

GREEN AUDIT REPORT

(2021-2022)



**Adarsha Science, J. B. Arts & Birla Commerce Mahavidyalaya,
Dhamangaon Rly**

Green Audit Team-

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Report on Green Audit

Green Audit Executive Summary

Colleges and Universities have broad impacts on the world around them, both negative and positive. The colleges are in a unique position to be leaders in providing environmentally sustainable solutions to challenges faced by the society. Green Audit is linked to Sustainable development process. Through Green Audit, one gets a direction as how to improve the condition of environment. The process of green audit involves energy conservation, use of renewable sources, rain water harvesting, and efforts of carbon neutrality, plantation, hazardous waste management, E-waste management etc.

It is necessary to conduct green audit in college campus because students have to be aware about environment through green audit, its advantages to save the planet and thereby get motivated to become good citizens of the country. Green audit and sustainable development process help to reduce wastage and associated cost as well as increase the product quality. 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 relevant.

Green audit can be a useful tool for a college to determine how and where they are using most of energy, water or other 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 can also create health consciousness and promote environmental awareness, values and ethics. It provides staff and students better understanding of the impact of green methods on campus. It gives an opportunity for the development of ownership, personal and social responsibility for the students and teachers.

All across the world, colleges and universities are looking to a sustainable future by working to become carbon neutral. Universities are taking responsibility for their environmental impact and are working to neutralize those effects. To become carbon neutral, universities are working to reduce their emissions of greenhouse gases, reduce their use of energy, use more renewable energy, and emphasize the importance of sustainable energy sources.

Adarsha Mahavidyalaya, Dhamangaon Rly has conducted a green auditing during the period of 2018-2019. After two years we conducted green auditing for the period of 2021-2022 for a sustainable future of the campus. This audit process involved initial interviews with management to clarify policies, activities, records and the co-operation of staff and students in the implementation of mitigation measures. This was followed by staff and student interviews, collection of data through questionnaire, review of records, observation of practices and observable outcomes. In addition, the approach ensured that the management and staff are active participants in the green auditing process in the college.

The findings of this report show that the college performs fairly well on sustainability issues and has made possible rectifications on the previous audit recommendations within a period of two years. The college does consider the environmental impacts of most of its actions and makes a concerted effort to act in an environmentally responsible manner. Even though the college does perform fairly well, the recommendations in this report highlight many ways in which the college can work to improve its actions and become a more sustainable institution.

Chapter I

Introduction

1.1 Green Campus, a Tool for Environmental Protection and Conservation:

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

Considering the present environmental problems of pollution and excess use of natural resources, Hon. Prime Minister, Shri. Narendra Modi declared the Mission of Swachh Bharat Abhiyan. Also, University Grants Commission has mentioned “Green Campus, Clean Campus” mission mandatory for all higher educational institutes. 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.

Green campus is the most efficient ecological tool to solve such environmental problems. It is a process of regular identification, quantification, documenting, reporting and monitoring of environmentally important components in a specified area. Through this process the regular environmental activities are monitored within and outside of the concerned sites which have direct and indirect impact on surroundings. Green audit can be one of the initiative for such institutes to account their energy, water resource use as well as wastewater, solid waste, E-waste, hazardous waste generation. Green Audit process can play an important role in promotion of environmental awareness and sensitization about resource use. It can create consciousness towards ecological values and ethics. Through green audit one can get direction about how to improve the condition of environment.

1.2 Need of Green auditing:

Green auditing is the process of identifying and determining whether institutions practices are eco-friendly and sustainable. Traditionally, we are good and efficient users of natural resources. But over the period of time excess use of resources like energy, water, chemicals are become habitual for everyone especially, in common areas. Now, it is necessary to check whether our processes are consuming more than required resources? Whether we are handling waste carefully? Green audit regulates all such practices and gives an efficient way of natural resource utilization. In the era of climate change and resource depletion it is necessary to verify the processes and convert it in to green and clean one. Green audit provides an approach for it. It also increases overall consciousness among the people working in institution towards an environment.

1.3 Goals of Green audit:

College has conducted a green audit with specific goals as:

1. Identification and documentation of green practices followed by college.
2. Identify strength and weakness in green practices.
3. Conduct a survey to know the ground reality about green practices.

4. Analyze and suggest solution for problems identified from survey.
5. Assess facility of different types of waste management.
6. Increase environmental awareness throughout campus.
7. Identify and assess environmental risk.
8. Motivates staff for optimized sustainable use of available resources.
9. The long term goal of the environmental audit program is to collect baseline data of environmental parameters and resolve environmental issue before they become problem.

1.4 Objectives of Green audit:

1. To examine the current practices which can impact on environment such as of resource utilization, waste management etc.
2. To identify and analyse significant environmental issues.
3. Setup goal, vision and mission for Green practices in campus.
4. Establish and implement Environmental Management in various departments.
5. Continuous assessment for betterment in performance in green practices and its evaluation.
6. To prepare an Environmental Statement Report on green practices followed by different departments, support services and administration building.

1.5 NAAC criteria VII Environmental Consciousness:

Colleges are playing a key role in development of human resources worldwide. Higher education institutes campus run various activities with aim to percolate the knowledge along with practical dimension among the society. Different types of evolutionary methods are used to assess the problem concerning environment. It includes Environmental Impact Assessment (EIA), Social Impact Assessment (SIA), Carbon Footprint Mapping, Green audit etc.

National Assessment and Accreditation Council (NAAC) which is a self-governing organization that awards the institutions with a Grade according to the scores assigned at the time of accreditation of the institution. Green Audit has become mandatory procedure for educational institutes under Criterion VII of NAAC. The intention of green audit is to upgrade the environmental condition inside and around the institution. It is performed by considering environmental parameters like water and wastewater accounting, energy conservation, waste management, air, noise monitoring etc. for making the institution more eco-friendly.

Students are the major strength of any academic institution. Practicing green actions in any educational institution will inculcate the good habit of caring natural resources in students. Many environmental activities like plantation and nurturing saplings and trees, Cleanliness drives, Bird watching camps, No vehicle day, Rain water harvesting, etc. will make the students good citizen of the country. Through Green Audit, higher educational institutions can ensure that they contribute towards the reduction of Global warming through Carbon Footprint reduction measures.

1.6 Benefits of Green Audit to an Educational Institute:

There are many advantages of green audit to an Educational Institute:

- It would help to protect the environment in and around the campus.
- Recognize the cost saving methods through waste minimization and energy conservation.
- Find out the prevailing and forthcoming complications.
- Empower the organization to frame a better environmental performance.
- It portrays good image of institution through its clean and green campus.
- Finally, it will help to build positive impression for through green initiatives the upcoming NAAC visit.

1.7 About College-

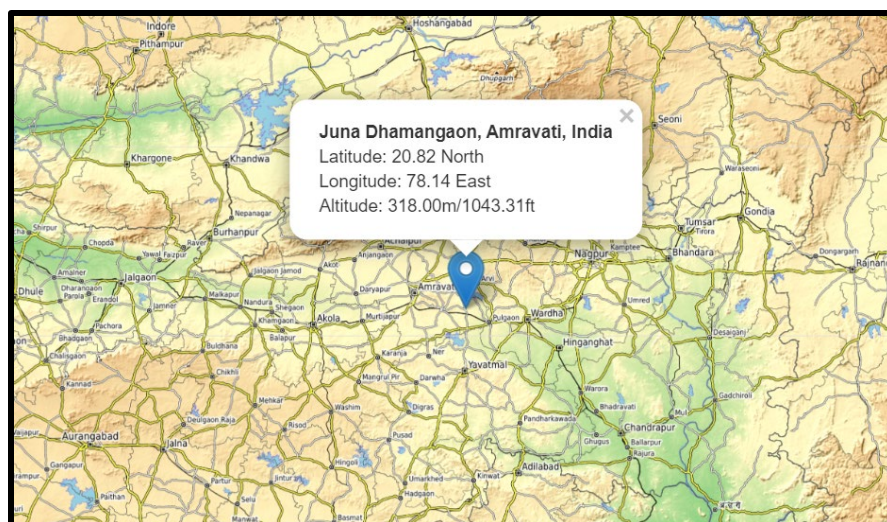
The college was established in the year 1961 under the aegis of Dhamangaon Education Society- one of the oldest institutions in Vidarbha Region catering to the needs of education since 1914. Situated on its own spacious campus on Anjansingi Road, it is affiliated to Sant Gadge Baba Amravati University, Amravati. It offers instructions through English and Marathi medium. The teaching departments are manned by competent staff and are provided with modern, well-equipped laboratories. The administrative section is computerized, so that maintenance and retrieval of records has become easier.

In 1961, this college started with the faculty of Arts & Commerce. However, Science faculty was added later in the year 1972. Presently, this college is a multidisciplinary one, with B.A., B.Com.(Marathi and English medium), B.Sc., B.C.A., M.A. (Economics), M.Com. M.C.M., M.Sc. in Mathematics, Microbiology, Zoology and Electronics, Ph.D. in Botany, Zoology, Mathematics, Microbiology, Electronics and Commerce. Junior College of Science, Arts & Commerce education. The college is a pioneer to start Microbiology & Computer education in entire Vidarbha region since 1979 and 1987 respectively. College offers Computer Science as one of the electives in faculty of Science & Commerce. Career Oriented Courses like- Web Designing and Office Automation, Clinical Laboratory Technology are also available. Information Technology (IT) as an elective subject is offered at Junior College level. A faculty in Computer Centre is also available where various short-term courses are organized frequently. It was also a recognized Network Access Centre (NAC) for MS-CIT course of state Government.

Students of this college come out with flying colours which of course is a prestigious factor. Our students have brought laurels by fetching prizes, even topping the list, at National Level Essay Competition organized by Bhabha Atomic Research Centre, Mumbai during last few years. It may not be out of place to add here that probably this is the only college in the region participating in this National Level Competition consistently since 1996.

The department of Games & Sports is very active. It is due to their able guidance and constant efforts many of the students could shine in various events. Students are not only selected in university teams but also in District, State level teams.

