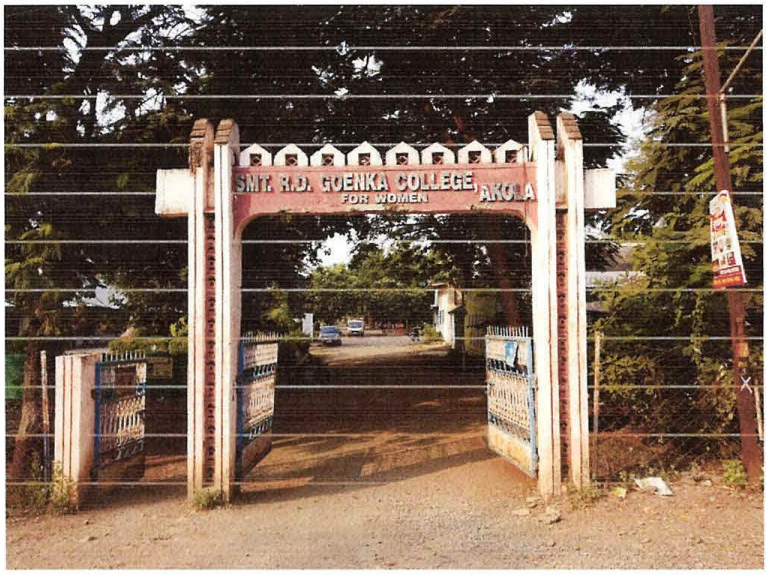
Criterion VII: Institutional Values and Best Practices

7.1.6 Quality audits on environment and energy regularly undertaken by the Institution.

Report of Energy Audit:

DETAILED ENERGY AUDIT REPORT



Smt. R. D. Goenka College for Women, Akola

Murtizapur Road, Akola - 450905

Maharashtra

November 2019

Conducted By

PPS Energy Solutions Pvt. Ltd.

Engineering Consultants

Plot No-18, Girish Housing Society

Warje, Pune – 411058, Maharashtra, India

PREFACE

Energy Audit is a key parameter of systematic approach for decision-making in the area of energy management. It attempts to determine how and where energy is used and to identify methods for energy savings. There is now a universal recognition of the fact that new technologies and much greater use of some that already exists provide the most hopeful prospects for the future. The opportunities lie in the use of existing renewable energy technologies, greater efforts at energy efficiency and the dissemination of these technologies and options.

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".

Present audit is a mare mile marker towards destination of achieving safe, healthy and energy efficient unit. We would like to emphasize that an electrical audit is a continuous process. We have compiled a list of possible actions to conserve and efficiently utilize our scarce resources and identified their savings potential. The next step would be to prioritize their implementation. Implementation of recommended measures can help consumes to achieve significant reduction in their energy consumption levels.

WHY ENERGY AUDIT?

An energy audit determines the amount of energy consumption affiliated with a building and the potential savings associated with that energy consumption. Additionally, an energy audit is designed to understand the specific conditions that are impacting the performance and comfort in your facility to maximize the overall impact of energy-focused building improvements.

An energy audit is a systematic review of the energy consuming installations in a building or premises to ensure that energy is being used sensibly and efficiently. An energy audit usually commences with the collection and analysis of all information that may affect the energy consumption of the building or premises, then follows with reviewing and analyzing the condition and performance of various building services installations and building management, with an aim at identifying areas of inefficiency and suggesting means for improvement.

Through implementation of the suggested improvement measures, building owners can get the immediate benefit for paying less for energy bills. On the other hand, lowering of energy consumption in buildings will lead to the chain effect that less fossil fuel will be burnt for electricity generation by the power supply companies and relatively less pollutants and greenhouse gases will be introduced into the atmosphere, thus contributing to conserve the environment and to enhance sustainable development.

ACKNOWLEDGEMENT

We express our sincere gratitude to the authorities of Smt. R. D. Goenka college for Women, Akola for entrusting and offering the opportunity. It is our immense pleasure to present the detailed report on energy assessment.

We acknowledge the support from management for their positive support in undertaking the task of energy efficiency assessment of all electrical system, thermal systems, utilities and other area and for continuous help and support before and during the audit.

We are also thankful to all field staff and agencies working with whom we interacted during the field studies for their wholehearted support in undertaking measurements and eagerness to assess the system / equipment performance and saving potential. We admire the help of all concerned staff for their active participation in completing official documentations.

We express our sincere gratitude to the authorities of Smt. R. D. Goenka college for Women, Akola for entrusting PPS Energy Solutions Pvt. Ltd.

For PPS Energy Solutions Pvt. Ltd.

Criterion VII: Institutional Values and Best Practices

CONTENTS

Figure

Table

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About PPSES

M/s. PPS Energy Solutions Pvt. Ltd (PPSES) is an ambitious company, established by enterprising engineering professionals in the year 2009. The company offers services pertaining to Energy and Engineering to clients across the globe. Our team is based in Pune, a city known for its Software and Engineering talent in India. We are a rapidly growing company with a team of about 100 people which includes highly trained and experienced Techno-Managers, Analysts, and Engineers & Detailers.

We are presently working in India (Maharashtra, Assam, Madhya Pradesh, Gujarat, Andhra Pradesh, Delhi, Orissa, Chhattisgarh, Bihar, Andhra Pradesh, Telangana and Jharkhand) and Abroad (Bahrain, Stanford)

- We serve in majorly four areas,
  - Energy Audit, Management and System Evaluations
  - Power Distribution System Design, Evaluations and Monitoring
  - MEP Design and Project management
  - Research and Training

PPSES Team Members

Name	Role	Academics and Expertise
Dr. Ravi Deshmukh	ECM verification, Report verification and presentation	Accredited Energy Auditor PhD, M tech, MBA (Power), Graduate E&TC Engineer with over 18 years of experience in Energy Management, Management of Power System, street light projects, Power Exchange Operations, Power Trading and Analysis, Electrical Automation. Has worked as Expert in Iron & Steel sector and Energy
Mr .Nilesh Saraf	Co-ordination with officers, project status review.	Expert in Energy sector with 16 years of experience in Energy efficiency assessment, Industrial engineering sector & Renewable Energy.
Mr. Vinayak Apte	Energy Audit Expert	Graduate Electrical Engineer with more than 10 years of experience in various sectors. He handled Energy Audits, Energy Conservation and Energy Efficiency projects in Industries, Commercial and Residential Buildings, Pump House
Mr. Vedmurthy Swamy	Field study, data tabulation and analysis, report preparation	Graduate Mechanical Engineer with 5 years of experience in project management, energy efficiency assessment
Mrs. Utkarsha Bharate	Data tabulation and analysis, report preparation	Graduate in Electrical & Electronics Engineering, Sr. Engineer, 3 years of experience in Energy & Power projects

1. EXECUTIVE SUMMARY

Detailed Energy Audit was undertaken in order to evaluate energy performance and identify potential energy conservation measures. The assessment was undertaken in three steps, i.e. document review of data and information initially provided by facility, site visit and preparation of this report.

The building visit was conducted by energy audit team. The site visit included interaction with staff, electricians of building, the collection/review of further data and a field inspection of the facilities and equipment.

This brief report has therefore sought to provide a high-level overview of the status of energy efficiency at building, combined with an illustration of areas where further, previously unidentified savings opportunities may exist.

Our survey has identified further potential opportunities, ranging from "no & low cost" measures, through to those that will require significant capital expenditure.

Note: Investment figures mentioned in are only indicative, further detailed study is recommended.

Summary of Recommended Energy Conservation Measures:

Sr. No.	ECM Details	Investment (Rs. Lacs)	Savings (kWh/year)	Carbon credit (Tons of Co2)	Saving (Rs. Lacs /Year)	Payback (Years)
1	Replacement of Conventional Lights with More Efficient Lights	1.33	4263.00	3.62	0.24	5.55
2	Replacement of Existing Fans with Energy Efficient Fans	5.09	9665.25	8.22	0.54	9.41
	Total	**6.42**	**13928.25**	**11.84**	**0.78**	**8.23**

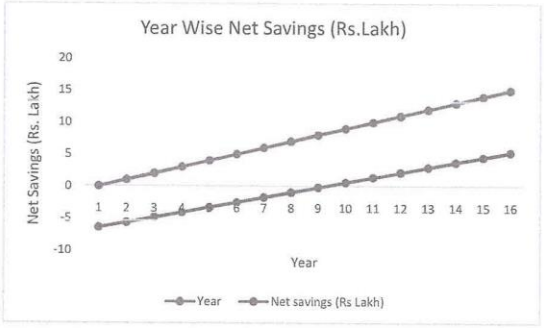
Note: Estimated savings may base on operating conditions

Other Recommendations:

A. Regular cleaning and maintenance of equipment's is important to reduce energy losses.
B. Use of start rates equipment's is also strongly recommended specially in case of Fans and Air conditioning.
C. Cleaning of ceiling fan and exhaust fan blades will reduce the drag on the fan and intern will reduce energy loss.
D. Awareness amongst students and staff is very essential step to reduce wastage of electricity

E. Energy conservation awareness programs can be conducted once a year. Increasing energy awareness of employees and students motivates them to work as a team can lead to reductions in energy consumption and save the money.

Year	Investment (Rs. In Lacs)	Saving (Rs.In Lacs /Year)	Cum Savings(Rs Lakh)	Net savings (Rs Lakh)
0	-6	0	0	-6
1	0	1	1	-6
2	0	1	2	-5
3	0	1	2	-4
4	0	1	3	-3
5	0	1	4	-3
6	0	1	5	-2
7	0	1	5	-1
8	0	1	6	0
9	0	1	7	1
10	0	1	8	1
11	0	1	9	2
12	0	1	9	3
13	0	1	10	4
14	0	1	11	4
15	0	1	12	5



2. GENERAL AUDIT REVIEW

Building can implement faster payback energy conservation measures (ECMs) which have already been considered and for which the ECMs are fully developed.

