



## **Preliminary Energy Audit**

**Date: 12<sup>th</sup> October 2019**

**Place: Sanjivani Rural Education Society Campus, Kopergaon**

*We are happy to certify that the institute has implemented necessary framework in following areas: -*

- *Energy Conservation,*
- *Energy Management,*
- *Use of Renewal Energy.*

*Based on the documentation submitted and our site visit, we appreciate the commitment demonstrated by the institute in implementing initiatives for energy conservation and use of natural resource like solar energy.*

*This has resulted in achieving substantial savings and sustenance of Green March.*

*Koranglekar*

**Vivekanand Koranglekar**

**Practical Vision Consultants**



**Preliminary Green Initiatives Assessment**

**Date: 12<sup>th</sup> October 2019**

**Place: Sanjivani Rural Education Society Campus, Kopergaon**

*We are happy to certify that the institute has implemented necessary framework in following areas: -*

- *Water Conservation,*
- *Use of Renewal Energy,*
- *Waste management.*

*Based on the documentation submitted and our site visit, we appreciate the initiatives being implemented and substantial results achieved by the institute for Environment protection and commitment for conservation of natural resources.*

*This shall definitely result into nourishment of student education for Green Environment and sustenance of Green March.*

*Koranglekar*

**Vivekanand Koranglekar**

**Practical Vision Consultants**

# **Preliminary Energy Audit**

**for**

**SANJIVANI RURAL EDUCATION SOCIETY CAMPUS**

**At - Sahajanandnagar, post - Shinganapur,**

**Tal-Kopargaon - 423603, Dist. Ahemadnagar**

**Prepared by**

**Practical Vision Consultants, Auranagabad**

Audit Date: 12-10-2019

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## 1 Introduction

### 1.0 Walk through energy audit :

<b>Organisation Name:</b>	<b>SANJIVANI RURAL EDUCATION SOCIETY CAMPUS</b>
<b>Site Name &amp; Address:</b>	At - Sahajanandnagar, Post - Shinganapur, Tal - Kopargaon-423603, Dist - Ahemadnagar
<b>Buildings included:</b>	Campus area of Sanjivani ACS college Pharmacy college College of Engineering campus area
<b>Date of Visit:</b>	12-10-2019
<b>Walk through energy auditors</b>	Mr. Vivekanand Koranglekar Mr. Ganesh Gayake Practical Vision Consultants , Aurangabad
<b>Visit Hosted by:</b>	Mr. Hajare

## **1.1 Objective**

The objective of this Preliminary Energy Audit, (Walk Through Audit), is primarily to assess the institutes initiatives for the awareness of Environment consciousness among the students and nourish the environmental education among the students studying in college campus along with assessing the progress with respect to previous year's performance.

This objective will be achieved by:

- Identifying a suitable energy performance indicator for existing and target energy use to quantify the potential for energy savings. This also helps to assess the impact of the energy conservation measures in achieving this potential and provide a sense-check of calculations.
- Identifying a suite of measures, including savings and implementation budget, which together are of sufficient scale and combined payback to create a financially viable project suitable for implementation as a single package of works, where appropriate, non-energy savings, such as water or maintenance, will also be quantified.
- Identifying additional metering and recording requirements, including any environmental conditions that are likely to be required for a baseline should the measurement and verification of savings be necessary. The associated installation budget will be included.
- Identifying the yearly calendar dates for environment awareness generation and education by celebrating the respective weeks with environment conservation themes./ arranging expert lectures /seminars in college campus with participation of students.

This Preliminary Energy Audit is not an Investment Grade Audit and has been completed in a relatively short period of time with using readily available site information, sector performance indicators, and rules of thumb. It is a concise, or walkthrough survey that has been prepared with all reasonable skill, care and diligence possible within a short period of time





