

# GREEN, ENVIRONMENT & ENERGY AUDIT REPORT | 2020



# GREEN AUDIT REPORT - 2020

is presented to

**KLE LAW COLLEGE**

CA-2, Sir M. Vishweshwaraiah Layout, V Block, Ullal, Bengaluru – 560091,  
Karnataka.

has successfully demonstrated knowledge on Energy conservation,  
Water conservation, Bio diversity, Waste management, Indoor  
Environmental quality, Carbon footprint.

06.01.2021

DATE



**NISCHAY N**  
GREEN BUILDING CONSULTANT



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# Green Auditing

The term “Green” means eco-friendly or not damaging the environment. This can be called as '**Global Readiness in Ensuring Ecological Neutrality**' (GREEN). 'Green Audit' can be defined as 'systematic identification, quantification, recording, reporting and analysing of components of ecological diversity and expressing the same in financial or social terms'. 'Green Auditing', an umbrella term, is known by another name 'Environmental Auditing'. To implement the green audit other important aspects such as objective of green audit, drivers of green audit, future scope, benefits, and advantages are necessary to understand. The green audit practically involves energy conservation, use of renewable sources, rain water harvesting, and efforts of carbon neutrality, plantation, hazardous waste management & E-waste management. Institutions use the concept of Green Audit as a management tool to evaluate the environmental standards and improve their performance for the sustainable development of the organization.



K.L.E. Law College - Campus.

## Executive Summary

Colleges and Universities have huge impact on the world around them, both negative and positive. The activities pursued by colleges can create a variety of environmental impacts. Being imparters of education, colleges are in a unique position to be leaders in pursuing environmentally sustainable solutions. K.L.E. Law College expresses its commitment to sustainability in many ways. It has taken a number of positive steps to reduce its environmental impact. But many areas remain in which substantial improvements can be made. This report serves to highlight the many accomplishments of K.L.E Law College and to make recommendations for improving the College's environmental sustainability. The college conducted the Green Audit in academic year 2019-20 and strives to maintain eco-friendly atmosphere in the college.

The initiatives taken by the college to make the campus Ecofriendly:

1. Energy conservation
2. Water conservation
3. Efforts for carbon neutrality
4. Hazardous waste management
5. E-waste management
6. Plantation

The college undertakes various activities through NSS and Green Lawyers Club (GLC) to create awareness about the environment. The college also organises special programs by inviting eminent personalities who train and educate the students as well as the public. Students are encouraged to participate in eco-friendly activities.

