

Estd. 20<sup>th</sup> June, 1991

Mayani Bhag Shikshan Prasarak Mandal's

**ARTS AND COMMERCE COLLEGE, MAYANI**

(Affiliated to Shivaji University, Kolhapur)

Tal- Khatav, Dist. Satara (M.S.)- 415 102

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॥ उपर्युपरि तिष्ठेत् आदित्य इव तेजसा ॥



NAAC Accredited "C" Grade

स्थापना : २० जून, १९९१

मायणी भाग शिक्षण प्रसारक मंडळ, मायणीचे

**कला व वाणिज्य महाविद्यालय, मायणी**

(शिवाजी विद्यापीठ, कोल्हापूर सलग्नित)

ता. खटाव, जि. सातारा (महाराष्ट्र) ४१५ १०२

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प्राचार्य

दिनांक :

## Key Indicator - 7.1 Institutional values and Social Responsibilities

### 7.1.3

**Green Audit and Energy Audit Report from  
Recognized Bodies**

# GREEN AUDIT REPORT (2021-2022)



## *Mayani Bhag Shikshan Prasarak Mandal's* **Arts and Commerce College, Mayani**



**Prepared By**

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**ISO 9001:2015 Certified Organization**

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Our special thanks to:

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- ♣ IQAC Head – Dr. L. G. Jathar
- ♣ IQAC Member – Mr. S. C. Mali
- ♣ Environment Expert at the campus –Mr. V. Y. Kamble
- ♣ Green Audit coordinator– Dr. U. S. Tembare
- ♣ Teaching & Supporting Staff of College

For giving us necessary inputs to carry out this very vital exercise of Green Audit. We are also thankful to other staff members who were actively involved while collecting the data and conducting field measurements.

## 2.0 DISCLAIMER

Sahyagiri Enterprises Green Audit Team has prepared this report for Arts and Commerce College, Mayani based on input data submitted by the representatives of College complemented with the best judgment capacity of the expert team.

It is further informed that the conclusions are arrived following best estimates and no representation, warranty or undertaking, express or implied is made and no responsibility is accepted by Audit Team in this report or for any direct or consequential loss arising from any use of the information, statements or forecasts in the report.

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**Report by: Mayuri M. Jadhav**

**EMS Lead Auditor**

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## 3.0 CONCEPT

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Green Audit is defined as systematic identification, quantification, recording, reporting and analysis of components of environmental diversity. The 'Green Audit' aims to analyse environmental practices within and outside the college campus, which will have an impact on the eco-friendly ambience. It was initiated with the motive of inspecting the work conducted within the organizations whose exercises can cause risk to the health of inhabitants and the environment. Through Green Audit, one gets a direction as how to improve the condition of environment and there are various factors that have determined the growth of carrying out Green Audit. Green audit is assigned to the criteria 7 of NAAC, (National Assessment and Accreditation Council) which is a self-governing organization of India which declares the institutions as Grade A, B or C according to the scores assigned during the accreditation.

## 4.0 INTRODUCTION

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A Nation's growth starts from its educational institutions, where the ecology is thought as a prime factor of development associated with environment. Educational institutions now days are becoming more sensitive to environmental factors and more concepts are being introduced to make them eco-friendly. To preserve the environment within the campus, various viewpoints are applied by the several educational institutes to solve their environmental problems such as promotion of the energy savings, recycle of waste, water reduction, water harvesting etc. The activities pursued by colleges can also create a variety of adverse environmental impacts.

Environmental auditing is a process whereby an organization's environmental performance is tested against its environmental policies and objectives. Green audit is defined as an official examination of the effects a college has on the environment. As a part of such practice, internal environmental audit (Green Audit) is conducted to evaluate the actual scenario at the campus.

Green audit is a useful tool for a college to determine how and where they are using the most energy or water or resources; the college can then consider how to implement changes and make savings. It can also be used to determine the type and volume of waste, which can be used for a recycling project or to improve waste minimization plan. Green auditing and the implementation of mitigation measures is a win-win situation for all the college, the learners and the planet. It can also create health consciousness and promote environmental awareness, values and ethics. It provides staff and students better understanding of Green impact on campus.

Green auditing promote financial savings through reduction of resource use. It gives an opportunity for the development of ownership, personal and social responsibility for the students and teachers. Thus it is imperative that the college evaluate its own contributions toward a sustainable future. As environmental sustainability is becoming an increasingly important issue for the nation, the role of higher educational institutions in relation to environmental sustainability is more prevalent.

A clean and healthy environment aids effective learning and provides a conducive learning environment. There are various efforts around the world to address environmental education issues.

Environmental Management Systems (EMS) is very popular in the industrial sector, but the general belief is that EMS is something pertaining to industries only. Other parts of the



world have started adopting compatible environmental management systems either voluntarily or for promoting standards by external certification. International environmental standards do not suit the existing Indian educational system. Hence Sahyagiri Enterprises has developed a compatible system by developing locally-applicable techniques.

A very simple indigenized system has been devised to monitor the environmental performance of educational institutions. It comes with a series of questions to be answered on a regular basis. Environmental conditions may be monitored from angles that are relevant to Indian requirements, without stress on legal issues or compliance.

This innovative scheme is user-friendly and totally voluntary. The environmental monitoring system helps the institution to set environmental examples for the community and to educate young learners. It can be adapted to urban and / or rural situations.



## 5.0 OVERVIEW OF INSTITUTE

Khatav taluka in the east part of Satara district is known as permanent drought stricken and rain shadow belt. Mayani is a rural village in this taluka where people are frequent victims of famine and drought. They suffer to get food and water struggle for their existence and face deadly state of affairs at the every corner of life. However, a smaller artificial lake built by the British is the only attraction for the local people visitors and foreign birds like Flamingo.

Having this background on 5<sup>th</sup> July 1954, the institution “**MAYANI BHAG SHIKSHAN PRASARK MANDAL**” was established with just five student by great insight of Jagannathrao Jadhav (Dada) and Shri S.D.Kuber (Sir) with the motto ‘**Be Bright Like the Sun**’ the institution opened doors of education to the students of Mayani and adjoining village. Under the able leadership of Advocate Bhausahab Gudge (Former Chairman & former MLA) and Honrble Secretary Shri S.D. Kuber (Sir), the institution developed with its eight Secondary school, One Girls High School ,a Pharmacy college, Junior college and a Senior college and one English medium school. Our institution has bright future under the Leadership of young and inspritive personality Mr.Surendra Gudge (Dada).

Arts, Commerce College, Mayani 20th June 1991 were established with a view to spread higher education for drought stricken rural, hilly students and to develop their overall personality. Before 1991, it was difficult for our student to go to Vita, Atpadi, karad or Dahiwadi some 20 to 50 km. away from Mayani for higher education. Especially girl student were completely away from higher education but this college proved fruitful for their needs. This college has played a vital role of uplifting social, cultural and educational life of the youth form its catchments area.

We expect our students to be bright independent, guide to the society builder of the nation and self respecting person.

College is permanently affiliated to Shivaji University, Kolhapur. College has 6.775 Acre campus Area.

College provides instructions to the students for three year degree courses B.A and. B.Sc Stream is started in the academic year 2016-17. The college, right from its inception has shown academic excellence and students have won meritorious awards and have maintained top ranks in the University examinations as well as in extra-curricular activities. Total Student strength of college is 361. College has total 12 teaching staff and 07 non-teaching staff. College has highly qualified staff

The infrastructure of a college plays a vital role in the development of the college as the students are now focusing on the labs, class rooms, etc. while selecting a college. It is important that the college has very good infrastructure with Specious Classrooms, Specious Labs, I.Q.A.C Department, NSS, Separate Canteen, Playground and Store Rooms etc. Various indoor and outdoor games are conducted by college.

The college has also adopted the 'Green Campus' system for environmental conservation and sustainability. The goal is to reduce CO<sub>2</sub> emission, water use while creating an atmosphere where students can learn and be healthy.



## 6.0 AUDIT OBJECTIVES AND SCOPE

The main objective of the green audit is to promote the Environment Management and Conservation in the College Campus. The purpose of the audit is to identify, quantify, describe and prioritize framework of Environment Sustainability in compliance with the applicable regulations, policies and standards. The main objectives of carrying out Green Audit are:

- To introduce and aware students to real concerns of environment and its sustainability.
- To secure the environment and cut down the threats posed to human health by analysing the pattern and extent of resource use on the campus.
- To establish a baseline data to assess future sustainability by avoiding the interruptions in environment that are more difficult to handle and their corrections requires high cost.
- Developing an environmental ethic and value systems in young people.
- Improving environmental standards.
- Benchmarking for environmental protection initiatives.
- Enhancement of College profile.