Other General Points:

1. Energy conservation awareness programs can be conducted once a year. Increasing energy awareness of staff, students and motivating them to work as a team can lead to reductions in energy consumption and save the money. Savings estimates range in the order of 5 to 10%. When implemented effectively these savings can be realized quickly and cost effectively.
2. Most of the fans are of older design and not energy inefficient.
3. Most of the places the tube light installed are energy efficient and fittings are in healthy condition.
4. Natural day light is efficiently used in corridor and few classrooms and labs areas.

It is believed that with the current approach and organization of energy management, energy can be reduced in a systematic, cost effective manner. We hope that this report will help building to implement these changes and provide direction to the Energy Management Team

3. ABOUT ENERGY AUDIT

Objective

The overall objective of the assignment is to quantify energy saving in existing system and achieve reduction in energy consumption pattern.

Hence the detail objectives are as under,

1. To calculate the energy consumption.
2. To evaluate the performance of the equipment.
3. To find out the energy saving opportunities.
4. To quantify the total energy savings.
5. To find out the ways to achieve energy efficiency.

3.1. Scope of Work

Following is the scope of work envisaged for this assignment,

Data Collection

To collect the details of various electrical and mechanical system and their ratings, the available drawings and details shall be studied. Detail load list shall be prepared and checked.

A, B, C Analysis

With the details available from load list, analysis shall be carried out depending on the present usage trends. All the power consuming equipment's shall be classified in three categories depending on their ratings, condition and operating time. The area for larger potentials for savings shall be identified.

Field Study

The detail field study on site shall include the following as well as all other measures required for energy audit study,

a. Lay out the system and study of Electrical distribution.
b. Study of area wise power distribution and Measurement of power consumption
c. Study of instrumentation provided
d. Measurement of motor currents, voltages, power etc. parameters by energy analyzer and measurement of water flow, pressures etc. parameters of pumps simultaneously and other measurements as needed to characterize the system and required for calculating efficiency at various combinations.
e. Study of air conditioner operations and system requirements.
f. Analysis of readings obtained from field with the standard consumption.

3.2. Approach and Methodology

1. Understanding the Scope of Work and Resource Planning

2. Identification of Key Personnel for the assignment/ project

3. Structured Organization Matrix

4. Steps in preparing and implementing energy audit assignment.
   a) Discussions with key facility personnel.
   b) Site visits and conducting "walk-through audit".
   c) Preliminary Data Collection through questionnaire before audit team's site visit.
   d) Steps for conducting the detailed audit
      - Plan the activities of site data collection in coordination with the facility in-charge.
      - Study the existing operations involving energy consumption
      - Collect and collate the energy consumption data with respect to electricity consumption
      - Conduct performance tests to assess the efficiency of the system equipment/ electricity distribution, lighting, and identify energy losses.
      - Discuss with facility personnel about identified energy losses.

5. List proposed efficiency measures
   - Develop a set of potential efficiency improvement proposals
   - Baseline parameters
   - Data presentation
   - System mapping
   - List of potential Energy Savings proposals with cost benefit analysis.
   - Review of current operation & maintenance practices

6. Preparation of the Draft Energy Audit Report.

7. Preparation and submission of final Energy Audit Report after discussion with concerned persons.

4. ENERGY DETAILS

The electricity supply for building is provided by Maharashtra State Electricity Distribution Company Limited (MSEDCL). Having Connected total 8 meters. Billing is carried out according to LT-X B Tariff.

Detailed Energy Audit was conducted for the load connected to the mains supply used.

Mainly energy is used on this facility for the following purposes:

1) Lighting load
2) Ceiling fans

Based on above it is clear that followings buildings have highest potential for energy savings

Table 1 Name of College Areas

Sr. No.	Name of the Building
1	Building I
2	Building II (Home Science)
3	MCVC Building

4.1. Electricity Bill Analysis

1. Consumer Details of Meter No. 310070530707

Consumer Details

Table 2 Consumer Details

Parameter	Details
Consumer No.	**310070530707**
Consumer Name	The Principal R D G College
Address	Murtizapur Road, Akola
Pin Code	444001
Connected load (KW)	8
Contract demand(KVA	7
Tariff	LT-X B

Consumption Details

Table 3 Billing Data

Month	Units Consumed (kWh)	Energy Charges (Rs)	Total Bill (Rs)
Oct-18	1988	12968	21363
Nov-18	1363	8724	13690
Dec-18	1109	7000	11417
Jan-19	1128	7076	11698
Feb-19	1366	8745	14001
Mar-19	1597	10336	16785
Apr-19	3375	22757	36319
May-19	4109	27822	44374
Jun-19	3061	20590	32844
Jul-19	2982	20045	30992
Aug-19	3006	20211	30108
Sep-19	4591	31147	47578

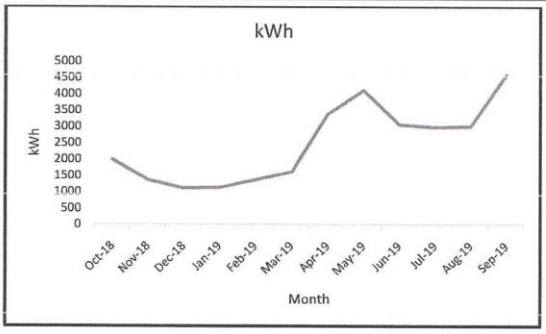


Figure 1 Monthly kWh Consumption

2. Consumer Details of Meter No. 310070530961

Consumer Details

Table 4 Consumer Details

Parameter	Details
Consumer No.	**310070530961**
Consumer Name	Smt Radhadevi Goenka College
Address	Murtizapur Road, Akola
Pin Code	444001
Sanction load (KW)	1
Tariff	LT-X B

Consumption Details

Table 5Billing Data

Month	Units Consumed (kWh)	Energy Charges (Rs)	Total Bill (Rs)
Oct-18	2062	12,940.98	9972.90
Nov-18	3718	24,731.12	37773.60
Jan-19	703	4,227.47	7528.04
Feb-19	1471	9,458.09	15573.10
Mar-19	1471	9,458.09	15097.03
Apr-19	1471	9,576.23	15538.42
May-19	6722	43,840.28	25189.46
Jun-19	1680	11062.00	17,990.93
Jul-19	1680	11,062.00	17,911.96
Aug-19	1680	11,062.00	17362.20
Sep-19	1680	11,062.00	16733.63

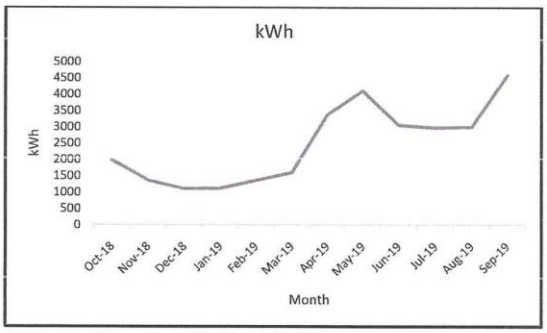


Figure 2Monthly kWh Consumption

3. Consumer Details of Meter No.310070530952

Consumer Details

Table 6 Consumer Details

Parameter	Details
Consumer No.	**310070530952**
Consumer Name	The Principal Radhadevi Goenka College
Address	Murtizapur Road, Akola
Pin Code	444001
Sanction load (KW)	2
Tariff	LT-X B

Consumption Details

Table 7Billing Data

Month	Units Consumed (kWh)	Energy Charges (Rs)	Total Bill (Rs)
Sep-19	439	2,499.10	4213
Aug-19	580	3,456.10	5818
Jul-19	514	3,016.60	5301
Jun-19	628	3,787.30	6542
May-19	565	3,368.50	5864
Apr-19	461	2,637.26	4694
Mar-19	369	1,991.41	3626
Feb-19	329	1,666.81	3230
Jan-19	280	1,371.20	3108
Nov-18	315	1,592.95	2962
Oct-18	313	1,664.17	3224

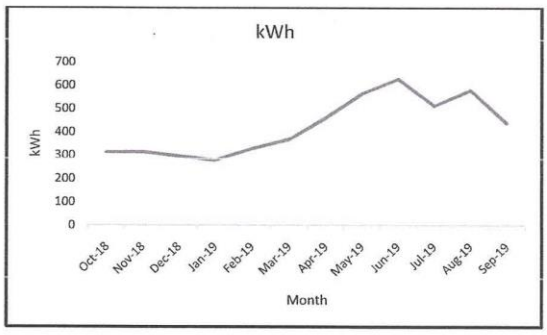


Figure 3Monthly kWh Consumption

4. Consumer Details of Meter No.310070530979

Consumer Details

Table 8 Consumer Details

Parameter	Details
Consumer No.	**310070530979**
Consumer Name	Smt Radhadevi Goenka College
Address	Murtizapur Road, Akola
Pin Code	444001
Sanction load (KW)	2
Tariff	LT-X B

Consumption Details

Table 9Billing Data

Month	Units Consumed (kWh)	Energy Charges (Rs)	Total Bill (Rs)
Oct-18	571	3,400.00	6011
Nov-18	571	3,347.00	5597
Jan-19	590	3,476.00	6362
Feb-19	774	4,688.00	8020
Mar-19	1041	6,554.00	10633
Apr-19	1411	9,163.00	14894
May-19	1266	8,205.00	13462
Jun-19	946	5,981.00	9996
Jul-19	640	3,886.00	6664
Aug-19	1014	6,450.00	10365
Sep-19	1027	6,556.00	10145

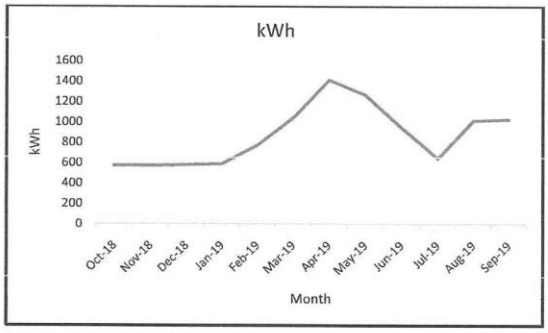


Figure 4Monthly kWh Consumption

5. Consumer Details of Meter No.310070557591

Consumer Details

Table 10 Consumer Details

Parameter	Details
Consumer No.	**310070557591**
Consumer Name	Principa L R.D.G College For Women
Address	Murtizapur Road, Akola
Pin Code	444001
Sanction load (KW)	5
Tariff	LT-X B