### **Awareness of Carbon Consumption:**

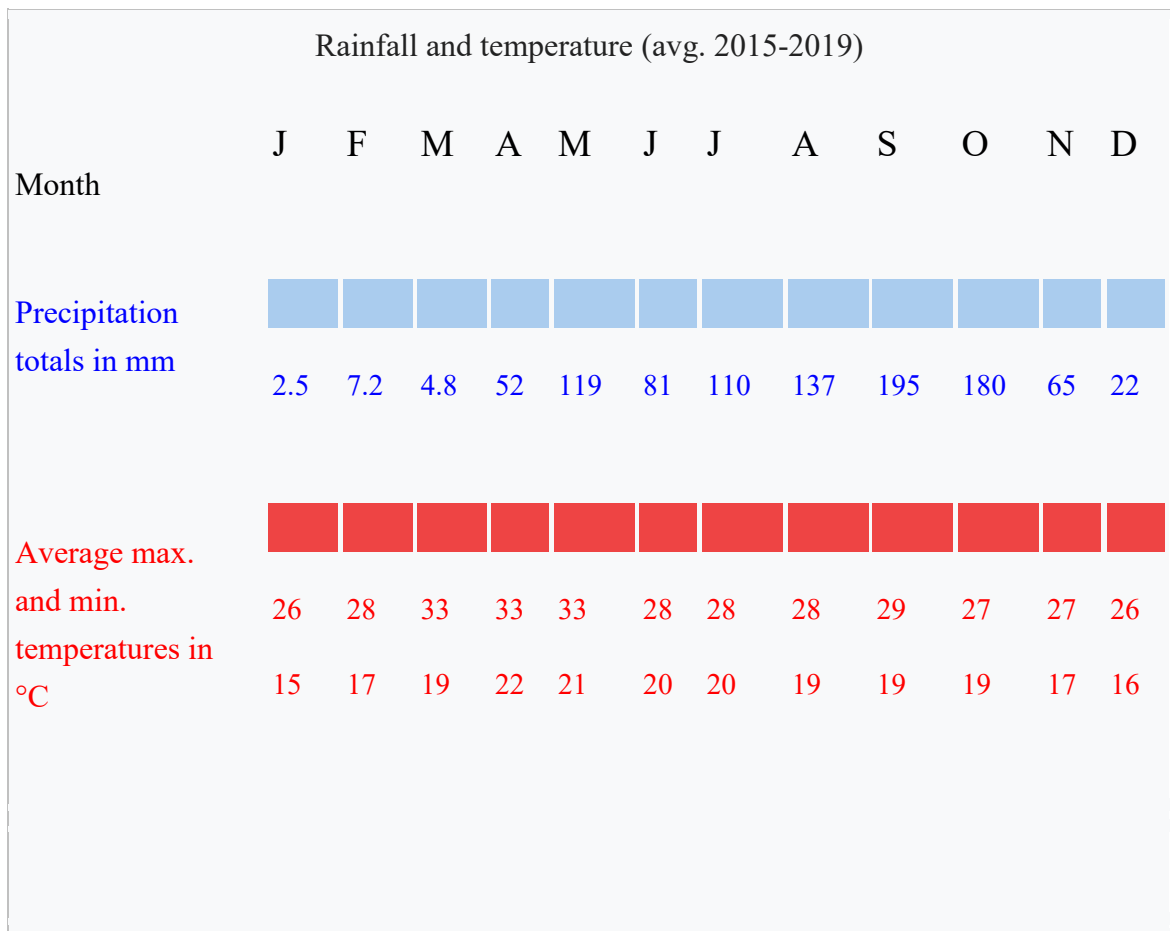
The students and members of the staff are made aware of pollution that are caused by use of vehicles. The carbon consumption awareness program helps in reducing carbon emission at individual as well as community level and avoids air and noise pollution in the campus due to vehicles or any activity in it. Green Audit is the most efficient & ecological way to solve such an environmental problem. The experiments on the nature by avoiding natural rules is one major reason behind Green audit process. Green Audit is a professional care which is the responsibility of each individual who is a part of economic, financial, social, environmental factor. It is necessary to conduct a green audit in college campus so that the students will be aware of green audit, its role in saving the planet and encourage them to become responsible citizens of the country. Thus Green Audit becomes necessary at the college level too. Environmental auditing is essentially an environmental management tool for measuring the effects of certain activities on the environment against set criteria or standards. Depending on the types of standards and the focus of the audit, there are different types of environmental audit. Organizations of all kinds now recognize the importance of environmental matters and accept that their environmental performance will be scrutinized by a wide range of interested parties. Environmental auditing is used to Investigate, Understand and Identify.