## 7.0 EXECUTIVE SUMMARY

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The rapid urbanization and economic development at local, regional and global level has led to several environmental and ecological crises. On this background it becomes essential to adopt the system of the Green Campus for the institute which will lead for sustainable development.

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

Arts and Commerce College, Mayani done internal green assessment and annual reports published for continual improvements; QS Programme and doing their bid towards environmental protection and environmental awareness at local and global front.

The methodology include: preparation and filling up of questionnaire, physical inspection of the campus, observation and review of the documentation, interviewing key persons and data analysis, measurements and recommendations. It works on the several facets of 'Green Campus' including Water Conservation, Tree Plantation, Waste Management, Paperless Work, Alternative Energy and Mapping of Biodiversity.

This audit report contains observations, appreciations and recommendations for improvement of environmental consciousness.

## 8.0 METHODOLOGY

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In order to perform green audit, the methodology included different tools such as preparation of questionnaire, physical inspection of the campus, observation and review of the documentation, interviewing key persons and data analysis, measurements and recommendations. The study covered the following areas to summarize the present status of environment management in the campus:

- Waste Management
- Energy Conservation
- Water Conservation
- Green area management/biodiversity survey
- Carbon Footprint
- Best Practices for Environment

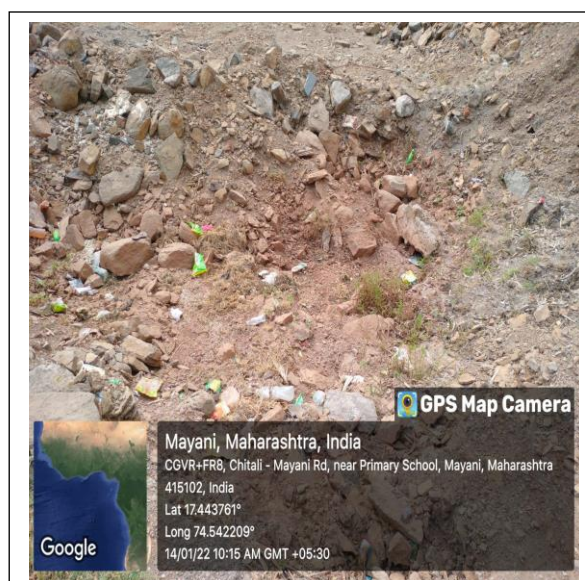
## 9.0 OBSERVATIONS, APPRECIATIONS AND RECOMMENDATIONS

### 9.1 WASTE MANAGEMENT

This indicator addresses waste production and disposal of different wastes like paper, food, plastic, biodegradable, construction, glass, dust etc. and recycling. Furthermore, solid waste often includes wasted material resources that could otherwise be channeled into better service through recycling, repair and reuse. Solid waste generation and management is a burning issue. Unscientific handling of solid waste can create threats to everyone. The survey focused on volume, type and current management practice of solid waste generated in the campus. The different solid wastes collected as mentioned above.

#### A) Observations:

The total organic waste collected in the campus is 25 kg/month. Waste generated from canteen and garden is a major solid waste in the campus. Near about 2 kg/month of non-biodegradable waste is generated in the campus including glass bottles. Near about 100-200 lit/day chemical waste is generated from laboratories. The waste is segregated at source by providing separate dustbins for Bio-degradable, Non-Bio-degradable. Single sided used papers reused for writing and printing in all departments. Approx.1 kg/month plastic waste is generated by departments, office, garden etc. but it is neither categorized at point source nor sent for recycling. College has E-waste collection centre. The food waste from canteen is sent to composting. The institute has adopted one composting units in campus having capacity of 30 kg. The main purpose of this is to breakdown & decomposes all kind of organic waste by using microorganisms that require oxygen. called compost. After complete process of composting, it is used as manure in the garden.



**Composting Unit**





**Dustbins are provided throughout the college premises for waste collection**

### **B) Appreciations:**

- Each and every place of campus is provided with dustbin.
- Laboratory waste is connected to sewer.
- Paper waste generated from office, laboratories and departments are transported to the vendors for recycling.
- Every department and office tries to reduce consumption of paper.
- College reuses empty side of printed paper.

### **C) Recommendations:**

- Make full use of all recycling facilities provided by City Municipality and private suppliers, including glass, batteries, print cartridges, cardboard and furniture.
- Provide sufficient, accessible and well-publicized collection points for recyclable waste with responsibility for recycling clearly allocated.
- Separate E-waste collection centre is necessary. Collected E-waste should supply to E-waste management and disposal facility in order to dispose E- waste in scientific manner.

## **9.2 WATER CONSERVATION**

This indicator addresses water consumption, water sources, irrigation, storm water appliances and fixtures. A water audit is an on-site survey and assessment to determine the water use and hence improving the efficiency of its use.

### **A) Observations:**

The study observed that bore well water is main sources of water in the campus. Water is used for drinking, canteen, toilets, laboratory and gardening purpose. During the survey, no loss of water is observed, through leakages and no over flow of water from overhead tanks. The data collected from all the departments is examined and verified. On an average the total use of water in the college is

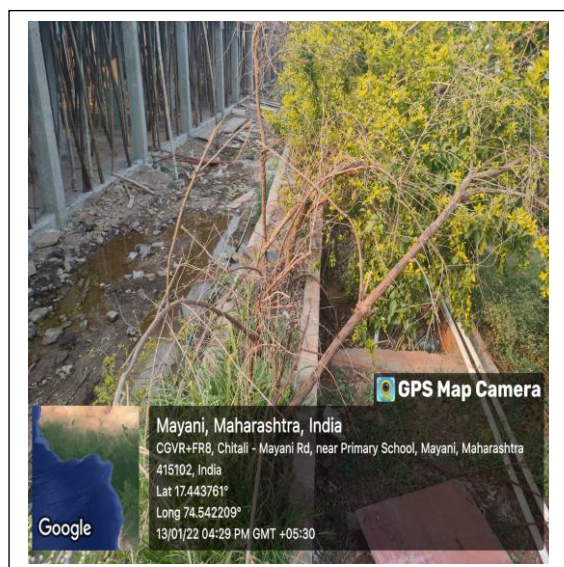
2,000 L/day, which include 1,500 L/day for domestic purposes, 2,00 L/day for gardening and 3,00 L/day for different laboratories. College has 1 R.O systems having capacity 200 LPH. The college has rain water harvesting facility in a campus. Water used for drinking purpose analyzed as per IS 10500:2012 drinking water specification and observed it was potable.

### Daily Water Consumption

Parameter	Quantity	Total water consumption
Total tanks	5	2 m <sup>3</sup>
Garden water consumption	0.2 m <sup>3</sup>	
College building water consumption	1.5 m <sup>3</sup>	
R.O. water consumption	0.3 m <sup>3</sup>	



R.O. System



Rainwater Harvesting System



## Water Sample Analysis Report

Sr. No.	Parameters	Results	Acceptable Limit as per IS 10500: 2012	Units
1.	Colour	< 1	Max. 5	Hazen Units
2.	Odour	Agreeable	Agreeable	-
3.	pH	7.08	6.5-8.5	-
4.	Turbidity	0.8	Max. 1	N.T.U.
5.	Total Dissolved Solids	95	Max.500	mg/L
6.	Calcium (as Ca)	20	Max.75	mg/L
7.	Chloride (as Cl)	17	Max.250	mg/L
8.	Fluoride (as F)	< 0.05	Max.1	mg/L
9.	Iron (as Fe)	<0.09	Max.0.3	mg/L
10.	Magnesium (as Mg)	10	Max. 30	mg/L
11.	Alkalinity (as CaCO <sub>3</sub> )	31	Max.200	mg/L
12.	Nitrate (as NO <sub>3</sub> )	5.17	Max. 45	mg/L
13.	Sulphate (as SO <sub>4</sub> )	2.94	Max.200	mg/L
14.	Total Hardness (as CaCO <sub>3</sub> )	60	Max.200	mg/L
15.	E. coli	Absent	Not Detectable	/100 ml
16.	Total Coliforms	Absent	Not Detectable	/100 ml

**B) Appreciations:**

- Water is properly used in the campus and water reusing strategy is followed by the college.
- Rain water is collected and used for bore well recharge.
- Waste water from R.O. is reused for gardening purpose.
- Waste water generated from campus is connected to sewer.

**C) Recommendations:**

- Year wise water consumption report.
- Provide leakage free water taps.

**9.3 ENERGY CONSERVATION:****A) Observations:**

This indicator addresses energy consumption, energy sources, energy monitoring, lighting, appliance, natural gas and vehicles. Energy use is clearly an important aspect of campus sustainability and thus requires no explanation for its inclusion in the assessment.

Energy source utilized by all the departments and common facility center is electricity only. Maximum energy consumption is by major energy consuming equipment. College has 2 solar street lamps.