Consumption Details

Table 11Billing Data

Month	Units Consumed (kWh)	Energy Charges (Rs)	Total Bill (Rs)
Oct-18	878	5,431.00	8894
Nov-18	641	3,785.00	6654
Jan-19	591	3,482.00	5950
Feb-19	574	3,330.00	5868
Mar-19	554	3,231.00	5535
Apr-19	1359	8,227.00	8495
May-19	644	3,913.00	6720
Jun-19	1411	8,675.00	8088
Jul-19	573	3,423.00	5990
Aug-19	545	3,214.00	5451
Sep-19	752	4,642.00	7351
Oct-18	878	5,431.00	8894

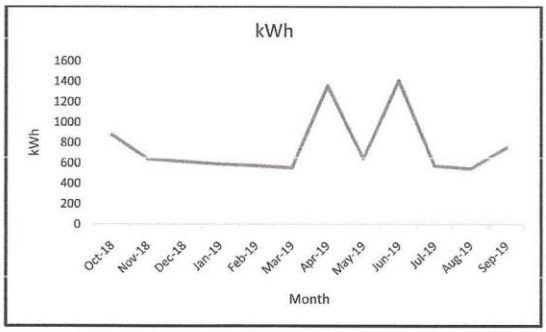


Figure 5Monthly kWh Consumption

6. Consumer Details of Meter No.310070548339

Consumer Details

Table 12 Consumer Details

Parameter	Details
Consumer No.	**310070548339**
Consumer Name	Principal R.D.G College For Women
Address	Murtizapur Road, Akola
Pin Code	444001
Sanction load (KW)	3
Tariff	LT-X B

Consumption Details

Table 13Billing Data

Month	Units Consumed (kWh)	Energy Charges (Rs)	Total Bill (Rs)
Oct-18	878	5,431.00	8894
Nov-18	284	1,398.00	2664
Jan-19	173	716.00	2076
Feb-19	255	1,164.00	2433
Mar-19	394	2,161.00	3886
Apr-19	345	1,840.00	3448
May-19	644	3,913.00	6720
Jun-19	301	1,546.00	3009
Jul-19	286	1,215.00	-42
Aug-19	290	1,455.00	2779
Sep-19	317	1,657.00	2981

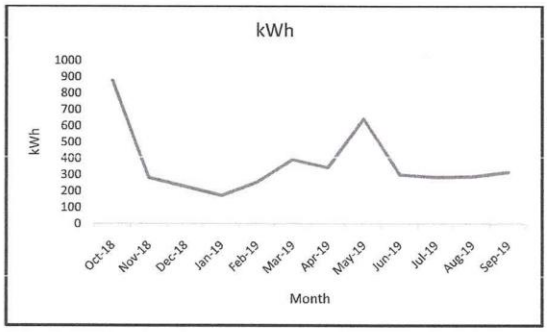


Figure 6Monthly kWh Consumption

7. Consumer Details of Meter No.310070530987

Consumer Details

Table 14 Consumer Details

Parameter	Details
Consumer No.	**310070530987**
Consumer Name	Principal R.D.G College For Women
Address	Murtizapur Road, Akola
Pin Code	444001
Sanction load (KW)	2
Tariff	LT-X B

Consumption Details

Table 15Billing Data

Month	Units Consumed (kWh)	Energy Charges (Rs)	Total Bill (Rs)
Oct-18	218	950.00	2099
Nov-18	304	1,258.00	852
Jan-19	126	521.00	1742
Feb-19	173	716.00	1691
Mar-19	150	621.00	1488
Apr-19	150	633.00	1526
May-19	150	637.00	1536
Jun-19	895	4,025.00	4098
Jul-19	143	607.00	1483
Aug-19	207	882.00	1910
Sep-19	303	1,560.00	2840

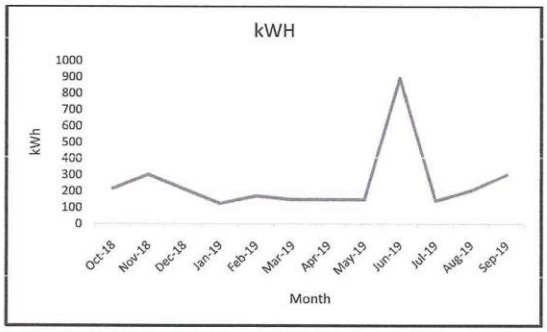


Figure 7Monthly kWh Consumption

8. Consumer Details of Meter No.310070548347

Consumer Details

Table 16 Consumer Details

Parameter	Details
Consumer No.	**310070548347**
Consumer Name	Principal R.D.G College For Women
Address	Murtizapur Road, Akola
Pin Code	444001
Sanction load (KW)	3
Tariff	LT-X B

Consumption Details

Table 17Billing Data

Month	Units Consumed (kWh)	Energy Charges (Rs)	Total Bill (Rs)
Oct-18	0	0.00	350
Nov-18	0	0.00	350
Jan-19	0	0.00	700
Feb-19	0	0.00	350
Mar-19	0	0.00	350
Apr-19	0	0.00	350
May-19	172	731.00	1699
Jun-19	172	731.00	1704
Jul-19	207	879.00	677
Aug-19	0	0.00	351
Sep-19	0	0.00	351

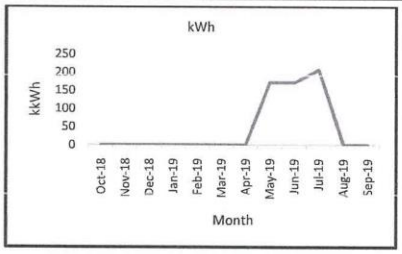


Figure 8Monthly kWh Consumption

4.2. Connected Load of Building

Connected Load of Buildings I:

Table 18 Connected Load of Building I

Equipment's	wattage	office	Auditorium	class room	Musical class room	library	N.G.C. office	Reading room	office-II	Staff room-I	Class Room	Computer Lab	NCC Office
Tube Light	28	9	15	52	32	10		13	2	5	64	8	11
LED Tube Light	20	3					7		2	2			
CFL	15												
Ceiling Fan	60	11	14	65	32	10	5	10	3	5	45	6	4
Exhaust Fan	45										9		
A/C (Split) (2*)	1500	1											
A/C (Split) (3*)	1500						1						
TV 43"	85						1						
Coffee Machine	100								1				
Computer	150	12	1			5	6		2				
Printer	150	5					2		1			2	
Xerox M/C	800	1											
Water Cooler	1100												
DG Set (50 KVA)		1											

Equipment's	wattage	office	Auditorium	class room	Musical class room	library	N.G.C. office	Reading room	office-II	Staff room-I	Class Room	Computer Lab	NCC Office
Pump Submersible	1491.4									4			
Projector	150		1									1	
Amplifier	350		1										

Connected Load of Buildings II:

Table 19 Connected Load of Building II

Equipment's	Wattage	Office	Class Room
Tube Light	28	4	45
Ceiling Fan	60	5	30

Connected Load of MCVC Building:

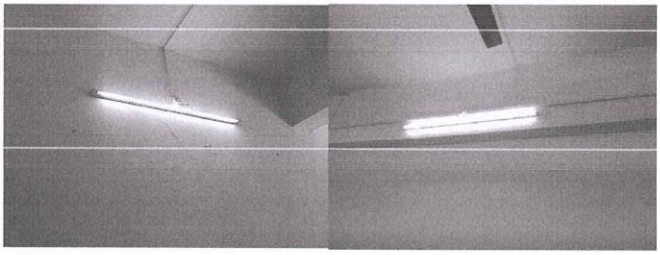
Table 20 Connected Load of MCVC Building

Equipment's	Wattage	Office	Class Room	Lab	Computer Lab
Tube Light	28	2	17	12	2
CFL	15				12
Ceiling Fan	60	2	10	6	
Exhaust Fan	45				3
Computer (PC)	150				62
Water Cooler	1100		1		
Desert Cooler	150				1

5. ENERGY CONSERVATION MEASURES

ECM 1: Replacement of Tube Lights with More Efficient Lights

ECM No.	Energy efficiency improvement measures	Investment Rs. In Lakh	Estimated saving		Estimated Savings Rs. In Lacs	Estimated Payback Years
			Electricity kWh	Carbon credit (Tons of CO2)		
1	Replacement of Conventional Lights with More Efficient Lights	1.33	4263	3.62	0.24	5.55



Observations:

Facility has installed 28 Watts Tube lights in the buildings

Recommendations:

During energy audit, it is observed that facility has installed T8 tube lights at some of the places in the factory. Also energy team at facility has already replaced some of the of the T8 tube lights with LEDs. The operating hours for these lightings are around 7 hours. T8 tube lightings can be replaced with the LED lightings thereby achieving significant energy consumption reduction. The LEDs could be replaced in such a manner that it has same fixture so there will not be retrofitting cost attached to the replacement. The replacement could be done in a phased manner. LED lightings have better efficacy as well as better lifetime than T8 lightings.

Energy Saving Calculations:

Particular	Unit	Value
Power consumption of TL,MV lamps	KW	5.68
Power consumption of suitable LED Street light	KW	3.65
Average power saving after replacement with LED Street light	KW	2.03
Replacement of conventional lights with suitable LEDs	Nos	203
Average working hour per day	hrs	7
No. of working days in a year	Days	300
Cost Benefit Calculation		
Annual Energy Saving potential	kWh	4263
Electricity tariff	Rs/unit	5.6
Annual Cost Saving	Rs. Lakh	0.24
Total investment cost	Rs. Lakh	1.33
Annual Saving	Rs. Lakh	0.24
Simple Payback Period	Years	5.55

Type of Fitting	Wattage	Qty	Proposed LED W	Existing KW	Proposed KW	Saved kW	Investment Rs Lakh
Tube Light	28	203	18	5.68	3.65	2.03	1.33

ECM 2: Replacement of Old Fan with Energy Efficient Super Fan

ECM No.	Energy efficiency improvement measures	Investment Rs. In Lakh	Estimated saving		Estimated Savings Rs. In Lacs	Estimated Payback Years
			Electricity kWh	Carbon credit (Tons of CO_2)		
2	Replacement of Existing Fans with Energy Efficient Fans	5.09	9665.25	8.22	0.54	9.41

Observations:

During energy audit, it is observed that facility has old 60 watts' fan and its energy consumption is on higher side.

