

Green Audit Report

of

Sri ShanmughaCollege of Engineering and Technology

Green Audit Done by

Internal Audit Team

01/02/2019

Project Report Title	:	Green Audit
Client Name	:	Sri Shanmugha College of Engineering and Technology
Plant Location	:	Pullipalayam,
		Sankari,
		Salem,-637 304.
Date of Audit	:	01 st February 2019
Green Audit done by	:	Internal Audit Team
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Index

Sl.No	Particulars	Page No
1.	Introduction	6
2.	Objective	7
3.	Methodology	. 8
4.	About the college	. 9
5.	Water Quality assessment, Consumption and Management	10
6.	Air Quality assessment, Consumption and Management	16
7.	Energy consumption Analysis	17
8.	Lighting and Fan power Consumption Analysis	18
9.	AC Power Consumption Analysis	19
10.	Main Incoming Trends	20
11.	Points for Improvement	24
12.	Sound Pollution Monitoring	25
13.	Waste Management	26
14.	Green Campus	28
15.	Carbon Foot Print	29
16.	Major Audit Observation	31
17.	Water Audit Findings	32
18.	Energy Audit Findings	32
19.	Waste Audit Findings	33
20.	Green Audit Findings	33

21.	Carbon Foot Print Audit Findings	33
22.	Preparation of Action Plan	34
23.	Follow up Actions and Plan	34
24.	Environmental Education	35
25.	Awareness of Carbon Consumption	35
26.	Conclusion and Full list of recommendation	36
27.	Common Recommendations	37
28.	Criteria wise Recommendation	37
29.	Audit Report	40

1. Introduction

Sri Shanmugha College of Engineering and Technology is one of the leading higher education institutions under Anna University, Chennai. This college was established by Shri.K.Shanmugham in the year of 2011.

This college is located at Sankari to Tiruchengode Main Road, PulliPalayam village, Sankari, Salem. This college is having lot of courses in Engineering sector with complete equipped. It has been providing quality education to the rural and semi-urban students of Salem district. This institution has LTCT TNEB service and two backup generator. High quality panels and switch gears are connected with this service for giving quality supply to the equipment's. The capacity of generator is also well enough to meet the demand.

This college is located is well away from main road which leads to dust free environment. More over college is concentrating much on Green garden with enough trees and plants. The water supplied inside the campus is good. On the next step, the management decided to conduct the Green audit in their institution to provide effective environment.

2. Objectives

The main objectives of the green audit are to promote the environment management and conservation in the college campus. The purpose of the audit is to identify, quantify, describe and priorities framework environment sustainability in compliance with the applicable regulations, policies and standards. The main objectives of carrying out Green Audit are,

- To introduce and make aware students to real concerns of environment and its sustainability.
- To secure the environment and cut down the threats posed to human health by analyzing the pattern and the extent of resource use on the campus
- To establish a baseline data to assess future sustainability by avoiding the interruptions in environment that are more difficult to handle and their corrections requires high cost
- To bring out a present status report on environmental compliance

3. <u>Methodology</u>

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

- > Water quality assessment, consumption and management
- Air quality assessment and management
- Electricity consumption and management
- Sound pollution monitoring
- > Waste management
- Biodiversity status of the campus

4. About the College

<u>Vision</u>

To be an institute of repute in the field of engineering and technology by implementing the best educational practices akin to global standards for fostering domain knowledge and developing research attitude among students to make them globally competent.

<u>Mission</u>

Achieving excellence in Teaching Learning process using state-of-the-art resources Extending opportunity to upgrade faculty knowledge and skills Implementing the best student training practices for requirements of industrial scenario of the state Motivating faculty and students in research activity for real time application

Objectivies

- To provide quality education to the students
- To prepare the students for future needs of the respective industries
- To impart scientific acumen and promote life-long learning zeal among the students and the staff
- To use modern technology keeping in pace with its up-gradation
- To enhance the competency of the faculty and comprehension of the students

NAAC Grading in Assessments

NAAC accreditation First cycle : B+ Grade with 2.53 Points

5. Water Quality Assessment, Consumption and Management

Water quality analysis was conducted by Eutech PCS multi-parameter tester 35, uc turbidity meter 135 and Lutron DO-5509 meter.