## **1.2 Description of Site & Scope of Assessment**



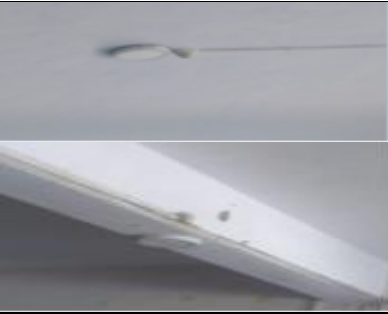
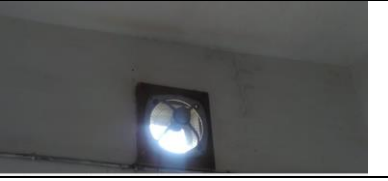
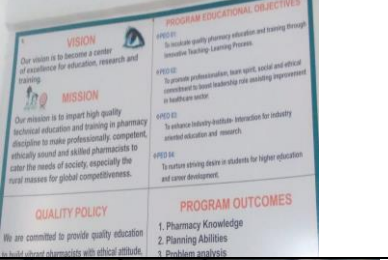

The Site within the campus of Sanjivani Rural education society forms the scope of Assessment.

### **This assessment includes the following aspects:**

- Electricity / Thermal Energy / Fossil fuel
- Re-enable energy
- Water Conservation
- Waste management

### 1.3 Brief account of site visit as follow.

Sr No	Site name	Excellent Initiatives for conservation natural resources and energy	PHOTO
01	Solar Panel installation	Use of Solar Energy for generating electricity will help to reduce grid supplied electricity. This is now fully functional and reduction in electric bills will be reflected in next month onwards.	
02	Solar panel supporting shed	<p>The specially created shed to support solar panel serves dual purpose :</p> <ol style="list-style-type: none"> <li>1) Firm support to panels at optimum level from ground; i.e. direct access to sunlight and ease of maintenance.</li> <li>2) Creation of covered assembly area for various college functions</li> </ol>	
03	Laboratory	<p>Abundant natural light coming through broad and wide windows across laboratory and lecture hall will significantly reduce the need to use flurocent tubes, lights.</p>	
04	Lecture hall	<p>Excellent natural air ventilation ensures fresh air circulation in lecture hall and reduces the use of electricity for fans</p>	

05	<b>Building walls with drain water pipes</b>	Water Harvesting to capture all water on the science building roof is excellent initiative. The proper sloping arrangements on roof at different locations ensures the rain water is carried through pipelines to soak pit.	
06	<b>Soak Pit</b>	Rain water soak pit is created for charging ground by rain water. The soak pit can further be developed as water storage pond.	
07	<b>Passages</b>	Progressive replacement of fluorescent tubes by LED bulbs is resulting in reduced electricity consumption for illumination. The institute had made a resolve to replace every fluorescent tube by LED bulb whenever it stops working.	
08	<b>Laboratory</b>	Enthusiastic members are planning to use the exhaust fan working on natural air current to generate electricity.....may be enough to charge cell phone batteries.	
09	<b>Exit point</b>	All the lecture halls, labs and offices are having one central switch at exit point to switch off all appliance in the hall.	
10	<b>Display Boards</b>	The quality policy, environmental policy boards are displayed at prominent locations to make every member and especially new entrants, aware of institute's commitment to conserve natural resources.	
11	<b>Biodigester</b>	Biogas is Eco-Friendly. Biogas Generation Reduces Soil and Water Pollution. Biogas Generation Produces Organic Fertilizer. It's A Simple and Low-Cost Technology That Encourages A Circular Economy. Healthy Cooking Alternative For Developing Areas.	

**Table No 1 : Site visit and Observation**



## 2 Energy Consumption

### 2.1 Annual Energy Consumption

The data regarding electricity consumption was available for the entire capus of Sanjivani Rural Education Society. On similar lines data to be captured for all college buildings for annual energy consumption by installing sub meters for all the institutes in the campus .

Table 2 : Annual Electrical Energy Consumption & Electrical Energy Costs (from July 2018 to Aug. 2019) As per the MSEDL Monthly billing to the institute.

