



Solapur Zill Samaj Seva Mandal's
SANTOSH BHIMRAO PATIL
ARTS, COMMERCE AND
SCIENCE COLLEGE,
MANDRUP



**ENERGY,
ENVIRONMENT
AND GREEN
AUDIT**

Consultant:-

NSVK ENGINEERS

**[Unit of Sun Energy
Consultancy Service]**





ACKNOWLEDGEMENT

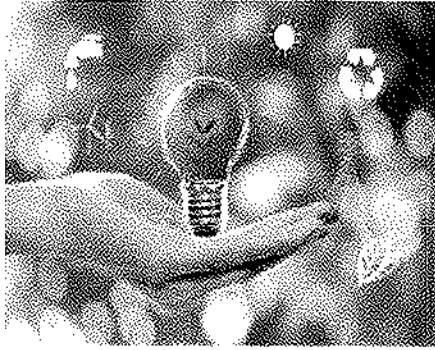
Energy ,Environmental & Green Audit Assessment Team thanks the management of Santosh Bhimrao Patil Arts, Commerce and Science College, Mandrup for assigning this important work of Audit. We appreciate the cooperation to us Team for completion of study.

Our special thanks are due to

- Hon Shri. P. L. Koli - Chairman of the Institute
- Hon Shri M.D.Kamale - Secretary of the Institute
- Pri.Dr.B.M.Bhanje- Principal, Santosh Bhimrao Patil Arts, Commerce and Science College, Mandrup
- Dr.C.S.Mulage -Coordinator of the IQAC
- Dr. K U Garad- Assistant Professor
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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.

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 Accredited



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DISCLAIMER

Audit Team has prepared this report for Santosh Bhimrao Patil Arts, Commerce and Science College, Mandrup based on input data submitted by the representatives of College complemented with the best judgment capacity of the expert team. While all reasonable care has been taken in its preparation, details contained in this report have been compiled in good faith based on information gathered. It is further informed that the calculations 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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1.Introduction

Energy, Environmental & green audit is one of major parameters for institute development. These parameters covered under 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.

Definition & Objectives of Energy Management

The fundamental goal of energy management is to produce goods and provide services with the least cost and least environmental effect.

Energy Audit defines as "The strategy of adjusting and optimizing energy, using systems and procedures so as to reduce energy requirements per unit of output while holding constant or reducing total costs of producing the output from these systems"

The objective of Energy Management is to achieve and maintain optimum energy procurement and utilization, throughout the organization and:

- To minimize energy costs / waste without affecting production & quality
- To minimize environmental effects.

The ICC defines Environmental Auditing as:

"A management tool comprising a systematic, documented, periodic and objective evaluation of how well environmental organization, management and equipment are performing with the aim of safeguarding the environment and natural resources in its operations/projects." Green audit is a valuable means for a college to determine how and where they are using the most energy or water or other resources; the college can then consider how to implement changes and make savings. It can create health consciousness and promote environmental awareness, values and ethics. It provides staff and students better understanding of Green impact on campus. If self-enquiry is a natural and necessary outgrowth of a quality education, it could also be stated that institutional self-enquiry is a natural and necessary outgrowth of a quality educational institution. 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.

1.1 ABOUT THE COLLEGE

Honorable late Kamle Guruji established "Solapur Zilla Samaj Seva Mandal" on March 6 1956. The main objective of this institution is to develop society socially, economically, and culturally. To achieve this goal he started schools, colleges, boardings, libraries. And with the help of these institutions he endeavoured the dynamic development of the society. To provide the higher education for the students of Bheema Seena river basin honorable Kamale guruji established Santosh Bhimrao Patil Arts, Commerce and Science College with the help of former minister Sushil Kumar Shinde and late Bhimrav Patil Wadakbalkar on July 26th 2001. This helped tremendously to the rural, backward and more prominently girls living in Mandrup and nearby villages. . The college has successfully completed 18 years. Presently there are Arts, Commerce and Science faculty in the college. Apart from this, college has research centre for Ph D in Geography and Economics. Our college recognized by UGC under 2(f) and 12(B) as well as accredited by NAAC with CGPA 2.21. Faculty members of the college have represented and are representing on various crucial statutory governing Bodies in P A H Solapur University Solapur.

Also the institution has provided a beautiful building for the college to cater the needs of the students of higher education. Not only this but there are advanced and modern educational and teaching aids as well as large playground. Because of quality education, infrastructure, library and qualified faculty members, students from distant placed seek admission in the college.

1.2 Details of Programme/ Level

The programmes offered by the college at different levels are U.G.,P.G. and Certified courses.Details of programmes offered by the college is as below

Sr. No.	Programme/ Level	Name of Programme, Course	Duration
1.	U.G.	B.A.	3 Years
		B.Com.	3 Years
		B.SC	3 Years

The college is in the rural area implementing number of programmes such as remedial coaching schemes, NET/SET Coaching Centre, Entry in Services Coaching Centre, Equal Opportunity Centre, Network Resource Centre, Career and Counseling Cell etc.

The college has rich tradition of co-curricular and extra-curricular activities such as NSS, NCC, Sports and Cultural Activities, which play an important role in the overall personality development of the students. The Career Guidance Center makes its presence felt by providing necessary information and guidance to the students as and when required.

Teaching staff of the college is highly qualified. Institute have qualification with Ph. D, M.Phil. and NET / SET teachers. Some of them are doing research. Some of them have completed minor and major research projects financed by UGC. The college has organized national conference and International conference, seminars and state level workshops. The students are also reciprocating by their high achievements in academic performance.

The College has Yashwantrao Chavan Maharashtra Open University study center for the students who wish to study with distance mode.

Details of the Teaching and non-teaching staff is given below table

Sr.no	Position	Govt Aided			Un Aided		
		Male	Female	Total	Male	Female	Total
	A Senior Division						
1	Principal	1	0	1	0	0	0
2	CHB Teacher	1	1	2	3	1	4
3	Full Time Teacher	15	1	16	7	1	8
	Total-A	17	2	19	10	2	12
	B.Non Teaching						
1	Register						
2	Office Supridentend		0			0	
3	Head Cleark		1			0	
4	Senior Cleark		1			0	
5	Junior Cleark		1			0	

6	Lab Assistance	0	1
7	Library Cleark	0	0
8	Librarian	1	0
9	Typist	0	0
10	Lab Attendent	0	4
11	library Attendant	2	0
12	Peon	3	0
Sub Total		9	5
Total-A+B		28	17

1.3 Location of College

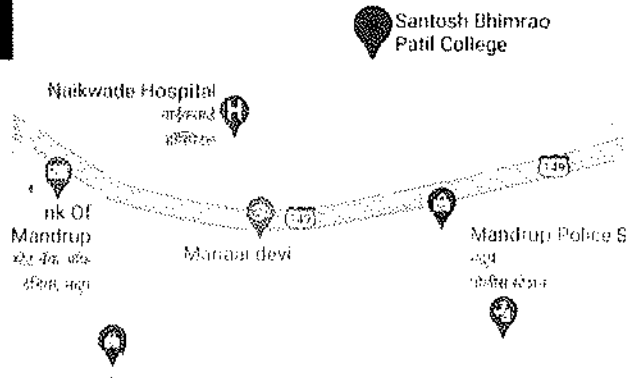
The college located at Mandrup Mohal Road. The college is located in the rural area. Latitude and Longitude of college is 17°29'44.1"N 75°49'21.5"E