Recommendations:

During energy audit, it is observed that facility has installed non star rated fan of 60 watts so we recommend to replace energy consuming fan with energy efficient super fan.

Energy Saving Calculations:

Particular	Unit	Value
Existing energy consumption of Fan	kWh/year	33138
Fan Wattage	Watt	35
Energy consumption after replacing with Energy Efficient Super Fan	kWh/year	19331
Operating hrs/year	Hrs/year	2100
Diversity factor	%	70%
Annual Saving	kWh/year	9665
Unit rate	Rs/kWh	5.6
Annual Saving	Rs. In Lacs	0.54

Category	Nos	Estimated Running kW
Ceiling Fan 60W	263	15.78

6. LIST OF INSTRUMENTS

Power analyser

Picture 1 Fluke Power analyzer

Specification of the 434 Fluke power analyzer:

Electrical	
Single Phase	YES
Three Phase	YES
USER INTERFACE	
LCD-Type	Graphic LCD
LCD-Dimension	127 x 88 mm
Traditional energy analysis	V, I, P, Q, S, F, PF, cos ϕ, peak, minimum, maximum, demand etc.
Voltage	1V to 1000 V phase to neutral
Current	Up to 6000 A
Frequency	42.50 to 57.50 Hz
Precision Voltage, Current, Power	±0.1 %

Luxmeter

Picture 2 Luxmeter

Indi 6171 Luxmeter was used to measure the lux levels. The lux levels at the workplaces were found to be adequate.

Digital Clamp Meter

Picture 3 Mastech M266 clamp meter

Mastech M266C Digital AC Clamp Meter is used to measure the instantaneous current. The temporary measurements were recorded for the Main feeder, Lightings panel, ducted air conditioners. Following are the specification for this clamp meter:

Specification	Range	Accuracy
DC Voltage	200mV	-1.005
	2V/20V/200V	-3.005
	1000V	-3.008
AC Voltage	200V	-5.01
	750V	-5.012
AC Current	20A	-5.04
	200A	-5.025
	1000A	-10.03
Resistance	200Ω	-5.01
	2KΩ/20KΩ/200KΩ/2MΩ	-8.01
Temperature	0□~400□(32□~752□)	-3.01
	401□~750□(752□~1382□)	-3.02
Insulation Test	20MΩ	-2.02
	2000MΩ(Note<500Ω)	-2.04
	2000MΩ(Note>500Ω)	-2.05

7. ANNEXURE (SOLAR)

1) Introduction

The solar energy has a great potential as future source of energy. With its availability in large quantity almost in every corner of the country, solar power has the distinctive advantage of generating power at local and decentralized levels and being one of the prime factors for empowering people at grassroots level. The solar mission, which is part of the National Action Plan on Climate change has been set up to promote the development and use of solar energy for power generation and other uses with the ultimate objective of making solar energy competitive with fossil-based energy options. The solar photovoltaic device systems for power generation had been deployed in the various parts in the country for electrification where the grid connectivity is either not feasible or not cost effective as also some times in conjunction with diesel based generating stations in isolated places, communication transmitters at remote locations. With the downward trend in the cost of solar energy and appreciation for the need for development of solar power, solar power projects have recently been implemented. A significant part of the large potential of solar energy in the country could be developed by promoting solar photovoltaic power systems of varying sizes as per the need and affordability coupled with ensuring adequate return on investment.

2) Benefits of Solar Energy

a. Power from the sun is clean, silent, limitless and free.

b. Photovoltaic process releases no CO2, SO2, or NO2 gases which are normally associated with burning finite fossil fuel reserves and don't contribute to global warming.

c. Photovoltaic are now a proven technology which is inherently safe as opposed to other fossil fuel based electricity generating technologies.

d. Solar power shall augment the needs of peak power needs.

e. provides a potential revenue source in a diverse energy portfolio

f. Assists in meeting renewable portfolio standards goals.

This proposal is prepared for design, engineering, procurement / manufacture and installation of solar power generating system. The grid-tie solar photovoltaic power generation system is mainly composed of PV array, String Inverter, and PV mounting structure.

It also consists of supporting devices like AC / DC switchgears, Lighting Arrestor, Earth Electrodes, AC / DC cables. As there is no any battery, it's maintenance cost is negligible and initial investment per KW is very low.

3) Objective

- Provide reliable, clean, regulated, un-interrupted power on demand to the pre-identified critical loads
- System to provide low life cycle cost and maximize savings to the beneficiaries.

- To save diesel in institutions and other commercial establishments including industry facing huge power cuts especially during daytime.

4) Design Assumptions

General

a. The Solar Radiation Data's are based on standard books & simulation software as NASA and Metronome. The Mean Hourly Radiation Data is considered.

b. The module rating considered is tentative. The exact module sizing and rating will depend on the availability of cell grade and site suitability.

c. Solar Panels are roof/ground mounted in one location. Environmentally protected, closed, ventilated, inverter room at minimum distance from PV modules.

d. Application: Self consumption, captive grid or NET metering.

e. Emergency Backup: Generator or any other source in absence of Grid.

5) System Description

Solar Power Plant comprises of the main equipment and components listed below:

1. Solar PV Modules
2. String Inverter with MPPT
3. Module mounting system
4. Monitoring system
5. Cables & connectors

Each of the sub systems has been described for the functionality and operation modes. The physical construction of the system follows a modular approach, which is field-tested and is regularly used for delivery of power systems.

5.1 Solar PV Module (Electrical Features)

The PV modules convert the light reaching them into DC power. The amount of power they produce is roughly proportional to the intensity and the angle of the light reaching them. They are therefore required to be positioned to take maximum advantage of available sunlight within sitting constraints.

5.2 Solar PV Module (Mechanical Features)

Solar Module design will conform to following Mechanical requirements:

- Toughened,
- low iron content,
- High transmissivity from glass.
- Anodized Aluminum Frame.
- Ethyl Vinyl Acetate (EVA) encapsulating.

- Tedlar/Polyester trilaminate back surface.
- ABS plastic terminal box for the module output termination with gasket to prevent water & moisture.
- Resistant to water, abrasion hail impact, humidity & other environment of actors for the worst situation at site.

5.3 Module Mounting Structure

The structure shall be designed to allow easy replacement of any module and shall be in line with site requirement. Structure shall be designed for simple mechanical and electrical installation. It shall support SPV modules at a given orientation, absorb and transfer the mechanical loads to the ground properly. There shall be no requirement of welding or complex machinery at site. The array structure shall have tilt arrangement to adjust the plane of the solar array for optimum tilt.

5.4 Junction Box

The junction boxes shall be dust, vermin and waterproof and made of FRP/ABS Plastic with IP65 protection. The terminals shall be connected to copper bus bar arrangement of proper sizes. The junction boxes shall have suitable cable entry points fitted with cable glands of appropriate sizes for both incoming and outgoing cables. Suitable marking shall be provided on the bus bar for easy identification and cable ferrules shall be fitted at the cable termination points for identification

5.5 String Inverter

The STRING INVERTER is A combination of Solar Charger (MPPT), Inverter and synchronization unit for two different AC supplies, all housed in a single unit. Maximum power point tracker (MPPT) shall be integrated into it to maximize energy drawn from the solar array. The Inverter converts the DC available from the array into an AC output. The output of the inverter is filtered to reduce the harmonics to an acceptable level (less than 5%). MPPT shall be microprocessor/micro controller based to minimize power losses and maximize energy utilization. The efficiency of MPPT shall not be less than 90% and shall be designed to meet the solar PV Array capacity.

5.6 AC /DC Cables

We use DC & AC cables of Lap, Apar, Polycab, Havels, Finolex or equivalent make to ensure minimum losses in transmission.

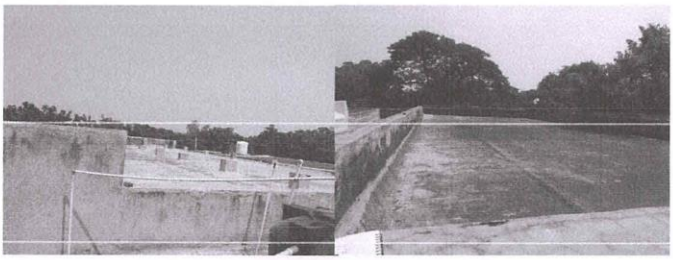
In order to complete the energy study that leads to the construction of a photovoltaic installation, hourly series of global horizontal irradiation values for a complete year are used, which resume the irradiation and other meteorological parameters behavior over a long term. We use PV. SYST. Software to workout optimum power production at site with minimum loses.

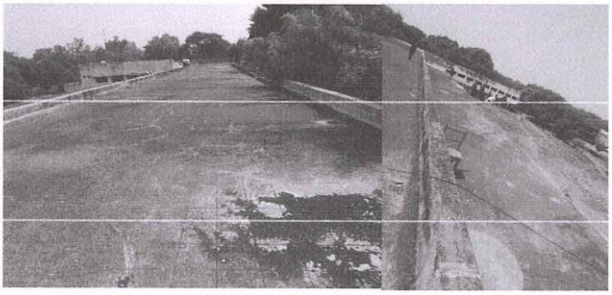
5.7 Grounding and Lighting Protection

- A protective earth (PE) connection ensures that all exposed conductive surfaces are at the same electrical potential as the surface of the Earth, to avoid the risk of electrical shock. It ensures that in the case of an insulation fault (a "short circuit"), a very high current flows, which will trigger an over current protection device as fuses and circuit breakers that disconnects the power supply.
- A functional earth connection serves a purpose other than providing protection against electrical shock. In contrast to a protective earth connection, a functional earth connection may carry a current during the normal operation of a device.
- Lightning protection is a very specialized form of grounding used in an attempt to divert the huge currents from lightning strikes. A ground conductor on a lightning arrester system is used to dissipate the strike into the earth.
- Lightning ground conductors must carry heavy currents for a short period of time. To limit inductance and the resulting voltage due to the fast pulse nature of lightning currents, lightning ground conductors may be wide flat strips of metal, usually run as directly as possible to electrodes in contact with the earth.
- In proposal, the entire system is fully provided with the required lighting and grounding protection.