Geographical Location of the college:



Administrative building, Adarsha Mahavidyalaya, Anjansingi Road, Dhamangaon Rly

Building Block A	Administrative Building, Chemistry, Zoology, Botany, Physics, Electronics, Mathematics, Microbiology and Science Class rooms and departments
Building Block B	Political Science, Sociology, Economics, History, Marathi, English and Sanskrit Class rooms, Library
Building Block C	Commerce and Management class rooms, History and Economics department
Building Block D	Commerce Department, Indoor stadium, Auditorium, Sport and Gym, IQAC centre, Canteen,

Chapter II

Methodology

2.1 Background of Adarsha Mahavidyalaya Green Audit preparation:

This is being the first attempt to conduct Green Audit of Adarsha College, Dhamangaon Rly campus; the report not only includes the data regarding the use of resources but also highlights the biodiversity status of College. The resource utilization of Water and Electricity, Solid waste generation, E waste, Hazardous waste, Noise and Air monitoring, wastewater generation etc. on college campus are studied through this Green Audit process. Besides, these observations, the report also includes the information about the social responsibility taken by college.

The audit process was carried out in three phases. At first, all the secondary data required for the study was collected from various sources, like concerned departments as arts, commerce, science, garden etc. A broad reference work was carried out to clear the idea of green auditing. Different case studies and methodologies were studied and the following methodology was adopted for present audit. The methodology of present study is based on onsite visits, the personal observations and questionnaires survey tool. Initially, based on data requirement, sets of questionnaires were prepared. The surveyors then visited all the departments of the college and the questionnaires were filled. The generated data is subsequently gathered and used for further analysis. From the outcome of the overall study, a final report is prepared.

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

2.2 Survey by Questionnaire:

Baseline data for green audit report preparation was collected by questionnaire survey method. Questionnaires prepared to conduct the green audit in the college campus is based on the guidelines, rules, acts and formats prepared by Ministry of Environment, Forest and Climate Change, New Delhi, Central Pollution Control Board and other statutory organizations. Most of the guidelines and formats are based on broad aspects and some of the issues or formats were not applicable for college campus. Therefore, using these guidelines and formats, combinations, modifications and restructuring was done and sets of questionnaires were prepared as solid waste, energy, water, hazardous waste, and e-waste. All the questionnaires comprises of group of modules. The first module is related to the general information of the concerned department, which broadly includes name of the department, month and year, total number of students and employees, visitors of the department, average working days and office timings etc. The next module is related to the present consumption of resources like water, energy, or the handling of solid and hazardous waste. Maintaining records of the handling of solid and hazardous waste is much important in green audit.

There are possibilities of loss of resources like water, energy due to improper maintenances and assessment of this kind of probability is necessary in green audit. One separate module is based on the questions related to this aspect. Another module is related to maintaining records, like records of disposal of solid waste, records of solid waste recovery etc. For better convenience of the surveyor, some statistics like, basic energy consumption characteristics for electrical equipment etc. was provided with the questionnaires itself.

2.3 Onsite visit and observations:

The Adarsha Mahavidyalaya has vast built up area comprising of various departments, administrative building, teachers and staff room, IQAC centre, Auditorium, Indoorstadium, sports complex and garden. All these amenities have different kind of infrastructure as per their requirement. All these buildings were visited by the surveyors and the present condition is checked with the help of the questionnaires. Personal observations were made during the onsite visit. All the amenities were clubbed in as per their similarities and differences, which makes the survey and further analysis easier. For the data compilation purpose the college Departments and support services were clubbed into Four Blocks and given coding as Building Block A, Building Block B, Building Block C and Building Block D. The details of the Blocks are as follows:

Table No. 2.1 Details of each block including the various departments

Sr. No.	Name of the Building Block	Code
1	Administrative and Science Block	Building Block A
2	Arts and Library Block	Building Block B
3	Commerce Block	Building Block C
4	Support Services	Building Block D

After collection of secondary data, the reviews related to each environmental factor were taken by the green audit team. The data was tabulated, 9 analysed and graphs were prepared using computer. Depending upon the observations and data collected, interpretations were made. The lacunas and good practices were documented. The Environmental Management Plan (EMP) was prepared for the next academic year in order to have better environmental sensitization. Finally, all the information was compiled in the form of Green Audit Report.

2.4 Data analysis and final report preparation:

A proper analysis and presentation of data produced from work is a vital element. In case of green audit, the filled questionnaires of the survey from each group, were tabulated as per their modules, in Excel spreadsheets. The tabulated data is then used for further analysis. For better understanding of the results and to avoid complications, averages and percentages of the tables were calculated. Graphical representation of these results was made to give a quick idea of the status. Interpretation of the overall outcomes was made which incorporates all the primary and secondary data, references and interrelations within. Final report preparation was done using this interpretation.

Table No. 2.1 Categorisation of college departments and support services at Adarsha College Campus.

Building Block A	Administrative Building, Chemistry, Zoology, Botany, Physics, Electronics, Mathematics, Microbiology and Science Class rooms and departments
Building Block B	Political Science, Sociology, Economics, History, Marathi, English and Sanskrit Class rooms, Library
Building Block C	Commerce and Management class rooms, History and Economics department
Building Block D	Commerce Department, Indoor stadium, Auditorium, Sport and Gym, IQAC centre, Canteen,

Chapter III

Water and Wastewater Audit

Water which is precious natural resource available with fixed quantum. The availability of water is decreasing due to increasing population of nation, as per capita availability of utilizable water is going down. Due to ever rising standard of living of people, industrialization, urbanization, demand of fresh water is increasing day by day. The unabated discharge of industrial effluent in the available water bodies is reducing the quality of these ample sources of water continuously. Hence, the national mission on water conservation was declared by the then Hon. Prime Minister Narendra Modi as 'Jal Shakti Abhiyan' and appealed to all citizens to collectively address the problem of water shortage, by conserving every drop of water and suggested for conducting water audit for all sectors of water use. Water audit can be defined as a qualitative and quantitative analysis of water consumption to identify means of reducing, reusing and recycling of water. Water Audit is nothing but an effective measure for minimizing losses, optimizing various uses and thus, enabling considerable conservation of water in irrigation sector, domestic, power and industrial as well. A water audit is a technique or method which makes possible to identify ways of conserving water by determining any inefficiencies in the system of water distribution. The measurement of water losses due to different uses in the system or any utility is essential to implement water conservation measures in such an establishment.

3.1 Importance of Water Audit:

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

It is observed that a number of factors like climate, culture, food habits, work and working conditions, level and type of development, and physiology to determine the requirement of water. The community which has a population between 20,000 to 1,00,000 requires 100 to 150 liters per person (capita) per day. The communities with a population can consume over 1, 00,000 requires 150 to 200 liters person (capita) per day. As per the standards provided by WHO Regional office for South East Asia Schools require 2 liters per student; 10-15 liters per student if water-flushed toilets, Administration requires (Staff accommodation not included) 50 liters per person per day, Staff accommodation requires 30 liters per person per day and for sanitation purposes it depends on technology.

3.2 Water Audit:

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

- Measurement
- Calculations
- Audit Observation
- Report
- Discussion

- Planning and Process
- Finalization
- Implementation
- Zeroing on conservation
- steps that can be taken

3.3 Study Area:

Dhamangaon Railway is a tehsil place and municipal council of Amravati district in the state of Maharashtra. Dhamangaon Railway lies between 20°46'00" N to 20°46'00" N latitude and 78°10'00" E to 78°10'00" E / 20.7667; 78.1667 longitude. It is situated at an average elevation of 291 metres. The main water sources of Dhamangaon railway are river water, well or hand pump and dug well waters.

Water Quality Assessment

Water samples from four different locations were collected and analyzed for its quality parameters. The samples includes two well water which are the main water source of the college campus and two tap water samples which is used for canteen and drinking water cum cooler systems. The samples were collected, preserved and transported to school of Environmental Sciences and analyzed for various physio-chemical parameters. The major parameters analyzed include dissolved oxygen, acidity, alkalinity, chloride, hardness, pH, conductivity, total dissolved solids and salinity. The results are presented in the Table 1. The results are comparable with the values of drinking water standards prescribed by different agencies.

Table 1. Results of water quality

Parameters	Well water	Water filter	Standard value (BIS)
Temperature °C	25	25	25
Turbidity (NTU)	0.02	0.01	5-15
Alkalinity (mg/l)	280	40	200
Chloride (mg/l)	20	10	250
Hardness (Total)	216	36	200
Conductivity (µs)	903	249	
pH	7.2	7.9	6.5-8.5
Total Dissolved Solids (ppm)	587	162	500
Fluoride mg/l	1.0	0.6	1-1.5
Nitrate mg/l	56	27	45
Iron mg/l	0.07	0.02	0.3
Calcium mg/l	90	8	75-200
Magnesium mg/l	3.8	3.8	30-100
Sodium mg/l	49	13	200
Chloride mg/l	20	10	250-1000
Sulphate mg/l	68	26	200-400
Total coliform	-	-	0
Fecal coliform	-	-	0

Waste management

Waste management is important for an eco-friendly campus. In a college different types of wastes are generated, its collection and management are very challenging. The following data provide the details of the waste generated and the disposal method adopted by the college.

Total number of stakeholders in the college: 3025

Total number of building (Departments, Class rooms, canteen, office, auditorium, library etc): 12

Table . Different types of waste generated in the college and their disposal

Types of waste	Particulars	Disposal method
E-Waste	Computers, electrical and electronic parts	Direct selling
Plastic waste	Pen, Refill, Plastic water bottles and other plastic containers, wrappers etc	Direct selling, Eco brick plant carry,
Solid wastes	Damaged furniture, paper waste, paper plates, food wastes	Reuse after maintenance energy conversion
Chemical wastes	Laboratory waste	Neutralise with water
Waste water	Washing, urinals, bathrooms	Soak pits
Glass waste	Broken glass wares from the labs	Direct selling

Water Management

The source of water used in the College are one wells present in the campus. These wells are recharging with rainwater from the roof. A total of 9000L of water is pumped out from the well every day (Table 2). Wastage of water from the lab is reduced by adopting microscale analysis. An average of 180,000 L of water is used by the College per month.