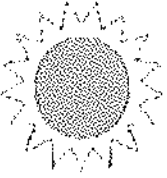


Santosh Bhimrao Patil College

संतोष भीमराव पाटील कॉलेज
 4.3 ★★★★★ 9 reviews
 School

- 
Directions
- 
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- 
Nearby
- 
Send to your phone
- 
Share





SUN ENERGY CONSULTANCY SERVICES

Mr. Shubhas B. Wankhade, Retired S.E. (Elect) PWD

Head office:- 31, Congress Nagar, Amravati - 444606, MO- 9373109344

Branch office 1:- Fulare Energy Center, Wagholi, Dist- Paighar, Nirmal-401304

Branch office 2:- Plot no 5/6, Near old Indian Model School, Chidambarnagar, Jule Solapur-413007

Email Id:- sunenergy31@gmail.com

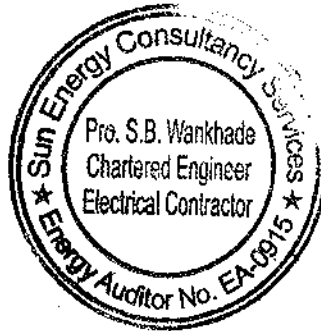
Sun/Sur/En/2021-22/25

Certificate of Energy Audit

**This is certified that Sun energy consultancy conducted energy audit of
Santosh Bhimrao Patil Arts, Commerce and Science College, Mandrup the
initiatives taken by the institute for energy conservations are satisfactory.**

Date:-29/10/2021

Place: - Solapur



State Level Award for Excellence in Energy Conservation And Management by Maharashtra Energy Development Agency (MEDA) for New MLA Hostel Nagpur.

2.1 Energy Audit: Types and Methodology

Energy Audit is the key to a systematic approach for decision-making in the area of energy management. It attempts to balance the total energy inputs with its use, and serves to identify all the energy streams in a facility. It quantifies energy usage according to its discrete functions. Industrial energy audit is an effective tool in defining and pursuing comprehensive energy management Programme.

As per the Energy Conservation Act, 2001, Energy Audit is defined as "the verification, monitoring and analysis of use of energy including submission of technical report containing recommendations for improving energy efficiency with cost benefit analysis and an action plan to reduce energy consumption"

2.2 Need for Energy Audit

In any institution, the three top operating expenses are often found to be energy (both electrical and thermal), staff and materials. If one were to relate to the manageability of the cost or potential cost savings in each of the above components, energy would invariably emerge as a top ranker, and thus energy management function constitutes a strategic area for cost reduction. Energy Audit will help to understand more about the ways energy and fuel are used in any industry, and help in identifying the areas where waste can occur and where scope for improvement exists.

The Energy Audit would give a positive orientation to the energy cost reduction, preventive maintenance and quality control Programme which are vital for production and utility activities. Such an audit Programme will help to keep focus on variations, which occur in the energy costs, availability and reliability of supply of energy, decide on appropriate energy mix, identify energy conservation technologies, retrofit for energy conservation equipment etc. In general, Energy Audit is the translation of conservation ideas into realities, by lending technically feasible solutions with economic and other organizational considerations within a specified period.

The primary objective of Energy Audit is to determine ways to reduce energy consumption per unit of product output or to lower operating costs. Energy Audit provides a "bench-mark" (Reference point) for managing energy in the organization and provides the basis for planning a more effective use of energy throughout the organization.

2.3 Type of Energy Audit

The type of Energy Audit to be performed depends on: - Function and type of industry - Depth to which final audit is needed, and - Potential and magnitude of cost reduction desired Thus Energy Audit can be classified into the following two types.

- Preliminary Audit
- Detailed Audit

2.4 Energy Audit Methodology

2.4.1 Preliminary Energy Audit Methodology

Preliminary energy audit is a relatively quick exercise to:

- Establish energy consumption in the organization
- Estimate the scope for saving
- Identify the most likely (and the easiest areas for attention
- Identify immediate (especially no-/low-cost) improvements/ savings
- Set a 'reference point'
- Identify areas for more detailed study/measurement
- Preliminary energy audit uses existing, or easily obtained data

2.4.2 Detailed Energy Audit Methodology

A comprehensive audit provides a detailed energy project implementation plan for a facility, since it evaluates all major energy using systems. This type of audit offers the most accurate estimate of energy savings and cost. It considers the interactive effects of all projects, accounts for the energy use of all major equipment, and includes detailed energy cost saving calculations and project cost. In a comprehensive audit, one of the key elements is the energy balance. This is based on an inventory of energy using systems, assumptions of current operating conditions and calculations of energy use. This estimated use is then compared to utility bill charges.

3.0 Preliminary Audit

3.1 About the Unit (College)

The college offers degree courses in Arts, Commerce and Science as well as various Diplomas and Certificate courses. This college infrastructure including internet and computer facilities, well equipped laboratories, research Center, Library, huge premises and playgrounds, and learning resources facilitating to the career building of the students. We have qualified and research-oriented faculties.

3.1.1 LT/ HT-

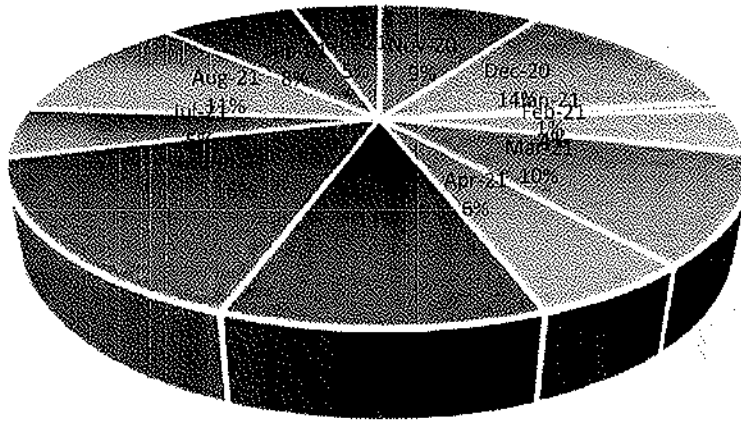
For the institute two LT connections observed during the walk-through audit.