6) Solar PV Locations

Buildings Considered for Solar Power Installation





Details of Smt. R. D. Goenka College Building:

Average Unit Consumption / year of Buildings is **84716** Units (Ref. 12 months Electricity Bills)

Sr. No.	Name of Building	Length (ft.)	Width (ft.)	Area (Sq. ft.)	Plant Installed (kW)
1	Terrace I	300	15	4500	56.25
2	Terrace II	60	15	900	11.25
3	Terrace III	40	30	1200	15.00
4	Terrace IV	60	30	1800	22.50
5	Terrace V	60	30	1800	22.50
6	Terrace VI	300	10	3000	37.50
Total				**13200**	**165.00**

Total Available Area = 13200 Sq. Ft. & As per available shadow free Area maximum 165 KW Plant can be installed on I & II buildings as per details mentioned in above table.

7) Capacity Evaluation

Calculation for Required Solar Capacity plant to fulfill In-house Requirement

Calculation to Fulfill Building Total Load Requirement			
Sr. No.	Details	Value	Unit
1	Average electrical consumption per year	84716	KWh
2	Units generated per day per KWp	4.5	KWh/KWp/day
3	Units generated per Year per KWp (330 days / Year)	1485	KWh/KWp/Year
4	Solar KW capacity For 84716 KWh consumption / year	57	KWp

As per electrical consumption (Building Load), capacity of Solar Power Plant required is 57 KWp. As per shadow free space available on college building maximum 165 KWp plant can be installed which is more than the actual requirement of full Electrical Load.

It is suggested to install Solar Plant of Capacity 57 KWp, which can be installed on New building itself & it covers all required load.

The SPV power plant with proposed capacity of 57 KWp would be connected to the main electrical distribution panel. The system would meet full load requirement of the connected load during the day. Advance control mechanism in the Power Conditioning Unit will ensure that the maximum power generated by PV modules will be utilized first and the balance requirement of power will be met by either grid or DG set.

The 57 KWp SPV Power Plant is estimated to afford annual energy feed of 84716 KWh/year (After considering all losses) considering efficiency of the solar module as 15.16%, Power Conditioning Unit (PCU) efficiency as 98.3% and losses in the DC and AC system as 3%.

8) Budgetary Estimation of the Project

Details	Value	Unit
Shadow free space required for approx. 1 KWp Solar Plant	80	Sq.Ft
Shadow free space available on college building	13200	Sq.Ft.
Solar Plant capacity to be Installed on college building	165	KWp
Solar Plant Requirement as per actual consumption	57	KWp
Installation Cost Per KW for 1KWp Solar Plant	0.55	Rs. In Lakh
Gross Estimated System cost (For 57 KWp Grid Connected Solar Plant)	31.35	Rs. In Lakh
Unit generated per day per kWp	4.5	KWh
Electricity generation per day for 57 KWp Grid Connected Solar Plant	256.5	KWh/day
Electricity generation per year for 8 KWp Grid Connected Solar Plant (330 days / year)	84645	KWh/year
Average Electricity Unit Cost	5.6	Rs./KWh
Electricity cost saved per year	4.74	Rs. In Lakh
Simple payback period	**6.61**	Years

Criterion VII: Institutional Values and Best Practices

Green and Environment Audit Report

Bharatiya Seva Sadan's

Smt. Radhadevi Goenka College for Women

Akola, 444001, Maharashtra, India

INTERNAL GREEN & ENVIRONMENT AUDIT REPORT

2019 - 2020

Prepared by:

Internal Green & Environment Audit Committee

Smt. Radhadevi Goenka College for Women

Akola, 444001, Maharashtra, India

Internal Green and Environment Audit Committee, Smt. Radhadevi Goenka College for Women, Akola

Acknowledgment

Internal Green and Environment Audit Committee would like to thank the management of Smt. Radhadevi Goenka College for Women, teaching & non-teaching staff, students, parents, and adjoining community for extending their co-operation and valuable inputs in a collection of various facts and figures. This is a significant step taken by the college and their efforts towards their contribution in conservation of resources, a worth mentioning here. Internal Green and Environment Audit Committee also wish to thank EFEC for helping Internal Green and Environment Audit Committee and appreciate their cooperation in extending their knowledge throughout the process of the Internal Green and Environment Audit program. Our special thanks are due to the Principal, Dr. Devendra N. Vyas of Smt. Radhadevi Goenka College for Women for giving valuable guidance in drafting this internal audit report.

About Smt. Radhadevi Goenka College for Women

Bharatiya Seva Sadan's Smt. Radhadevi Goenka College for Women, Akola, (Maharashtra) is affiliated to Sant Gadge Baba Amravati University. Established in 1965, this Educational Society is one of the oldest and pioneering among other educational societies in Vidarbha region of Maharashtra. It was established to extend educational opportunities to empower the women of this region, which come from various small villages of Akola District. It was a dream of Pujaniya Mataji, Late. Smt. Radhadevi Goenka, the founder of this institute. The vision of society is 'Empowerment of Women through Economic Independence for Betterment of Society' and the mission is 'To Impart holistic education to transform the girls into Empowered, Self-Earning & Efficient, Individual, Family members and, Citizens.' The college is centrally located in the heart of Akola city. It has a sprawling campus of 23 acres. It offers Five Undergraduate Programs and ten Postgraduate Programs.

Bharatiya Seva Sadan's

Smt. Radhadevi Goenka College for Women

Akola, 444001, Maharashtra, India

IGEAC : Internal Green and Environment Audit Committee

Sr. No.	Name	Designation	Sign
01	Dr. Devendra N. Vyas	Principal / Chairman	
02	Dr. Umesh P. Patil	Co-ordinator IGEAC	
03	Dr. Archana Ambhore	HOD, Member, IGEAC	
04	Dr. Anjali Rajwade	HOD, Member, IGEAC	
05	Dr. Ambadas Pande	HOD, Member, IGEAC	
06	Dr. R. S. Nitnawre	Member, IGEAC	
07	Dr. Vijay Alasi	Member, IGEAC	
08	Dr. Sumedh Sagane	Member, IGEAC	
09	Mr. Sabale	Non-teaching Staff, IGEAC	
10	Mr. Jatale	Gardner, IGEAC	A. P. Jatale
11	Miss Shaline Wankhade	Student Representative, IGEAC	
12	Mr. Devendra Telkar	External Member, IGEAC Srushti Vaibhav NGO	
12	Mr. Uday Vaze	External Member, IGEAC Director : EFEC	

The Internal Green & Environment Audit Committee authenticate observations, records and recommendations in this report.

Internal Green & Environment Audit Key Steps:

Pre Audit Training Workshop:	**May 2019 (Online)**
Questionnaire Data Collection:	**June 2019 to March 2020**
Draft report completed:	**April 2020 (Online)**
Review Meeting:	**April 2020 (Online)**
Final report completed:	**June 2020**

Synthesis Document

Internal Green and Environment Audit is a process of systematic identification, quantification, recording, reporting, and analysis of components of environmental factors of various establishments. It aims to analyze environmental practices within and outside of the concerned sites, which will have an impact on the ambiance. Thus it is imperative that the college should evaluate its contributions towards a sustainable future. As environmental sustainability is becoming an increasingly important issue for the nation, the role of higher education institutions in environmental sustainability is more prevalent. Internal Green and Environmental Audit are assigned to the Criteria 7 of NAAC, National Assessment and, Accreditation Council. The Internal Green & Environment Audit Committee was formed. Committee decided to conduct an Internal Green and Environmental Audit of the college in May 2019. The motive of the internal audit was to make sure that the practices followed in the campus are environment friendly. The questionnaire was obtained with the help of an external member of the Internal Green & Environment Audit Committee. The methodology was simple and started right from collecting data, insight inspection, evaluation, computation, conducting the physical survey, and review of the relevant documentation.

Statement of Assertion

The Internal Green & Environment Audit Committee has adopted the audit procedure that meets the terms of International Standards of Internal Auditing Practices. **The committee is causing to feel certain that adequate and relevant audit procedures were followed, concrete evidence was gathered and conclusions were drawn from facts.** The Internal Green and Environment Audit committee believes that recommendations are for improving the effectiveness of environmental management efforts made by the college. Recommendations are based on evidence compiled in this report as they existed at the time of the audit.

Compendium

It was truly evident from the data collected in several visits to the college that teaching & non-teaching staff, students of the college are aware of the importance of efforts to save and protect the environment on the campus. The college staff follows best course of action such as reducing all types of waste, time to time garden maintenance, following composting practices, follow ways and means to reduce energy consumption, conducting review meetings, organize environmental educational activities for staff as well as for students.

Although, it was also observed that, many of the practices followed by the college are in a nascent stage and need further action to improvise the environment.

Contents

Introduction

The expeditious urbanization and economic development at the local, national and international level have led to several environmental and ecological emergencies. To prevent damages due to site-specific activities, practices, processes and procedures followed by various institutions, businesses, organizations or factories, it becomes essential to adopt methods, processes, and procedures for making green campuses for the institutions, businesses, organizations or, factories which will lead for sustainable development.

Smt. Radhadevi Goenka College for Women has concentrated its focus to save the environment in every possible way. The college made it clear from its environment policy that it is a priority area to conserve the environment and promote education & awareness about keeping campus green. The purpose of conducting the Internal Green and Environment Audit is to understand and make continuous efforts to reduce the adverse impact on the environment. The college hires consultants and resource persons in environment education and protection.

Internal Green Audit

Internal Green Audit is a process of systematic verification of activities, identification of adverse impacts, evaluation of systems, documentation process, reporting, and analysis of ecological diversity of various institutions, businesses, organizations or factories. It aims to analyze ecological practices and processes within and outside of the targeted institution, business, organization, or factory, which will have an impact on the ecologically friendly environmentally safe ambiance.

Internal Environment Audit

An Internal Environment Audit is an assessment performed to ensure that institutions, businesses, organizations, or factories are complying with environmental regulations policies. It examines the amount of adverse impact on the environment or risk of injury that may be posed by the assessed entity and determines the types of pollution being produced by looking at a broad range of site-specific activities, practices, processes, and procedures.

