energy saving sensors, and raising awareness amongst consumers.

Energy Efficiency:

To check the efficiency all the buildings in the campus were assessed for the electrical conduit and use of electrical equipment. More than 22 rooms, departments and common locations were assessed by students, checking working conditions of lighting, fans, flaws or risk and requirements etc.

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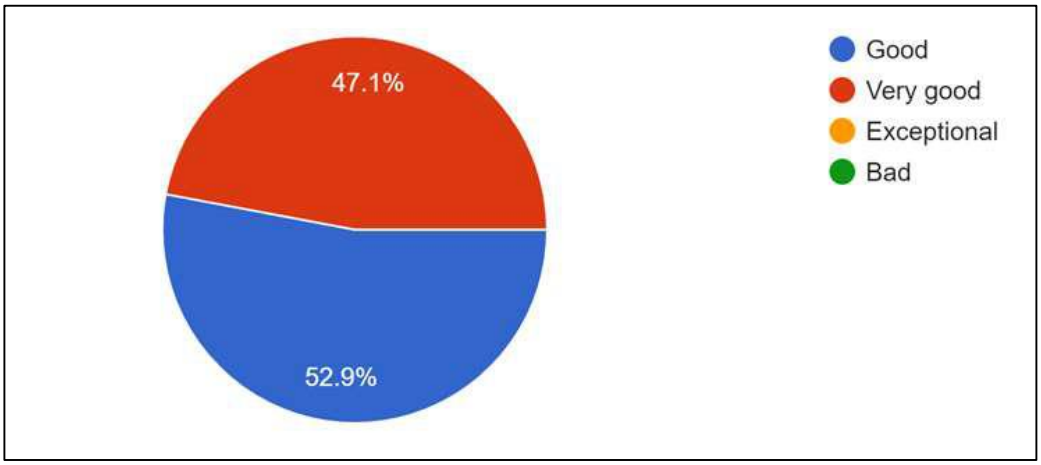
Energy conservation & Renewable Energy Initiative:

- There is no system or schedule planning in place for conservation of energy in the campus.
- No any message is displayed about conservation of energy and putting off Electrical equipment when not in use.
- Issue of wastage of electrical energy in the classrooms, while not in use, needs to be addressed, to reduce the consumption.
- Three times in a week during assessment, more than 12 Tube lights in 07 classrooms, were on for more than 2 hours. We do not know how frequently this incidents occur wasting energy resources and indirectly increasing our carbon footprint.
- Energy conservation awareness and sensitivities needs to be inculcated in the students and staff members of the institutions.
- Use of LED lights instead of sodium bulbs and fluorescent tubes to reduce the consumption of electricity.
- Energy-saving awareness shall be promoted by displaying suitable boards at different places.
- The Management should try to install solar panels on the terrace of the building to reduce consumption of electricity.

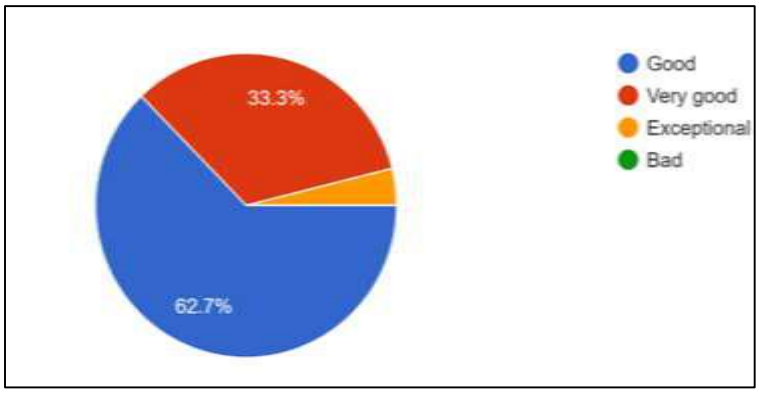
❖ **Staff and student awareness assessment:**

A small self-designed exercise was undertaken to assess the environmental awareness, their perceptions, understanding, involvement of social- environmental cause, and sensitivities etc. All the staff members and students were asked to fill questionnaires on based on campus cleanliness, waste disposal, their understanding of ecology and green processes, problems faced by them, possible solutions. This exercise was to make staff members think about environmental systems dynamics. (The questionnaire is attached in the annexure)

1. Staff members and students assigned to give grades to the College campus based on the Cleanliness.
    - Most of the staff and students has given good remark.