Sr.No.	Energy/Power Suppler	Meter No.	Remark
1	Maharashtra State Electricity Distribution Company Limited.	331910993492	090 /LT-I (B) Residential 1Ph

3.2 Energy Scenario

Sr. No.	Particulars	Any one month	Annual
1.	Electrical Units (kWh)	502	11686
2.	Power Factor	0.98	0.95
3.	kVA Contract Demand	3.2	1168
4.	kVA (Registered Max. Demand)	5.0	1820
5.	Bill Amount	Rs.5,450.00	Rs.108760.00

Energy Consumption in One Year



- Nov-20
- Dec-20
- Jan-21
- Feb-21
- Mar-21
- Apr-21
- May-21
- Jun-21
- Jul-21
- Aug-21
- Sep-21

3.3 End User Profile

3.3.1 Lighting

Number of light points	57
Type of lamps and fixtures used	Tube light with Cholk=05 LED Tube Light/Bulb=52
Lamp wattage	Tube light with Cholk=40 Watts/Tubelight LED Tube Light=18 Watts/Tubelight LED Bulb=9/12-Watts
Running hours per day	On average Eight Hours per day
Name and make	Bajaj, Philips, Syska
Year of installation	Tube light with Cholk=5 years ago LED Tube Light=Recently in 2 Years
Present status (Operation/ Out of service/ standby)	Operation

3.3.2 Pumps

Year of installation	5 years Ago
Capacity	1hp
Any efficiency test conducted in last three years (Y/N)	No
Running hours per day	Three Hours Per Day
Present status (Operation/ Out of service/ standby)	Operation

3.3.3 Energy Cost of each as % of Total Electrical Cost

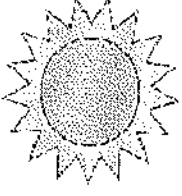
From the electricity connection total electricity annual cost for the unit has been calculated. Unit consumed by the college annually is 11686. Total lighting load is calculated annually is 38% of total load. Other 62% load consist of other electrical & electronics load like Computers, CCTV, UPS Laptops & other devices.

3.3.4 kW of each as % of Total Electrical Consumption

As per directives from power/energy supplier college has maintained power factor above 0.95. On date of visit to college power factor measured is 0.98. So total active power is achieved is 95% of total energy consumed.

3.3.5 Energy Efficient Technologies Applicability

Sr. No.	Name of EET	Applicability	Estimated Energy Consumption / hr (or any relevant energy indicator) by existing Equipment	Hours of operation / day	Nos	Estd Potential for Savings (%) - Order of magnitude of savings margin indicated in brackets
1.	Efficient lamps (T5, CFL, Metal Halide, HPSV)	Applicable	18 Watt (T5 LED/Solar Street light)	06 hrs/Day	05	(30-50 % of existing lighting kW)
2.	Soft Starter Energy Savers	Applicable	50 Watts	3 hrs/Day	01	(3 % of operating kW)
3.	Energy efficient water pumps	Applicable	735	3 hrs/Day	01	(Improvement in existing efficiency upto 75 %)



SUN ENERGY CONSULTANCY SERVICES

Mr. Shubhas B. Wankhade, Retired S.E. (Elect) PWD

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Branch office 1:- Fulare Energy Center, Waghali, Dist- Palghar, Nirmal-401304

Branch office 2:- Plot no 5/6, Near old Indian Model School, Chidambarnagar, Jule Solapur-413007

Email Id:- sunenergy31@gmail.com

Dt: 4-02-2021

To,
..... S. B. Patil Lok Uspc
..... Mandur
.....

Quotation for Premises

Dear Sir,
Greetings!

We are pleased to offer as follows:

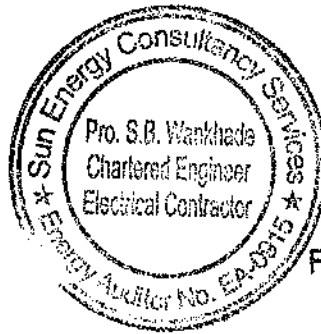
Sr.No	Description	Amount in Indian rupee
1.	Quotation for carrying out Green, Environment & Energy Audit.	= 18,354/- 18% GST = 3303/-

*GST will be extra

21,657/-

Thanks & Regards
(Contact No:-9860125800)

Twenty one thousand
Six hundred & fifty seven.



For Sun Energy Consultancy Services

Proprietor

State Level Award for Excellence in Energy Conservation And Management by Maharashtra Energy Development Agency (MEDA) for New MLA Hostel Nagpur.

4.0 Detailed Audit

4.1 Need for Energy Conservation

Power shortage hampers the economic growth of any State. Energy Conservation is the cheapest, easiest and cleanest way for bridging the gap between demand and supply. It is estimated that energy conservation projects require only one fifth of investment compared to the investment required for installation of new power projects.

4.2 Recommended frequency of Energy Audit

The interval time for the conduct and completion of subsequent energy audit shall be **Three years** with effect from date of the report of the first energy audit conducted and completed by Energy Auditor.

4.3 General Aspects about Building

4.3.1 Size, Age and Construction of the Building

Santosh Bhimrao Patil Arts, Commerce and Science College buildings has been constructed in 2008 and new extension of building is built up in 2018. College Campus area is 20234.2821 sq. mtrs. and Built up area is 16200 sq.mtrs. Old building College construction age is 10 years.

4.3.1.1 Connected Load or Contract Demand

The college runs three courses in level of graduation with specialization in different eight courses. Santosh Bhimrao Patil Arts, Commerce and Science College is affiliated to Solapur University follows rules and regulations given by university and University grant commission. College have different electrical and electronics equipment's. Its connected load is calculate das follows.

Sr.No.	Particular/Equipment	Total No	Wattage Per Equipment	Total Power in Watts
1	Fan	81	78	6318
2	Tube light (FTL-T5)	5	40	200
3	Tube light LED+ Bulb	42+14	18+12	924
4	Computers	16	200	3200
5	Printer	08	50	400
6	Scanner	01	10	10
7	CCTV	13	25	325
8	Drinking Water Filter Unit	01	25	25
9	Air Cooler	02	400	800
10	Door Bell	01	15	15
11	Speaker	02	200	400
12	Xerox Machine	01	950	950
13	Stabilizer	12	50	600
14	Laptop	02	50	100
15	Biometric Machine	01	5	05
16	Amplifier	01	75	75
17	Mike	01	10	10
18	LED Projector & CPU	02	250	500

Total Connected Load 14857 Watts

Form the above table Connected load is 14.86 kW and estimated kVA is 15.64.

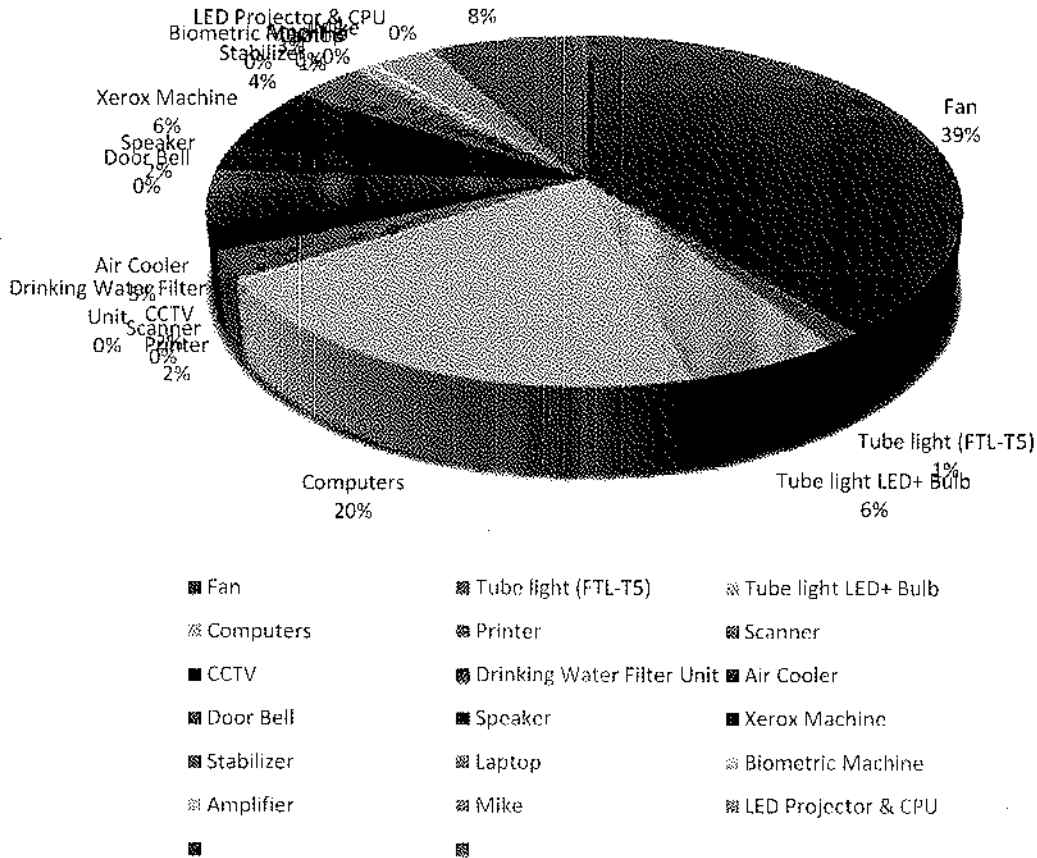
4.3.1.4 Total electricity purchased from utilities