Month	Total Electricity Units	Total Amount in Rs.
Aug-19	51352	768654
Jul-19	51213	649218
Jun-19	21273	394215
May-19	28670	495678
Apr-19	36924	594644
Mar-19	36792	584917
Feb-19	23070	1004871
Jan-19	20984	989084
Dec-18	12674	880399
Nov-18	8499	831189
Oct-18	47425	1383286
Sep-18	43659	1214640
Aug-18	44270	534653
Jul-18	44223	469856

## 2.2 Main Energy Consumers

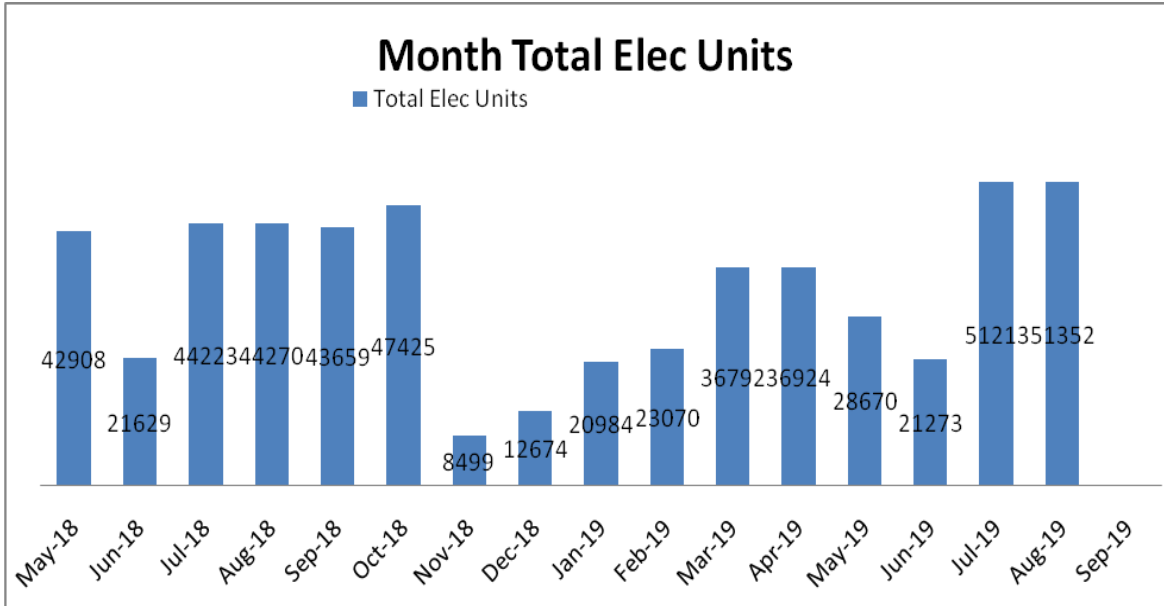
The main energy consumers at the site that have been quantified for this assessment are summarised in Tables 3 below.