## I. Site Selection

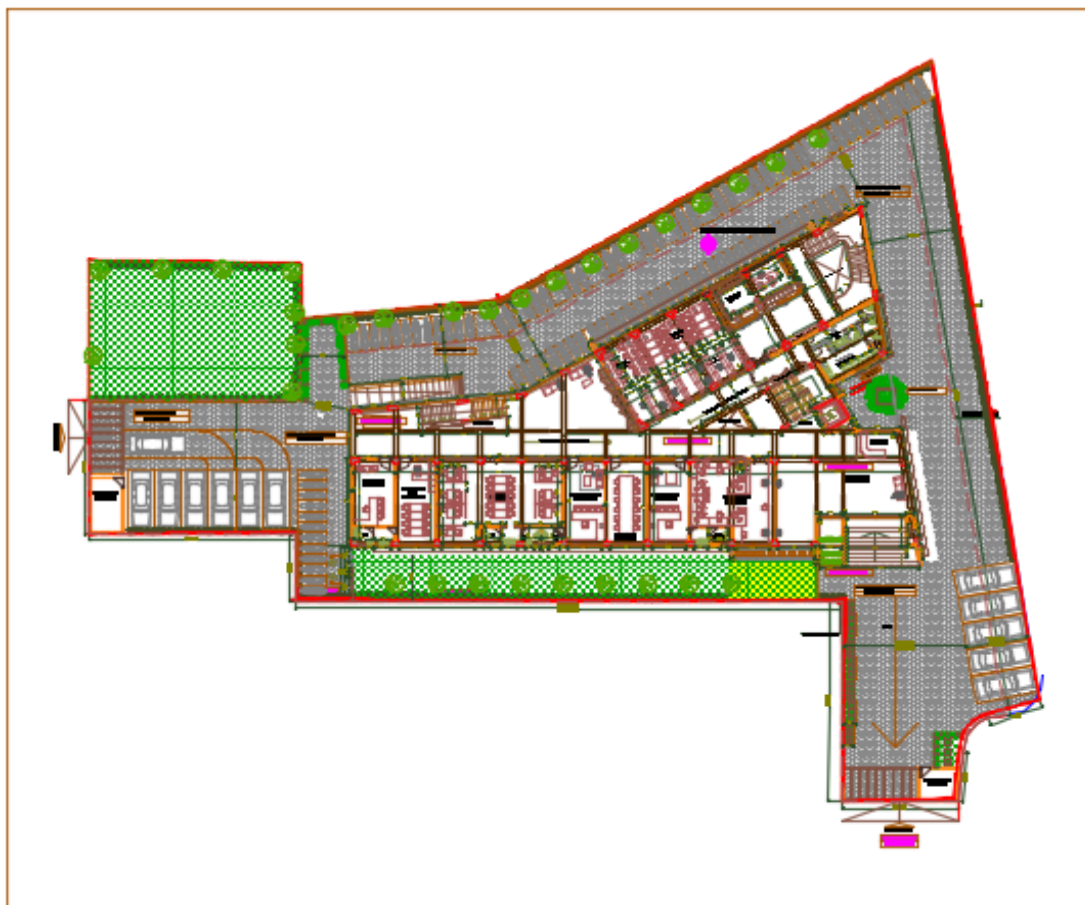
3, CA-2 V Block, West Circle, Sir M. Vishweshwaraiah layout, Ullal Post, Bengaluru, Karnataka 560091. It is positioned at 12°58'5.94"N 77°28'54.82"E and covers an area of 2572 square meters,

Topography, The North Bangalore taluk is a relatively more level plateau and lies between an average of 839 to 962 meters above mean sea level. Seismicity, it lies in the seismically stable region, Zone III.

### i. Climate Chart



## ii. Master Plan



## iii. Area details

Sl.No.	Zone	Total Area in Sq. m
1	Total site area	2573
2	Vegetated area	547
3	Non-roof hardscape area	875
4	Total Built-up area	6636

#### **iv. Erosion & Sedimentation Control**

K.L.E. Law College has greenery within the campus, thereby providing habitat to and promoting biodiversity. By having a vegetated area of 488 sq.m the soil is protected and preserved, thereby reducing the negative impacts of soil erosion on the site and surroundings.



#### **v. Development Footprint**

K.L.E. Law College open space adjacent to the building is more than the building footprint.

Total Site Area: 2573 Sq.m

Building Foot print: 1151 Sq.m----- (1)

Open space provided: 1422 Sq.m----- (2)

Equ. 2 is greater than Equ. 1, thus project has provided open space that is more than the building footprint of the project building.

A scientific survey of flora and fauna of the campus is carried out covering rainy, winter and summer seasons during 2019-20, this biodiversity audit has revealed more than 68 trees, various species of Mammals, Aves, Arthropods and Annelids were also recorded. This indicated excellent composition of Flora and Fauna quite unique considering that the campus is situated in the heart of the city. Many birds are reported in the campus seasonally.

## II. Built Environment

### i. Ambient Air Quality

Air pollution has long term and short term impact on the biotic and abiotic component of the environment. The ambient air quality at the core zone of K.L.E. Law College was monitored. The study area represents it is very calm environment with less pollutants. Air quality test sampling is done for major pollutants released in the atmosphere like (SPM) PM10, SO<sub>2</sub>, NO<sub>x</sub> and CO etc.