In Maharashtra state main supplier of electricity is Maharashtra state Electricity distribution company limited. Almost all the electricity has been purchased from same supplier. In emergency college has generator unit for supply of electricity.

4.3.2 Load distribution pattern (total lighting load, air cooling load and other loads)

For the unit major load is air cooling (Fan) and lighting. Lighting and air-cooling load is about 46% of full load. Computers consumed about 20% of total connected load. The detailed load distribution is shown in below load distribution pattern

Chart Title



4.4 payment of electricity bills

Supplier i.e. Maharashtra state Electricity Distribution Company limited took monthly reading and send energy/electricity bill to consumer. Also on web portal of supplier monthly electricity bill and history of payment and last 12 month energy consumption.

4.4.1 Authority responsible for payment of electricity bills and payment mechanism

Head of the institute is responsible for payment of bill assistance with office staff. Monthly received bill has been proceed and paid through bank check, NEFT or RTGS. Sometimes bill has been paid at supplier bill collection center.

4.4.2 Status of Bill Payments on time/Delay in Bill Payments, percentage paid

No delay in payment has been observed since last 12 month. Bill payment has been made time to time to avoid charges and penalty.

4.5 Use of renewable Energy

College has installed four solar street light of 10 watts. Which generate light energy from solar energy. Earlier they planned to install two 150 watts high pressure sodium vapor (HPSV) lamps. However, considering use of solar energy solar street lamps has been installed. By considering operating time of eight hours saving of energy calculated as below

Sr.No.	Parameters	High Pressure Sodium Vapor (HPSV) Lamps	Solar Street Light Lamps
1.	No of Lamp to be installed	Two-02	Two-04
2.	Rating in Watts	150	40
3.	Operating hours in Day	8 hr/Day	8 hr/Day
4.	Energy Consumption in Day in Units	2.4 units (150*2*8)	0.64 units(40*2*8)

5.	Total Energy Consumed in Year	876 units	233.6 units
6.	Energy price per Unit	Rs.4.68	Solar energy is freely available
7.	Total cost for energy in year	Rs.4169.76	-

From above table it is clearly seen that Rs Rs.4169.76 will be saved if solar street lights are installed. So we recommended that installed at least four solar street lights in campus which lighten campus and also energy will be conserved.

4.7 Energy Saving Majors and Pay back period calculation

4.7.1 Energy Saving Majors

When our energy engineering has visited institute and find out energy saving measures. Our measurement, analysis and study finds following suggestion & recommendations for energy conservation.

- It is found that 05 no old luminaries (tube lights) are operative in institute. We recommended to replace these luminaries which will reduce energy cost of lighting system to 50%
- Use transferring roofing sheet in Halls, corridor and gymkhana room which will reduce luminary's requirement.
- It is observed that 81 old fans are operative in college campus. We recommended replacing with energy efficient cooling fans.
- Replace old wiring in campus, which will reduce 3 to 5 % energy, cost.
- Install solar roof top system having capacity of 10 kW

4.7.2 Pay back period calculation

Pay back period calculation has been taken in two different form. One while considering 50% replacement of equipment and other with all replacement of equipments. We considered following parameters for pay back period calculation

- Light luminaries working for 8 hr/day
- Fan working for 6 hr/day
- Electricity cost is Rs.4.68 per unit.

4.7.2.1 Suggestion no 1- Considering 50% replacement of equipment

Sr.No.	Parameters	Existing Luminaries & Fans	Replacement of equipment with energy efficient devices
1.	No of Fans & Luminaries installed	81 (Fans)+5(Tube lights)	81(Fans)+05(Tube lights)
2.	Rating in Watts	78 watts (Fan)+40 Watts (T.L.)	28 watts (Fan)+18 Watts (T.L.)
3.	Operating hours in Day	6 hr/Day+ 8 hr/Day	6 hr/Day+8 hr/Day
4.	Energy Consumption in Day in Units	40 units (Maximum) (82*78*6+5*40*8)	14.32units (Maximum) (81*28*6+05*18*8)
5.	Total Energy Consumed in Year (125 days working)	5000 Units	358.2 units
6.	Energy price per Unit	Rs.4.68	Rs.4.68
7.	Total cost for energy in year	Rs.23,400/-	Rs.1676.376/-

- Total Investment = $81 * \text{Rs.}2500 + 05 * \text{Rs.}850$
= Rs. 2,06,750/-
- Cost Saving per year = Rs.23,400-Rs 1676
=Rs.21724/-

Pay Back Period = $\text{Rs.}287750 / 21724 = 9.5$ Years

- Total cost of investment will be recovered in 9.5 Years

4.7 Requirement of NAAC

4.7.1 Alternative Energy Initiative

Percentage of power requirement met by renewable energy sources

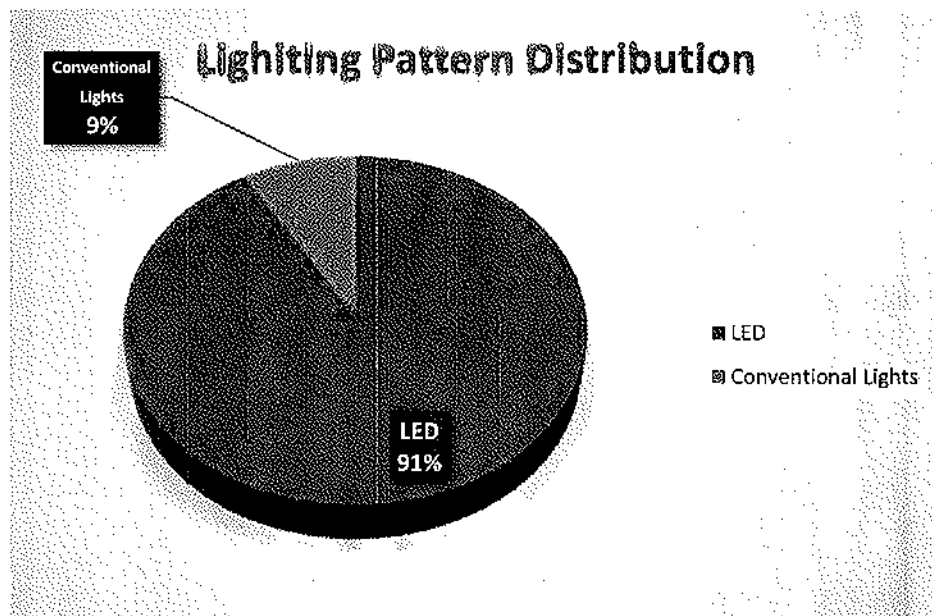
$$= (\text{Power requirement met by renewable energy sources} / \text{Total power requirement}) \times 100$$