Sr. No.	Parameter	Response
1	Source of water	Well
2	No of Wells	01
3	No of motors used	02
4	Horse power – Motor	1-1HP, 2- 1HP
5	Depth of well –Total	12 meter
6	Water level	06 meter
7	Number of water tanks	13
8	Capacity of tank	1000 L-07 2000 L-01 500 L-02
9	Any water wastage/why?	Nil
10	Water usage for gardening	1000 L/day
11	Waste water sources	Lab, Canteen
12	Use of waste water	Rain water use as distilled water for practical
13	Any wastewater treatment for lab water	Nil
14	Whether any green chemistry method practiced in labs	“Micro scale analysis “is implemented for Chemistry students
15	Rain water harvest available?	Yes

16	No of units and amount of water harvested	02
17	Any leaky taps	No
18	Amount of water lost per day	Nil
19	Any water management plan used?	Water management audit conducted
20	Any water saving techniques followed?	Water harvesting

Soil Quality assessment

Soil samples were collected from four locations of the campus and analysed for the basic parameters. The results are tabulated and presented in the table.

Parameter	Normal	Result	Remark
pH	6.5-7.5	8.10	Medium basic
EC	0-1	0.32	Normal
Total organic carbon (%)	0.40-0.60	0.42	Medium
Phosphate (kg/hector)	14-21	22.50	Much Normal
Potassium (kg/hector)	150-200	1236.48	Very high
Nitrogn (kg/hector)	280-420	132.50	Very low
CaCO ₃	2.5-5.0	20.18	Very high
Ca	4-9.99	32.96	High
Mg	0.50-3.99	20.84	High
Na	5-15	29.09	High

Waste management Practices adopted by the college -

For the last few years, college is following zero organic waste protocol throughout the campus. The food waste generated by the students and staffs are taken by them to their own home, so that, minimum waste is generated inside the campus. Leaf litters waste and other plant waste were used to fed in the vermin-compost pit and the resulting vermin-cast is used as manure in the garden. The chemicals from the laboratories are disposed in a sealed tank along with water, so that the chemicals undergo neutralization with the water.

A. Waste Management

1. Solid Waste Management

E – Waste Management:

Waste management is important for an eco-friendly campus. In college different types of wastes are generated, its collection and management are very challenging. The following data provide the details of the e - waste generated and the disposal method adopted by the college. Total number of Regular stakeholders in the college: 2864

Total number of Regular stakeholders in the college: 2864	
Total number of Places in the college as a source of E - Waste (Different Departments, Class rooms, Canteen, Administrative office, Auditorium, Library etc):	12

Different types of waste generated in the college and their disposal		
Types of waste	Particulars	Disposal Method
E-Waste	Computers, electrical and electronic parts	Direct Selling/Replacing with the new units from different vendors.

1. Organic Biodegradable Waste:

Vermicompost Unit:

Our college has Vermicompost unit for collection of garbage in it. It is biocompatible and of natural origin. Using this Mechanism whole degradable organic waste like leaf litter of the college can be recycled. Vermicompost which is formed after the activity of the Earthworms in the Vermicompost Unit is utilized as a replacement of Chemical fertilized in the college premises.

Compost Unit:

It has been estimated that Plant leaf litter and other organic waste of the college comprises near about 70 to 75 % of the total college solid waste. This biodegradable waste can be recycled by taking use of microorganism-based degradation and excellent quality of green compost can be made, this compost can be use as a replacement of harmful chemical fertilizers for college garden plants and for other plants in the college premises. For this, college has constructed natural composting units in the college Botanical Garden and at another accessible place. All the staff members, students, workers are strictly advised to make use of this composting unit in regular basis.



Vermicomposting Unit



Simple Compost Unit

2. Dust Bins in the College Premises

In our college campus all the laboratories, cabin and corridor are having dustbins. Laboratories are having separate dustbins for dry and wet wastage. The use of dustbins maintains garbage free campus.

3. No use of Plastic in College Canteen

Our canteen uses paper plates, newspapers, utensils so as to control the use of plastic on the college campus. It has helped in keeping the campus plastic free.

4. Use of Dust Proof Chalks

In our college some classrooms and laboratories are fitted with white board and at other places dust free chalks are used.

5. Minimum use of Photocopy and Printing

In the college paper data is converted into soft copies and procedures are digitalized which minimizes the use of printing papers. We also put Instruction banners on each Photocopy/ Printing machine to use. The maximum working procedures are paperless. We take the

already one-sided Photocopy papers in use to avoid the maximum use of papers. Only justifiable printing is allowed in the college.

6. Single Use Plastic:

Department of Botany in association with NSS unit has arranged many programs to create awareness among students, college staff and peoples of the society about serious consequences of plastic and its effect on sustainability of resources. College has arranged Cycle Rallies, Pathanaty, Slogan Campaign, Poster competitions etc.



7. Eco Brick Program

Department of Commerce and NSS Unit of the college collectively organized this campaign for environment protection since academic year 2018. Plastic bottles are made filled with pieces of plastic waste and converted into Eco- Bricks. These Plastic filled bottles are used as a brick during construction work in the college premises and all plastic which cannot be degraded naturally will be permanently fitted at the construction site. For this purpose, all the students of the college including teaching, non-teaching staff are requested to bring household plastic filled in the plastic bottles and at college level they have been converted into “Eco-Bricks”.

During previous two years, near about 850 Kg of plastic is converted into eco bricks and used during construction work in the college.

Up till now, Plant carry has been constructed using these eco bricks and in front of Commerce Department, Eco brick Tank has been constructed for the plantation for shrubs to increase aesthetic value of the premises.

“Eco Brick Campaign”



2. Sewage Water Management

College authority has identified many sources which are responsible for production of sewage water. They are as follows

SN	Sewage Water Source	Number	College block
1	Drinking water Places	04	A
2	College Common Urinal	01	B
3	Girl's Common Room	02	B
4	Boys Common Urinal	01	Separate
5	College Common Toilet	01	C
6	College Departmental Toilet	07	D
7	Wash Basins	15	Whole College

It has been estimated that 500 liters / day sewage water has been produced by these sources in the college premises. Most part of this sewage water is deviated towards the septic tanks and some part of it is directed towards Soaking Pits that has been constructed at each source of sewage water for the conservation of the water instead of discharging that water directly into the environment. Other attempts have been made to provide this reusable water to the plants around the college campus for its reuse.



Sewage water is discharged directly underground of to the plants

B. Soil Management

8. Vermicomposting Unit

Our college has Vermicompost unit for collection of garbage in it. It is biocompatible and of natural origin. Using this Mechanism whole degradable organic waste like leaf litter of the college can be recycled. Vermicompost which is formed after the activity of the Earthworms in the Vermicompost Unit is utilized as a replacement of Chemical fertilized in the college premises.



Vermicompost Unit Constructed in the College Botanical Garden

9. Soil Erosion

Soil is very important edaphic factor for the whole terrestrial ecosystem. But due to human anthropogenic activities, Erosion of soil is happening very rapidly. College authority has identified vulnerable places in the college premises where soil erosion is likely to be takes place every year due to heavy rain, flood, temperature and deforestation. Special attempt has been made to level up all the upper strata of college campus soil. Expert personals from Gram panchayat Karyalaya, Dhamangaon Rly has been requested to visit the college and leveling and drainage system of the college campus ground has been constructed.

10. No Use of Chemical Fertilizers in the college:

College authority has strictly advised to the all departments of the college along with the respective students, working persons of the college to restrict use of chemical fertilizers during all soil related activities in the college premises. This will help to reduce soil pollution at remarkable level and help to go in organic direction.

C. Tree Plantation

SN	Theme	Location	Plants
1.	Oxygen rich	Throughout the Campus	Tulsi, Pimpal, Neem
2.	Beauty	Front of College Gate	Ficus, Croton, Delonix, Bombax
3.	Medicinal Plants	Campus	Bahava, Adulsa, Tulsi, Ran Korpadi, bael, etc
4.	Climbers	Compound Wall	Madhumalti, Gokarn, Gulvel
5.	Shade	Avenue in the Campus	Teak, Melingtonia, Neem, Bakul, Banyan Tree, Pimpal etc
6.	Avenue	College road	Gulmohar, Amaltash
7.	Palms	Campus	Areca palm
8.	Gymnosperms	Campus	Cycas, Thuja
9.	Pteridophytes	Campus	Nephrolepis

1. Green Cover of the college Campus

SN	Scientific Name	Common/local name	Habit	No. of Plants	Use
1	Cocculus hirsutus	Patalgarudi, Wasanvel	CLIMBER	15	treatment of fever, skin diseases, stomach disorders, urinary diseases and also as a sedative
2	Asparagus racemosus	Shatavari	CLIMBER	50	upset stomach (dyspepsia), constipation, stomach spasms, and stomach ulcers
3	Ipomoea cairica	Railway Creeper	CLIMBER	16	Antioxidant, anti-inflammatory, antiviral and highly potent against malaria.
4	Bignonia venusta	Golden Shower	CLIMBER	1	Treating white patches and infections on the skin (leukoderma, vitiligo).
5	Passiflora incaranta	Krushnkamal	CLIMBER	2	Treating digestive problems, including dyspepsia and diarrhoea; alternatively, it used as an astringent and expectorant for nervous conditions and spasms.