Scope

Internal Green and Environment Audit play a significant role in the continuous operation of institutions. It keeps institutions accountable by scrutinizing their site-specific procedures and determining what remedial measures are required to be added or put in place to ensure institutions, businesses, organizations or, factories are following the proper statute.

Methodology

Internal Green & Environment Audit Committee was formed and decided to call upon an open discussion on how to conduct Internal Green & Environment Audit. The committee concluded that the external party will look into the overall infrastructure, procedures, practices, and operation of the college and will draft a detailed questionnaire. Questionnaires provide a relatively rapid and efficient way of obtaining large amounts of information from a large number of people. Questionnaire are easy to respond to. Specifically, answers obtained through closed-ended questions with multiple choice answer options are easy to obtain and less time-consuming. Answers obtained from the open-ended questionnaire are analyzed using qualitative methods and they involve discussions and critical analyses without any difficulty. This was useful because the information lead to concrete conclusions.

The methodology also included a physical inspection of the campus, observation, and review of the documentation, interviewing key persons and data analysis, measurements, and suggesting recommendations.

The efforts were taken to understand the following focus areas and emphasis was given to know facts on the ground :

i) Overall area inspection to find out efforts taken by the college to promote greenery on the campus.

ii) Management & performance of water distribution and its conservation, be it a municipal supply or the water collected by rainwater harvesting.

iii) Drinking water and water consumption for other purposes such as construction, gardening etc, and its management.

iv) Use of electricity and other types of energy uses and management related to it.

v) Test air quality, noise level and, water on the campus with the help of external service providers.

vi) Observe solid and liquid waste management on the campus.

vii)Initiatives, projects and, activities taken for conservation of flora, fauna and the measures taken to improve environment management systems in the college campus.

Environment Policy

Smt. Radhadevi Goenka College for Women not only targets to impart quality education but also understand responsibility towards protection of the environment for the future generation. The college wishes to create environmentally safe practices to ensure that the college campus is kept green by reducing its carbon footprint. **The college monitors its operation and makes it economically successful & sustainable along with being socially responsible and protecting the environment.**

Environmental Policy Document

Smt. Radhadevi Goenka College for Women is a quality-conscious college. It protects its environment and efforts are taken to keep it a pollution-free green campus. Environment protection, conservation, and education are key areas that are stitched together in the education of the college. The college look after the environment carefully. Every year, during the rainy season, trees are planted and are carefully looked after.

It's the responsibility of Smt. Radhadevi Goenka College for Women to preserve the greenery in the college campus.

i. To create awareness regarding the environmental policy of the college to management, teaching & non-teaching staff, students and, community members.

ii. To keep college campus free from pollution by avoiding open fire, managing garbage, prohibiting the eating of tobacco & pan masala spitting on the campus.

iii. Display Caution poster regarding to health, hygiene, and environmental protection on the campus wherever possible to sensitize each and everyone visiting the college.

iv. To install and maintain 'Rain Water Harvesting' on the campus. To collect every raindrop falling on the roof of the college, and to store the harvested water in water harvesting well constructed at the college.

v. To observe 'No Vehicle Day' in pursuit of reducing vehicular pollution.

vi. To communicate electronically to reduce consumption of paper.

vii. To evaluate the environmental performance of the college by conducting Internal Green and Environment Audit annually.

Location of the college

Smt. Radhadevi Goenka College for Women, Akola district of Maharashtra State is a prominent college in the Vidarbha region. It is well connected by state highway road, enabling students from adjoining districts to reach the college comfortably.

Latitude : 20°42'3.68"N Longitude : 77° 0'39.45"E

Land use and land cover

The total area of the college campus: 82,565.40 Sq. Mtrs.

Built-up area: 4001.12 Sq. Mtrs.

Population

Students : 2718 Teaching Staff: 181 Non Teaching Staff: 41 Floating : 10

Internal Green and Environment Audit Training

Smt. Radhadevi Goenka College for Women Akola has a well-defined decentralized and participatory organizational structure to coordinate and promote the academic and administrative function. The college has organized Pre Internal Green & Environment Audit Orientation Program and taken special efforts in enrolling teaching, non-teaching staff, students, and community representatives to attend the program. Environmentalists & subject specialists presented various topics such as protecting the environment by preventing practices that create wastage, enhancing environmental performance, introducing new ways to reduce pollution.

Internal Audit Questionnaire & Internal Audit Forms

Internal Green and Environment Audit Committee were given a host of audit forms and questionnaires. The committee was well supported by the teaching and non-teaching staff of the college to collect the data. The evidence was collected by referring to Questionnaires and field visits to the college.

Water Quality

Access to safe drinking water is essential to health and, a component of effective policy for health protection. Water is essential to sustain life, and a satisfactory (adequate, safe and accessible) supply should be available to all.

Sound Pressure Level Testing

Several sound pressure level tests were carried out to measure noise pollution.

Primary Air Quality

Several primary air quality tests were carried out. The results of the tests came out to be within prescribed limit.

Installations

The installation of solar panels, solar water heater, and compost pits are noteworthy initiatives taken by Smt. Radhadevi Goenka College for Women Akola.

Biodiversity in campus

Smt. Radhadevi Goenka College for Women Akola campus is keen in planting diverse species of trees every year. The diversity of trees promote various species of flora and fauna on the campus.

Flora

A wide variety of floral species can be seen on the campus. The college has taken a painstaking effort in maintaining green cover and a botanical garden that nurtures a host of a wide variety of medicinal species for educational purposes.

Fauna

The green cover in the campus helps in creating favorable conditions for many living organisms. One can watch many birds chirping on the campus. 5 species of butterflies too are seen every year.

Green initiatives

Smt. Radhadevi Goenka College for Women, Akola is a premier institute in Vidarbha and is aware of the importance of educating students about the environment and special efforts are taken by the college in initiating activities that reduce its adverse impacts on the environment. Initiatives such as Tree Plantations, No Vehicle Day, Installation of Solar Panels, Plastic Waste Free Campus, Regular Maintenance Of Electrical Gadgets, Awareness Training Workshops, are organized by the college. Internal Green & Environment Audit Committee has recommended a few remedial measures.

Recommendations

Few recommendations are given by Internal Green & Environment Audit Committee. The recommendations made by the committee will improve the environment and will make a positive impact on the environment performance of the college.

Post Internal Green & Environment Audit Commitments

A review meeting was organized to discuss recommendations made by committee after the Green & Environment Audit process was completed.

Internal Green & Environment Audit Document Storage

Documents related to Internal Audits are stored at the IQAC chamber.

Bio-diversity in campus : Flora

Exhaustive list of floral species found in the campus are presented in following table.

English Name	Marathi Name	Botanical Name	Type
False Ashoka	अशोक	*Polyalthia longifolia*	Tree
Golden Champa	सोन चाफा	*Michelia champaca*	Tree
Mango	आंबा	*Mangifera indica*	Tree
Indian Almond	गोड बदाम	*Terminalia catappa*	Tree
Crape Jasmine	तगर	Tabernaemontana divaricata	Shrub
Indian Gooseberry	आवळा	*Emblica officinalis*	Tree
Bamboo	बांबू	*Bambusa bambos*	Tree
Basil	तुळस	*Ocimum sanctum*	Tree
Periwinkle	सदाफुली	*Vinca rosea*	Shrub
Whistling Pine	सरू	*Casuarina equisetifolia*	Tree
Narium	कण्हेर	*Narium oliender*	Tree
Arjun Tree	अर्जून	*Terminalia arjuna*	Tree
Soapnut Tree	रीठा	*Sapindus trifoliatus*	Tree
Bidi Leaf Tree	आपटा	*Bauhinia racemosa*	Tree
Neem Tree	कडूलिंब	*Azadiracta indica*	Tree
Indian Medlr	बकुळ	*Mimusops elengi*	Tree
Royal Poinciana	गुलमोहर	*Delonix regia*	Tree
Bodhi Tree	पिंपळ	*Ficus religiosa*	Tree
Indian Teak	सागवान	*Tactona grandis*	Tree
Sapota Tree	चिकू	*Manilkara zapota*	Tree
Stone Apple	बेल	*Aegle marmelos*	Tree
Jamun Tree	जांभूळ	*Syzygium cumini*	Tree
Lemon Tree	लिंबू	*Citrus limon*	Tree
Gauva Tree	पेरू	*Psidium guajava*	Tree
Mungana Tree	शेवगा	*Moringa Oleifera*	Tree
Jamun Tree	जांभूळ	*Syzygium cumini*	Tree
Pomengranate	डाळिंब	*Punica granatum*	Tree

Green initiatives by Smt. Radhadevi Goenka College for Women, Akola

College made special efforts to work with Akola Municipal Corporation regarding waste disposing of. The waste is regularly collected by corporations and helps collage to keep the campus clean & green.

'Making of Eco-friendly Ganesh idols Workshop' was organized to spread the message of avoiding the use of Plaster of Paris idols.

Installation of vermicompost pit. As students n staff tend to dispose of waste food in the compost pit. Manure is available and is utilized in the garden of the college.

No Vehicle Day is observed once a week. This surely is an activity that reduces vehicular pollution. It also educates students and, staff to follow minimalization approach. This is a significant step taken by the College.

Swatch Bharat Abhiyan initiative was launched to keep campus clean n green and to promote hygienic conditions.

Save Paper Save Tree initiative was organized by Smt. Radhadevi Goenka College for Women Akola. An event to enroll students to minimize their use of papers leads to saving a few trees from cutting.

Save energy, save electricity signs are fixed at many electrical switch boards. The signs promoting students and staff to switch off electrical gadgets such as fans, lights when they are not in use. This helps to minimize electricity consumption.

NSS and NCC activities are organized such as tree plantation and swachata initiatives on a time to time basis. The cleaning drive was organized by the college and also involved teaching, non-teaching staff and, students to participate in it.

To manage waste generated by classrooms, the dust bins are kept outside the classroom and, it made safe waste disposable on an everyday basis.

New energy conserving lights were installed whereever possible to reduce the energy consumption. Old electrical cables were replaced with new ones.