Well Water

Parameter	Value
РН	7.5
P.Alkalinity	Nil
M.Alkalinity	385 ppm
H.Alkalinity	Nil
Total Alkalinity	385 ppm
Total Hardness	530 ppm
Total Dissolved solids	660 ppm

Borewell Water

Parameter	Value	
РН	7.5	
P.Alkalinity	Nil	
M.Alkalinity	390 ppm	
H.Alkalinity	Nil	
Total Alkalinity	390 ppm	
Total Hardness	375 ppm	
Total Dissolved solids	740 ppm	

RO Water

Parameter	Value
РН	7.3
P.Alkalinity	Nil
M.Alkalinity	65 ppm
H.Alkalinity	Nil
Total Alkalinity	65 ppm
Total Hardness	48 ppm
Total Dissolved solids	90 ppm

Kitchen Water

Parameter	Value
РН	7.3
P.Alkalinity	Nil
M.Alkalinity	85 ppm
H.Alkalinity	Nil
Total Alkalinity	85 ppm
Total Hardness	65 ppm
Total Dissolved solids	70 ppm

Boys Hostel Water

Parameter	Value
РН	7.5
P.Alkalinity	Nil
M.Alkalinity	330 ppm
H.Alkalinity	Nil
Total Alkalinity	330 ppm
Total Hardness	540 ppm
Total Dissolved solids	760 ppm

Girls Hostel Water

Parameter	Value
РН	7.5
P.Alkalinity	Nil
M.Alkalinity	480 ppm
H.Alkalinity	Nil
Total Alkalinity	480 ppm
Total Hardness	535 ppm
Total Dissolved solids	840 ppm

Sample No	Location	MPN Index (per 100ml)	Water Quality
1	Class Room - GF	00	Outstanding (Potable)
2	Class Room - FF	00	Outstanding (Potable)
3	Class Room - SF	00	Outstanding (Potable)
4	Staffs Room	00	Outstanding (Potable)
5	Canteen	00	Outstanding (Potable)
6	Tap Water	09	Good (Non-potable)
7	Bore water	54	Average (Non-potable)

- Main water uses in the campus
 - o Drinking
 - o Canteen
 - o Toilet
 - \circ Garden
 - o Lab
 - o Cleaning
 - \circ Bathrooms
 - o Washing
 - o Construction works
 - o Bus maintenance
- ✤ There are water treatment system to purify the water
- ✤ Water cooler with drinking water filtration is installed

- Number of urinals and toilet 88 Nos
- Number of waterless urinals Nil
- Number of Bathroom 106 Nos
- Number of Toilets 190 Nos
- Number of water taps 224 Nos
- Number of borewell 8 Nos
- Number of Open well 1 Nos
- ✤ Water pumps 12 Nos
- Quantity of water pumped 30 KL including agriculture purpose
- Water charges paid No water charges (No municipal water supply, using water from own well)
- Number of water tanks for storage 16 Nos
- Amount of water stored 20,000 Liters
- No meters fixed for water management
- Number of leaky water taps 4 Nos
- There are signs reminding people to turn off the water
- Number of water fountain 2 Nos
- Drip irrigation system is used to water plants
- Time of watering plants 9AM to 5 PM
- Reasons for water wastage
 - Leakage from water taps
 - Over use of water
 - Overflow of water from motors
 - Unorganized watering of garden

✤ Overall utilization of water in the college

Sections	Water use / day in KL
Garden	13 KL
College	16 KL
Hostel	40 KL
Bus wash	2 KL
Canteen	5 KL

Water Audit at SSCET, salem					
Activity	Water useper activity (litres)	Number of activity /day	Average water use/ person / day (litres)	Number of persons using water	Total water consumption / day (litres)
Washing hands and face	2L	Twice	1.5 L	1484	4450
Bath	10-30	once	20L	50	1000
Toilet flush	6-20	once	10L	500	5000
Drinking (cup)	0.25	twice	0.5L	1000	500
Washing dishes	5	once	5L	1500	7500
Leaking/dripping tap (1 drop/ second /day)	10-30	continu ous		3	720
garden use	4	once			13000
Cooking (average)	3	once	3		4500
Hostel uses	All uses	Twice	100	398	39800
Total Water Use					76470

6. Air Quality Assessment, Consumption and Management

The following air quality parameters were measured using Ayurveda and government's official sites.