$$= (0.64/16.19) \times 100$$

$$= 4\%$$

4.7.2 Percentage of lighting power requirement met through LED bulbs

Type	Quantity	Load in Watts	% Load
LED	52	2150	91.48 %
Conventional Lights	05	200	08.51%
Total	57	2350	100%



Percentage of lighting power requirement met through LED bulbs

$$= (\text{Lighting power requirement met through LED bulbs} / \text{Total lighting power requirement}) \times 100$$

$$= (91.48/100) \times 100$$

$$= 91.48 \%$$

4.7.3 Energy saving initiatives for air cooling (FAN)

Conventional ceiling fans in the institute is replaced by new energy saving fans. Recently institute has replaced old energy consumption fans, which consumes 78 to 80 watts. The newly installed fans consumes 28 watts, which is almost one-third savings energy. Six new energy saving fans has been installed in institute which saves 52 watts energy per fan. Considering six hours per day use and 125 working days total energy saving due to new energy efficient fans is 39 kwh. Which saves.

4.8 CONCLUSION

After detailed energy audit of institute it is observed that institute has taking energy conservation majors like LED installation and solar streetlights. Still Institute require to take many imitative towards energy conservation. Some of recommendations are as follows

Audit team recommended following Recommendations for Energy Conservation

- Install rooftop solar system
- Replace conventional lighting devices with new energy saving LED's
- Conventional fan should be replaced
- Register for Maharashtra Energy Saving Programme initiated by Government of Maharashtra by Maharashtra Energy Developing Agency
- Ensure DG maintenance, as per the maintenance check list
- Give more attention to Electrical Safety
- Conduct Energy Conservation Awareness Campaign among the staff for reducing energy consumption and display posters/slogans of Energy Conservation, Electrical safety etc. at conspicuous places
- Establish a Facility Management System, exclusively for energy efficiency activities.

5.0 Environment And Green Audit

Certification

CERTIFICATE
GREEN AUDIT CERTIFICATE

Academic Year 2022-23

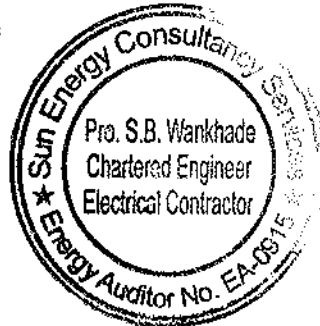
This is to certify that Santosh Bhimrao Patil Arts, Commerce and Science College, Mandrup Tal-South Solapur Dist- Solapur, Maharashtra has taking and implementing respectable initiatives for conservation and protection of Environment.

We, Dr. Subbarao's Environment Centre have satisfactory and successfully completed the work of audit based on the site situation and information provided with support of Principal, staff of Santosh Bhimrao Patil Arts, Commerce and Science College

Signature

Date:-30/10/2021

Dr. Subbarao's Environment Centre



5.1 Introduction

The main objective of the Environment/Green audit is to promote the management and conservation of Environment 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:

- *Green Plantation and Plant Diversity*
- *To Document the Water Analysis report of the college*
- *To document the waste disposal system*
- *To document the ambient environmental condition of air, Soil and noise of the college*

5.2 METHODOLOGY

In order to conduct the green audit, the methodology included different tools such as

- Preparation of questionnaire,
- Preparation of data collection formats
- Collection of data
- Physical checking of the campus,
- Observation and review of the documentation,
- Interview of 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:

- Green area management
- Waste management
- Water Analysis Report
- Ambient environmental condition of air, Soil and noise

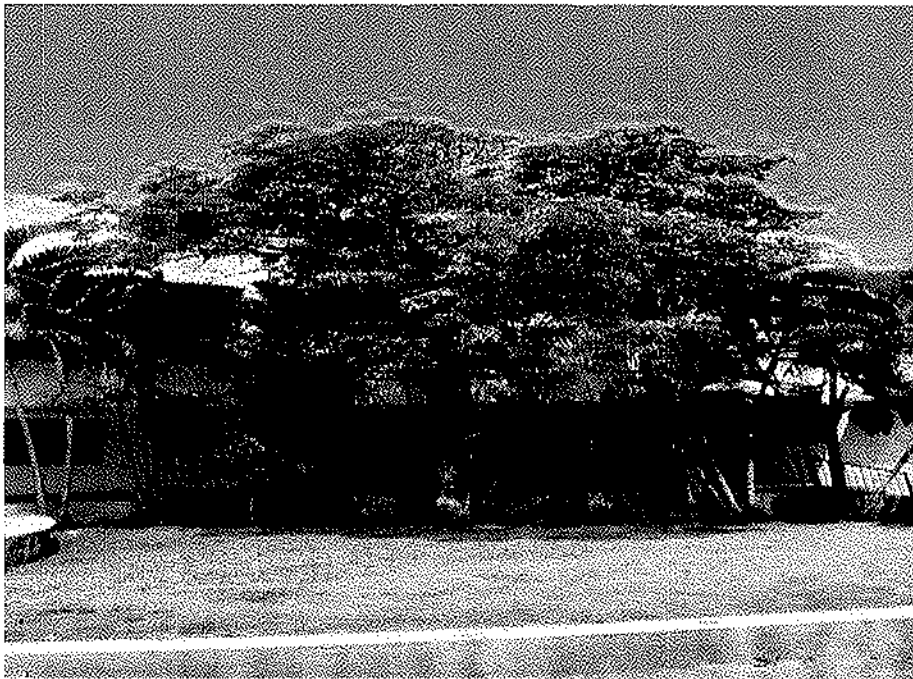
5.3 Green Audit

Green audit was initiated with the beginning of 1970s with the motive of inspecting the work conducted within the organizations whose exercises can cause risk to the health of inhabitants and the environment. It exposes the authenticity of the proclamations made by multinational companies, armies and national governments with the concern of health issues as the consequences of environmental pollution. It is the duty of organizations to carry out the Green Audits of their ongoing processes for various reasons such as; to make sure whether they are performing in accordance with relevant rules and regulations, to improve the procedures and ability of materials, to analyze the potential duties and to determine a way which can lower the cost and add to the revenue. 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. Some of the incidents like Bhopal Gas Tragedy (Bhopal; 1984), Chernobyl Catastrophe (Ukraine; 1986) and Exxon Valdez Oil Spill (Alaska; 1989) have cautioned the industries that setting corporate strategies for environmental security elements have no meaning until they are implemented. The intention of organizing Green Audit is to upgrade the environment condition in and around the institutes, colleges, companies and other organizations. It is carried out with the aid of performing tasks like waste management, energy saving and others to turn into a better environmentally friendly institute.