**Table 3: Equipment wise Summary of Primary Electrical Energy Consumers**

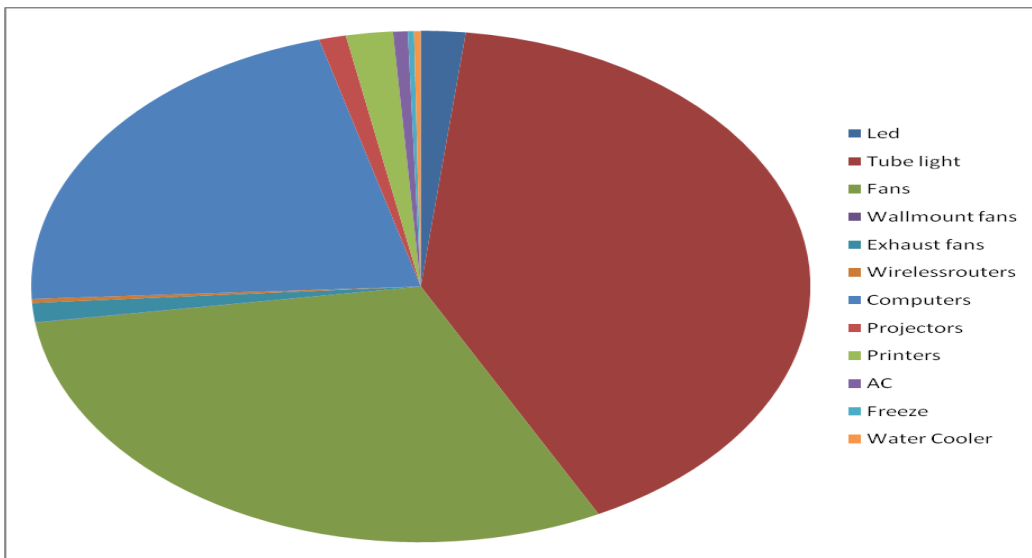
<i>Electric Instrument wise connecting load</i>			
<i>Electric appliances</i>	<i>Total Instruments</i>	<i>Energy consume/ unit</i>	<i>Total Connected load</i>
<i>Led</i>	<b>94</b>	<i>18</i>	<b>1692</b>
<i>Tube light</i>	<b>2071</b>	<i>18</i>	<b>37278</b>
<i>Fans</i>	<b>1543</b>	<i>100</i>	<b>154300</b>
<i>Wallmo-unt fans</i>	<b>1</b>	<i>80</i>	<b>80</b>
<i>Exhaust fans</i>	<b>62</b>	<i>80</i>	<b>4960</b>
<i>Wireless routers</i>	<b>13</b>	<i>600</i>	<b>7800</b>
<i>Computers</i>	<b>1100</b>	<i>233</i>	<b>256300</b>
<i>Projectors</i>	<b>57</b>	<i>600</i>	<b>34200</b>
<i>Printers</i>	<b>99</b>	<i>233.33</i>	<b>23099.67</b>
<i>AC</i>	<b>31</b>	<i>3517</i>	<b>109027</b>
<i>Freeze</i>	<b>13</b>	<i>1800</i>	<b>23400</b>
<i>Water Coolar</i>	<b>14</b>	<i>1800</i>	<b>25200</b>
<b>Totals</b>	<b>5098</b>		<b>677336.7</b>

<b>College wise Distribution of Electric Appliance</b>					
<b>College -&gt;</b>	<b>B. Pharmacy</b>	<b>D. Pharmacy</b>	<b>Jr. college</b>	<b>Engg. college</b>	<b>Total</b>
<b>Led</b>	15	2	7	<b>70</b>	<b>94</b>
<b>Tube light</b>	139	40	114	<b>1778</b>	<b>2071</b>
<b>Fans</b>	110	40	82	<b>1311</b>	<b>1543</b>
<b>Wallmount fans</b>	1	0	0	<b>0</b>	<b>1</b>
<b>Exhaust fans</b>	27	18	1	<b>16</b>	<b>62</b>
<b>Wirelessrouters</b>	1	0	0	<b>12</b>	<b>13</b>
<b>Computers</b>	52	7	9	<b>1032</b>	<b>1100</b>
<b>Projectors</b>	4	2	1	<b>50</b>	<b>57</b>
<b>Printers</b>	8	4	2	<b>85</b>	<b>99</b>
<b>AC</b>	8	0	0	<b>23</b>	<b>31</b>
<b>Freeze</b>	6	3		<b>4</b>	<b>13</b>
<b>Water Cooler</b>	1	0	1	<b>12</b>	<b>14</b>
<b>Totals</b>	372	116	217	<b>4393</b>	<b>5098</b>

**Month Wise Electrical Energy Consumption Trend**



**Energy Equipment Share As Per Connected Load**



## **2.3 Energy Performance**

The objective of this subsection is to establish how the facility is performing. The monitoring of energy performance indicator by institute will reflect the effectiveness of energy saving initiatives.

### **2.3.1 Energy Performance Indicators**

As suggested in previous audit the following “Energy Performance Indicator” at the site is being monitored and shows good improvement as summarised in Tables 4 below :

**Table 4: Energy Performance Indicators : SRES CAMPUS**

<b>Sr No</b>	<b>SRES CAMPUS Year</b>	<b>Average monthly Elec. Energy Consumption in Units</b>	<b>Population (Student + Staff)</b>	<b>Performance Indicators Units/ Student</b>
<b>1</b>	<b>2016-2017</b>	<b>69536</b>	<b>6306</b>	<b>11.02</b>
<b>2</b>	<b>2017-2018</b>	<b>68047</b>	<b>7043</b>	<b>9.66</b>
<b>3</b>	<b>2018-2019</b>	<b>47246</b>	<b>7400</b>	<b>6.38</b>

### **2.3.2 Benchmarks**

The term “Benchmark” is used here to reflect a comparison of this facilities existing and projected energy use (i.e. when energy saving measures proposed herein are implemented) with industry norms. This Benchmarks gives an indication of existing performance, the potential for further savings and a sense check for the overall savings that this audit has identified.