'Swatchata Pandharwada' was celebrated on the campus and in the adopted village through NSS activities.

Sound Pressure Level Testing Report

Sound Pressure Level Testing

Sound waves are vibrations of air molecules carried from a noise source to the ear. Sound is typically described in terms of the loudness (amplitude) and the pitch (frequency) of the wave. Loudness (also called sound pressure level, or SPL) is measured in logarithmic units called decibels (dB). The normal human ear can detect sounds that range between 0 dB (hearing threshold) and about 140 dB, with sounds between 120dB and 140 dB causing pain (pain threshold). The ambient SPL in a library is about 35 dB, while that inside a moving bus or subway train is roughly 85 dB; building construction activities can generate SPLs as high as 105 dB at the source. SPLs decrease with distance from the source.

Standards of sound:
To control the generation of noise by various sources in the environment, the **Central Pollution Control Board**, under the **Ministry of Environment and Forests, Government of India**, has set standards of sound for different categories of areas (residential, commercial, industrial and silence zones), separately for day-time and at night [Table 1].

[Table 1]

Category of Area/Zone	Limits in dB(A)	
	Day Time	Night Time
Industrial Area	75	70
Commercial Area	65	55
Residential Area	55	45
Silence Zone	50	40

Date	Location	Remarks	dB(A)	Date	Location	Remarks	dB(A)
21.08.20	RDG COLLEGE MANAGEMENT CHAMBERS.		99/74				
	LIBRARY		78/62				
〃	R2 CLASSROOM		84/69				
C LAB	〃		84/63				
Bio Ch Lab	LAB	OLD FANS	81/66				
Parking Area			78/54				

Reducing noise pollution can be achieved through regulation, improved building methods, better product design, noise barriers and better planning. Growing populations, urbanization and modern technologies all contribute to increased noise pollution. It may sound extreme, but it qualifies as a practical way to reduce noise pollution. Noise is produced by strong sound waves or vibrations, which can be significantly reduced by barriers. By installing a live fence, you'll be creating a barrier that absorbs the strong sound waves or vibrations, thereby reducing noise pollution around your office or institution. Vegetation reduces noise pollution through a phenomenon called sound attenuation, which is the reduction of sound intensity. Leaves, twigs, and branches on trees, shrubs absorb and deflect sound energy. Declare a "No Horn Zone" in Hospital, Educational institutes, and Residential Areas : Horns from trucks, buses, and cars produce a considerable degree of noise pollution and as such, the introduction of no horn zone can help reduce noise pollution. Governing and city authorities hold the power to introduce policies that can help reduce noise pollution. The laws should limit the amount of noise in public and private places to cut noise pollution. Do regular checking of noise levels: Keeping the noise level within the limit requires frequent verification of noise level. Therefore see to it that regular checking of noise level is done.

Name of the institute: Smt Radhadevi Goenka College for Women, Akola
Place: Akola
Date: 20/08/2021
Seal:

Environment & Forest Education Center
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The human ear distorts its sensitivity to lower and higher frequency sounds. Sound meters try to mimic this process by weighting the readings. This scale is known as the **A scale** and readings taken using this scale will be denoted as **dB(A).**

The World Health Organization (WHO) suggests that the optimal sound level in a classroom should be **at or below 35 dB. Noise pollution is an invisible danger.** The most common health problem it causes is Noise Induced Hearing Loss (NIHL). Exposure to loud noise can also cause high blood pressure, heart disease, sleep disturbances, and stress. **The Central Pollution Control Board (CPCB)** has proposed a new set of fines between **Rs 1,000 and Rs 1 lakh** for those who violate norms restricting noise pollution under the Noise Pollution (Regulation and Control) Rules, 2000.

Primary Air Quality Report

Primary Air Quality Testing

20/08/20

Time/In or Out	PM 2.5	PM1	PM10	TVOC	CH2O	Humidity	
PREM 10.08 AM	16	9	20	0.013/0.020	0.000	87%	22°C
LIBRARY 10.34 AM	24	13	30	0.006/0.104	0.000	76%	24°C
RT CLASSROOM 10.41	26	14	32	0.026	0.000	77%	24.9°C
CLAB 10.49	21	27	12	0.520/0.650	0.000	75%	25.0°C
BIOCH LAB 11.07	25	33	18	0.130 0.715	0.000	80%	23.9°C
Painting Area(Store)	37	48	22	0.195	0.000	69%	27.7°C

Air Quality Grade	PM 2.5 Average Value (ug/m³)
Excellent	0-35
Good	35-75
Slight Pollution	75-115
Moderate Pollution	115-150
Severe Pollution	150-250
Serious Pollution	> 500

TVOCs: Total Volatile Organic Compounds (TVOCs) are a group of compounds with high vapor pressure and low water solubility. In other words, these substances won't easily bind to themselves (volatile) or dissolve in water (organic). Inside your home or in an institution , volatile organic compounds are harmful, carcinogenic air pollutants that evaporate at normal indoor atmospheric conditions. TVOCs affect your sense off wellbeing. Some VOC's are even bad for health.

CH2O: Formaldehyde is a colorless poisonous gas synthesized by the oxidation of methanol and used as an antiseptic, disinfectant, histologic fixative, and general-purpose chemical reagent for laboratory applications. Formaldehyde is readily soluble in water and is commonly distributed as a 37% solution in water; formalin, a 10% solution of formaldehyde in water, is used as a disinfectant and to preserve biological specimens. Environmentally, formaldehyde may be found in the atmosphere, smoke from fires, automobile exhaust and cigarette smoke. Small amounts are produced during normal metabolic processes in most organisms, including humans.

Particulate Matter measurement with laser scattering method. Particulate matter is a mixture of liquid droplets and solid particles found in the atmosphere. The particle sizes are classified by size for the purpose of measurement, emission control, effects, and mitigation strategies. Historically, particles with diameters less than 10 microns (PM-10) have been the major concern, because they can easily pass into the lung. However more recently scientist have labeled particle sizes measuring 2.5 micron (PM-2.5) in diameter and smaller as the most damaging to human health because they penetrate and remain in the deepest passages of the lungs. Particulate matter contains toxic chemicals, some of which are known to cause cancer. They can irritate the respiratory system, accumulate in the lungs to cause silicosis, asbestosis, and aggravate conditions such as asthma and other respiratory disease. PM-10 also interferes with plant photosynthesis. The main sources of PM-10 include carbon used in industrial and domestic combustion gasoline, diesel, industrial processes, and fires, and includes dust, soot, metallic particles, cement, pollen, and organic compounds. The Indian NAAQS for PM-2.5 is 40 µg/m³

Humidity: Most people find that a relative humidity between 30 to 60 percent is the most comfortable, with indoor humidity ideally between 30 to 50 percent.Low levels of humidity lead to very dry air which increases the prospect of catching airborne viruses like the flu, possibly due to both their ability to survive longer in dry cool conditions and irritated nasal passages making it easier to catch them. Eczema can be exacerbated and dry skin can also be uncomfortable.Higher humidity in the home creates an environment for two of the most common and undesirable triggers for asthma and allergy – dust mites and mold.

Name of the institute: Smt Radhadevi Goenka College for Women, Akola
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Recommendations / Analysis

Internal Green & Environment Audit Committee surveyed and scrutinized the overall environmental performance of Smt. Radhadevi Goenka College for Women Akola and recommendations are made as per the following:

i) The Internal Green and Environment Audit committee recommends to conducting a carbon footprint of the college and planting more trees.

ii) Automated sensors must be installed to prevent overflow from water tanks. Install a water meter and assign a specific person to record water consumption on the college campus.

iii) The committee also recommends appointing a specific person who will monitor the consumption of water and create a mechanism to reduce the wastage of water.

iv) The Internal Green and Environment Audit Committee recommends to initiating measures that may reduce pollutants on the campus. The Primary Air Quality Testing results show a slight increase in the TVOC range which itself suggests to adding pollution barriers in between the adjacent road and the campus. The committee recommends consulting a subject specialist to bring down pollutant numbers to some extent.

v)The Internal Green and Environment Audit Committee recommends college focus on bringing down sound pollution by putting a sound barrier in between the adjacent road and the college campus. The sound pressure levels detected inside classrooms in the college are slightly above prescribed limits. The committee recommends consulting a subject specialists and, reducing the noise coming from vehicles passing by the adjacent road.

vi) The Internal Green and Environment Audit Committee recommends to strengthening the present sewage and monitoring it on regular basis.

vii) More sensible electrical consumption approach is required at the college campus. The electrical gadget maintenance schedule is required to be displayed at a certain spot and care is to be taken to follow it. Even a specific person should be designated with the responsibility to do timely checks.

viii) College should take initiative in reducing its dependance on MSED power distribution network and support renewable and carbon-neutral electricity generation options such as generation of electricity by solar energy.

Recommendations / Analysis

ix) Old fans that make clicking, grinding, rattling, and ticking noise, must be repaired immediately or be replaced with new one. The disturbing sound from old fans creates noise pollution and it is not permissible in the classroom. The students may lose important study lessons due to a lack of concentration in their studies. Cleaning of tube lights and fans to be to be done periodically, to remove dust over it. The college should display the maintenance schedule publicly.

x) Occurrence of dense weed growth is noticeable and measures should be taken for its eradication.

xi) Roadside avenue trees are to be painted with a specific color for protecting them.

xii) Signs for various activities should be added on the premises and on the campus.

Post Internal Green and Environment Audit Review Meeting

Internal Green & Environment Audit Committee review meeting was attended by all teaching and non-teaching staff. A detailed discussion was carried out and recommendations made by Internal Green and Environment Audit Committee were shared with everyone in the meeting. Unanimously everyone present in the meeting agreed to be vigilant enough to take measures and meet the demands of audit reports.

Initiatives are undertaken by the college:

College canteen and the lush green landscape on the campus.

NSS activity to promote water conservation in the village

De-weeding Program Making of Ganesh Idol NCC - Tree Plantation

Initiatives are undertaken by the college:

Eating, chewing and spitting Tobacco is prohibitted in the college.

No Vehicle Day is observed in the college.