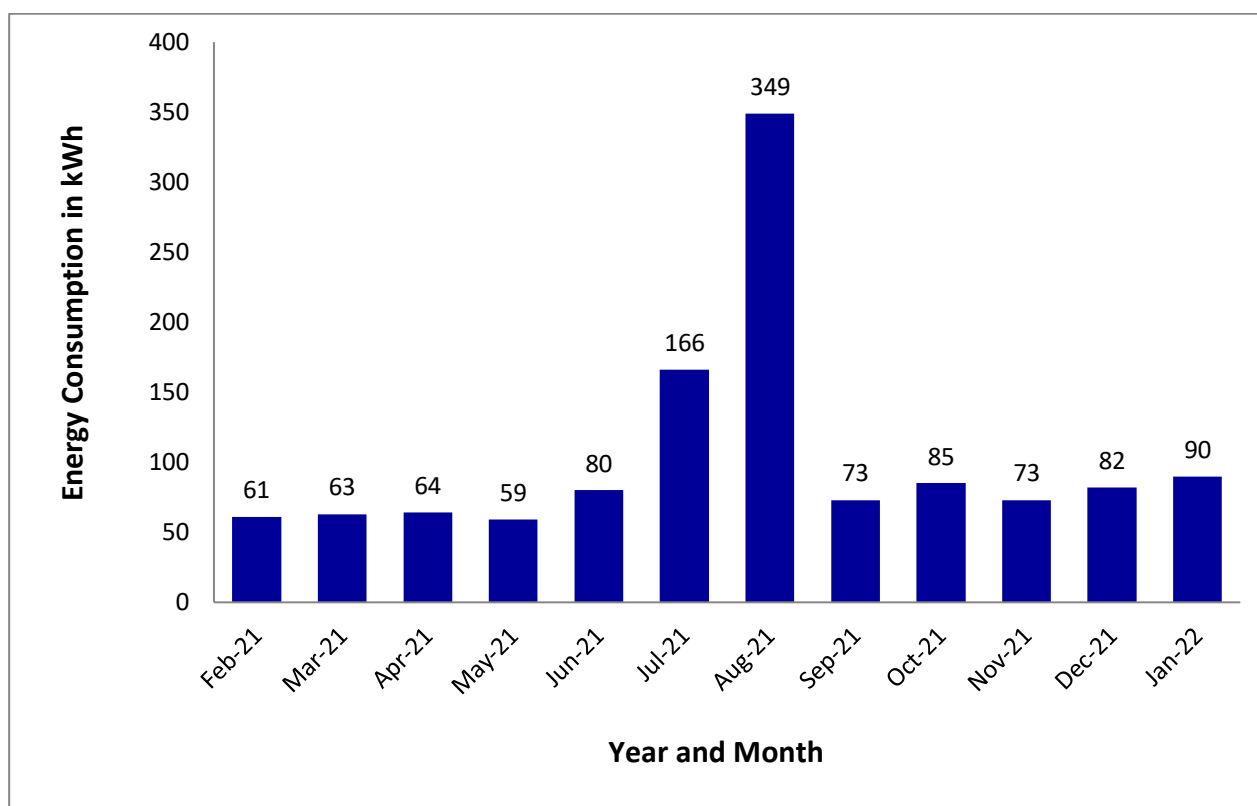
All the departments and common facility centers are equipped with LED lamps. Approximately 23 computers, 3 printers, 67 LED bulbs, 44 fans, 36 tubes, 6 projectors, 3 A.C with 3 star rating, 1 xerox

machine these all are observed during the survey. Equipment like Computers is used with power saving mode. Also, campus administration runs switch-off drill on regular basis. In various labs after completion of work, electricity was shut down; it is one of the practices for energy conservation.

The campus imports electricity from Maharashtra State Electricity Distribution Co. Ltd. The total electricity that was imported by the college during the year 2021-2022 is as shown below. Total 12 month's energy consumption of the campus is presented below for the year 2021-2022. The graph shows that institute requires more electricity and it costs too much. If instate install solar panels then it will saves electricity charges.



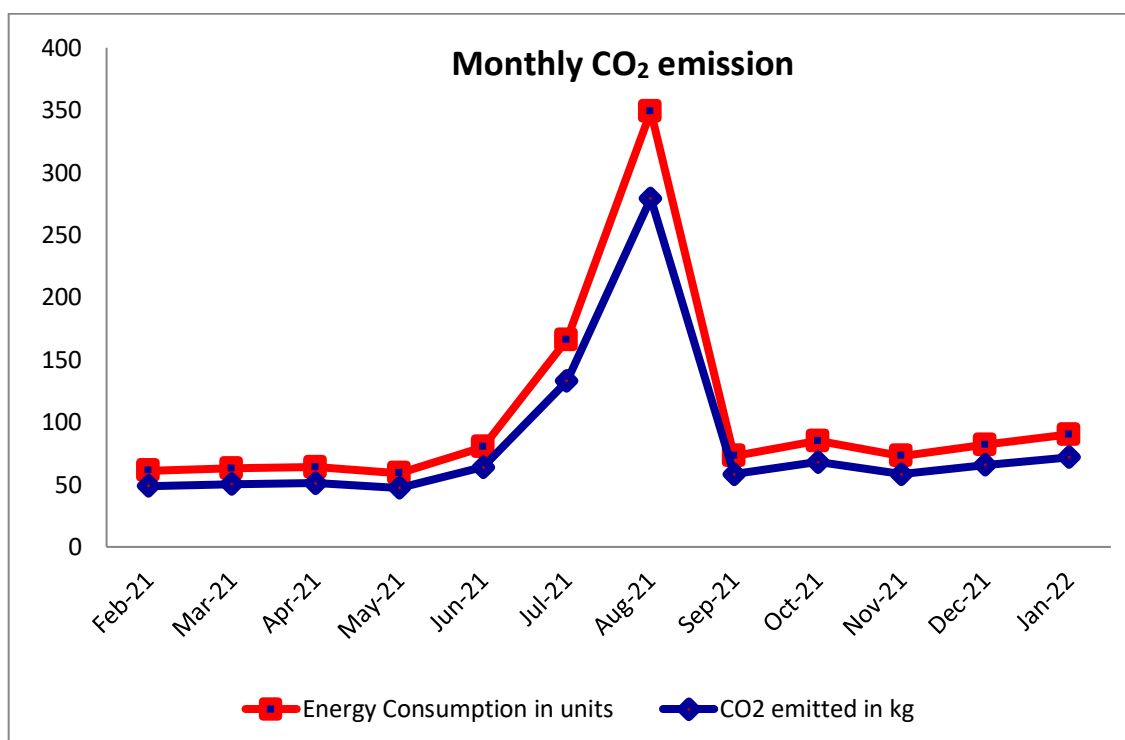
Month	Energy Consumption in units
February -2021	61
March -2021	63
April -2021	64
May -2021	59
June -2021	80
July -2021	166
August -2021	349
September -2021	73
October -2021	85
November -2021	73
December-2021	82
January-2022	90
Avg.	103.75



### CARBON- DIOXIDE EMISSION

For consumption of 1 Unit (1 kWh) of Electricity, the CO<sub>2</sub> emitted is 0.8 Kg. OR the Emission is 0.8 Kg/kWh. In the following Table we present the total units consumed and CO<sub>2</sub> emitted as under:

Sr.No.	Month	Energy consumption (kWh)	CO <sub>2</sub> emitted in kg
1	February -2021	61	48.8
2	March -2021	63	50.4
3	April -2021	64	51.2
4	May -2021	59	47.2
5	June -2021	80	64
6	July -2021	166	132.8
7	August -2021	349	279.2
8	September -2021	73	58.4
9	October -2021	85	68
10	November -2021	73	58.4
11	December-2021	82	65.6
12	January-2022	90	72
13.	Avg.	103.75	83



#### B) Appreciations:

- Appreciate that college has 5 & 3 star electrical appliances like A.C.
- Campus is well equipped with LED lamps.
- Appreciate that college has total 8 solar street lamps having capacity 60 W. It saves 162 KWh per month.

#### C) Recommendations:

- Try to install solar street light throughout the campus.
- Installation of solar power plant is necessary and it's in progress.