5.4 GREEN AREA/ PLANTATION

Green area or plantation includes the plant, greenery and landscaping of the campus to enhance the environment of the area. This will help to increase the beauty of the campus. The college area is diverse with a variety of plant species performing a variety of functions. Most of the plant species are planted through various plantation programs organized by the college.

The plantation in college have increased the quality of life, not only in college campus but also the surrounding area in term of temperature control, contributing to improving air quality, soil conservation, water conservation and habitat for birds and small animals etc.



Greenery at College Main Building



Greenery at College near Principal Cabin



Green Plantation area at main function area of College

5.5 Plant Diversity

- Total 31 plant species are observed in the college campus area.
- About 199 number of total trees are planted in college campus area.
- College conducted and participated in various Planation activity programs are being organized at college campus and surrounding villages through NSS unit.
- This program conducted through the students and helps in encouraging eco-friendly environment which provides pure oxygen within the campus and awareness among nearer villagers.
- The plantation program includes various types of indigenous species of ornamental and medicinal wild plant species.
- College actively participated in 2 Cr tree plantation programme of Government of Maharashtra.

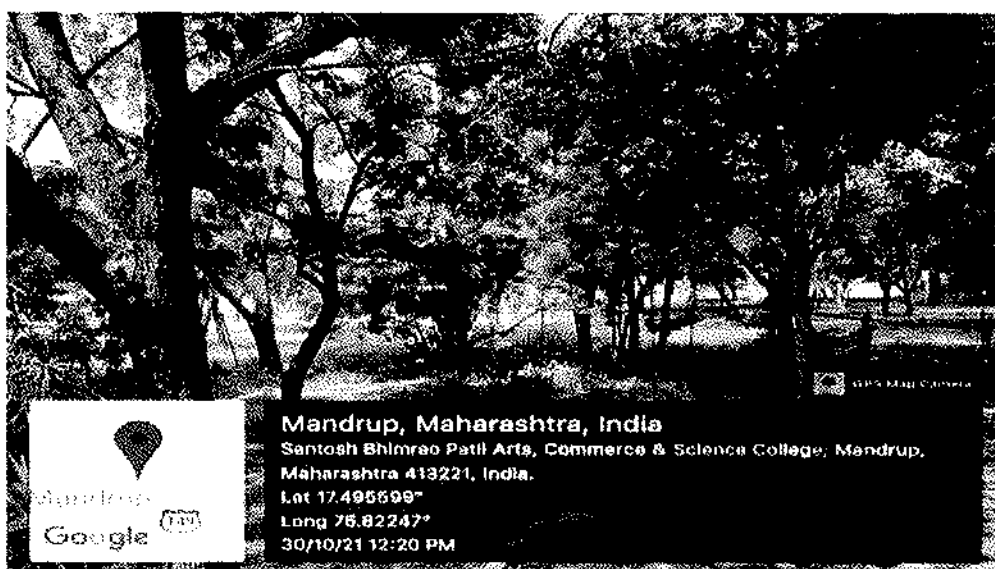


Table 1. List of plant species observed in the campus during the field visit

Sr	Botanical Name	Local name	Family	Type	Number
1	<i>Alstonia scholaris</i> (L.) R. Br.	Devil's tree	Apocynaceae	Blackboard Tree	27
2	<i>Dypsis decaryi</i> (Jum.) Beentje & J. Dransf	Triangle Palm	Arecaceae	Flowering Plant	21
3	<i>Ixora coccinea</i> L.	Jungle Geranium	Rubiaceae	Flowering Plant	02
4	<i>Mimusops elengi</i> L.	Bakul	Sapotaceae	Ayurvedic Medicinal Plant	02
5	<i>Pongamia pinnata</i> (L.) Pierre	Karanj	Fabaceae	Ayurvedic Medicinal Plant	03
6	<i>Azadirachta indica</i> A. Juss.	Kadulimb	Meliaceae	Ayurvedic Medicinal Plant	27
7	<i>Delonix regia</i> (Hook.) Raf.	Gulmohar	Caesalpiniaceae	Flame Tree	07
8	<i>Ficus religiosa</i> L.	Pimple	Moraceae	Tree	04
9	<i>Spathodea campanulata</i> P.Beauv.	Akash Shevga	Bignoniaceae	Tree	07
10	<i>Handroanthus albus</i> (Cham.) Mattos	Golden Trumpet Tree	Bignoniaceae	Plantae	06
11	<i>Samanea saman</i> (Jacq.) Merr.	Samanea saman	Mimosaceae	Rain Tree	04

12	<i>Leucaena leucocephala</i> (Lam.) de Wit	River Tamarind	Mimosaceae	Tree	05
13	<i>Cascabela thevetia</i> (L.) Lippold	Peeli Kaner	Apocynaceae	Small Tree	23
14	<i>Duranta dombeyana</i> Moldenke	Duranta	Verbenaceae	Tree	Compound
15	<i>Tectona grandis</i> L.f.	Sag	Lamiaceae	Tree	01
16	<i>Phyllanthus emblica</i> L.	Awala	Phyllanthaceae	Tree	01
17	<i>Magnolia champaca</i> (L.) Baill. ex Pierre	Champak	Magnoliaceae	Tree	01
18	<i>Bauhinia purpurea</i> L.	Rakta Chandan	Caesalpiniaceae	Flowering Plant	01
20	<i>Nyctanthes arbor-tristis</i> L.	Night- flowering jasmine	Oleaceae	Flowering Plant	01
21	<i>Albizia lebbek</i> (L.) Benth.	Shirish	Caesalpiniaceae	Tree	11
22	<i>Ficus benghalensis</i> L.	Banyan	Moraceae	Tree	02
23	<i>Ficus religiosa</i> L.	Pimpal	Moraceae	Tree	04
24	<i>Cordia dichotoma</i> G.Forst.	Bhokar tree	Boraginaceae	Ayurvedic Medicinal Plant	01

25	<i>Polyalthia longifolia</i> (Sonn.) Thwaites	False Ashoka	Annonaceae	Small Tree Species	13
26	<i>Bougainvillea spectabilis</i> Willd.	Great Bougainvillea	Nyctaginaceae	Flowering Plant	Compound
27	<i>Hibiscus rosa-sinensis</i> L.	Jaswant	Malvaceae	Flowering Plant	03
28	<i>Dalbergia sissoo</i> DC.	Shisvi	Fabaceae	Tree	06
29	<i>Pithecellobium dulce</i> (Roxb.) Benth.	Gorati Tamarind (Madras Thorn)	Mimosaceae	Plant	03
30	<i>Eucalyptus globulus</i> Labill.	Southern Blue Gum	Myrtaceae	Evergreen Tree	02
31	<i>Justicia adhatoda</i> L.	Adulsa	Acanthaceae	Ayurvedic Medicinal Plant	01
32	<i>Peltophorum pterocarpum</i> (DC.) K.Heyne	Copper tree	Caesalpinaceae	Flowering Plant	10
Total					199

Recommendations:

- Review yearly the list of trees planted in the college campus, botanical garden, and allots numbers to the trees along with scientific /botanical and local/common name to the trees
- Select endemic or local species for the planation
- Considerations for selection of plant species
 - o Plants that show vigorous growth, and higher forage value
 - o Plants having ability of fixing nitrogen
 - o Preferably indigenous, endemic and rare species
 - o Plant that serves as nesting, feeding and breeding site for fauna
 - o Plants species having high fodder and fuel value
 - o Plant that enhances the aesthetics of the surrounding areas
 - o Plants species having importance in soil binding
 - o Plant species with different height, growth habits and bole shapes
 - o Species tolerant to specific conditions or capacity to endure water stress and climatic extremes after initial establishment
 - o Economically important plant species
- Avoid plantation of exotic plant species in college campus.