➤ Ambient Air Quality Monitoring Results:

Station Name	Description	Date of sampling
Near Main Gate	Sensitive zone	20.12.2019

Sr.no	SO <sub>2</sub> (µg/m <sup>3</sup> )		NO <sub>x</sub> (µg/m <sup>3</sup> )		PM10(µg/m <sup>3</sup> )		(CO) (µg/m <sup>3</sup> )	
	Result	NAAQS	Result	NAAQS	Result	NAAQS	Result	NAAQS
1	12.0	≤80	17.6	≤80	61.8	≤100	NIL	≤4

- National Ambient Air Quality Standards (NAAQS)
- Ambient Air Quality Monitoring Report:(Annex A)



Respirable Dust Sampler.

## ii. Day lighting

K.L.E.Law College has maintained that all regularly occupied spaces are daylit, thereby improving health and well-being of students & teachers.

Sr.no.	Space	Prescribed Illumination Level (Lux)	Readings
1	Moot Court	150-300	175
2	Classroom GF	150-300	188
3	Library	200-300	375
4	Classroom FF	150-300	258
5	Classroom SF	150-300	280
6	Staff room 1	150-300	265
7	Staff room 2	150-300	275

*Source: IS 8827- 1978- affirmed in 2006, Please note that the illumination level is monitored only for daylight. Before starting the monitoring process, the artificial lighting fixtures were switched off.*

The institution is having more opportunity to save energy in buildings by maximizing the use of daylight. There is no need for artificial lighting during daylight hours and thereby avoiding heating problems due to Bengaluru's climate and building's design



Classroom

### **iii. Outdoor Light Pollution Reduction**

To reduce light pollution and to increase night sky access and enhance the nocturnal environment, the institute has designed exterior lighting such that no external light fixture emits more than 5% of the total initial designed fixture Lumens, at an angle of 90 degrees or higher from nadir (straight down).



### III. Water Audit

Water audit is an effective management tool for minimising losses, optimizing various uses and thus enabling considerable conservation of water. The efforts of the institution in water usage and management is seen through the following activities and is satisfactory and no unnecessary water wastage is noticed in the campus.

#### i. Water Supply and Usage

Water source is from 1 bore well and municipal connection which satisfies the water demand.

Water demand calculation based on WHO standard:

Year	Population	Demand @15 LPCD	Provision per 15% losses	Total demand
2020	1250	18,750	2,812	21,562

*Considering Lower limit of lpcd as per WHO is 15 lpcd*

#### ii. Water quality

The quality of Bore well water meets the potable water standards.

The quality of waste water meets the prescribed values by Central (or) State Pollution Control Board, as applicable.

Institution has adopted UV and IS: 1500-2012 RO purified drinking water filtration system to provide portable water to the staffs and students in each floor. Test report - Annex B.

#### iv. Rain water recharge pit

The institution has planned for rain water recharge roof method to enhance ground water table and non-roof method is planned providing more vegetated area.

A 15 feet deep recharge pit is located in the institution. The rain water recharge pit allows the rain water to restore ground water. Considering the catchment area, rate of percolation of the soil and depth of ground water level, the recharge pit is made near to the bore well in order to recharge the underground aquifers and help water infiltration in one area. The recharge pit is filled with stones of different sizes at the bottom from large gaps for the water to pass through. A mesh between sand and stones prevents the sand from escaping. A layer of soil and leaves of plant act as a filter for pure water which percolates through the soil layer and then into bedrock. Thus rain water is used for recharging the ground water level.

The rainwater harvesting system is designed to cater at least “one-day normal rainfall\*” occurred in the last 5 years.

The institution has total roof run-off volume of 0. 61cu.m



Rain water Recharge Pit

**v. Operation and maintenance:**

Proper facility has been provided for its effective use. The following measures will be followed:

- Inspection of recharge pit had been conducted after every major storm in the initial months after construction. Annual inspection of rainwater pond and recharge pits will be conducted.
- Quarterly cleanouts and removal of debris from all drainage inlets and outlets.
- Periodic removal and disposal of accumulated sediments from rainwater drains running all around the site.

**vi. Quality Control:**

Measure considered for removal of total suspended solids from storm water is follows:

1. Post construction

- Landscaping areas post construction will also retain the suspended solids from storm water runoff.
- Periodical cleaning process will be carried out to improve the TSS removal efficiency for both the rain water recharge pit.