### 9.4 GREEN AREA MANAGEMENT/BIODIVERSITY SURVEY

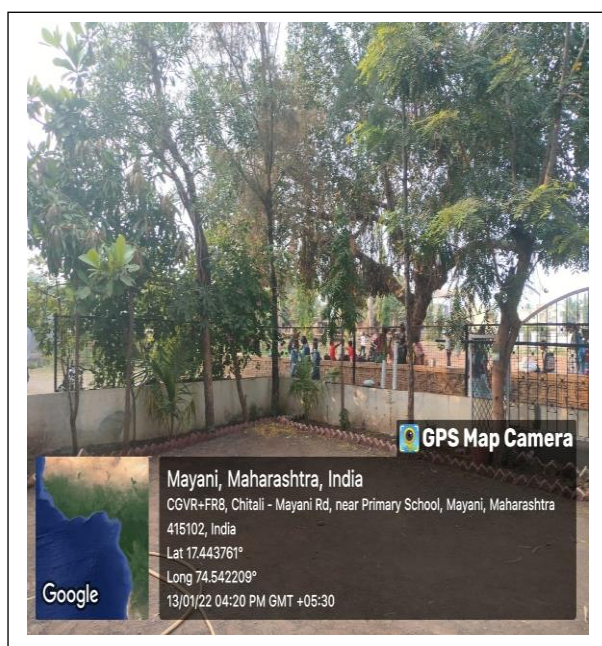
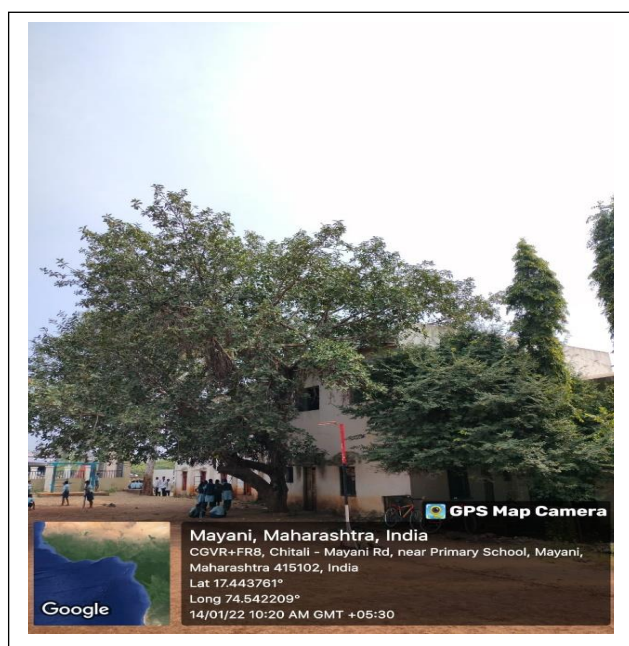
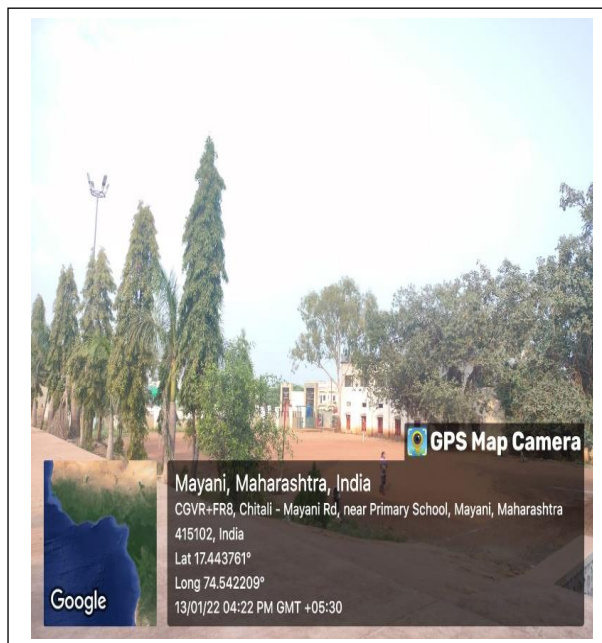
This includes the plants, greenery and sustainability of the campus to ensure that the buildings conform to green standards. This also helps in ensuring that the Environmental Policy is enacted, enforced and reviewed using various environmental awareness programs.

#### A) Observations:

To create- green cover, eco-friendly atmosphere, pure oxygen at the college campus, plantation program is organized every year with involving all students, principal and all departments faculty members.

Campus is located in the vicinity of approximately 20 (species) of trees total no. 106, 5(species) of shrubs total no.30 and grass cover is 40 sq.m. Approximately 10 species of birds, 8 species of mammals and 4 species of reptiles are found in the campus. College has 500 sq m. grass cover. Various tree plantation programs are being organized during the month of July and August at college campus and outside the college campus. This program helps in encouraging eco-friendly environment

which provides pure oxygen within the institute and awareness among students and staff members. The plantation program includes plantation of various type of indigenous species of ornamental and medicinal as well as wild plant species under the biodiversity and ecological survey. The Institute has a policy of gift a plant to guests in any program. It is a good thing for environment.



### Green campus

#### B) Appreciations:

- Appreciate that the college has well developed and maintained green cover.
- Appreciate that the college has variety of trees, bushes & shrubs.
- College has Eco club and various activities are taken under this club for conservation of Environment.



- Appreciate that college celebrates 5<sup>th</sup> June as 'Environment Day', 21<sup>st</sup> March as Forest Day, 22<sup>nd</sup> April as a Vasundhara Din (Earth Day) every year and plant trees on this day to make the campus Greener.

### C) Recommendations:

- Review periodically the list of trees planted in the campus and keep records.
- Try to plant more trees in the campus.
- Promote environmental awareness as a part of course work in various curricular areas, independent research projects and community services.
- Ensure that an audit is conducted annually. And action is taken on the basis of audit report and recommendation and findings.

## 9.5 CARBON FOOTPRINT

A carbon footprint (CF) is the total amount of greenhouse gases (including carbon dioxide and methane) that are generated by our actions.

A carbon footprint is an estimate of the climate change impact of activity – such as making a product, living a lifestyle or running a company.

There are many existing and evolving standards for calculating carbon footprints but in truth no footprint is precise. For more complicated activities these uncertainties are greatly multiplied.

### a) Carbon Emissions:

#### List of carbon emissions

Classification/Scope	Sources	Description
<b>Scope 1 (Direct)</b>	Equipments usage	LPG
<b>Scope 2 (Indirect)</b>	Electricity Use	Arts and Commerce College, Mayani uses electricity to heat, cool, light, and run appliances at its facilities.
<b>Scope 3 (Indirect)</b>	Employee commuting	Employees commute from their residences to the college

### Emission Data and Calculations:

- Scope 1 – All Direct Emissions from the activities of an institution or under their control.  
Including fuel combustion on site such as gas, etc.

#### Scope 1 Emissions

Type of Fuel	Quantity	Emission Factor	Kg CO <sub>2</sub> /month
LPG	15 kg/month	2.983	44.745

TOTAL SCOPE 1 EMISSIONS	<b>44.745</b> <b>Kg CO<sub>2</sub>/month</b>
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- Scope 2 – Indirect Emissions from electricity purchased and used by the institution. Emissions are created during the production of the energy and eventually used by the organization.

#### Emissions from Purchased electricity:

#### Indirect Emissions /scope 2 emissions

Type of Emission	Quantity	Emission Factor	Kg CO <sub>2</sub>
Emissions from Purchased electricity	103.75 kWh/month	0.97	100.64 KgCO <sub>2</sub> /month
TOTAL SCOPE 2 EMISSIONS			<b>100.64</b> <b>Kg CO<sub>2</sub>/month</b>

- Scope 3 – All Other Indirect Emissions from activities of the institution, occurring from sources that they do not own or control.

**A. Employee Transportation:** Increase in student intake can lead to increased greenhouse gas (GHG) pollution caused by the resulting growth in vehicular traffic, energy use, and other activities. This unit seeks to identify the impact on global climate change through its emissions of greenhouse gases (GHGs), notably carbon dioxide (CO<sub>2</sub>). Transportation is the fastest growing major contributor to global climate change, accounting for 23% of energy-related carbon dioxide (CO<sub>2</sub>) emissions.