- Conduct small workshop or training programme for the students on medicinal plants
- Establish Environment Policy for the environment conservation and protection of college.
- The Environmental cell shall be the source of advice and guidance to staff and students on how to implement this Policy.
- Conduct six monthly internal audit to ensure that implementation of activities for the environment planned for the year, action is taken on the basis of audit report, recommendation and findings.
- Celebrate every year 5th June as „Environment Day“, wildlife week and plant trees on this day to make the campus more Green.
- Establish Green library for the students.
- Prepare five year planation programme /Plan in consultation with management and students.
- Establish nature club
- Organize exhibitions like plant painting, flower painting, flowers, posters etc.
- Develop seed bank under botanical garden programme

6.0 SOLID WASTE MANAGEMENT

To reduce waste in the college campus, recycling efforts are taken. Waste is collected and segregated properly. Students, faculty, and staff are aware and educated on proper waste management practices such as waste source and disposal, plastic waste, paper waste, food waste, and recycling. Solid waste is divided into two categories: dry waste and wet waste

- Wet waste: biodegradable waste
- Dry waste: no Biodegradable waste

6.1 Observations

The waste generated in the campus includes glass, metals, wrappers, paper, plastics, etc. Old newspapers, used papers and journal files, workshop scrap etc. are given for recycling to external agencies.

Glass, metals, plastic and other non-biodegradable wastes are given to external agencies where they are segregated and disposed/ recycled according to the nature of the waste.

Wet and dry waste is collected by Waste collection vehicle of Mandrup Grampanchyat Clean and neat College campus was observed during the visit.

- Dissolved organics: colored dissolved organic matter (CDOM), dissolved organic
- Carbon (DOC)
- Heavy metals

अ. नं	घटक	युनिट	प्रमाण	योग्य प्रमाण	शेरा
1	pH		6.97	6.5-7.5	सुरक्षित
2	Electrical Conductivity (EC)	mmhos/cm	2.23	0.1-1.4	असुरक्षित
3	TDS	mg/L	163	<700	सुरक्षित
4	Total Hardness	mg/L	650	<600	असुरक्षित
5	Carbonate	mg/L	Absent	-	सुरक्षित
6	Bicarbonate	mg/L	207	<600	सुरक्षित
7	Alkalinity	mg/L	170	<500	सुरक्षित
8	Potassium	mg/L	1.95	<75	सुरक्षित
9	Calcium	mg/L	196	<600	सुरक्षित
10	Magnesium	mg/L	39	<400	सुरक्षित
11	Na	mg/L	51.29	<50	असुरक्षित
12	So ₄	mg/L	29	<300	सुरक्षित
13	Chloride (Cl)	mg/L	212.5	<300	सुरक्षित
14	mg:ca	-	0.19	<1.50	सुरक्षित
15	Sodium Adsorption Ratio (SAR)	meq/L	0.87	<10	सुरक्षित
16	Residual Sodium Carbonate (RSC)	meq/L	-9.59	<1.25	सुरक्षित

Water Type :- C3 : S1

With help of Yash Agrotech Laboratory (ISO 9001:2015) water analysis completed. It is observed that EC is more in water and deviated from slandered.

8.0 Ambient environmental condition of air, Soil and noise

8.1 Air Quality

Ambient air quality monitoring was carried out in the college campus to understand the air quality of the campus. Ambient air quality monitored at center of the campus

Air quality is measure by SMILEDRIVE Portable Air Quality Pollution Meter meter.

The results are given below Table

Parameter	Unit	Result	NAAQ Standards for 24hrs
PM10	$\mu\text{g}/\text{m}^3$	63	100
PM2.5	$\mu\text{g}/\text{m}^3$	51	60

Remark:- The results show the concentrations of PM₁₀ PM_{2.5} were found within the National Ambient Air Quality Standards (NAAQ).

8.2 Soil Analysis

The first step in soil analysis is soil sample collection. It's important to realize that only a tiny portion of a field is actually analyzed in the laboratory. Thus, collecting a representative soil sample is critical for accurate result. As part of a soil analysis the laboratory will usually supply some interpretation, which includes an indication of whether individual soil tests are low, medium, or high. The laboratory may also provide fertilizer recommendations based on the analysis, although these recommendations are plant and soil specific.

With the collaboration of Yash Agrotech Laboratory (ISO 9001:2015) soil analysis completed. Results are shown as follows

Sr.No.	Contains	Unit	Results	Reference Value	Remark
1	सामू (pH)		7.52	6.5-8.5	In Limit
2	Electrical Conductivity (EC)	mmhos/cm	0.692	<1	In Limit
3	Free Lime	%	10.0	1-5	More
4	Cation exchange capacity(CEC)	Meq/100gm	20.3	15-25	In Limit
5	organic matter (OM)	%	1.56	1.72-3.5	Less
6	Organic carbon (OC)	%	0.90	0.41-0.60	More
8	Available-N(Avail-N)	Kg/ha	282	280-420	In Limit
9	Available -P	Kg/ha	29	30-50	Less
10	Available -K	Kg/ha	228	180-240	In Limit
11	Available -Ca	%	0.60	0.1-3.30	In Limit
12	Available -Mg	%	0.14	0.12-0.30	In Limit
13	Available -S	PPM	6.86	26-50	Less
14	Available -Na	%	5.3	< 5	More
15	zinc - (Zn)	PPM	2.04	0.60	In Limit
16	Copper (Cu)	PPM	2.34	0.25-0.50	In Limit
17	Iron (Fe)	PPM	4.02	4.50	Less

18	Manganese (Mn)	PPM	7.29	2	In Limit
19	Boron (B)	PPM	0.13	<1	In Limit
20	Molybdenum (Mo)	PPM	-	-	-
21	C:N	-	5.53	10-20	Limit
22	Ca:Mg	-	4.28	5.5-6.5	Limit
23	Mg:k	-	0.61	1.5-2.5	Limit
24	Ca : K	-	0.26	1.25-1.35	Limit
25	Fe Fe:Mn M	-	0.55 : 1	1.10:1	Limit
26	Plasmodesmata (PD)	-	0.84	2.65	Limit
27	Integrity (P)	%	16.43	40-50	Limit
28	soil water holding	%	24.9	41-50	Limit

8.3 Noise Level Campus

The human ear is constantly being assailed by man-made sounds from all sides, and there remain few places in populous areas where relative quiet prevails. There are two basic properties of sound:

- Loudness and
- Frequency

Loudness is the strength of sensation of sound perceived by the individual. It is measured in terms of Decibels. Just audible sound is about 10 dB, a whisper about 20 dB, library place 30 dB, normal conversation about 35-60 dB, heavy street traffic 60-0 dB, boiler factories 120 dB, jet planes during take-off is about 150 dB, rocket engine about 180 dB. The loudest sound a person can stand without much discomfort is about 80 dB. Sounds beyond 80 dB can be safely regarded as Pollutant as it harms hearing system. The WHO has fixed 45 dB as the safe noise level for a city. For international standards a noise level up to 65 dB is considered tolerate. Loudness is also expressed in sones. One sone equals the loudness of 40 dB sound pressure at 1000 Hz. Frequency is defined as the number of vibration per second. It is denoted as Hertz(Hz).