**Table 5: Energy Benchmarks**

<b>Monthly Running Average Usage</b>	<b>Electricity KWH</b>	<b>Renewable Energy (Solar) KWH</b>	<b>Remark</b>
2016-17	<b>69536</b>	<b>0</b>	<b>Solar panel installation of 480 KWH is implemented</b>
2017-18	<b>68047</b>	<b>10000 Expected</b>	
2018-19	<b>47246</b>	<b>10013</b>	<b>@10013 solar units credited</b>

### 3 Scope of Natural Resources Conservation

#### 3.1 Recent / Existing Energy-Saving & Environment protection Initiatives

**Table 6 : List Of Energy Saving & Environment Projects**

<u>Sr No</u>	Project	Category	Status	Impact
1	Solar Water Heater	Renewable Energy	Implemented	Fuel and Electricity billing ↓
2	Solar panel 480 KWH for electricity	Renewable Energy	Implemented	Electricity billing ↓
3	Rain Water Harvesting	Water	Implemented	Water consumption ↓
4	RO reject water circulation	Water	Implemented	Water consumption ↓
5	Strom water, Waste water collection and recycling	Water	Implemented	Water consumption ↓
6	Water Sprinklers	Water	Implemented	Water consumption ↓
7	Street light timers	Electricity	Implemented	Electricity billing ↓
8	No vehicle movement in campus	Fossil Fuel	Implemented	Air & Noise pollution ↓
9	Provision of bus for commuting to reduce individual vehicle usage	Fossil Fuel	Implemented	Air Pollution ↓
10	Curriculum projects undertaken by Final Year students for Energy savings	Electricity, Renewable energy usage, Fossil fuels, Water conservation, GHG reduction , Waste management	Implemented	As academic initiative for environment consciousness among budding engineers.
11	Biodigester	Waste Managements	Implemented	Dirt volume ↓
12	Sewage Treatment plant capacity 100 KLD	Waste water management	Implemented	Water pollution ↓
13	Composting pit 15*15*8 mtrs	Garden waste	Implemented	Soil erosion ↓
14	E waste management through repair, reuse, recycle	E waste	Implemented	Soil erosion ↓

**GREEN FIELD SURVEY**

<b>GREEN FIELD Survey</b>					
<b>Sr. NO.</b>	<b>FRUIT TREE</b>	<b>Tall</b>	<b>Medium</b>	<b>Small</b>	
1.	COCONUT	65	55	32	
2.	MONGO	5	11	20	
3.	LEMON	6	-	-	
4.	BOR(JIUPAS)	8	2	10	
5.	DRUM STIK	20	-	-	
6.	ALMOND	20	5	5	
7.	VILAYTI CHINCH	8	-	-	
8.	Chinch	15	07		
9.	Karanj	30	40	50	
10.	Bottle Brush	12	10	4	
11.	Bottle Palm	130	90	30	
12.	Suru Shrubs/ Bush	825	-	-	
13.	Chafa	06	06	05	
14.	Rubber Tree	01	-	-	
15.	Crotton	05	03	03	
16.	Gava (Peru Tree)	25	-	-	
17.	Sappota Chikku	15	60	5	
18.	Jamun	5	12	-	
19.	Custared Apple (Sitaphal)	-	22	-	
20.	Phyrus Tree	80	50	50	
21.	SaptaPanni	5	60	30	
22.	Rain Tree	130	100	100	
23.	Kashid	800	200	258	
24.	Pelto Form	600	100	40	
25.	Nilgiri	852	-	-	
26.	Kanchan	-	80	-	
27.	Sandal Wood (Chandan)	22	35	30	
28.	Bogan Wel	-	225	-	
29.	Morpankhi	-	-	27	
30.	Rudraksha	-	2	-	
31.	Bhadraksha	-	2	-	
32.	Subabul	15	35	100	
33.	Other Flower Bushes	-	510	900	
34.	Bamboo	-	50	-	

### **3.2 Suggested Opportunities for Energy Savings**

We identified a number of opportunities for further energy savings at the site; these are summarised as below.