#### Fuel Consumption through Staff Transportation

Mode of transportation	Daily Count	Travelling distance (km/Vehicle) (to and fro)	Total Km	Emission Factor	Kg CO <sub>2</sub>
2 wheeler (teachers)	12	10	120	0.0319	3.828
4 wheeler (Cars)	02	10	20	0.13	2.6
Bus	02	20	40	0.01516	0.6064
TOTAL					<b>7.0344 Kg CO<sub>2</sub>/day</b>
					<b>211.032 Kg CO<sub>2</sub> /month</b>

**Fuel Consumption through students Transportation**

Mode of transportation	Daily Count	Travelling distance (km/Vehicle) (to and fro)	Total Km	Emission Factor	Kg CO <sub>2</sub>
2 wheeler	16	10	160	0.0319	5.104
Bus	5	20	100	0.01516	1.516
TOTAL					6.62
					Kg CO <sub>2</sub> /day
					198.6
					Kg CO <sub>2</sub> /month

**B) Solid Waste Generation:****Wet Solid Waste Generation**

Wet waste generated	Emission factor	Total Kg CO <sub>2</sub>
25 kg/month	0.21	5.25 KgCO <sub>2</sub> /month

**Total emissions throughout a year****Total emissions throughout a year**

Reporting Year	Total Emissions (kg CO <sub>2</sub> /month)	Total Emissions (kg CO <sub>2</sub> /year)
2022	560.267	6723.204

**C) Recommendations:**

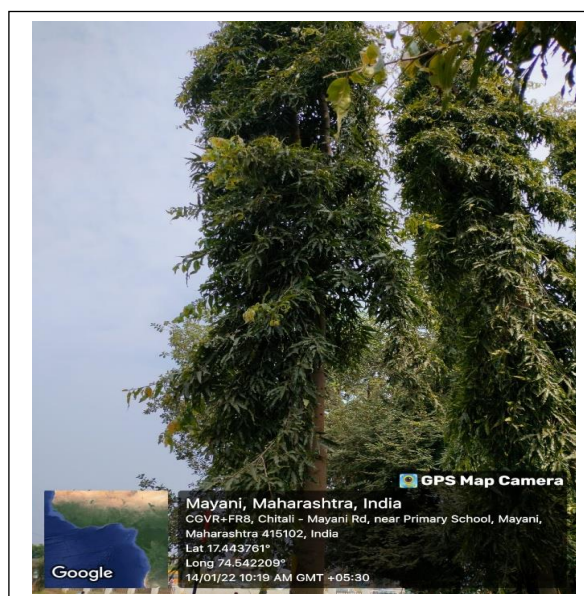
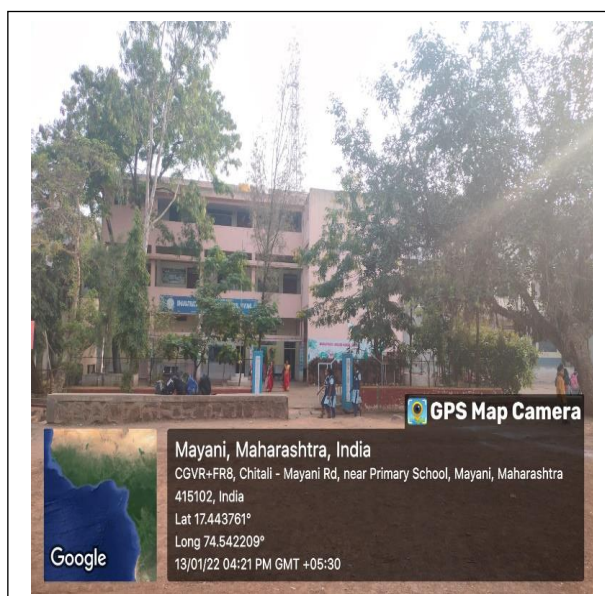
- Make sure most teachers and students opt for public transport instead of using personal vehicle.
- Use as much renewable sources of energy as you can.
- Reduce the waste generated by all departments.



## 10. BEST PRACTICES FOR ENVIRONMENT

### 1. Biodiversity Conservation:

- ♣ They have green campus which provides habitat to various species.
- ♣ They maintain flora and fauna in the campus.



### 2. Tree Plantation Drives and Days Celebrations

- ♣ Periodically the plantation drives conducted by students and staff of campus.
- ♣ Every Guest is honored by tree at campus.
- ♣ World Environment Day, Wetland Day, Ozone Day etc. celebrated by students and staff every year.
- ♣ College has Eco Club.
- ♣ To create awareness among the students campus is provided with different Environmental Slogans.





### 3. Solid Waste Management

- ♣ Different mechanisms for proper disposal of biodegradable, non-biodegradable and MSW are implemented in campus.
- ♣ Cleanliness drives are arranged by college.
- ♣ Refuse is transferred to Municipal Corporation using Ghanta gadi mechanism.



### 4. Water Conservation

- ♣ Water saving push taps fitted in the drinking water zone and the toilets to avoid the wastage of water.
- ♣ Sign boards for awareness of environment are there in the campus.
- ♣ Pipe is used for watering trees.

- ♣ Hand washed water is reused for trees.



## 11. OVERALL RECOMMENDATIONS

- Formation of Environment Policy and communicated to all faculties and other staff members.
- Environmental Monitoring i.e. (Ambient Air Quality Monitoring, Water monitoring, D.G set monitoring) need to be conducted by approved laboratory with frequency of six month.
- Reduction in use of paper work by go digital system.
- Need of installation of roof top solar panels.
- Need of implementation of drip irrigation.
- Increase in Environmental promotional activities for spreading awareness at campus.
- As practically feasible avoid use of personal vehicles inside the campus.



## 12. CONCLUSION

This audit involved extensive consultation with all the campus team, interactions with key personnel on wide range of issues related to Environmental aspects. The Arts and Commerce College, Mayani has Environmental Committee for sustainable use of resources. The audit has identified several observations for making the campus premise more environmental friendly. The recommendations are also mentioned with observations for campus team to initiate actions.

The audit team opines that the overall site is maintained well from environmental perspective. The paperless work system, green campus management, solid waste management, rain water harvesting system, composting unit and water conservation practices are noteworthy.

As part of green audit of campus, we carried out the environmental monitoring of campus which includes Water Testing which is used for drinking purpose in the campus. Drinking water also analyzed and found it was potable.

There are some major observations like installation of solar panels are necessary and implementation of drip irrigation is necessary. And few minor things are important to initiate urgently are waste management records by monthly inventory, water balance cycle and periodic inspection of buildings housekeeping and environment policy.





# ENERGY AUDIT REPORT (2021-2022)



## *Mayani Bhag Shikshan Prasarak Mandal's* **Arts and Commerce College, Mayani**



**Prepared By**



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**ISO 9001:2015 Certified Organization**

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# 1.0 ACKNOWLEDGEMENT

Sahyagiri Enterprises Green Audit Team thanks the management of Arts and Commerce College, Mayani for assigning this important work of Energy Audit. We appreciate the co-operation to our team for completion of study.

Our special thanks to:

- ♣ Principal of the college – Dr. Sayajiraje Mokashi
- ♣ IQAC Head – Dr. L. G. Jathar
- ♣ IQAC Member – Mr. S. C. Mali
- ♣ Environment Expert at the campus –Mr. V. Y. Kamble
- ♣ Green Audit coordinator– Dr. U. S. Tembare
- ♣ Teaching & Supporting Staff of College

For giving us necessary inputs to carry out this very vital exercise of Energy Audit. We are also thankful to other staff members who were actively involved while collecting the data and conducting field measurements.



## 2.0 DISCLAIMER

Sahyagiri Enterprises Green Audit Team has prepared this report for Arts and Commerce College, Mayani based on input data submitted by the representatives of College complemented with the best judgment capacity of the expert team.

It is further informed that the conclusions are arrived following best estimates and no representation, warranty or undertaking, express or implied is made and no responsibility is accepted by Audit Team in this report or for any direct or consequential loss arising from any use of the information, statements or forecasts in the report.

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**Report by: Mayuri M. Jadhav**

**EMS Lead Auditor**

## 3.0 SUMMARY

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The objective of the audit was to study the energy consumption pattern of the facility, identify the areas where potential for energy/cost saving exists and prepare proposals for energy/cost saving along with investment and payback periods.

The salient observations and recommendations are given below.

1. Arts and Commerce College, Mayani uses energy in the following forms:
  - a) Electricity from MSEDCL
  - b) High Speed Diesel (HSD)
2. Electrical energy is used for various applications, like Computers, Lighting, Air-Conditioning, Fans, Other Lab Equipment  
The average energy consumption is around 103.75 kWh/Month.
3. The Specific Energy Consumption (SEC) is the ratio of energy required per square meter. In this case the SEC is evaluated as electrical units consumed per square meter of area. It is calculated as under: For Electricity: 0.01123 kWh/Sq m
4. It has found that there is wide scope for energy saving and pollution free campus development. Recommendations with cost benefit analysis have given in detail in report.

## 4.0 INTRODUCTION OF ENERGY AUDIT

An energy audit is a process to study of a building or industry to know the energy consumption of the building and identify methods to reduce the energy consumption for energy savings. In Commercial Building, the present electrical consumption is about 8-10 percent of the total electricity. To meet the international level comfort and facilities the electrical demand is increasingly by 11-12 % annually. This is a challenge for every industry to ensure that energy growth in commercial building does not become unmanageable but also give and presents an opportunity to influence and identifies energy management issues in various commercial buildings and facilities. As the natural resources are limited and energy uses are increasingly very sharply so it is very necessary to save natural resources by reducing energy consumption which can be achieved by using energy efficient equipment's and also by awareness of peoples about energy conservation .Energy audit in industrial and commercial, is the process to identifying opportunities to reduce carbon footprints and energy conservation.

### GENERAL

For Arts and Commerce College, Mayani entrusted the work of conducting a Detailed Energy Audit of campus at Mayani with the main objectives as below:


- To study the present pattern of energy consumption
- To identify potential areas for energy optimization
- To recommend energy conservation proposals with cost benefit analysis.