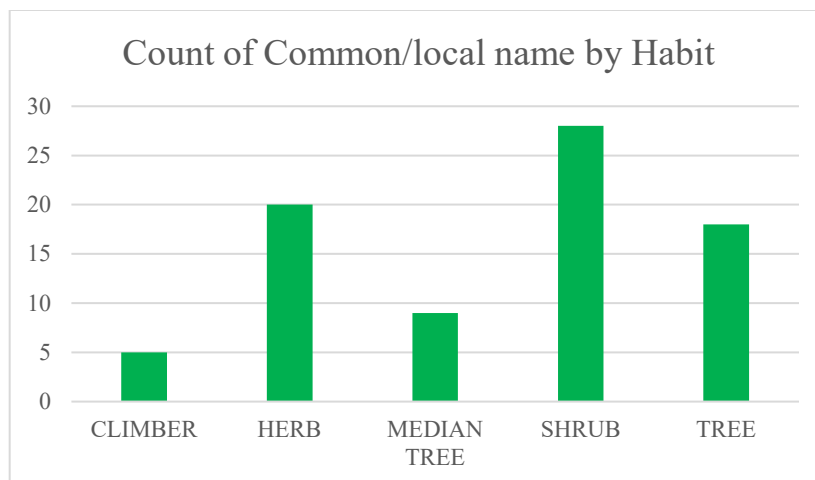
6	Cassia tora	Tarota	HERB	Many	Acrid, laxative, antiperiodic, anthelmintic, ophthalmic, liver tonic, cardio tonic and expectorant.
7	Cleome viscosa	Weed	HERB	Many	rheumatic arthritis, hypertension, malaria, neurasthenia, and wound healing
8	Argemone mexicana	Bilai, Paradi	HERB	Many	Tumors, warts, skin diseases, inflammations, rheumatism, jaundice, leprosy, microbial infections, and malaria.
9	Euphorbia geniculata	Dudhi	HERB	Many	Cancer, skin itches, leprosy, chicken pox, measles, asthma and ulcers.
10	Ziziphus jujuba	Bor	HERB	5	asthma, cough, and laryngitis, constipation, colitis and liver diseases, genitourinary system diseases
11	Tridax procumbens	Kambarmodi	HERB	Many	Wound healing and as an anticoagulant, antifungal, and insect repellent.
12	Parthenium hysterophorus	Gajargawat	HERB	Many	Remedy for skin inflammation, rheumatic pain, diarrhoea, urinary tract infections.
13	Thespesia populnea	Paras Pimpal	HERB	20	Antifertility, antibacterial, anti-inflammatory, antioxidant, purgative and hepatoprotective activity.
14	Bauhinia sp	Apta	HERB	Many	
15	Hyptis suaveolens	Jangli Tulas	HERB	Many	treat inflammation, gastric ulcer and infection
16	Trichodesma zeylanicum	Camel Bush	HERB	Many	Leaves and root infusion is used as a remedy for intestinal worms, coughing, itching and throat pain.
17	Ocimum sanctum	Tulas	HERB	Many	aiding cough, asthma, diarrhea, fever, dysentery, arthritis, eye diseases, indigestion, gastric ailments, etc

18	<i>Ageratum conyzoides</i>	Mahakua	HERB	Many	to treat fever, rheumatism, headache, colic, wounds caused by burns, dyspepsia, eye problem, uterine disorders and pneumonia
19	Aloe vera	Korfad	HERB	Many	Medicinal, Skin Problem, Cosmetic, Acidity, Stomach Related Problems
20	<i>Bryophyllum indicum</i>	Panfuti	HERB	10	eaten for diabetes, diuresis, dissolving kidney stones, respiratory tract infections, as well as applied to wounds, boils, and insect bites
21	<i>Symbopogon</i> sp	Gawati Chaha	HERB	2	antispasmodic, hypotensive, anticonvulsant, analgesic, antiemetic, antitussive, antirheumatic, antiseptic and treatment for nervous and gastrointestinal disorders and fevers.
22	<i>Heliconia rostrata</i>	Fishtail	HERB	12	cure jaundice, intestinal pain and hypertension
23	<i>Lilium indicum</i>	Lily	HERB	8	heart problems including heart failure and irregular heartbeat
24	<i>Hymenocallis littoralis</i>	Spider Lily	HERB	6	wound healing. To treat blemishes and freckles the plant is used as folk remedy.
25	<i>Tegetes erecta</i>	Piwala Zendu	HERB	20	Ornamental
26	<i>Cassia siamea</i>	Kassod	MEDIAN TREE	2	Typhoid, jaundice, abdominal pain, menstrual pain
27	<i>Alstonia scholaris</i>	Saptaparni	MEDIAN TREE	8	Rheumatism, leprosy, diarrhoea, tuberculosis,
28	<i>Pongamia pinnata</i>	Karanj	MEDIAN TREE	15	Rheumatism, Cough, Skin Disease
29	<i>Butea monosperma</i>	Palas	MEDIAN TREE	2	Astringent antidiarrheal antidyenteric febrifuge aphrodisiac purgative anthelmintic
30	<i>Thuja occidentali</i>	Thooja	MEDIAN TREE	10	Ornamental
31	<i>Acacia leucofholoea</i>	Hewar	MEDIAN TREE	5	astringent, a bitter, a thermogenic, a styptic, a preventive of infections

32	<i>Leucaena leucocephala</i>	Subabhul	MEDIAN TREE	20	stomach diseases, facilitate abortion and provide contraction, and it is often used as an alternative, complementary treatment for diabetes
33	<i>Ficus hispida</i>	Fig	MEDIAN TREE	8	inducing purgation and emesis to remove excess pitta dosha from the body.
34	<i>Peltophorum pterocarpum</i>	Sonmohor	MEDIAN TREE	2	Ornamental
35	<i>Bauhinia variegata</i>	Kanchan	SHRUB	5	antibacterial, antidiabetic, analgesic, anti-inflammatory, anti-diarrheal, anticancerous, nephroprotective and thyroid hormone regulating
36	<i>Bougainvillea glabra</i>	Booganvel	SHRUB	6	Stomach aches, inflammation and as an antiseptic. It's also been used to treat diabetes, high blood pressure, and high cholesterol.
37	<i>Nyctanthes arbor-tristis</i>	Parijatak	SHRUB	2	Anti-helminthic and anti-pyretic besides its use as a laxative, in rheumatism, skin ailments and as a sedative.
38	<i>Dalbergia sissoo</i>	Sisam	SHRUB	3	Furniture, musical instruments, decorative items and veneers.
39	<i>Nerium indicum</i>	Kaner	SHRUB	3	Ornamental
40	<i>Murraya koenigii</i>	Kadi patta	SHRUB	5	treating piles, inflammation, itching, fresh cuts, dysentery, bruises, and edema
41	<i>Tabernaemontana divaricate</i>	Swastik	SHRUB	2	hypertension, headaches, scabies, and toothaches
42	<i>Psidium guajava</i>	Jambh	SHRUB	2	inflammation, diabetes, hypertension
43	<i>Punica granatum</i>	Annar	SHRUB	1	treat sore throats, coughs, urinary infections
44	<i>Thevetia nerifolia</i>	Bitti	SHRUB	10	Ornamental
45	<i>Cassia fistula</i>	Bahawa	SHRUB	6	Treatment of inflammatory swellings and as a cleaning agent for ulcers and wounds.

46	<i>Tecoma stans</i>	Tecoma	SHRUB	5	Diabetes and stomach pains; a strong leaf and root decoction is taken orally as a diuretic, to treat syphilis or for intestinal worms.
47	<i>Hibiscus rosa-sinensis</i>	Jaswand	SHRUB	10	Ornamental
48	<i>Caesalpinia pulcherrima</i>	Chhota gulmohar	SHRUB	1	Ornamental
49	<i>Hamelia patens</i>	Hamelia	SHRUB	1	Ornamental
50	<i>Dyopsis lutescens</i>	Areca palm	SHRUB	2	Ornamental
51	<i>Plumeria rubra</i>	Chafa	SHRUB	2	anti-inflammatory, antioxidant, hepato-protective and antimicrobial activities
52	<i>Annona squamosa</i>	Sitafal	SHRUB	3	Vomiting, Tumours
53	<i>Annona reticulata</i>	Ramfal	SHRUB	1	Vomiting, Tumours
54	<i>Lantana camara</i>	Raimoni	SHRUB	Many	Cancer, skin itches, leprosy, chicken pox, measles, asthma and ulcers.
55	<i>Jatropha curcas</i>	Ratnajyoti	SHRUB		Bacterial and fungal infections or febrile diseases, muscle pain or jaundice.
56	<i>Celastrus paniculatus</i>	Jyotishmati, Black Oil Plant, Bharati	SHRUB	86	Sciatica, Amnesia, Leprosy (Juzaam), Pneumonia, Pleurisy, Anaemia (Su -al-Qiniya)
57	<i>Gliricidia sepium</i>	Gliricidia	SHRUB	2	alopecia, boils, bruises, burns, colds, cough, debility, eruptions, erysipelas, fever
58	<i>Abutilon indicum</i>	Indian mallow	SHRUB	Many	laxative, emollient, analgesic, anti-diabetic, anti-inflammatory and blood tonic agent and also in the treatment of leprosy, urinary disease, jaundice, piles
59	<i>Calatropis procera</i>	Rui, Ruchki	SHRUB	Many	Antidote for snake bite, sinus fistula, rheumatism, mumps, burn injuries, and body pain.
60	<i>Yucca sp</i>	Adam's needle	SHRUB	4	Ornamental
61	<i>Ixora chinensis</i>	Jungle Flame	SHRUB	9	As an astringent and to treat dysentery and tuberculosis.
62	<i>Thuja accidentalis</i>	Vidya	SHRUB	28	respiratory tract infections such as bronchitis

63	<i>Ficus benghalensis</i>	Wad	TREE	1	Wound, skin diseases, leucorrhoea, diabetes, diarrhoea etc
64	<i>Ficus religiosa</i>	Pimpal	TREE	1	Cough, skin diseases, vomiting, nausea, sexual potency, diarrhoea
65	<i>Delonix regia</i>	Gulmohar	TREE	2	Chronic fever, constipation, piles, arthritis, pyorrhoea, asthma etc
66	<i>Tamarindus indica</i>	Chinch	TREE	1	Malaria, dysentery, abdominal pain, respiratory problems etc.
67	<i>Tectona grandis</i>	Teak (Saag)	TREE	2	Piles, leukoderma, dysentery
68	<i>Azadirachta indica</i>	Neem	TREE	3	Antifungal, constipation, malaria, detoxification, boosting immunity
69	<i>Kigelia pinnata</i>	Zumber	TREE	3	Wound, abscesses, ulcers, rheumatism
70	<i>Bombax ceiba</i>	Katesawar	TREE	3	Diarrhoea, constipation, piles, Urinary disorder,
71	<i>Polyalthia longifolia</i>	Chota ashok	TREE	12	fever, helminthiasis, diabetes and various cardiac problems
72	<i>Cycas pectinata</i>	Cycas	TREE	4	Ornamental
73	<i>Pithecellobium dulce</i>	English chinch	TREE	1	treat gum ailments, toothache and bleeding
74	<i>Albezia lebbek</i>	Shiras	TREE	2	Jaundice, fever and as a purgative for intestinal worms.
75	<i>Emblica officinalis</i>	Awala	TREE	2	immunomodulatory, anti-inflammatory
76	<i>Aegle marmelos</i>	Bel	TREE	1	Fever, Stomach related problems, treat tuberculosis
77	<i>Acacia nilotica</i>	Babhul	TREE	10	human immunodeficiency virus, hepatitis C virus and cancer
78	<i>Ficus glomerusa</i>	Umbar, Audumbar	TREE		dysentery, spongy gums, ulcers, diabetes, asthma
79	<i>Terminalia belirica</i>	Chinch	TREE	1	protect the liver and to treat respiratory conditions
80	<i>Pterospermum acerifolium</i>	Mujkund	TREE	1	inflammation, abdominal pain, ascites, cures ulcers