2. Staff members and students also assigned grades to the College campus based on the College building / Campus/ work environment, sanitation infrastructure, Drinking water facility.

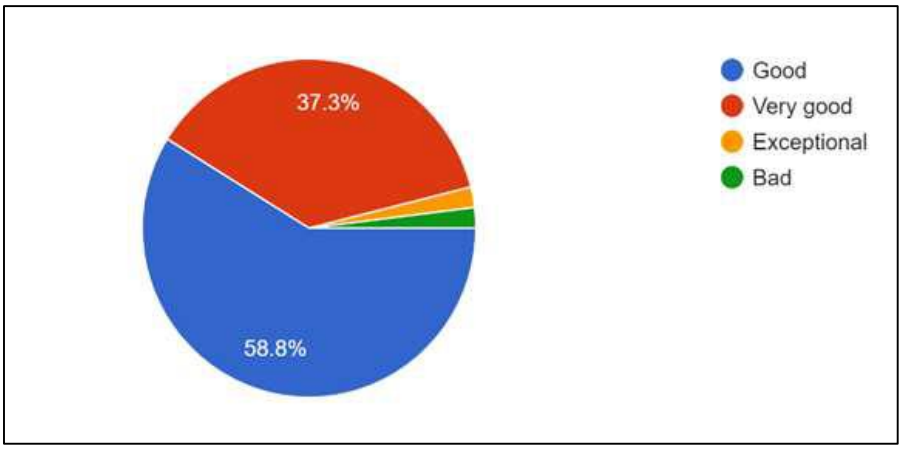


- Most of the staff and students of college i.e. 62.7% staff and students feels that

College campus and work environment is good.

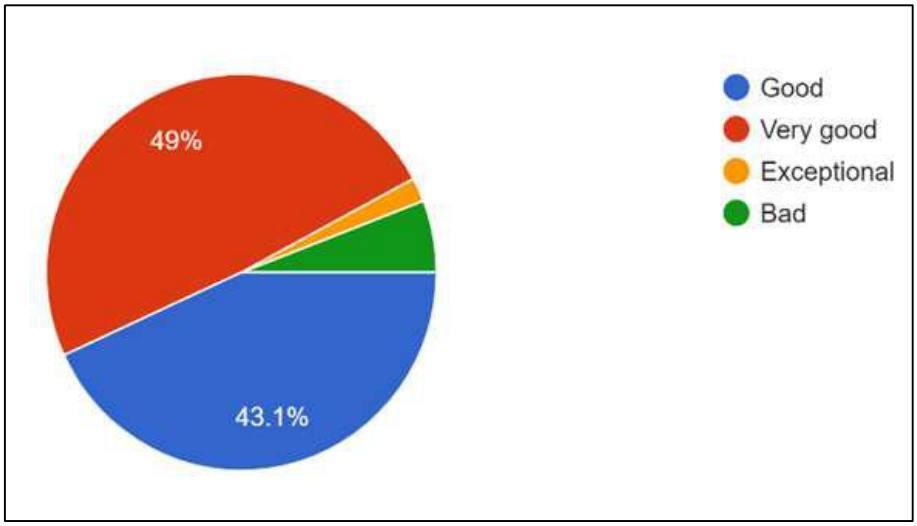
- 33.3% staff and students feedback is very good while few staff and students feedback is exceptional.