### Case Study in Campus:

We are taking this opportunity to express our heartily gratitude to Arts and Commerce College, Mayani for giving opportunity for carrying Energy Audit in campus We once again put up our appreciation for full cooperation & valuable guidance for perfect auditing of the Campus to technical as well as commercial persons for providing all the required information & data as well as for providing cooperation with all the departments & extend his best help in our work. We have tried our level best for the work of Energy Audit up to their satisfaction.

The major activities carried out during the audit are as follow:

- Collection of College's records regarding Electricity Power Bills, Power Distribution Diagram, Specifications of major power handling equipment – such as Fans, lighting and pumps.
- Analysis of above calculations, isolating the areas vulnerable to energy consumption not related to production.
- Recommendation of various methods of rectification.
- Making case study of projected saving by following our recommendations; and estimating potential investment & payback period.

 **Steps in Energy Auditing** The energy audit may range from a simple walk – through survey at one extreme to one that may span several phases: -

- 1) The first step is to identify the areas where energy is wasted and reduced energy without affecting the outputs of various functions.
- 2) The second step is to implement energy efficient appliances in place of normal appliances which reduce energy use by proper operations and maintenance. For this reason, it is necessary to reduce the number of operating machines and operating hours according to the demands of the load, and fully optimize equipment operations.

Energy audit depends on following factors: -

- Building equipment operation
- Lighting systems.
- Power systems.
- Building envelope
- Air-conditioning and ventilation equipment systems.
- Miscellaneous services.

The first two steps can be implemented without changing buildings and existing appliances.

- 3) The third step would require investment for remodeling, rebuilding, or introducing further control upgrades to the building.

- 4) The fourth step is to carry out large-scale energy reducing measures when existing facilities have past their useful life, or require extensive repairs or replacement because of obsolescence. In this case higher energy savings may be achieved. For these last two stages, the audit may be more extensive in order to identify more ECOs for evaluation, but at an increased need for heavier capital expenditure to realize these opportunities.

## 5.0 OVERVIEW OF INSTITUTE

Khatav taluka in the east part of Satara district is known as permanent drought stricken and rain shadow belt. Mayani is a rural village in this taluka where people are frequent victims of famine and drought. They suffer to get food and water struggle for their existence and face deadly state of affairs at the every corner of life. However, a smaller artificial lake built by the British is the only attraction for the local people visitors and foreign birds like Flamingo.

Having this background on 5<sup>th</sup> July 1954, the institution “**MAYANI BHAG SHIKSHAN PRASARK MANDAL**” was established with just five student by great insight of Jagannathrao Jadhav (Dada) and Shri S.D.Kuber (Sir) with the motto ‘**Be Bright Like the Sun**’ the institution opened doors of education to the students of Mayani and adjoining village. Under the able leadership of Advocate Bhausahab Gudge (Former Chairman & former MLA) and Honrble Secretary Shri S.D. Kuber (Sir), the institution developed with its eight Secondary school, One Girls High School ,a Pharmacy college, Junior college and a Senior college and one English medium school. Our institution has bright future under the Leadership of young and inspritive personality Mr.Surendra Gudge (Dada).

Arts, Commerce College, Mayani 20th June 1991 were established with a view to spread higher education for drought stricken rural, hilly students and to develop their overall personality. Before 1991, it was difficult for our student to go to Vita, Atpadi, karad or Dahiwadi some 20 to 50 km. away from Mayani for higher education. Especially girl student were completely away from higher education but this college proved fruitful for their needs. This college has played a vital role of uplifting social, cultural and educational life of the youth form its catchments area.

We expect our students to be bright independent, guide to the society builder of the nation and self respecting person.

College is permanently affiliated to Shivaji University, Kolhapur. College has 6.775 Acre campus Area.

College provides instructions to the students for three year degree courses B.A and B.Sc Stream is started in the academic year 2016-17. The college, right from its inception has shown academic excellence and students have won meritorious awards and have maintained top ranks in the University examinations as well as in extra-curricular activities. Total Student strength of college is 361. College has total 12 teaching staff and 7 non-teaching staff. College has highly qualified staff

The infrastructure of a college plays a vital role in the development of the college as the students are now focusing on the labs, class rooms, etc. while selecting a college. It is important that the college has very good infrastructure with Specious Classrooms, Specious Labs, I.Q.A.C Department, NSS, Separate Canteen, Playground and Store Rooms etc. Various indoor and outdoor games are conducted by college.

The college has also adopted the 'Green Campus' system for environmental conservation and sustainability. The goal is to reduce CO<sub>2</sub> emission, water use while creating an atmosphere where students can learn and be healthy.



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## 6.0 SCOPE OF WORK AND APPROACH

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### **SCOPE:**

Scope of work and methodology were as per the proposal. While undertaking data collection, field trials and their analysis, due care was always taken to avoid abnormal situations so as to generate normal/representative pattern of energy consumption at the facility.

### **Approach to Energy Audit:**

We focused our attention on energy management and optimization of energy efficiency of the systems, sub systems and equipment. The key to such performance evaluation lies in the sound knowledge of performance of equipment and system as a whole. The objective of Energy Audit is to balance the total energy inputs with its use and to identify the energy conservation opportunities in the stream.

Energy Audit also gives focused attention to energy cost and cost involved in achieving higher performance with technical and financial analysis. The best alternative is selected on financial analysis basis.



## 7.0 ENERGY AUDIT METHODOLOGY

Energy Audit Study is divided into following three steps

### **A] Historical Data Analysis**

The historical data analysis involves establishment of energy consumption pattern to establish base line data on energy consumption and its variation with change in production volumes.

### **B] Actual Measurement and Data Analysis**

This step involves actual site measurement and field trials using various portable measurement instruments. It also involves input to output analysis to establish actual operating equipment efficiency and finding out losses in the system.

### **C] Identification and evaluation of Energy Conservation Opportunities**

This step involves evaluation of energy conservation opportunities identified during the energy audit. It gives potential of energy saving and investment required to implement the proposed modifications with payback period. All recommendations for reducing losses in the system are backed with its cost benefit analysis.



### **Preliminary Survey**

In this Preliminary survey, the auditor may need to know the building envelope and its energy consumption. The data of a building can be obtained from: -

- Building Architectural blueprints.
- Building Air-conditioning blueprints.
- Building Electrical lighting and power drawings.
- Electrical bills and operation logs for the year preceding the audit.
- Air-conditioning manuals and system data.
- ECOs for evaluation, but at an increased need for heavier capital expenditure to realize these opportunities.

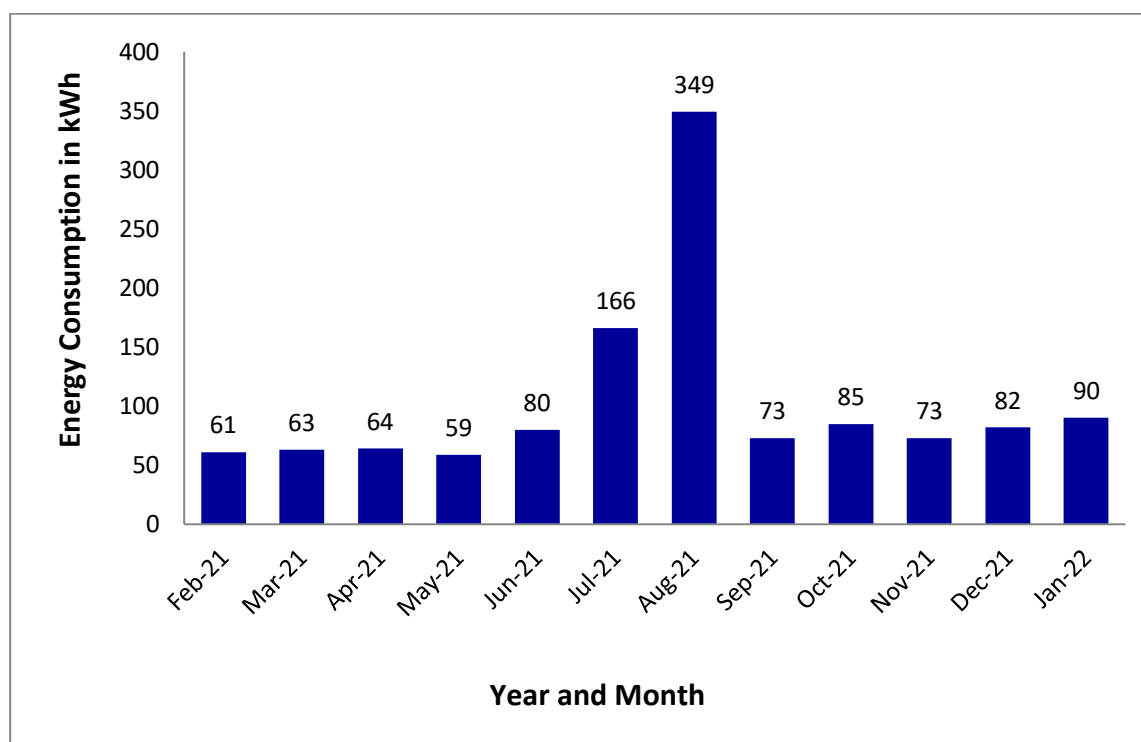
## A] HISTORICAL DATA ANALYSIS

Record of monthly energy consumption of individual meter in Kwh (units) and respective Energy bill in Rupees is given below