## **IV. Energy Audit**

The “Energy Audit” is the key to a systematic approach for decision-making in the area of energy management. It attempts to balance the total energy inputs with their use and serves to identify all the energy streams in a facility. It quantifies energy usage according to its discrete functions. Energy audit is an effective tool in defining and pursuing a comprehensive energy management program within a business. As per the Energy Conservation Act, 2001, passed by the government of India, energy audit is defined as “the verification, monitoring and analysis of use of energy including submission of technical reports containing recommendations for improving energy efficiency with cost benefit analysis and an action plan to reduce energy consumption.”

### **i. About Energy Audit**

An energy audit helps to understand more about the ways energy is used in any college and helps in identifying areas where waste may occur and scope for improvement exists. The overall energy efficiency from generation to the final consumer becomes 50%. Hence one unit saved in the end user is equivalent to two units generated in the power plant.

An energy audit is the most efficient way to identify the strength and weaknesses of energy management practices and to find a way to solve problems. An energy audit is a professional approach to utilizing economic, financial, social, and natural resources responsibly. Energy audits “adds value” to management control and are a way of evaluating the system.

GREEN AURA, Bengaluru, Karnataka carried out the “Energy Audit” at the site to find gaps in the energy consumption pattern for “KLE Law College, Ullal , Bengaluru” A technical report is prepared as per the need and the requirement of the project.

### **ii. Objectives of Energy Auditing**

An energy audit provides a vital information base for an overall energy conservation program covering essentially energy utilization analysis and evaluation of energy conservation measures. It aims at:

- Identifying the quality and cost of various energy inputs.
- Assessing the present pattern of energy consumption in different cost centers of operations.
- Relating energy inputs and production output.
- Identifying potential areas of the thermal and electrical energy economy.

- Highlighting wastage in major areas.
- Fixing of energy-saving potential targets for individual cost centers.
- Implementation of measures for energy conservation & realization of savings.

### iii. Methodology

The methodology adopted for achieving the desired objectives viz.: Assessment of the current operational status and energy savings includes the following:

- Discussions with the concerned officials for identification of major areas of focus and other related systems.
- A team of engineers visited the site and had discussions with the concerned officials/supervisors to collect data/information on the operations and load distribution within the plant and the same for the overall premises. The data were analyzed to arrive at a baseline energy consumption pattern.
- Measurements and monitoring with the help of appropriate instruments including continuous and/or time-lapse recording, as appropriate and visual observations were made to identify the energy usage pattern and losses in the system.
- Trend analysis of costs and consumptions.
- Capacity and efficiency test of major utility equipments, wherever applicable.
- Estimation of various losses
- Computation and in-depth analysis of the collected data, including utilization of computerized analysis and other techniques as appropriate, were done to draw inferences and to evolve suitable energy conservation plan's for improvements/ reduction in specific energy consumption.

## POWER SUPPLY SYSTEM

### iv. Power Supply System

College has meter connection from Bangalore Electricity Supply Company Limited  
Details are given following table

Sr.No.	Detail of Consumer	Connection detail
1	ConsumerName	Principal KLE Law College
2	Bill No.	409372487052
3	Tariff Category	1HT2C2
4	ContractDemand	125 KVA

## Electricity BILL ANALYSIS

### v. Monthly Electrical Energy Consumption 2020

The Monthly electrical consumption for the college is given in the table

Sr. No.	Month & Year	Contract Demand (KVA)	Maximum demand (KVA)	Billing Demand (KVA)	Unit Consumption (kWh)	Unit consumption kVAh	Power Factor	Amount (Rs/-)	Overall per unit charges Rs. / kVAh
1	Jan-20	125	20	106	3525	5362	0.65	55,488	10.35
2	Feb-20	125	31	106	4087	5192	0.77	59319	11.43
3	Mar-20	125	28	106	3725	4251	0.79	58450	13.75
4	Apr-20	125	17	106	4012	4103	0.53	41500	10.11
5	May-20	125	22	106	3357	4125	0.6	52410	12.71
6	Jun-20	125	21	106	2850	3950	0.78	51255	12.98
7	Jul-20	125	17	106	2220	4250	0.59	43586	10.26
8	Aug-20	125	35	106	2954	4012	0.88	42510	10.60
9	Sep-20	125	32	106	2828	3780	0.72	47851	12.66
10	Oct-20	125	18	106	3455	4251	0.82	57451	13.51
11	Nov-20	125	22	106	3500	3685	0.86	49870	13.53
12	Dec-20	125	25	106	2890	3784	0.71	47854	12.65
					<b>39403</b>	<b>50745</b>	<b>0.73</b>	<b>607544</b>	<b>12.04</b>