Noise Level is measure by meco 970p(35dB-130dB) Digital sound level meter.

Sr no.	Description	Classroom	Laboratory
1.	Max in dBA	59.2 dB	61.8 dB
2.	Min in dBA	52.3 dB	55.1 db

Remark: Noise level observed slightly higher than the standers.

9.0 Rain Water Harvesting to Augment Ground Water Resource

Rain water harvesting is the technique of collection and storage of rain water at surface or in sub-surface aquifers, before it is lost as surface run-off. The augmented resource can be harvested in the time of need. Artificial recharge to ground water is a process by which the ground water reservoir is augmented at rate exceeding that under natural conditions of replenishment.

9.1 Need

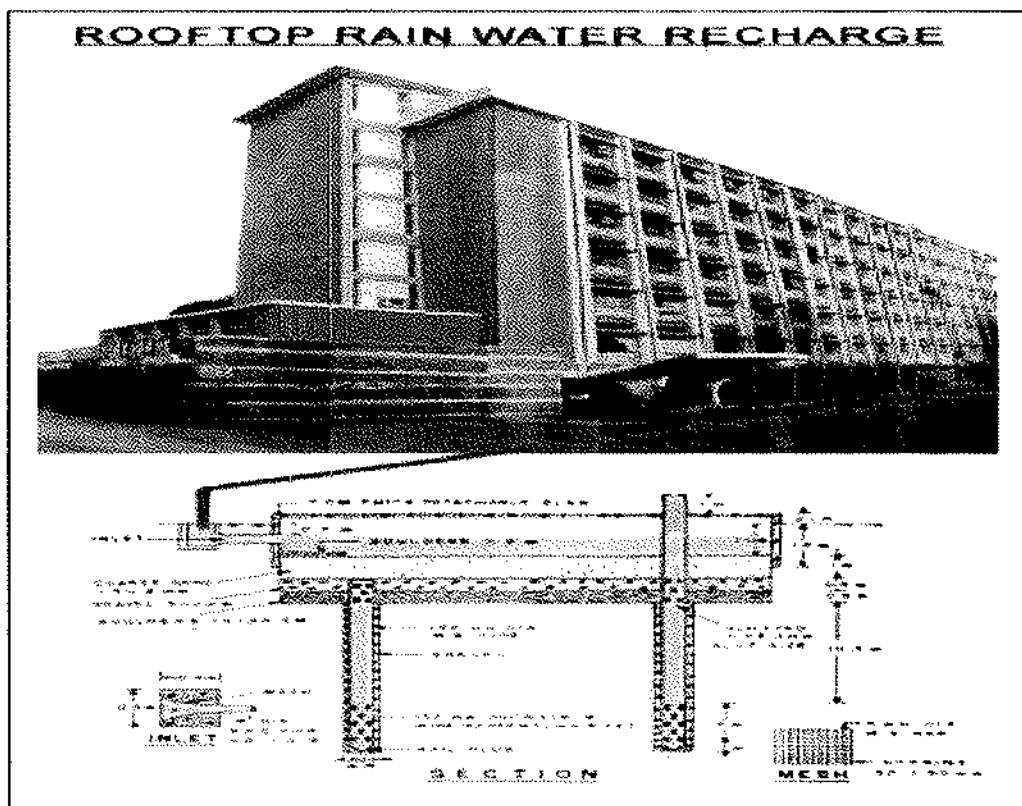
- To overcome the inadequacy of waters to meet our demands.
- To arrest decline in ground water levels.
- To enhance availability of ground water at specific place and time and utilize rain water for sustainable development.
- To increase infiltration of rain water in the subsoil which has decreased drastically in urban areas due to paving of open area.
- To improve ground water quality by dilution.
- increase agriculture production.
- To improve ecology of the area by increase in vegetation cover, etc.

9.2 Advantages

- Cost of recharge to sub-surface reservoir is lower than surface reservoirs.
- The aquifer serves as distribution system also.
- No land is wasted for storage purpose and no population displacement is involved.
- Ground water is not directly exposed to evaporation and pollution.
- Storing water underground is environment friendly.
- It increases the productivity of aquifer.
- It reduces flood hazards.
- Effects rise in ground water levels.
- Mitigates the effects of drought.
- Reduces soil erosion.

9.3 Institute Rainwater Harvesting Project

Santosh Bhimrao Patil Arts, Commerce and Science College, Mandrup is going to implement rainwater harvesting project in campus. Work is in progress and it is near to end. Institute is using roof top rainwater harvesting through trench with recharge well technic for harvesting. Existing rooftop is used for collection of rainwater and recharge wells will be installed for collection of water. Nearly 70% work is completed and reaming work is estimated to complete with in two weeks.



Model Diagram roof top rainwater harvesting through trench with recharge well technic.

10 E-Waste Management Initiative

CPCB India is finalizing the set of rules and most recently issued a formal set of guidelines for proper and eco-friendly handling and disposal of the electronic waste. The Ministry of Environment and Forests is now processing the rules framed by electronics equipment manufacturers with the help of NGOs.

The college has made MOU with Maharashtra pollution control board accredited agency for E waste management .The Institute initiative for E-waste management is that they are sent their electrical and electronic waste to M/s Green Tech solutions Industries which is Maharashtra pollutions control board certified agency for dismantling E waste using environmental sound technology as per E waste (M) Rule 2016.M/s Green Tech Solutions Industries has consent no BO/MPCB/RO(HQ)/CO/B-1801001022 dt. 25/01/2018.

The institute provided following information regarding E-waste given to M/s Green Tech solutions Industries

Monitor	07 Nos
C.P.U	02 Nos
Printer	3 Nos
Keyboard	2 Nos
UPS	10 Nos
Tape Recorder	1 nos

10.0 CONCLUSIONS

Green and environment audit is the powerful tool to identify the strength and weakness of college in environment area. This audit is one kind of scientific and professional approach towards accountability in utilization of resources. Green audit is helpful to the college for the identifying, evaluating and managing environmental risks and improvement in waste management, energy, water management etc.

Output of the green audit report in each area will be serve as a guide for educating the college community on the environment related practices and resource usage at the college as well as spawn new activities and innovative practices.

Important Suggestions

- Adopt an environmental policy for the college
- Establish Environment management Committee of the college.
- Establish a purchase policy for Eco friendly materials
- Conduct seminars and group discussions on environmental education and environment protection
- Involve Students and staff in local environmental problems to solve along with local body and people.
- Establish waste water Treatment system