D. Biodiversity and threatened / endangered species preservation

1. Seed Ball Campaign

This is very unique campaign organized by the NSS unit in association with Department of Botany for the protection of biodiversity of surrounding environment as well as wild species of the local forest. In this campaign, Seeds of wild, economically, ecologically important plants were collected during month of late April and upto the mid of May and these seeds were properly dried under the sun. With the mixture of cow dung, fertile humus rich soil, water and vermicompost has been made. Randomly seeds of wild plants were mixed with mud balls and ultimately Seeds Balls has been created. These Seed Balls sun dried immediately. Dried seed balls now have some seeds within it. These seed balls distributed amongst the dedicated student of green army and advised to throw them randomly into the wild. It has been found that many plants have been developed on the onset of the monsoon season.



Wild Plant Seeds Collected



Mud Paste mixing with wild plant seeds



Preparation of seed Balls



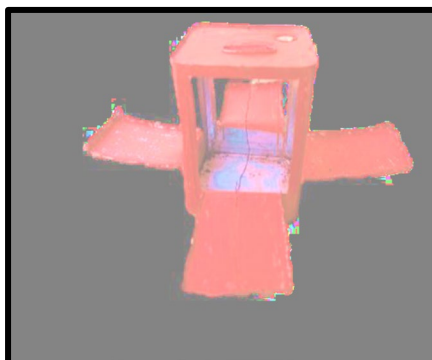
Seed Balls Wet Conditions Coated with cow dung & Sundried Seed Balls



Ready to go into the wild, Germination of Seeds within the Seed Ball

2. “Bird’s Water & Feed Station”

During onset of summer season temperature around get elevated upto 45°C and this is very dangerous conditions for not only humans but also for birds and other creatures. Students of the college has created Bird Water and Feed Station from unused tin barrels of oil. These cans were molded and designed in such a way that they could have birds feed and water filled in it. This nest station also provides excellent landing site specially for birds which make them easy to access food and water. Bird’s Water & Feed Station have been fitted at 20 different places in the college premises under the shade conditions. All the students of the college along with the teaching and non-teaching staff are requested to fill water regularly in these nests along with their food. Since then, it has been observed that many bird species are regularly visiting these nest and feed station.





NSS Students involved in Bird's Water and Feed Station Preparation

E. Noise Pollution

The College has only one entry gate for the all Students, Teachers and Non-teaching staff to enter in the college premises. College authority has appointed well trained security guard for college and this appointed security guard along with the physical director of the college insures safe, smooth and noise free entry of the students and working personals of the college. As college is located on Maharashtra State Highway No -237, front road has very heavy traffic prone to noise pollution during pick hours of the day. To overcome this problem, the front side of the college towards State Highway Road has been intentionally planted with the trees which can absorbs noise as much as possible.

SN	NAME OF THE TREES AT COLLEGE FRONT FENSING	NUMBER
1.	<i>Polyanthia longifolia</i>	28
2.	<i>Bombax ceba</i>	05
3.	<i>Delonix regia</i>	10
4.	<i>Techtona grandis</i>	05
5.	<i>Pongamia pinnata</i>	16
5.	<i>Ficus bengolensis</i>	01
6.	<i>Casia fistula</i>	10
7.	<i>Tamarindus indica</i>	01

F. Air Pollution

1. “Green Army” for Environment protection

College has long term commitment for the environment protection and creating awareness among the society using college resources specially with the college students (Youth). College has created a special team of dedicated students and teachers in the form of Green Army. The students registered their names in the green army and worked for nature and society.



Students of Green Army busy in doing environment protection work

2. Tree Plantation Campaign in College Campus (Yearly)

SN	YEAR OF PLANTATION	NUMBER
1	2019	150
2	2020	100
3	2021	130

3. Oxygen Rich Zones in College Campus

There were 4 oxygen rich zones have been considered in the college premises on the basis of plants located in that particular area. They area as follows.

SN	AREA	Plants
1	College Botanical Garden	Adulsa, Asparagus, Cyanadon Grass, Arica Palm, Heliconia, Himelia, Cycus, Techoma, Water Lily, Spider Lily, Echornia, Pistia etc. Tulsi, Pimpal, Ficus, Pongamia Pinnata
2	Administrative Building	Ashoka, Euphorbia, Thuja, Ficus, Amaltas, Kijelia Pinnata etc
3	Area around Commerce Classroom	Alstonia, Ashoka, Euphorbia, Thuja, Ficus

4	Cycle Stand Towards College Canteen	Pongamia, Boganvelia, Ashoka, Euphorbia, Thuja, Ficus
5	Commerce Department	Pongamia, Amaltash, Shiras, Cherry

4. Awareness Program for college Students, Teacher & Staff

Special awareness program like “Donate RED, Spread GREEN, Save BLUE” has been organized by the NSS Unit of the college to create awareness about the environment protection and its sustainability



Donate RED, Spread GREEN, Save BLUE Campaign

5. “No Smoking” College Campus

To avoid or eliminate air pollution from the college campus, warning boards/ banners has been displayed at the college campus.





“No Smoking” Warning board displayed in the college corridor as a warning sign for students as well as whole college staff members

6. No Vehicle Day

No Vehicle Day has been celebrated throughout the academic year to reduce air pollution in and around college campus. This “No Vehicle Day” is organized on Thursday of every first week Month during whole year. It has been made mandatory for all to come without any vehicle in the college campus like car, motor-bikes except cycles. bicycles. The intention behind this activity to create awareness amongst the students, college staff and peoples of Dhamangaon Rly.

No Vehicle Day



No Vehicle Day in the College Campus

7. Pollution Checkup Using PUC Document

Staff Members and students owning vehicles are advised to check their vehicles for pollution norms and keep your PUC document upto date so as to check air pollution in the college campus.

8. Eco - Ventilators and Exhaust fans in the College laboratories

All the departments of the college are well ventilated and aerated so students can get adequate fresh air supply during their practical. At the same time some departments of the college are fitted with exhaust fans to eliminate hazardous fumes and air released during chemical reactions.

9. Periodic rallies and road shows in the Dhamangaon City

NSS/NCC Units of the college actively remain engaged with the students to arrange different rallies, 'Pathanatya' to create awareness among the society about the serious causes of the pollution.

G. Campus Cleanliness & Sanitization

Special Campus cleanliness drive has been periodically arranged by different departments of the college like NSS / NCC units for campus cleanliness and sanitization purpose. Students of NSS have made dust beans from disposed oil barrels and distributed to all classrooms and departments to collect all kind of waste material at one place. College Overhead Tanks has been periodically cleaned by sweepers so as to make sure that all departments, students and research laboratories getting clean water for their daily use.



SUGGESTIONS AND RECOMMENDATIONS

Water Management

The water sources are safe in terms of contamination. The students are taking back the food waste as per the zero waste management strategy of the college. It helped in reducing the consumption of water for washing.

The wells can be recharged with rainwater from rooftops of new building. The rain water can be harvested from the roof area of new building.

The BMC club can arrange awareness programmes for water conservation. There should be a proper monitoring of water consumption pattern in the campus. BMC can also conduct water quality monitoring during specific intervals.

The canteen waste can also be subjected to aerobic composting by setting-up of few composting yards in the campus. This will provide a chance for the students to learn by seeing and operating such compost yards by themselves. Also a good practice of managing their own waste (from lunch box) instead of carrying them back home they can be trained in operating the compost yard ,by using their lunch time waste to produce good organic manure

Energy management

The energy audit recommend to avoid the use of more energy consuming electrical appliances and to replace with more environment friendly and energy efficient appliances (for example five stars rated Air conditioner) in the college. The potential of renewable energy sources have to be explored. As the college has a very large roof area for installing solar panels so that it can be effectively used for generating power. The college has started steps in installing the solar panels for office. It is recommended to install the following solar powered appliances in the campus; Solar powered water heater and cooker in the college canteen Solar powered street lights and LED display board

Green Campus

In order to increase the carbon credit and greenery of the campus, it is recommended to plant more indigenous and evergreen / fruit trees inside the campus.

Waste Management

Try to avoid the use of plastic in the campus, and to encourage the use of biodegradable materials as alternatives. Try to achieve the goal of plastic free campus. Leaf litter from the campus can be effectively used for vermi composting, so that the composted material can also be used as good manure.

Recycle the paper waste instead of incinerate or burning.

Chapter IV

Energy Audit

Energy Audit Report

(2020 – 21)

For

Dhamangaon Education Society's

Adarsha Science, J. B. Arts and Birla Commerce Mahavidyalaya, Dhamangaon Railway, Dist:Amravati



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Article I. Preface

Data collection for energy audit of the Adarsha Science, J. B. Arts and Birla Commerce Mahavidyalaya, Dhamangaon Rly was conceded by the team for the period of April 2019 to March 2020.

This audit was over sighted to inquire about convenience to progress the energy competence of the campus. All data collected from each classroom, laboratory etc. The work is completed by considering how many tubes, fans, A. Cc., electronic instruments, etc. in each room and their participation in total electricity consumption.

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

Article II. Acknowledgement

We are very much thankful to principal, Dr. Y. B. Gandole and IQAC coordinator, Dr. A. G. Naranje for motivating us and giving us the opportunity for energy audit. We would like to express our sincere thanks to all the faculties and staff members from each department for providing us necessary information and data for this audit survey.

Article III. Introduction

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. It may include a process or system to reduce the amount of energy input into the system without negatively affecting the output.