Parameter	Minimum Value	Maximum Value
PM 2.5	82	161
PM 10	27	155
03	8	29
NO ₂	11	21
СО	7	15
Temp	25	34
Pressure	817	833
Humidity	23	67
Wind Speed	3	9

Present air pollution level is in the range of moderate due to high population and heavy transport. It's required lot of effort to reduce the air pollutions. Nehru institute of engineering and technology developed good green belt. Still it needs to be improved.

7. Energy Consumption Analysis

Load Type	Load Details in KW
Lighting and Fan	142.451
Pumps	15.321
Air Conditioner	40.851
Computer &	
Accessories	43.212
Others	7.129
Total	248.725

Building	Actual Consumption in KW	Energy saving Potential in KW
Academic Block	46.775	22.684
Library	8.592	4.272
Laboratory	11.376	5.696
Canteen	4.356	2.176
Boys Hostel	9.858	4.848
Girls Hostel	16.8	8.888
Total	142.251	70.863



8. Lighting and Fan Power Consumption Analysis

Power consumption indicated in KWH

9. AC Power Consumption Analysis

			Energy saving
	Actual	Proposed Consumption	Potential
AC Location	Consumption in KW	in KW	in KW
Smart Class Room I	2.08	1.768	0.312
Dean Room	1.21	1.02	0.19
Server Room	1.18	1.01	0.17
Placement	2.78	2.363	0.417
Admission office	2.85	2.43	0.420
Seminar Hall	1.12	0.95	0.68
Smart Class Room II	4.96	4.216	0.744
CISCO Lab	2.16	1.84	0.640
Room No.108	1.21	1.03	0.180
Principal Office	2.18	1.853	0.327
CEO Room	2.210	1.878	0.332
Conference Room	2.35	2.00	0.7
Sim Lab	2.36	2.006	2.124
Computer Lab7	2.27	1.929	1.364
IOT Lab	2.19	1.861	0.658
Total	40.812	34.702	6.11



Power consumption indicated in KWH

10. Main Incoming Trends

Voltage Trend



<u>Current Trend</u>



Power Trend



Power Factor Trend



Voltage Harmonics Trend



Current Harmonics Trend



Active Energy Consumption



Key Points

- Average energy consumption is 38 KWH per hour in day time
- Both voltage harmonics and current harmonics are on higher side requires harmonics mitigation equipment's at all UPS and Lighting Circuits
- Isolated earthling is needed for all UPS
- Some of the tube lights are conventional 36W bulbs and the same should be replaced with 20W LED tube light which gives same illumination. This saves 50% of energy bill.
- Fans which are used also conventional type 75W fans and the same should be replaced with 35W BLDC Fan which saves 53% energy bill.
- Power factor is in mid-range. But still we can improve by the balancing the load in all phases up to the maximum extend and providing load side capacitors to the pumps.

11. Points for Improvement

- > Provide double earth to all the motors and panel boards as a safety measures.
- > Provide MPD in all pumping application which is will protect your pumps from dry run.
- Provide automatic lighting on-off and trim control in all Street light and Verandah lighting circuits. Occupancy sensors function by switching the lights ON and OFF based on the occupancy of the room and are a smart way to save energy in commercial organizations.



Energy and Cost Savings for 1.5 Ton Window or Split Air Conditioner at Different Star Ratings (under standard test conditions and as per latest BEE regulations)

Star Rating	Minimum Energy Star (Approx.) Efficiency Ratio (EER)	Maximum Cooling Capacity (Watts)	Input Power (Watts)	Units Consumption/ Day (kWh)	Electricity Cost/Day	Electricity Cost/Month (Rs)	Savings per Month (w.r.t. 1 star) (Rs)
1*	2.7	5,200	1,926	15.4	108	3,234	0
2**	2.9	5,200	1,793	14.34	100	3,011	223
3***	3.1	5,200	1,677	13.42	93.94	2,818	416
4****	3.3	5,200	1,575	12.6	88	2,652	582
5****	3.5	5,200	1,486	11.89	83	2,497	737

Use 5 star rated AC's in next replacement period will yield energy saving in AC's Energy consumption

Star Level	Minimum	Maximum
1 Star*	2.70	2.89
2 Stars**	2.90	3.09
3 Stars***	3.10	3.29
4 Stars***	3.30	3.49
5 Stars****	3.50	