3. Staff and students were asked about infrastructure in college campus.

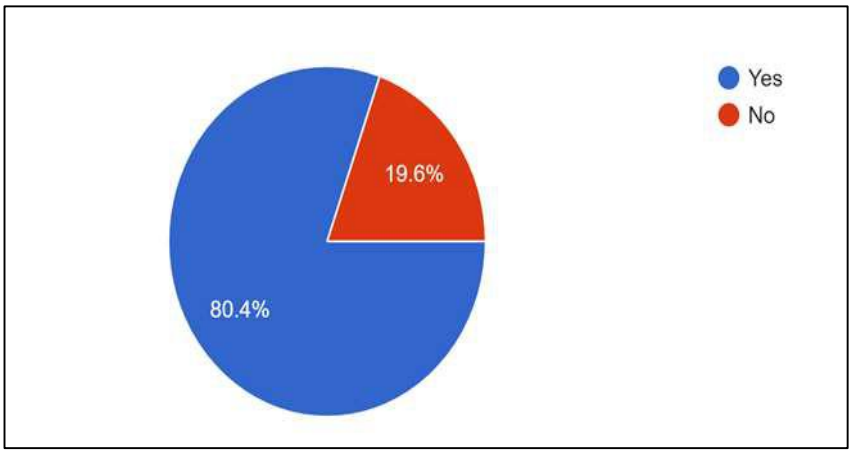


- Staff members and students also assigned grades to the infrastructure in college campus in which 58.8 % staff member feel infrastructure is good while 37.3% feels it is very good.

4. Staff members and students also assigned grades for drinking water facility in which most of the students and staff is satisfactory.

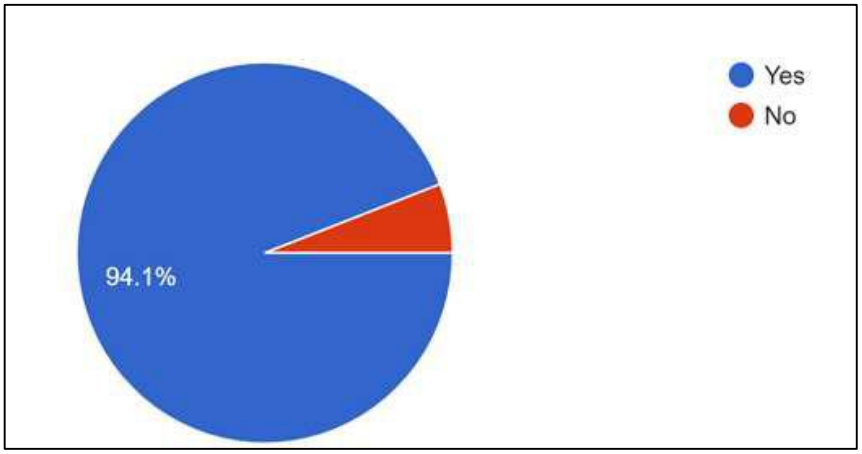


5. Questions were asked to observe if staff members have tried or taking any social/ environmental / educational / conservation etc. initiatives inside or outside college campus.



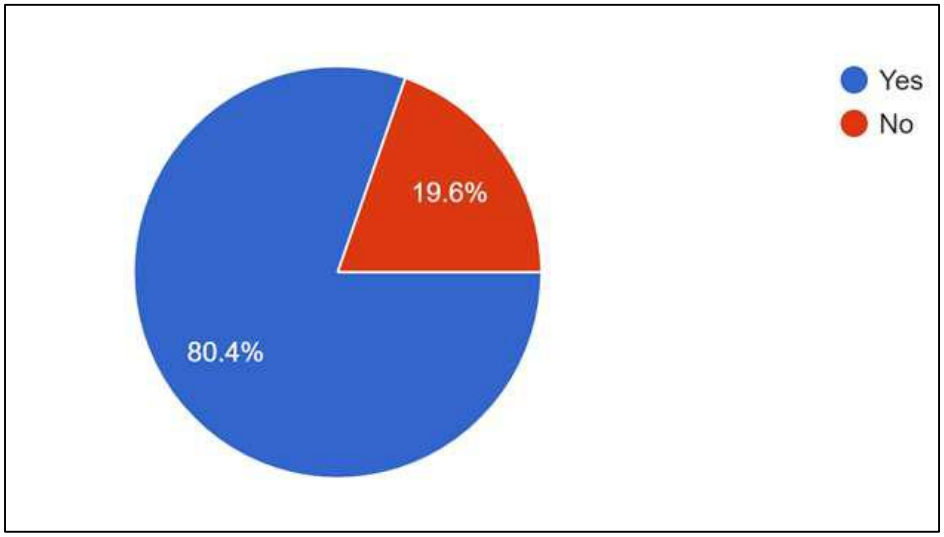
- Maximum staff and students i.e. 81% willing to take responsibility for social environmental and conservation while only 19 are not interested.