The energy demand in every institution is growing day by day for to meet the international level comfort. This is challenge for every institution to ensure that energy growth in institute does not become unmanageable. As natural resources are limited and energy uses are increasing 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.

In this energy audit survey, we collected data from every department and then find out the energy consumption in each department. The power consumption is calculated by considering the consumption of various devices such as tube lights, CFL bulbs, LED bulbs, fans, A. Cs. practical laboratory equipment's etc. from each department. The scope for energy conservation is found out by replacing the equipment's with equivalent energy efficient equipment's. The data generated in energy audit are useful for to understand the energy distribution and utilization of the college.

Section 3.01 Department wise Energy Requirement:

1) Department of Physics

Sr. No.	Name of the Appliance	Power Rating (Watt)	Quantity	Average daily usage in hours	Power consumption per day (Watt.Hours)
A	B	C	D	E	$F = C \times D \times E$
1	Tube light (F)	40	9	4	1440
2	CFL bulb	24	2	5	240
3	Ceiling Fans	80	6	6	2880
4	Cooler	300	1	0.5	150
5	PC (LED monitor)	60	3	3	540
6	Printer	500	2	0.2	200
7	Scanner	12	1	0.5	6
8	LCD Projector	300	1	0.5	150
9	Refrigerator (185 L)	1.5KWHr/day	1	1	1500
10	Lab equipment's for practical	300	10	2	6000
11	Microwave Oven	1400	1	0.1	140
12	Muffle Furnace	5000	2	0.1	1000
13	Water Distillation Plant	5000	1	0.1	500
	Total				14746
	Power Requirements in one day				14.746 unit
	Average Power requirement in one year				5382.29 units
	Average power requirement in one month				448.52 units
	Remarks:				
1.	Replacement of Old electric fittings.				
2.	3 -phase connection for furnace and water distillation plant is taken from microbiology lab. Separate 3-phase connection should be provided to avoid power load				

2) Department of Computer Science

Sr. No.	Name of the appliance	Power Rating (Watt)	Quantity	Average daily usage in hours	Power consumption per day (Watt.Hours)
A	B	C	D	E	$F = C \times D \times E$
1	Tube light (F)	40	11	6	2640
2	Exhaust Fan	60	3	2	360
3	Ceiling Fans	80	8	6	3840
4	PC (LED monitor)	60	12	3	2160
5	Laptop	50	1	2	100
6	Printer	500	3	0.5	750
7	LCD Projector	300	2	2	1200
	Total				11050
	Power Requirements in one day				11.05 unit
	Average Power requirement in one year				4033.25 unit
	Average power requirement in one month				336.1 unit

3) Department of Chemistry

Sr. No.	Name of the appliance	Power Rating (Watt)	Quantity	Average daily usage in hours	Power consumption per day (Watt.Hours)
A	B	C	D	E	$F = C \times D \times E$
1	Tube light (F)	40	11	6	2640
2	CFL light	22	1	6	132
3	Exhaust Fan	60	2	0.5	60
4	Ceiling Fans	80	6	4	1920
5	Wall Fan	40	2	4	320
6	PC (LED monitor)	60	4	2	480
7	Scanner	12	1	1	12
8	Printer	500	1	0.5	250
9	LCD Projector	300	1	0.5	150
10	Refrigerator	2 KWHr/Day	1	1	2000
11	Electric Ovens	1000	2	0.25	500
12	Practical Instruments	100	12	0.5	600
	Total				9064
	Power Requirements in one day				9.06 unit
	Average Power requirement in one year				3306.9 unit
	Average power requirement in one month				275.58 unit
	Remarks:				
1	Replacement of electric wiring.				

4) Department of Electronics

Sr. No.	Name of the appliance	Power Rating (Watt)	Quantity	Average daily usage in hours	Power consumption per day (Watt.Hours)
A	B	C	D	E	$F = C \times D \times E$
1	Tube light (F)	40	4	1	160
2	CFL bulb	24	1	1	24
3	Ceiling Fans	80	2	1	160
4	Tabel Fan	40	1	1	40
5	PC (LED monitor)	60	3	2	360
6	Laptop	50	2	1	100
7	Printer	500	1	0.25	125
8	LCD Projector	300	1	0.5	150
	Total				1119
	Power Requirements in one day				1.119 unit
	Average Power requirement in one year				408.44 unit
	Average power requirement in one month				34.04 unit
	Remarks:				
1.	Replacement of Old electric filltings.				

5) Department of Microbiology

Sr. No.	Name of the appliance	Power Rating (Watt)	Quantity	Average daily usage in hours	Power consumption per day (Watt.Hours)
A	B	C	D	E	$F = C \times D \times E$
1	Tube light (F)	40	11	5	2200
2	Ceiling Fans	80	6	5	2400
3	Wall Fan	40	2	4	320
4	Exhaust Fan	60	2	5	600
5	Cooler	300	1	0.5	150
6	PC (LED monitor)	60	3	1	180
7	Scanner	12	1	1	12
8	Printer	500	1	0.5	250
9	LCD Projector	300	2	2	1200
10	Refrigerator	2 KWHr/Day	4	24	8000
11	Electric Ovens	1750	2	1	3500
12	Incubator	0.25 KW/Hr	4	24	24000
13	BOD Incubator	0.25 KW/Hr	1	24	6000
14	Autoclave	2500	3	2	15000
15	Laminar Air flow	1000	1	0.02	20
	Total				63832
	Power Requirements in one day				63.83 unit
	Average Power requirement in one year				23297.95 unit
	Average power requirement in one month				1941.5 unit

6) Department of Zoology

Sr. No.	Name of the appliance	Power Rating (Watt)	Quantity	Average daily usage in hours	Power consumption per day (Watt.Hours)
A	B	C	D	E	$F = C \times D \times E$
1	Tube light (F)	40	10	3	1200
2	Ceiling Fans	80	7	3	1680
3	PC (LED monitor)	60	1	1	60
4	Printer	500	1	0.1	50
5	LCD Projector	300	1	0.2	60
6	Refrigerator	2 KWHr/Day	1	24	2000
7	Electric Ovens	1000	2	0.1	200
8	Autoclave	3000	1	0.05	150
9	Laminar flow hood	500	1	0.05	25
10	Centrifuge	150	1	0.05	7.5
	Total				5432.5
	Power Requirements in one day				5.43 unit
	Average Power requirement in one year				1981.95unit
	Average power requirement in one month				165.16unit

7) Department of Mathematics

Sr. No.	Name of the Appliance	Power Rating (Watt)	Quantity	Average daily usage in hours	Power consumption per day (Watt.Hours)
A	B	C	D	E	$F = C \times D \times E$
1	Tube light (F)	40	1	4	160
2	CFL bulb	24	1	2	48
3	Ceiling Fans	80	1	4	320
4	OHP	300	1	0.5	150
5	PC (LED monitor)	60	1	2	120
6	Laptop	50	1	2	100
7	Printer	500	1	0.5	250
8	LCD Projector	300	1	1	300
	Total				1448
	Power Requirements in one day				1.448 unit
	Average Power requirement in one year				528.52 unit
	Average power requirement in one month				44.04 unit

8) Department of Botany

Sr. No.	Name of the appliance	Power Rating (Watt)	Quantity	Average daily usage in hours	Power consumption per day (Watt.Hours)
A	B	C	D	E	$F = C \times D \times E$
1	Tube light (F)	40	8	6	1920
2	Ceiling Fans	80	5	5	2000
3	PC (LCD monitor)	60	1	0.5	30
4	PC (CRT monitor)	100	1	1	100
5	Laptop	50	1	3	150
6	Printer	500	1	0.5	250
7	LCD Projector	300	1	1	300
8	Refrigerator	1.5KWHr/Day	1	24	1500
9	Electric Ovens	1000	1	0.1	100
10	Autoclave	1000	1	0.1	100
11	Electric Heater	1000	1	0	0
12	Spectrophotometer	500	1	0.1	50
13	Inverter	1000	1	0.5	500
	Total				7000
	Power Requirements in one day				7 unit
	Average Power requirement in one year				2555 unit
	Average power requirement in one month				212.92 unit
	Remarks:				
1	Electric feeting repairing is urgent requirement				
2	Proper earthing is not present				
3	Two more ceiling fans are required				
4	Three more electric boards are required				
5	One desktop PC is required to replace CRT				

9) Department of Commerce

Sr. No.	Name of the appliance	Power Rating (Watt)	Quantity	Average daily usage in hours	Power consumption per day (Watt.Hours)
A	B	C	D	E	$F = C \times D \times E$
1	CFL light	24	4	3	288
2	LED light	20	1	1	20
3	Ceiling Fans	80	5	4	1600
4	PC (LED monitor)	60	19	3	3420
5	Laptop	50	1	4	200
6	Printer	500	2	0.5	500
7	LCD Projector	300	2	1	600
	Total				6628
	Power Requirements in one day				6.63 unit
	Average Power requirement in one year				2419.95unit
	Average power requirement in one month				201.66 unit

10) Department of English

Sr. No.	Name of the appliance	Power Rating (Watt)	Quantity	Average daily usage in hours	Power consumption perday (Watt.Hours)
A	B	C	D	E	$F = C \times D \times E$
1	Tube light	40	4	1	160
2	Ceiling Fans	80	4	1	320
3	PC (LED monitor)	60	10	2	1200
4	Printer	500	2	0.25	250
	Total				1930
	Power Requirements in one day				1.93 unit
	Average Power requirement in one year				704.45 unit
	Average power requirement in one month				58.7 unit

11) Department of social sciences and Humanities

Sr. No.	Name of the appliance	Power Rating (Watt)	Quantity	Average daily usage in hours	Power consumption perday (Watt.Hours)
A	B	C	D	E	$F = C \times D \times E$
1	CFL bulb	24	1	5	120
2	Ceiling Fans	80	1	5	400
	Total				520
	Power Requirements in one day				0.52 unit
	Average Power requirement in one year				189.8 unit
	Average power requirement in one month				15.82 unit
	Remarks:				
1	Required two more lights and fans.				