12. Sound Pollution Monitoring

Sound pollution is another important parameter that is taken into account for green auditing of the college campus. Six different sites are chosen for the monitoring purpose namely Sound is quantified by the Sound level meter (Lutron – SL4030)

Location	Average Sound Level (db)
Ground Floor	73
First Floor	64
Second Floor	61
Third Floor	59
Canteen	71
Main Gate	59
Hostel	48
Workshop	72
Power House	57
Library	51
Office	59
Principal Room	59
Conference Room	46
Reception	53
Play ground	67

13. Waste Management

This indicator addresses waste production and disposal of different wastes like food, Paper, Plastic, glass, dust etc. Furthermore, solid waste often includes wasted material resources that could otherwise be channeled into better service through recycling, repair and reuse. For proper segregation and management, proper use of waste bins is the only solutions for waste management purpose in the college campus.



In Sri Shanmugha College of Engineering and Technology, there is a practice of collecting the waste with color coded bins. Each floor contains two or more sets of color bins for proper waste management.

Location	Number of Waste bins
College – Ground Floor	6 No's
College – First Floor	6 No's
College – Second Floor	6 No's
Canteen	3 No's
Hostel	6 No's

- Total stake holders 1484
- Class rooms 57
- Staffs Rooms 10
- ✤ Office Rooms 4
- E-waste Computer, Electrical and electronics parts Disposal by selling
- Plastic Waste Disposal by selling
- Food waste to municipal waste collection center
- Solid wastes to municipal waste collection center
- Glass waste No treatment
- ♦ Waste water Urinals, washing, bathroom in soak Pits
- ✤ Napkin incinerator 2

Quantity of waste generated:-

- Biodegradable ½ kg/day (office)
- Non-biodegradable 0.1 kg/day (office)
- Biodegradable 0.1kg/day (labs)
- Non-biodegradable 0 kg/day (including glass bottles)
- Biodegradable 25 kgs/day (Canteen)

7. Green Campus

- ✤ Total number of plant species identified 712
- \clubsuit Tree cover of the campus 106687 m^2
- Free space in the campus 24506 m^2
- ✤ Garden area inside the college 82 acres
- ✤ Total campus area 100 Acres

8. Carbon Footprint

The main source of the energy consumption in the institute is from state electricity board (TANGEDCO) and it's cater the energy required by the various facilities like Academic building blocks, Air Conditioners, Lighting, Computer UPS, Lab equipment's, and Water pumping systems.

High speed diesel (HSD) is used in DG set as back-up power source in case of EB mains power failure. Solar plant installed capacity in the institution is 100 kWh. Average energy generated from the solar plant is around 11390 kWh/month.

Around 65.1% of the total electricity consumption was generated with solar energy and 34.9 % from wind energy adjustment. Overall efficiency of the solar generation system is nearly 91.8%. (0.881 lakhs kWh generated against 0.96 lakhs kWh). The average energy consumption from the EB mains is around 750 to 800 kWh/day.

Type of Fuel	Annual consumption	mtoe equivalent	CO ₂ equivalent
EB Units	149332 kWh	12.84	126.932
Solar Energy Generation	80104 kWh	6.89	67.88
Diesel	1086 ltrs	2.142	6.172
LPG	1908 kgs	2.26	5.692
Total		24.122	206.30

Petrol used by two wheelers/day-100 L

(Per person to and fro 40 kms =1L)

Fuel used by four wheelers (12 Persons) - 24 L
(Per person to and fro 40 kms = 2L)

Fuel for persons (total 1268 persons) travelling by common transportation = 507 L (20L x 50 persons)

* Total fossil fuel use is 631 L / day

Total fuel cost per day for transportation = Rs 45,432/-

(631 L x Rs 72)

- Cost of Gas cylinders used Rs. 24000/month (28 cylinders)
- Cost of generator fuel Rs. 648/month (0.3 L per day)
- Amount spent for transportation (office) Rs. 4500/month (Approx.)
- ✤ Amount spent for transportation (canteen) Rs. 4500/month
- Amount spent for transportation (visitors) Rs. 13000/year
- Other expenditures for the energy Rs. 638/day

Burning of fossil fuels is the main source and cause of carbon dioxide release to the atmosphere. Carbon dioxide release for the stakeholders to reach the college is very high. It is contributing to the global warming and increasing the pace of climate change. If a College bus is flying for the staff and students carbon dioxide released for the stakeholders' commutation can be reduced. More trees are planted in the campus in order to make a source of sink for the carbon dioxide and for other greenhouse gases.