6. Staff members and students were also asked to take responsibility for ecofriendly campus.

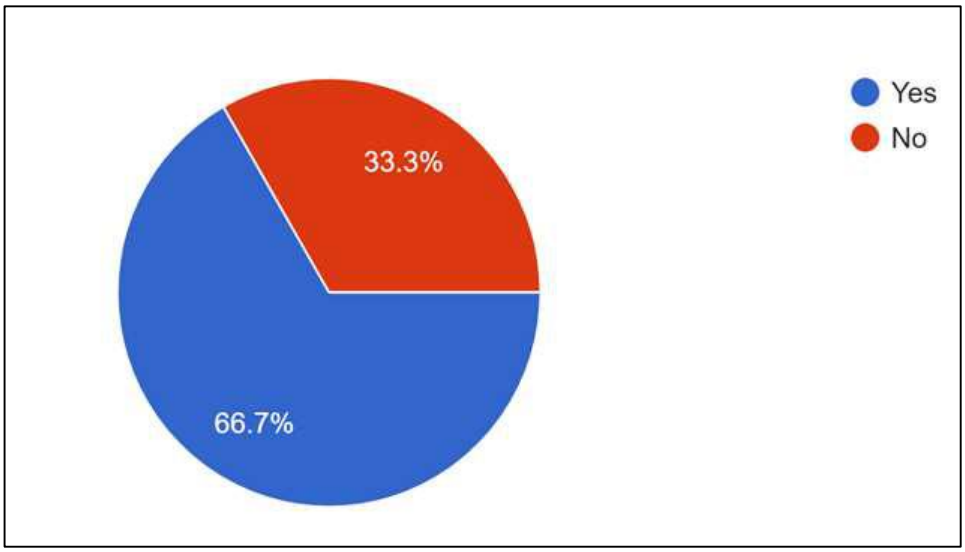


- 94.1 % of the staff members are willing to dedicate extra time for social cause.

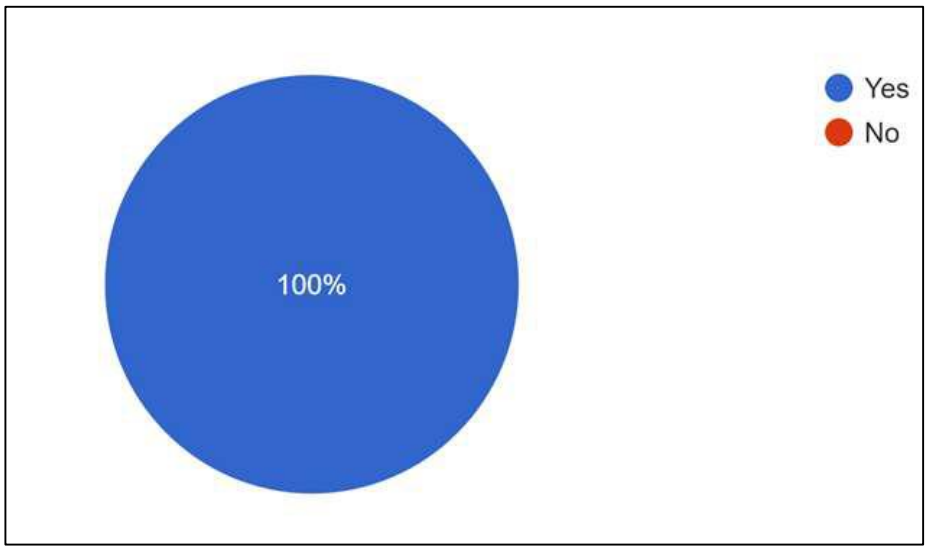
7. Staff and students were also asked were they make to reduce water and energy consumption in which most of the staff members are interested.