Above measures for energy saving mentioned in 3.1; to be extended to other locations in campus for horizontal deployment.

Further to this, following initiatives to be taken by institute for further saving in all types of energy conservation, preservation of natural resources and protection of environment.

**Table no 7 : Projects identified for Opportunities for Energy saving**

<b><u>Sr No</u></b>	<b>Project</b>	<b>Category</b>	<b>Status</b>	<b>Impact</b>
1	Replacement of Fluorescent tubes by LED bulbs	Electricity	In progress	Increase in Bulb life ↑ and Electricity units ↓
2	Replacement of Window Air conditioner to Split Air Conditioners	Electricity	To Plan	Electricity consumption reduction upto 25% .
3	Remote sensing lighting in isolated area / non traffic zones ( Corridors / lawns , Play grounds, Halls)	Electricity	To Plan	Electricity consumption↓
4	AMCs schedules & activities of Equipment such as Pumps / Motors / DG set and Transport vehicles to be reviewed from the point of equipment performance	Electricity, Fossil Fuel	To Plan	To ensure better performance of equipment resulting in reduction of Energy consumption and Air pollution.
5	To review the AMC with Housekeeping agency @ the disposal of wastes from campus is done as per Eco guideline and explore the possibility for re use in sugar factory	Waste Management	To plan	To use segregate the wastes as hazardous /Non hazardous  Use of campus waste as fuel
6	Additional Building expansion	Green Building	In progress.	To benchmark project as a model of Eco-friendly environment for budding engineers awareness /study

### **3.3 Activity Metrics**

If energy use is driven by other activities (e.g. Hostel occupancy, College Student Population, Running in day/ shift), this will have to be identified.

We suggest following activity metric to be monitored by the institute:

List of activities to be captured in the activity metric may include Electric meter and sub-meter for each building as well as utility, Water meter at intake and usage points, Pollution checks, and category wise waste generation in the campus.

Identify here any activity metrics that should be recorded, Location of measurement unit, the frequency of recording interval, Responsibility of recording and monitoring and the mechanism by which they will be recorded.

#### **Activity Metrics For Energy Profile :**

We propose institute to capture the energy usage as per energy type, to monitor the energy usage in KWH and energy cost in Rupees as well as explore the feasibility of using alternative low cost fuel. The energy types are Electricity, Diesel, Petrol, LNG, Solar, Wind, Wood, Coal etc.



## **4 Conclusions & Next Steps**

### **4.1 SANJIVANI College management commitment**

As a part of commitment to Environment consciousness, Institute has made the necessary provision of infrastructure such as Green Policy, Green Committee looking after implementation of Policy by monthly review meetings and making the Budgetary provisions for necessary Green initiatives and implementing the same.

The committee has also prepared the yearly calendar for Environmental days identified for the celebration to create the awareness for green Environment among the budding Engineers.

### **4.2 Mechanism for project proposal review**

Environment project review should be based on following simple formula to verify the viability and ROI and Payback period .

$$\text{Simple Payback} = \frac{\text{Total investment budget}}{\text{Expected savings per year}}$$

- Note- if the payback period of any project is less than one year those should be taken on priority basis.
- Record all non-quantified benefits and legal compliances

### **4.3 Checklist for Environment Consciousness in campus**

**As a part of Environment Consciousness in the College campus on continual basis, institute is following the checklist as mentioned in the Annexure no 1.**

Vivekananda Koranglekar  
PVC Aurangabad

**Appendix 1:****Campus Sustainability Best Practices**

Primarily focuses on energy and climate change, but also includes topics such as campus waste, food, and water usage which can impact climate change.

Based on above College can formulate strategies and ensure the success of campus sustainability programs.

**List of initiatives being undertaken by SANJIVANI RURAL EDUCATION SOCIETY CAMPUS**

as a part of Campus sustainability to check for adopting the best practices followed.