List of eco-friendly activities going on in the campus

- Planting and caring of trees in and around the campus.
- Timely disposal of wastes from the campus.
- Celebration of important days like World Environment Day, Ozone day, with great importance.
- Campus is declared plastic free.
- Management has decided to adopt green protocol
- Distribution of medicinal plant saplings among students

9. Major Audit Observations

- The environmental awareness initiatives are substantial.
- Training in vegetable cultivation and composting practices are inadequate.
- There is no Green policy/ environmental policy statement indicating the commitment of the college towards its environmental performance.
- Gardens inside the college premises are found well maintained.
- Attention needed in developing Herbal Gardens
- Use of notice boards and signs are inadequate to reduce over exploitation of natural resources.
- Rain water harvesting systems, solar power generation, environmental education programs have to be strengthened.
- Lot of NSS program conducted related cleaning activities in villages around the college are appreciable.
- Water conservation committee is needs to be framed and monitored
- Energy Conservation group also needed
- Separate group is needed to plan and cultivate location based plants to reduce the water consumption of the Garden
- College should take initiative to educate the nearby village peoples about global warming and waste management through their programs

10. Water Audit Findings

- There is no water consumption monitoring system in the college campus.
- The college does not have waste water treatment for waste water generated from laboratories, canteen, hostel kitchen, toilets, bathrooms and office rooms.
- Automatic switching system is not installed for pump sets used for overhead tank filling.
- Per day use of water is very high and there is no control over wastage of water.
- Display boards against the misuse of water use are lacking.

11. Energy Audit

- The communication process for awareness in relation to energy conservation is found adequate.
- Monthly use of electricity in the college is very optimum
- Objectives for reducing energy, water and fuel consumption are merger.
- There are fans of older generation and non-energy efficient which can be phase out by replacing with new energy efficient fans.
- Regular monitoring of equipment's and immediate rectification of any problems.
- Use of renewable energy is not sufficient. It needs great attention to reduce greenhouse gas emission.

12. Waste Audit

- Solid waste management systems established are sufficient.
- The college has proper communication with the local body for regular collection of solid waste from the campus.
- ✤ Waste bins in the class rooms, veranda, canteen and campus are adequate.
- Bio gas plant is not available
- Proper composting systems are lacking.
- Green chemistry labs are not introduced.

13. Green Campus Audit

- Tree cover of the college with respect to the stakeholder strength is enough.
- Regular planting of trees in the campus are adequate.
- Display boards to all plants identified are lacking.
- ✤ Water uses for gardens are high.
- No arboretum is set up in the college campus.
- There is only very few fruit trees in the college to attract birds.
- Registry for flora and fauna on the campus is lacking.
- College needs to plant more herbal plants

14. Carbon Foot Print Audit

- College has not yet taken any initiative for carbon accounting.
- Encourage students to use cycles.
- 631 liters of fossil fuel is burned every day for the functioning of the college. This is too high carbon emission
- A huge amount such as Rs. 45432 per day is spent as the cost of fossil fuel by the stakeholders.
- Usage of 28 gas cylinders per month is very high.

15. Preparation of Action Plan

Policies referring to college's management and approach's towards the use of resources need to be considered. The college should have a green policy/environmental policy for its sustainable development. The environmental policy formulated by the management of the college should be implemented meticulously. The college should have a policy on awareness raising or training programs (for ground staff or kitchen staff for example) and college also should have a procurement policy (the College's policy for purchasing materials).

16. Follow Up Action and Plans

Green Audits are exercises which generate considerable quantities of valuable management information. The time and effort and cost involved in this exercise is often considerable and in order to be able to justify this expenditure, it is important to ensure that the findings and recommendations of the audit are considered at the correct level within the organisation and that action plans and implementation programs result from the findings.

Audit follow up is part of the wider process of continuous improvement. Without follow-up, the audit becomes an isolated event which soon becomes forgotten in the pressures of organisational priorities and the passing of time.