12) Library

Sr. No.	Name of the appliance	Power Rating (Watt)	Quantity	Average daily usage in hours	Power consumption perday (Watt.Hours)
A	B	C	D	E	$F = C \times D \times E$
1	Tube light	40	26	3	3120
2	CFL light	24	4	2	192
3	LED light	20	4	3	240
4	Ceiling Fans	80	19	2	3040
5	Exhaust Fan	60	1	5	300
6	PC (LED monitor)	60	8	4	1920
7	Printer	500	2	0.5	500
8	Xerox machine	1200	1	4	4800
9	Coolers	300	2	1	600
10	Water cooler	575	1	0	0
	Total				14712
	Power Requirements in one day				14.71 unit
	Average Power requirement in one year				5369.15 unit
	Average power requirement in one month				447.43 unit

13) Department of Physical Education, Indoor stadium, NSS office

Sr. No.	Name of the appliance	Power Rating (Watt)	Quantity	Average daily usage in hours	Power consumption perday (Watt. Hours)
A	B	C	D	E	$F = C \times D \times E$
1	CFL light	24	4	5	480
2	Ceiling Fans	80	4	3	960
3	PC (LED monitor)	60	1	1	60
4	Printer	500	1	0.5	250
	Total				1750
	Power Requirements in one day				1.75 unit
	Average Power requirement in one year				638.75 unit
	Average power requirement in one month				53.23 unit

14) Health Center, NCC office

Sr. No.	Name of the appliance	Power Rating (Watt)	Quantity	Average daily usage in hours	Power consumption perday (Watt.Hours)
A	B	C	D	E	$F = C \times D \times E$
1	Tube light	40	9	5	1800
2	Ceiling Fans	80	6	5	2400
	Total				4200
	Power Requirements in one day				4.2 unit
	Average Power requirement in one year				1533 unit
	Average power requirement in one month				127.75 unit

15) Administration office, Cabin

Sr. No.	Name of the appliance	Power Rating (Watt)	Quantity	Average daily usage in hours	Power consumption perday (Watt.Hours)
A	B	C	D	E	$F = C \times D \times E$
1	Tube light	40	7	6	1680
2	LED light	20	4	6	480
3	Ceiling Fans	80	7	5	2800
4	Wall Fan	40	1	5	200
5	PC (LED monitor)	60	8	3	1440
6	Printer	500	4	0.5	1000
7	A.C.	1000	1	5	5000
8	Coolers	300	1	1	300
	Total				12900
	Power Requirements in one day				12.9 unit
	Average Power requirement in one year				4708.5 unit
	Average power requirement in one month				392.38 unit

16) IQAC

Sr. No.	Name of the appliance	Power Rating (Watt)	Quantity	Average daily usage in hours	Power consumption perday (Watt.Hours)
A	B	C	D	E	$F = C \times D \times E$
1	Tube light	40	3	3	360
2	Ceiling Fans	80	3	3	720
3	PC (LED monitor)	60	1	1	60
4	Printer	500	1	0.25	125
5	Cooler	300	1	0.5	150
	Total				1415
	Power Requirements in one day				1.42 unit
	Average Power requirement in one year				518.3 unit
	Average power requirement in one month				43.19 unit

17) Seminar Hall

Sr. No.	Name of the appliance	Power Rating (Watt)	Quantity	Average daily usage in hours	Power consumption perday (Watt.Hours)
A	B	C	D	E	$F = C \times D \times E$
1	Tube light	40	10	1	400
2	Ceiling Fans	80	7	1	560
3	Laptop	50	1	0.5	25
4	LCD Projector	300	1	0.5	150
5	Sound system	200	1	0.5	100
	Total				1235
	Power Requirements in one day				1.24 unit
	Average Power requirement in one year				452.6 unit
	Average power requirement in one month				37.72 unit

18) Staff room

Sr. No.	Name of the appliance	Power Rating (Watt)	Quantity	Average daily usage in hours	Power consumption per day (Watt.Hours)
A	B	C	D	E	$F = C \times D \times E$
1	Tube light	40	2	6	480
2	Ceiling Fans	80	2	6	960
3	Cooler	300	1	1	300
4	RO system	100	1	5	500
5	Water cooler	2.5 KW.Hr/day	1	24	2500
	Total				4740
	Power Requirements in one day				4.74 unit
	Average Power requirement in one year				1730.1 unit
	Average power requirement in one month				144.18 unit

19) Auditorium

Sr. No.	Name of the appliance	Power Rating (Watt)	Quantity	Average daily usage in hours	Power consumption per day (Watt.Hours)
A	B	C	D	E	$F = C \times D \times E$
1	Tube light	40	4	1	160
2	Ceiling Fans	80	4	1	320
3	Sound system	1000	1	0.2	200
	Total				680
	Power Requirements in one day				0.68 unit
	Average Power requirement in one year				248.2 unit
	Average power requirement in one month				20.68 unit

20) Canteen and Bookshop

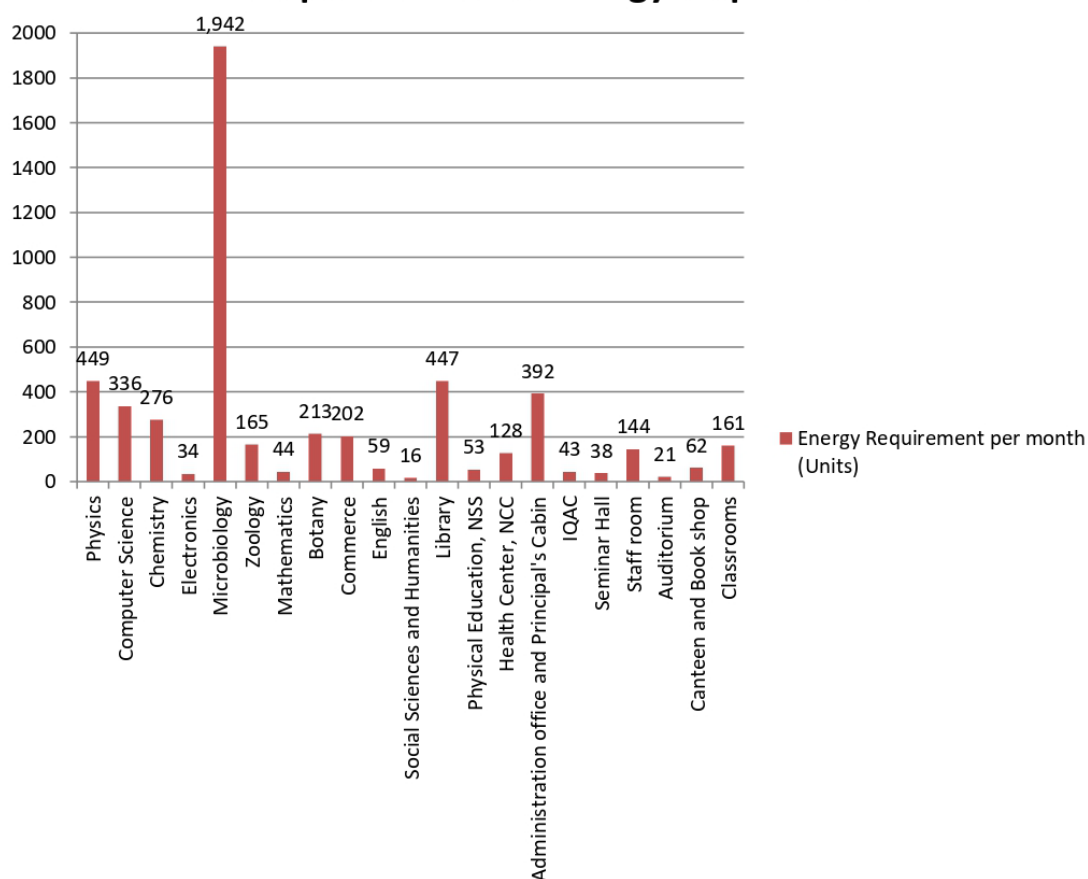
Sr. No.	Name of the appliance	Power Rating (Watt)	Quantity	Average daily usage in hours	Power consumption per day (Watt.Hours)
A	B	C	D	E	$F = C \times D \times E$
1	Tube light	40	3	3	360
2	Ceiling Fans	80	2	3	480
3	Xerox Machine	1200	1	1	1200
	Total				2040
	Power Requirements in one day				2.04 unit
	Average Power requirement in one year				744.6 unit
	Average power requirement in one month				62.05 unit

21) Classrooms

Sr. No.	Name of the appliance	Power Rating (Watt)	Quantity	Average daily usage in hours	Power consumption per day (Watt.Hours)
A	B	C	D	E	$F = C \times D \times E$
1	Tube light	40	10	2	800
2	Ceiling Fans	80	14	4	4480
	Total				5280
	Power Requirements in one day				5.28 unit
	Average Power requirement in one year				1927.2 unit
	Average power requirement in one month				160.6 unit

Note: This is total load consumption considered approximately. Actual load consumption might be different according to actual use of power for particular time period.