Dr. APJ Abdul Kalam
Environment Oath

1. I realize that every mature tree by photosynthesis absorbs 20 kgs of Carbon dioxide every year. By the same process, each tree lets out about 14 Kg of Oxygen every year.

2. I will plant and nurture ten trees and will ensure my parents, my sisters and, brothers plant trees and my neighbors also plant ten trees each. I will be an ambassador for a tree mission in my locality.

3. I will keep my house and its surroundings clean and use products that are bio-degradable to the extent possible.

4. I will promote a culture of environmental friendliness, through recycling and conservation of water and other recyclable materials both at home and school.

5. When I take a professional career, I will decide on organizational processes which protect the environment and preserves the biodiversity.

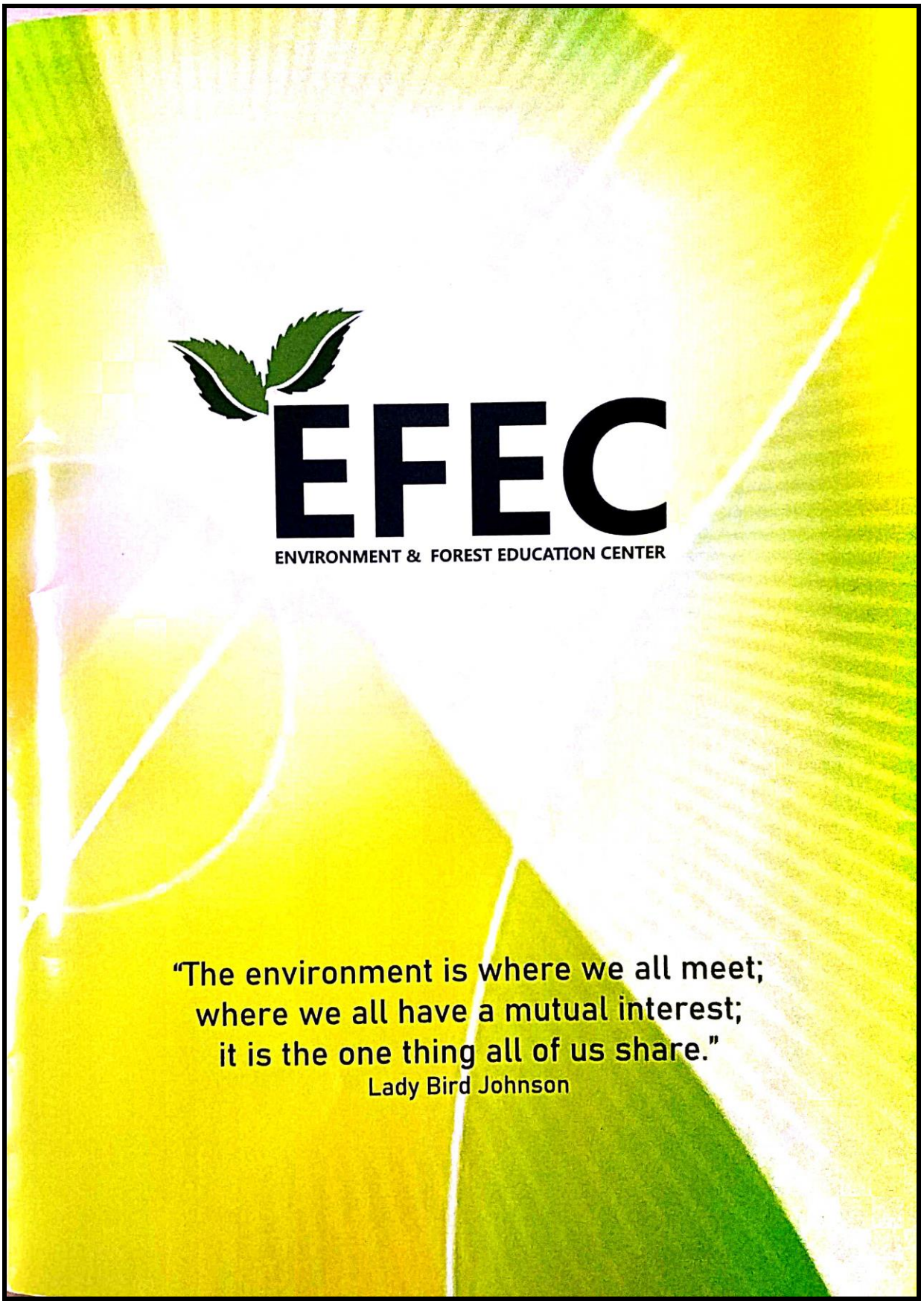
6. I will encourage the use of renewable energy to the maximum extent possible.

7. I will spread awareness about the need to preserve the environment in my home, in my locality, and among my student friends.

8. I will engage the water conservation, especially rainwater harvesting and, spread the message to my family and friends.

At Smt. Radhadevi Goenka College for Women Akola, we practice what we preach through our Environmental Pledge.

Thank you.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"The environment is where we all meet;
where we all have a mutual interest;
it is the one thing all of us share."
Lady Bird Johnson

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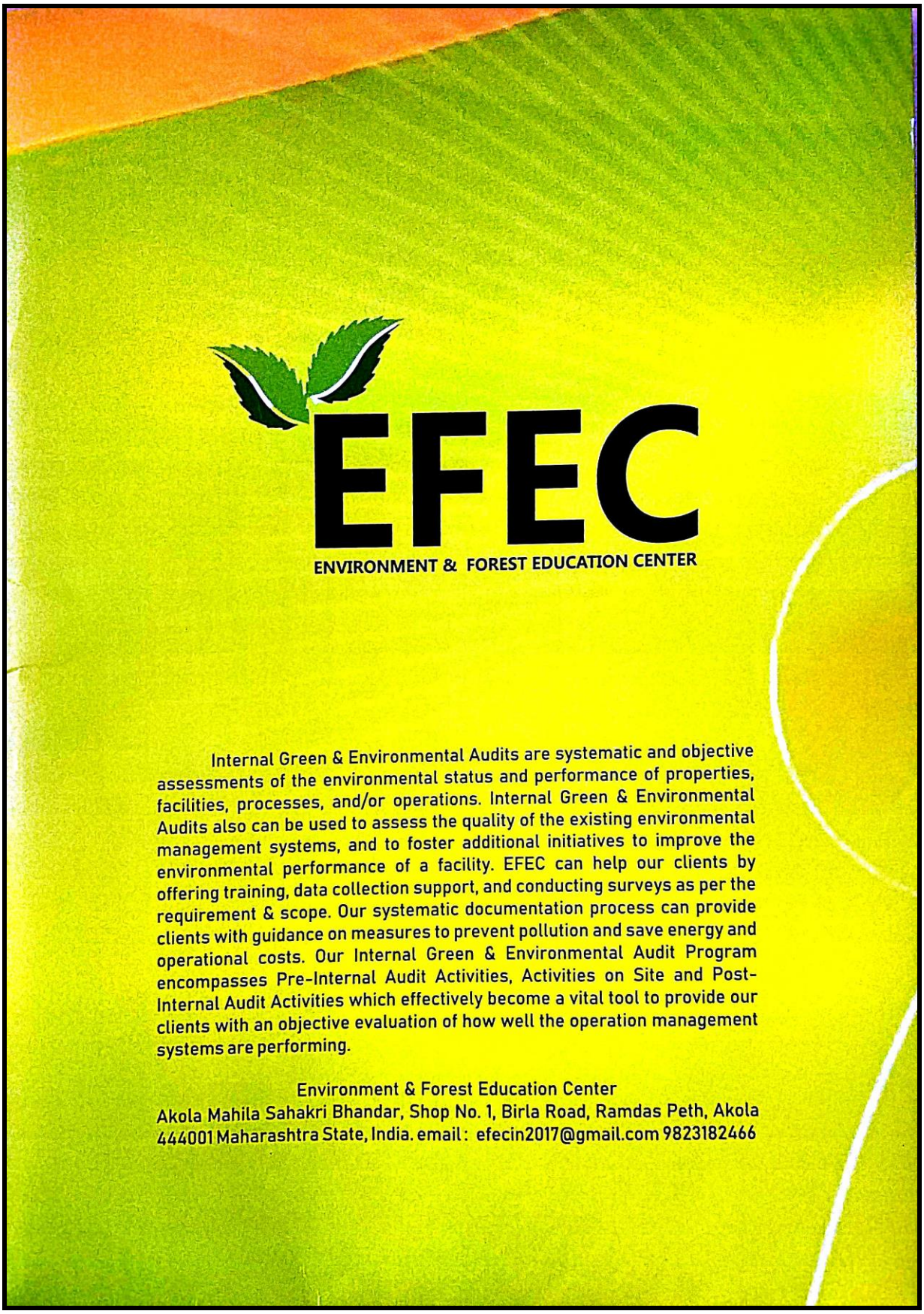
"Welcome to the green team."

"Let us all gather together and agree on our common achievable goals. Unfortunately, we all humans have not been good protector of the Earth over the last few centuries. In order to keep our planet healthy for our future generations we all need to take proactive steps better environment management systems. Most of the damage to our environment stems from consumption: what we consume, how much we consume and how often.

Whether it's gas, food, medicines, pigments, clothing, cars, furniture, water, toys, electronics, ornaments or other goods, we are all consumers. The key is not to stop consuming, but to start being mindful of our consumption. The sense of accomplishment from reaching these goals will generate lots of momentum. From today onwards as you read these of my few lines I expect you become part of the green team and protect the environment in every possible way."

Uday Vaze
Environment & Forest Education Center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Internal Green & Environmental Audits are systematic and objective assessments of the environmental status and performance of properties, facilities, processes, and/or operations. Internal Green & Environmental Audits also can be used to assess the quality of the existing environmental management systems, and to foster additional initiatives to improve the environmental performance of a facility. EFEC can help our clients by offering training, data collection support, and conducting surveys as per the requirement & scope. Our systematic documentation process can provide clients with guidance on measures to prevent pollution and save energy and operational costs. Our Internal Green & Environmental Audit Program encompasses Pre-Internal Audit Activities, Activities on Site and Post-Internal Audit Activities which effectively become a vital tool to provide our clients with an objective evaluation of how well the operation management systems are performing.
Environment & Forest Education Center
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