Month	Energy Consumption in units	Bill in Rs
February -2021	61	881
March -2021	63	910
April -2021	64	924
May -2021	59	852
June -2021	80	1156
July -2021	166	4310
August -2021	349	300
September -2021	73	960
October -2021	85	1228
November -2021	73	1054
December-2021	82	2936
January-2022	90	1300
Avg.	103.75	Total=16811

### A] Monthly Energy Consumption in units or kWh

Month	Energy Consumption in units
February -2021	61
March -2021	63
April -2021	64
May -2021	59
June -2021	80
July -2021	166
August -2021	349
September -2021	73
October -2021	85
November -2021	73
December-2021	82
January-2022	90
Avg.	103.75



## SOURCE OF ENERGY

Arts and Commerce College, Mayani uses Energy in following forms:

### A] Electricity from MSEDCL

Arts and Commerce College, Mayani receives Electricity from MSEBE

### B] High Speed Diesel (HSD)

HSD is used as a fuel for Diesel Generator which is run whenever power supply from MSEDCL is not available.

The following are the major consumers of electricity in the facility

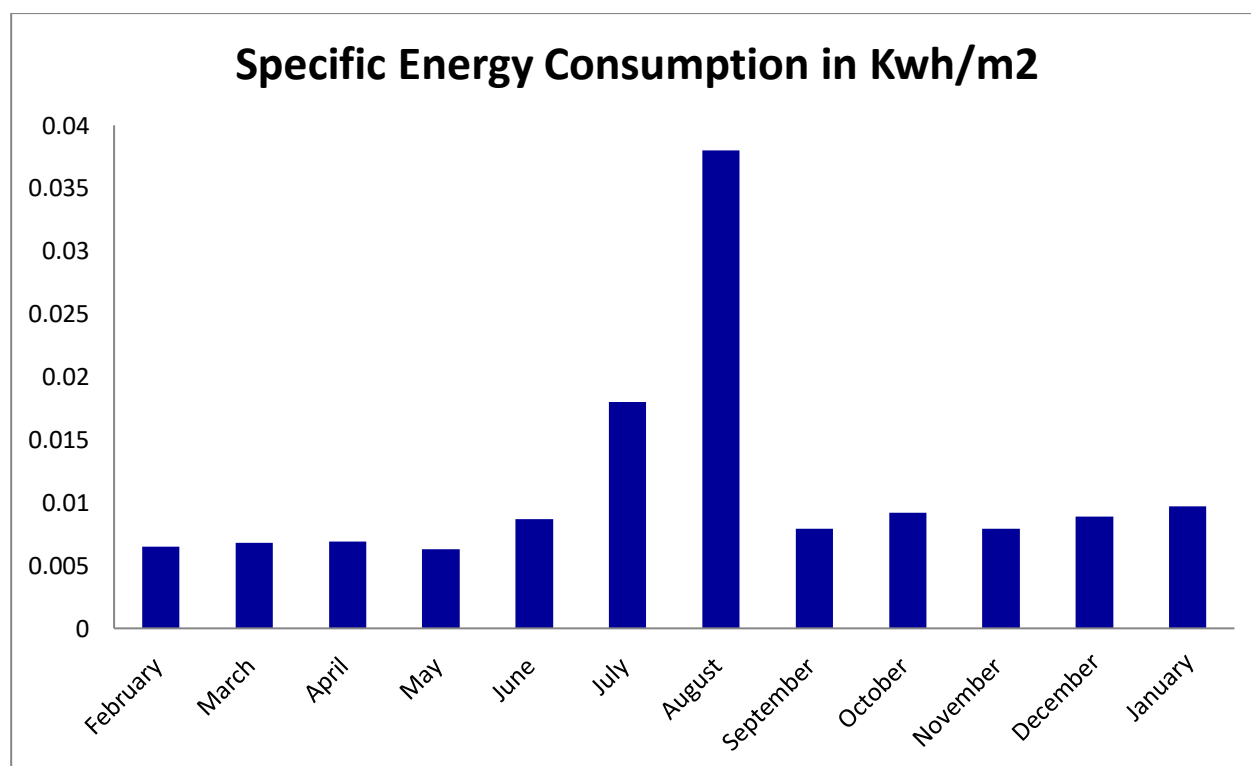
- Computers
- Lighting
- Air-Conditioning
- Fans
- Other Lab Equipment

## SPECIFIC ENERGY CONSUMPTION (SEC)

Specific Energy Consumption (SEC) is defined as energy usage per Square meter of area. it is calculated total electrical kWh/total area of the campus. By calculating SEC, we can crudely target the factors of energy efficiency or inefficiency. SEC for last twelve months was calculated and is as shown in the chart below:

Total College campus Area	6.775 acre
Build up Area	99501.69 Sq.ft or 9244 Sq.m
Specific Energy Consumption	Units/Sq.m

Month	Specific Energy Consumption in Kwh/m <sup>2</sup>	Energy Consumption in units
February	0.0065	61
March	0.0068	63
April	0.0069	64
May	0.0063	59
June	0.0087	80
July	0.018	166
August	0.038	349
September	0.0079	73
October	0.0092	85
November	0.0079	73
December	0.0089	82
January	0.0097	90



## B] STUDY OF ACTUAL MEASUREMENT AND ITS ANALYSIS

### D] ACTUAL MEASUREMENT OF EXISITING EQUIPMENTS:

All required data is collected by Energy Audit Team. In this data, different classifications are done and made survey of the college. In this survey, in every room, how much fans, tubes, fans, computer, instrument AC, etc. will these is measured. According to survey following data is collected

#### A] All Electricity consuming equipment and respective energy consumption in kW

Name of Department	Equipment	Quantity	Actual load in Watt	Total consumption in Watt
Principal cabin	Tube light	1	20	20
	computers	1	200	200
	Wall Fan	1	600	600
Office	Table Fan	2	600	1200
	Tube light	1	20	20
	computers	3	200	600
	Printer	2	200	400
	Wall Fan	1	600	600
	Outdoor Light	1	18	18
	LED Bulbs	2	18	36
	Scanner	1	200	200
Department of Geography	Tube Light	1	20	20
	Projector	1	150	150
	Wall Fan	1	600	600
Library	Tube Light	4	20	80
	Computer	3	150	450
	Printer	1	150	150
	Wall Fan	1	600	600
	Outdoor Light	1	12	12
	Xerox Machine	1	400	400
Gymkhana	LED Bulb	1	12	12
NSS	Table Fan	1	600	600
	LED Bulb	1	9	9
	Computer	1	150	150
	Outdoor Light	1	12	12
	Printer	1	150	150

B.A. II Room No.	CFL Bulb	1	12	12
	Outdoor Light	1	12	12
B.A. II Room No.	Fan	1	1200	1200
	LED Bulbs	1	12	12
B.A. III English Department	Fan	1	75	75
	CFL Bulbs	1	20	20
	Projector	1	150	150
B.A. III Hindi Department	Fan	1	1200	1200
	LED Bulbs	1	20	20
	Projector	1	150	150
Staff Room	Fan	1	600	600
	Tube Light	1	20	20
B.A. III History Department	Fan	1	1200	1200
	Tube Light /CFL Bulb	2	12	24
	Projector	1	150	150
B.A. III Economics Department	Fan	2	1200	2400
	Tube Light /CFL Bulb	2	12	24
	Projector	1	150	150
B.A.I Classroom	Fan	1	1200	1200
	Tube Light /CFL Bulb	6	20	120
B.Sc. I Classroom	Fan	1	1200	1200
	Tube Light /CFL Bulb	2	20	40
B.Sc. II Classroom	Fan	1	1200	1200
	Tube Light /CFL Bulb	2	20	40
B.Sc. III Classroom	Fan	1	1200	1200
	Tube Light /CFL Bulb	2	20	40
Science Lab-4	Fan	8	1200	9600
	Tube Light	8	20	160
Computer Lab	Tube Light	2	20	40
	Computer	15	150	2250
	Printer	1	150	150
	Fan	2	1200	2400
	Outdoor Light	1	12	12
Women's Hostel	Fan	12	1200	14400
	Tube Light	24	20	480
	Outdoor Light	2	20	40
	LED Bulbs	17	12	204