Department wise Energy Requirement

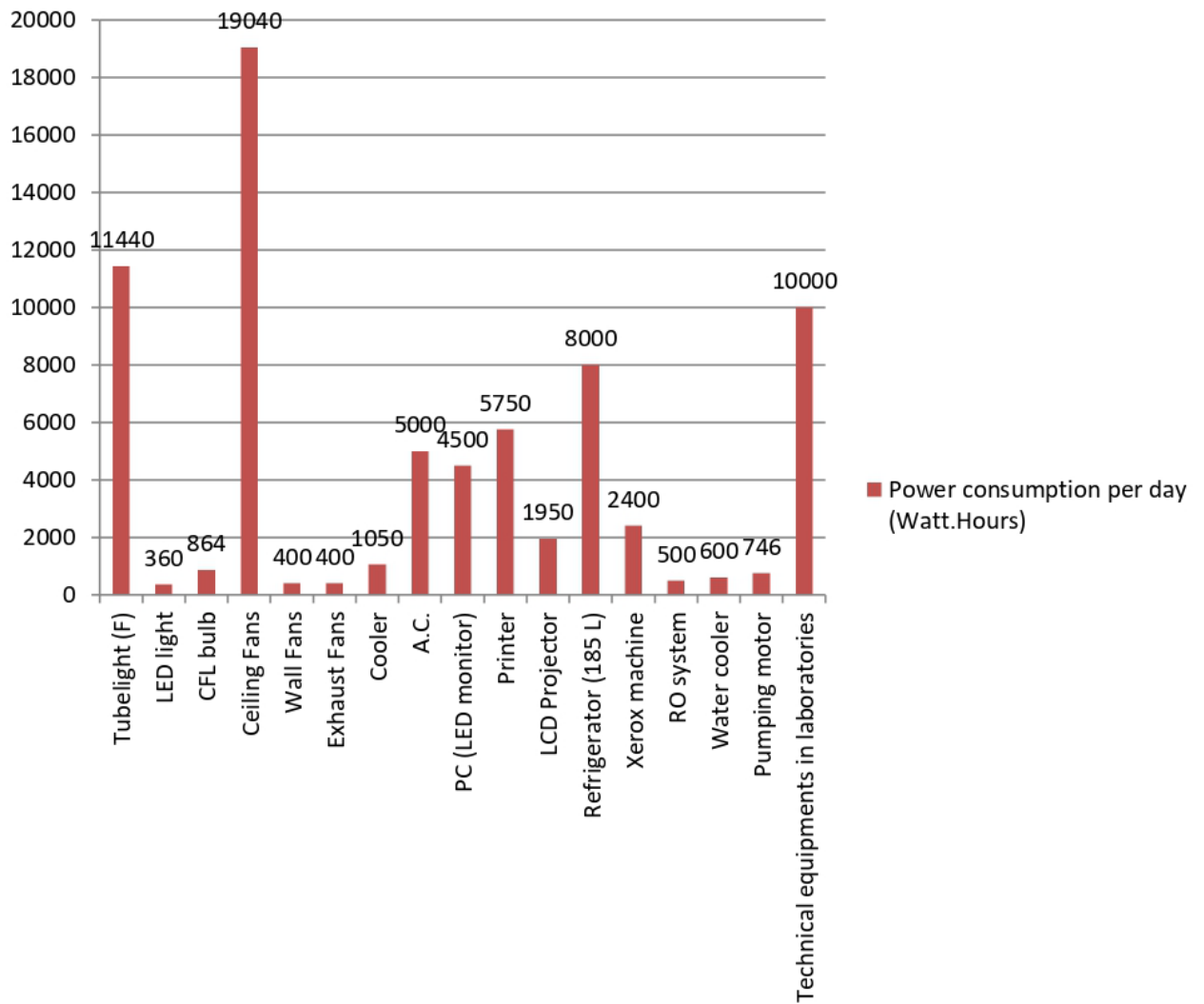


Section 3.02 Equipment wise Energy Consumption:

Sr. No.	Name of the appliance	Power Rating (Watt)	Quantity	Average daily usage in hours	Power consumption per day (Watt.Hours)
A	B	C	D	E	$F = C \times D \times E$
1	Tubelight (F)	40	143	2	11440
2	LED light	20	9	2	360
3	CFL bulb	24	18	2	864
4	Ceiling Fans	80	119	2	19040
5	Wall Fans	50	4	2	400
6	Exhaust Fans	50	8	1	400
7	Cooler	300	7	0.5	1050
8	A.C.	1000	1	5	5000
9	PC (LED monitor)	60	75	1	4500
10	Printer	500	23	0.5	5750
11	LCD Projector	300	13	0.5	1950
12	Refrigerator (185 L)	1 KWHr/day	8	24	8000
13	Xerox machine	1200	1	2	2400
14	RO system	100	1	5	500
15	Water cooler	2.5 KW.Hr/day	1	6	600
16	Pumping motor	746	1	1	746
17	Technical equipments in laboratories				10000
	Total				73000
	Energy consumed in one day = 73 unit				
	Average Energy consumption in one year = 26645 units				
	Average Energy consumption in one month = 2220 units				

Note: Since during the academic session 2020 – 21 the college is remain closed for students due to covid – 19 pandemic, the actual power consumed is less as that of required power.

Equipment wise Power consumption per day (Watt.Hours)

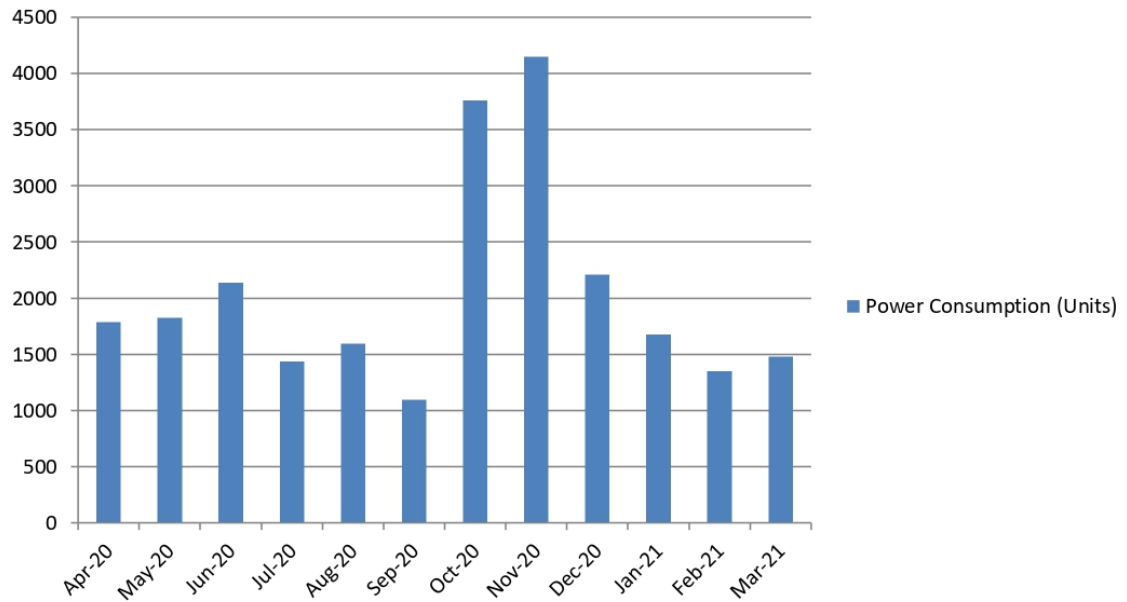


Month wise Energy Consumption:

Month	Power Consumption (Units)
Mar-21	1478
Feb-21	1348
Jan-21	1675
Dec-20	2207
Nov-20	4150
Oct-20	3758
Sep-20	1094
Aug-20	1594
Jul-20	1437
Jun-20	2135
May-20	1823
Apr-20	1787
Total	24486

Average Energy Consumption in one month = 2040 units

Month wise Power Consumption (Units)



Section 3.03 Recommendations

- 1) Replace all conventional tube lights with LED tube lights, to save more power.
- 2) In Physics laboratory, 3 -phase connection for furnace and water distillation plant is taken from microbiology lab. Separate 3-phase connection should be provided to avoid power load
- 3) In old building, there is need to replace the electric boards and electric fitting.
- 4) In some classrooms there is requirement of fans and tube lights.
- 5) Install solar plant to reduce electric bill.
- 6) Switch off Light, fans, P.Cs. and other electrical appliances whenever they are not in use.

Section 3.04 Energy saving calculation:

- 1) If the conventional tube lights are replaced with LED tube light, a large amount of energy can be save.

Total number of conventional tube lights in college campus = 143

The average power of conventional tube light = 40 W

The average power of LED tube light = 20 W

Difference in power saved per tube light = $(40 - 20) = 20$ W

Total power saving = $143 \times 20 = 2860$ W

Let average use of each tube light per day = 5 Hours

Energy saved per day = $2860 \times 5 = 14300$ Watt.Hours = 14.3 KW.Hours = 14.3 units

Energy saved in one year = $14.3 \times 365 = 5219.5$ units

The reduction in electric bill in one year = $5219.5 \times 4.86 = 25366$ Rs

Average cost of single LED tube light = 400 Rs

Total cost of replacing all conventional tube lights = 57200 Rs

Pay back period required = $57200/25366 = 2.25$ Years

- 2) If the old ceiling fans are replaced with 5 star energy saving fans:

Total number of ceiling fans in college campus = 119

The average power of existing ceiling fan = 80 W

The average power of 5 star energy saving ceiling fan = 50 W

Difference in power saved per ceiling fan = $(80 - 50) = 30$ W

Total power saving = $119 \times 30 = 3570$ W

Let average use of each ceiling fan per day = 5 Hours

Energy saved per day = $3570 \times 5 = 17850$ Watt.Hours = 17.85 KW.Hours = 17.85 units

Energy saved in one year = $17.85 \times 365 = 6515.25$ units

The reduction in electric bill in one year = $6515.25 \times 4.86 = 31664$ Rs

Average cost of single 5 star energy saving fan = 1600 Rs

Total cost of replacing all ceiling fans = 1,90,400 Rs

Pay back period required = $1,90,400/31664 = 6$ Years

Section 3.05 Estimate for installation of solar plant in college campus:

Department wise required power load:

S.N.	Department	Power Load (Watt)
1	Physics	2880
2	Computer Science	3130
3	Chemistry	2094
4	Electronics	1464
5	Microbiology	3512
6	Zoology	2020
7	Mathematics	1354
8	Botany	1930
9	Commerce	3306
10	English	2080
11	Social Sciences and Humanities	104
12	Library	6076
13	Physical Education, NSS	976
14	Health Center, NCC	840
15	Administration office and Principal's Cabin	4740
16	IQAC	1220
17	Seminar Hall	1510
18	Staff room	890
19	Auditorium	480
20	Canteen and Book shop	1480
21	Classrooms	1520
	Total	43606

Section 3.06 Total required power load = 44 kW

Note: While calculating power load, the technical instruments with high power rating (Furnace, incubator, oven etc) in Physics, Chemistry, Botany, Zoology and Microbiology departments are not taken into consideration.

Approximate expenditure required to install solar plant of 1 kW = Rs. 60,000/-
Approximate space required to install solar plant of 1 kW = 1 m²

The approximate units produced by solar plant of 1 kW per day = 4 units

The approximate units produced by solar plant of 1 kW in one year = 1460 units
Approximate Saving in electric bill in one year = Rs. 10,000/-

Payback period = 6 years

----- THE END -----