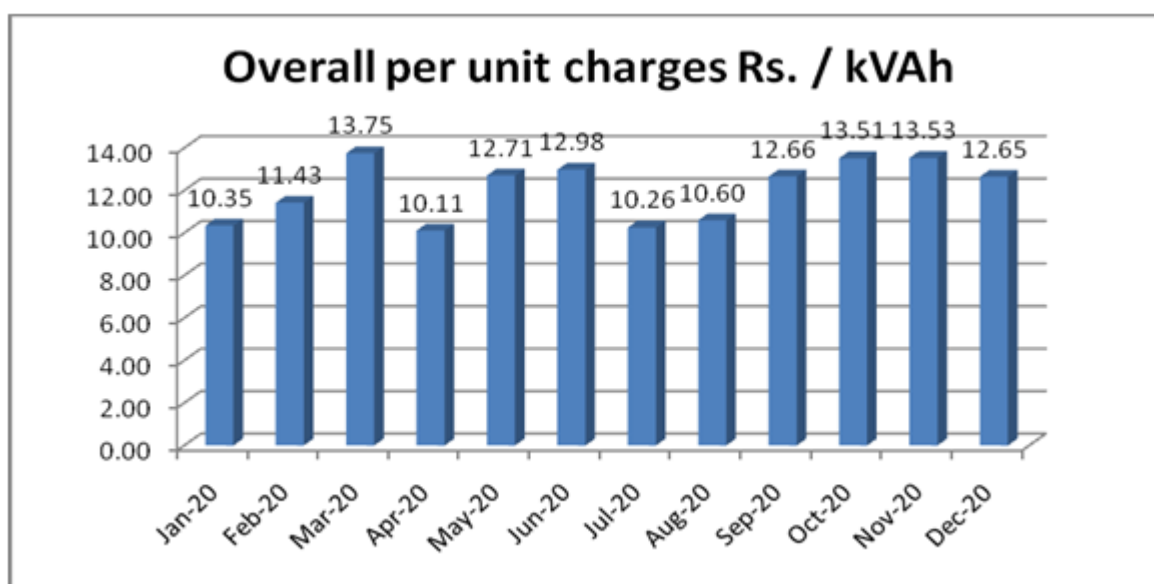


Figure 3.1:-Graphical presentation of per unit charges for the year 2020

Observation:

It was found that in the last 12 months overall per unit charge is Rs 12.04 /kWh

## **V. Health and Well-being.**

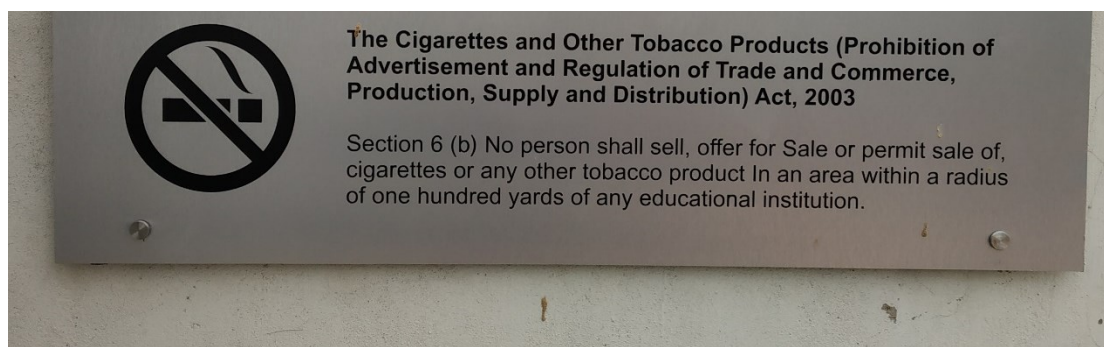
### **i. Campus design caters to differently able people**

The institution has provided building design that caters to differently able people such as:

- Non-slippery ramps.
- Lift with braille assistance.
- Preferred parking for differently abled.
- Wheel chair.

### **ii. Tobacco Free Zone**

The institution has taken care to eliminate exposure of students & teachers to tobacco smoke thereby reducing health impacts caused due to passive smoking.