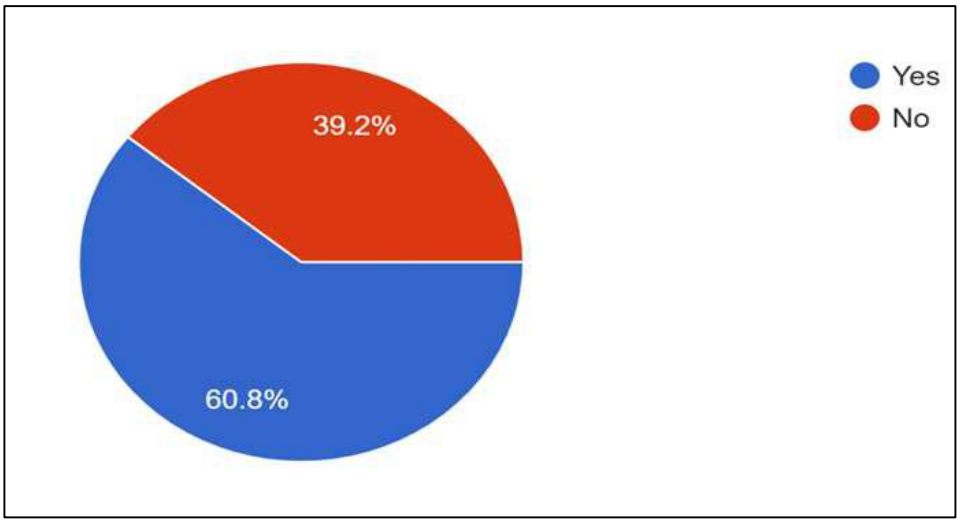
8. They are also asked about are they aware about carbon emission. Most of the staff members i.e. 66.7 % are aware about carbon emission.



9. All staff members and students also aware about throwing plastic in dustbins.



10. Staff and students are also asked about effect of pollution on health and most of the staff members response is positive means they are much more conscious about their health so they knows about green practices.



Electrical Instruments

	Electrical machinery	Year & Make	Capacity	Diesel cost
1	Generators			
2	Pump set			
3	Air conditions			
4	Number of Computers	RPD	GSS	
5	Any other Equipment			
	Data Filled by			

Expenditure

Energy management efficiency & alternatives		
Electricity Expenses	2013	2014
January		
February		
March		
April		
May		
June		
July		
August		
September		
October		
November		
December		
Total		

Stationary/ Paper/Print Expenses			
	2012	2013	2014
Total			
Gift - Bouquet Expenses			
	2012	2013	2014
Total			

ANNEXURE -1 ENERGY AUDIT

ANNEXURE-2

QUESTIONARE FOR GREEN AUDIT

1). Why do you think an Environment-Green audit is necessary for an educational institution?

a) an audit will help determine which native species are best suited to an area
b) audits, when properly installed, reduce energy consumption
c) audits gather information to embarrass the administration into making changes
d) audits collect baseline information to assess where change will help and how much change has occurred

2. How safe is your college building / campus/ work environment?

a) Good
b) Very good
c) Exceptional
d) Bad

3. How would rate the sanitation infrastructure in college campus?

a) Good
b) Very good
c) Exceptional
d) Bad

4. What grade will you assign to the Drinking water facility?

a) Good
b) Very good
c) Exceptional
d) Bad

5. Have you personally tried or taken any social/ environmental / educational / conservation etc. initiatives inside or outside college campus?

a) Yes
b) No

6. Are you willing to take small additional responsibility for eco-friendly campus? *

a) Yes
b) No

7. Do you make an effort to reduce water / electricity Consumption?

a) Yes
b) No

8. Are you aware about carbon emission?

a) Yes
b) No

9. Do you always throw the plastic in dustbin?

a) Yes
b) No

10. I believe my health has already been affected by pollution?

a) Yes
b) No

11. Which of the following is a greenhouse gas

a) Methane
b) Carbon dioxide
c) Nitrous oxide
d) all of above

12. Humans were meant to rule over the rest of nature

a) Agree
b) disagree
c) don’t know

13. Write few suggestions for well-being of college campus