**UPDATE STATUS FROM GREEN AUDIT FILE AND OTHER DETAILS**

<b><u>Initiatives suggested last year</u></b>	<b><u>Status on 12 Oct 2019</u></b>
<b><u>A. Small-Scale Energy Efficiency Initiatives</u></b>	
<input type="checkbox"/> Energy Competitions	Preliminary work done
<input type="checkbox"/> Computer Energy Savings	Replaced by energy efficient screens
<input type="checkbox"/> Energy Efficiency in equipment	done
<input type="checkbox"/> Light Bulb Replacement	done
<input type="checkbox"/> University Heating/Cooling Policy	AC temp to lock on 27 deg. Cel.
<b><u>B. Large-Scale Efficiency Initiatives</u></b>	
<input type="checkbox"/> Metering of Buildings	Separate meters for each building is must for monitoring the impact of various energy conservation initiatives & participation
<input type="checkbox"/> Cogeneration	Progress
<b><u>C. Renewable Energy Initiatives</u></b>	
<input type="checkbox"/> Wind Energy	
<input type="checkbox"/> Biomass	implemented
<input type="checkbox"/> Solar/ Photovoltaic Energy	Project is now fully operational
<input type="checkbox"/> Solar Hot Water	Implemented in hostel
<input type="checkbox"/> Biomass mixed with Fossil Fuels	Experimentation is under progress
<input type="checkbox"/> Geothermal	
<input type="checkbox"/> Renewable Energy Certificates	
<input type="checkbox"/> Carbon Offsets	
<b><u>D. Transportation</u></b>	
<input type="checkbox"/> Bicycle Initiatives	No personal vehicles within campus is boosting bicycle usage
<input type="checkbox"/> Commuter Programs	Common buses for staff and students are already in place
<input type="checkbox"/> Public Transit	
<input type="checkbox"/> Bio-fuels / Efficiency	

<b><u>E. Food</u></b>	
<input type="checkbox"/> Organic and Local Food	
<input type="checkbox"/> Gardens and Farming	
<input type="checkbox"/> Waste Associated with Food	Bio digester plant is implemented
<input type="checkbox"/> Food Procurement and Production	
<b><u>F. Environmental Procurement</u></b>	
<input type="checkbox"/> Recycled Paper, Water Bottles	Waste item are segregated at the point of collection
<input type="checkbox"/> Computer Policies .	Preference is accorded to procure equipment with higher BEE ratings
<input type="checkbox"/> Electrical items with higher star rating by BEE	
<b><u>G. Waste</u></b>	
<input type="checkbox"/> E waste Generation, Recycling and Disposal Management	Being followed, with comprehensive policy for monitoring effectiveness for incentives, promoting awareness programs for conservation and reduction. Implemented.
<input type="checkbox"/> Conservation Incentives	
<input type="checkbox"/> Recycling Awareness Programs	
<input type="checkbox"/> Reducing Consumption	
<b><u>H. Green Building Design</u></b>	
<input type="checkbox"/> White Roofs	Implemented
<input type="checkbox"/> Natural ventilation	Excellent implementation
<input type="checkbox"/> Day lighting	Excellent implementation
<b><u>I. Water and Ecological Design</u></b>	
<input type="checkbox"/> Green Roofs	Implemented
<input type="checkbox"/> Using Native Plants	Neem tree plantation observed
<input type="checkbox"/> Parking Improvements	Implemented
<input type="checkbox"/> Reducing Water Consumption	Awareness is observed
<input type="checkbox"/> Rainwater Harvesting	Excellent implementation
<b><u>J. Education and Outreach</u></b>	
<input type="checkbox"/> Eco-Representatives	Will be monitored
<input type="checkbox"/> Expanding the Curriculum	Projects to help environment conservation, using labs for extensive analysis are observed
<input type="checkbox"/> Green Laboratories	
<input type="checkbox"/> Incorporate Sustainability Awareness Early	
<b><u>K Innovative Financing</u></b>	
<input type="checkbox"/> Revolving Load Fund	Management is working on it.
<input type="checkbox"/> Alumni Sustainability Fund	
<input type="checkbox"/> Project Contracting / Performance Contracts	