17. Environmental Education

The following environmental education program may be implemented in the college before the next green auditing:-

- Training programs in solid waste management, liquid waste management, setting up of medicinal plant nursery, water management, vegetable cultivation, paddy cultivation, tree planting, energy management, landscape management, pollution monitoring methods, and rain water harvesting methods.
- Increase the number of display boards on environmental awareness such as save water, save electricity, no wastage of food/water, no smoking, switch off light and fan after use, plastic free campus etc.
- Activate the environmental clubs
- Set up model rainwater harvesting system, rainwater pits, vegetable garden, medicinal plant garden, paddy fields etc. for providing proper training to the students.
- Conduct exhibition of recyclable waste products
- Implement chemical treatment system for waste water from the laboratories.

18. Awareness on Carbon Consumption

- Students and Staff members may be made totally aware of pollution caused by use of vehicles.
- The carbon consumption awareness programs on carbon emission at individual as well as social level will help to avoid air and noise pollution in the campus due to vehicles.

19. Conclusion and Full List of Recommendations

The green audit assists in the process of testing performance in the environmental arena and is fast becoming an indispensable aid to decision making in a college.

The green audit reports assist in the process of attaining an eco-friendly approach to the sustainable development of the college. Hope that the results presented in the green auditing report will serve as a guide for educating the college community on the existing environment related practices and resource usage at the college as well as spawn new activities and innovative practices. A few recommendations are added to curb the menace of waste management using ecofriendly and scientific techniques. This may lead to the prosperous future in context of Green Campus and thus sustainable environment and community development.

It has been shown frequently that the practical suggestions, alternatives, and observations that have resulted from audits have added positive value to the audited organisation. An outside view, perspective and opinion often helps staff who have been too close to problems or methods to see the value of alternative approaches. A green audit report is a very powerful and valuable communications tool to use when working with various stakeholders who need to be convinced that things are running smoothly and systems and procedures are coping with natural changes and modifications that occur.

20. Common Recommendations

- Adopt an environmental policy for the college
- Establish a purchase policy for environmental friendly materials
- Introduce UGC Environmental Science course to all students
- Conduct more seminars and group discussions on environmental education
- Students and staff can be permitted to solve local environmental problems
- Renovation of cooking system in the canteen to save gas
- Establish water, waste and energy management systems

21. Criteria Wise Recommendations

<u>Water</u>

- Remove damaged taps and install sensitive taps is possible.
- > Drip irrigation for gardens and vegetable cultivation can be initiated.
- Install Meters to monitor the water use
- Establish water treatment systems.
- Use waterless urinals
- Spray the water to the garden in the early morning of the day
- Use aerator in the taps to reduce the water consumption and wastage
- Use treated water for bus wash and other toilet use
- Conduct leak test at least once in two months
- Awareness programs on water conservation to be conducted.
- Install display boards to control over exploitation of water.

Energy

- > Conventional Fans needs to be replaced with energy efficient BLDC Fans.
- > Conduct more save energy awareness programs for students and staff.
- Try to install more solar panels to reduce the greenhouse gas emission
- Optimize the energy usage
- Automatic power on/off systems may be introduced.

<u>Waste</u>

- > Establish a functional bio gas plant.
- > A model solid waste treatment system to be established.
- > A model Vermicomposting plant to be set up in the college campus.
- Establish a plastic free campus.
- > Avoid paper plates and cups for all functions in the college.

Green Campus

- > All trees in the campus should be named scientifically.
- Create more space for planting.
- Grow potted plants at both verandah and class rooms.
- > Create automatic drip irrigation system during summer holidays.
- > Not just celebrating environment day but making it a daily habit.
- > Beautify the college building with indoor plants
- > Providing funds to nature club for making campus more green
- Encouraging students not just through words, but through action for making the campus green
- Conducting competitions among departments for making students more interested in making the campus green.

Carbon footprint

- Establish a system of car pooling among the staff to reduce the number of four wheelers coming to the college.
- > Introduce college bus services to the students and staff.
- Encourage students and staff to use cycles.
- > Establish a more efficient cooking system to save gas.
- > Discourage the students using two wheelers for their commutation.
- > More use of generators every day should be discouraged.

29. Audit Report

We have conducted the Green audit at all important areas up to our maximum possible extend. We found lot of points in waste management needed attention. Overall performance of college is found satisfactory.

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