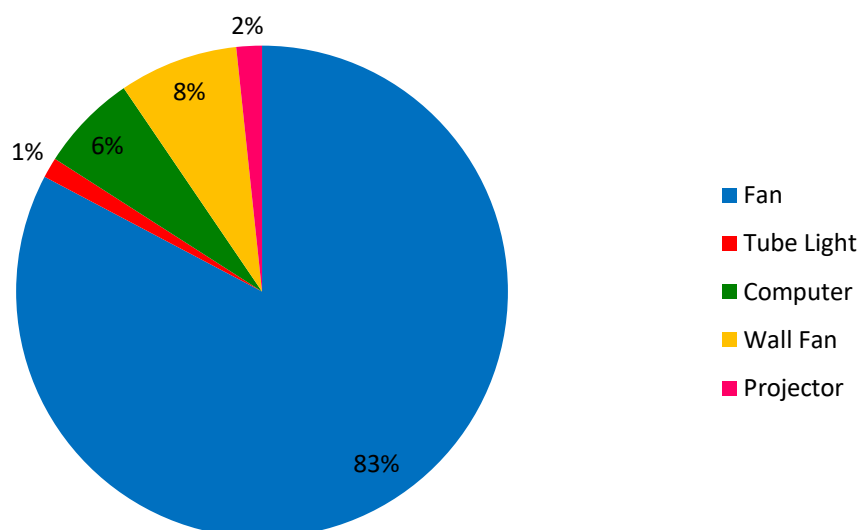


Auditorium Hall	Tube Light	6	20	120
	Fan	2	1200	2400
Ladies Room	Tube Light	1	20	20
	Fan	1	1200	1200
Ladies washroom	LED Bulb	1	12	12
	Outdoor Light	1	12	12
Gents Washroom	LED Bulb	2	12	24
	Outdoor Light	1	12	12
Campus	Street Light	1	200	200
<b>Total</b>	<b>55164</b>			

### **B] Major electricity consuming equipment and respective total load**

<b>Equipments</b>	<b>Quantity</b>	<b>Actual loadin Watt</b>	<b>Total Load in Watt</b>
Fan	37	1200	44400
Tube Light	36	20	720
Computer	23	150	3450
Wall Fan	7	600	4200
Projector	6	150	900
<b>Total</b>	<b>53670</b>		

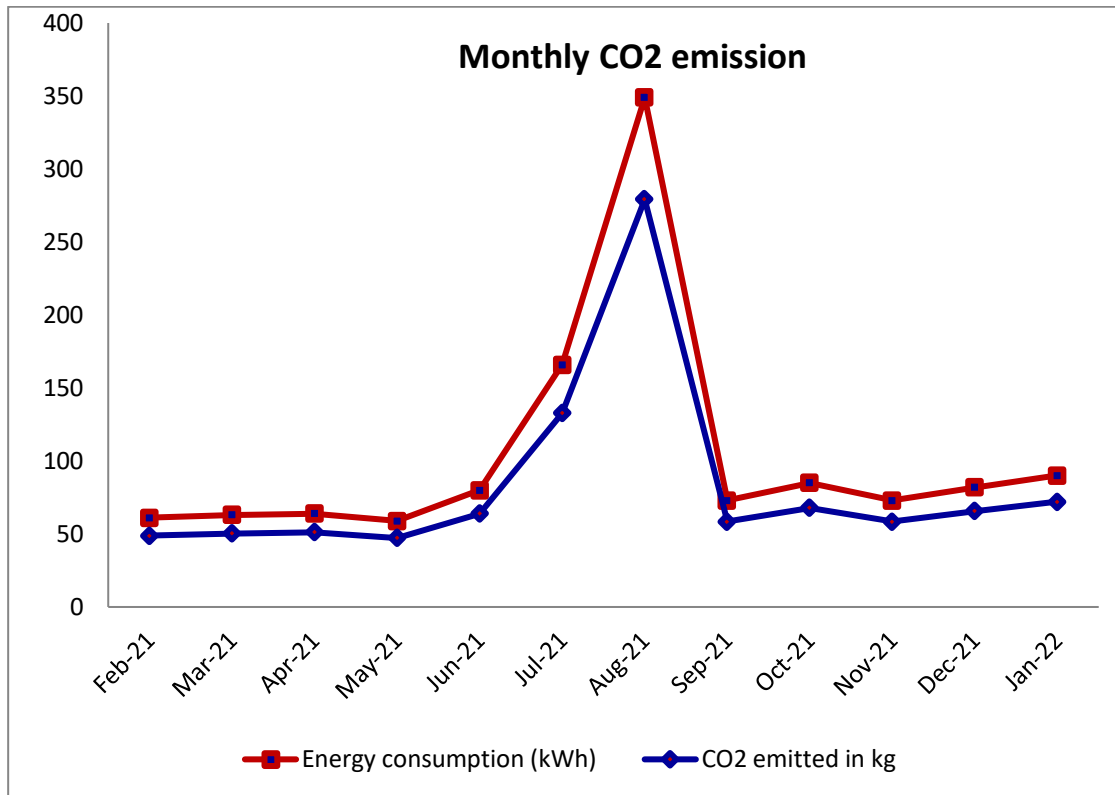
### Total Electrical Load Distribution in College Campus(Watt)



### CARBON- DIOXIDE EMISSION

For consumption of 1 Unit (1 kWh) of Electricity, the CO<sub>2</sub> emitted is 0.8 Kg. OR the Emission is 0.8 Kg/kWh. In the following Table we present the total units consumed and CO<sub>2</sub> emitted as under:

Sr.No.	Month	Energy consumption (kWh)	CO <sub>2</sub> emitted in kg
1	February -2021	61	48.8
2	March -2021	63	50.4
3	April -2021	64	51.2
4	May -2021	59	47.2
5	June -2021	80	64
6	July -2021	166	132.8
7	August -2021	349	279.2
8	September -2021	73	58.4
9	October -2021	85	68
10	November -2021	73	58.4
11	December-2021	82	65.6
12	January-2022	90	72
13.	Avg.	103.75	83



## C] IDENTIFICATION AND EVALUATION OF DATA

The electrical devices which are connected in college campus are not energy saving devices. These devices can be changed by electrical efficient appliances. The appliances are of high watt equipment so the electrical consumption is high in college campus. Now a day's low wattage appliances are used in building. They are helpful in saving electricity.

## ENERGY SAVING CALCULATION



### Providing Solar PV system for part load operations during day time

There are mainly Lighting and Computer loads. Since, there is no separate lighting feeder; it becomes necessary to separate out the lighting feeder for those lights where they are used 6 to 8 hours in a day.

A 3 kW Solar PV is proposed for the Lighting load application with minimum Storage batteries.

The power saved considering the 85% loading = 3 kW

Average Daily available hours = 6 h/day

Electricity Saved =  $6 \times 3 = 18$  kWh/day

Yearly availability = 300 days/year

Yearly savings in electricity =  $300 \times 18 = 5400$  kWh/year

Monetary Savings =  $5400 \times 8 = \text{Rs. } 43200$  / year

Approximate cost of the solar system = Rs. 2.4 lac

Payback Period:  $240000/43200 = 5.5$  Yrs.

Average life of project: 25 Yrs.

Net Saving:  $20 \text{ yrs} \times 43200/\text{yrs.} = 8,64,000/-$

## 8. RECOMMENDATIONS

### General Recommendations

- ✚ All Class Rooms and labs to have Display Messages regarding optimum use of electrical appliances in the room like lights, fans, computers and projectors.
- ✚ All projectors to be kept OFF or in idle mode if there will be no presentation slides. All computers to have power saving settings to turn off monitors and hard discs, say after 10 minutes/30 minutes.
- ✚ The comfort air conditioning temperature to be set between 24°C to 26°C.
- ✚ Lights in toilet area may be kept OFF during day time

### Commercial Recommendations

- ✚ Installation of solar PV panel system of capacity 3 kWh is highly recommended. The total saving through-out the project life is **Rs. 8,64,000/-**
- ✚ Replacement of CRT monitors with LED monitors. It's highly recommended as it will avoid digital eye strain on users.
- ✚ Replacement of Conventional tube lights with LED.

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## 9. CONCLUSION

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Natural resources on earth are limited and consuming very sharply. It can be saved by employing energy efficiency and it is very necessary to prevent depletion of natural resources. The Electrical audit of college buildings shows that the load of electrical equipment's is significant and should be taken some necessary step for reducing energy conservation. Today energy conservation plays a very important role for energy conserving because energy consumption is increasing day by day but the natural resources are not increasing and also generation is not match with consumption People should aware about energy conservation and reduce energy consumption by adopting modern technologies.