### **iii. Ozone Depletion**

Institution has provided the Inverter AC serving the Conference Room and AV Room, the refrigerant selected for the Air Conditioning System eliminates the emission of compounds that contribute to ozone depletion and global warming. The Air conditioning equipment has been selected with HFC based refrigerant R 410A.

### **iv. Fire suppression system**

The main fire suppression system used is hand held fire extinguishers and are Halon free. The project has not used any Halon based fire suppression system.

## VI. Waste Management Audit.

The waste management is in order with the installation of dust bins. The waste is segregated at source by providing separate dustbins for biodegradable and plastic waste. Daily cleaning is carried out and most of the non-biodegradable waste is lifted by the City Municipal service.

Institution strongly believes in 3R's: Reduce, Reuse and Recycle of waste as follows:

**Reduce:** Institution has replaced the use of paper in admission process of the candidates, filling of the examination forms, cash book etc. by Talley ER software. This has helped in drastically reducing the use of paper. The students have also been encouraged to use both the sides of the paper for writing tests and are asked to use the paper binding for their academic practical records instead of plastic.

**Sanitary waste:** The institution has installed the sanitary napkin burning machine called as “Incinerator” in the ladies washroom so as to enable ladies to drop the used sanitary napkins into the incinerator where it is burnt into sterile ash in seconds and flushed down for a greener tomorrow.



Sanitary Napkin Vending Machine



Incinerator

**Reuse:** The institution has made an arrangement with a local farmer, Sri.Ramakrishnappa, who collects wet waste generated in the college including the leftover food every evening and uses the same as fodder for his livestock.



Farmer Ramakrishnappa collecting the wet waste from the college canteen

- Vermicomposting pit is made and composting is done using earthworms for organic waste.



**Recycle:** The institution has entered into an MOU with Environmental & Recycling Solutions India, which collects wastes like cardboard, newspaper and magazines, shredded papers, old office records, dust bin papers, plastics, metal etc once a month. Then these materials are taken to a recycling plant. The house keeping staff, selected students & staff members are oriented by the Environmental & Recycling Solutions India regarding waste segregation and management. Further, these selected students will in turn motivate other students, so that it leads to a continuous process of effective waste management and awareness.



WOW imparting training to housekeeping staff

- The E-waste and defective item from computer lab is being stored properly. The institution has decided to contact approved E- waste management and Disposal facility in order to dispose E-waste in scientific manner.
- Hazardous Waste, Radioactive Waste not found.

## VII. Green Education.

The institution promotes green education by involving the students, staff along with the local communities to increase the awareness levels and encourage the implementation of eco-friendly practices through Green Lawyers Club.

Green Lawyers Club helps the students to understand environment, environmental law and their role in the environmental protection. The students conduct lot of programmes and awareness initiatives relating to protection of environment. In this regard many activities are conducted by the club periodically, such activities include many outreach and educational programmes in a year with the involvement of campus occupants, local communities to increase public awareness on environment sustainability and green features of the campus.

The whole campus involved in the Swachh Bharat Abhiyan by creating awareness around the institution regarding clean India mission by keeping their campus and its premises clean all the staffs and students were participated and made the mission successful in the whole campus.





Every year Environmental Day, Earth Day and Water Day are celebrated in the institution. Plantation activities are taken up to bring awareness and to increase the green coverage area in and around the campus.



## **Suggestions and recommendations.**

1. The number of rainwater storage tanks may be increased to collect complete volume of rainfall and with suitable treatment it can be reused foreseeing future needs of water. Further, rainwater pits can be prepared at appropriate places identified with the assistance of Department of Geology and restoration activities may be initiated to sustain the health of ponds and wetlands around the campus.
2. Add Solar lighting and heating systems.
3. Give preference to the most energy efficient and environmentally sound appliances available.
4. Vehicle pooling should be further promoted both among students and faculty and use of bicycles too should be increased.
5. Ensure that all cleaning products used by college staff have a minimal detrimental impact on the environment, i.e. are biodegradable and non-toxic, even where this exceeds the Control of Substances Hazardous to Health (COSHH) regulations.
6. Ensure that an audit is conducted annually and action is taken on the basis of audit report.





*Built Environment Sustainability & Transformation*