



ENERGY AUDIT & GREEN AUDIT CERTIFICATE

This is to certify that M/s. Raj Energy Services has conducted Energy Audit & Green Audit of Shri Shankaracharya Mahavidyalaya, Junwani, Bhilai Nagar.

Name of the Educational Institute	Shri Shankaracharya Mahavidyalaya 97/2, Junwani, Bhilai Nagar, Durg , Chhattisgarh 490 020
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Name of Director	Dr. Raksha Singh
Details of facilities Audited	Office, All departments, Laboratories, Classrooms, Library, Electrical Systems and complete Installations including Grid connected Solar Power Plant, Rain Water Harvesting System Etc.
Date of Audit Conducted	27 th & 28 th January 2020
Name of Certified Energy Auditor	Sanjay Kumar Mishra
Registration Number	EA- 8696

For, Raj Energy Services

Date : February 4, 2020

(Sanjay Kumar Mishra)



Green Audit & Energy Audit of

Shri Shankaracharya Mahavidyalaya, Junwani, Bhilai



Conducted & Prepared by

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3. ACKNOWLEDGEMENTS

We express our sincere thanks to Dr. Raksha Singh, Director & Principal for her kind support and giving us the assignment to contribute in their effort towards Green initiatives & efficient energy management in Shri Shankaracharya Mahavidyalaya Junwani, Bhilai.

We are highly indebted to Shri I. P. Mishra, Chairman, Shri Gangajali Education Society, Bhilai for their guidance, intellectual advice and his kind support in completing the project.

We also thank Smt. Jaya Mishra, President, Shri Gangajali Education Society, Bhilai, for the cooperation extended during our Audit work.

Our boundless gratitude to Dr. Rahul Mene – H.O.D. English, all members of the Pallavan Eco Club and other teaching and non-teaching staff associated with this Green Audit study of Shri Shankaracharya Mahavidyalaya, Junwani Bhilai for extending cooperation during collection of data and field study work.

We trust that the findings of this study will help the college in improving their Green initiative towards creating awareness for healthy and sustainable environment.

Raj Energy Services, Bhilai

Sanjay Kumar Mishra

Certified Energy Auditor, EA- 8696

4. EXECUTIVE SUMMARY

Shri Shankaracharya Mahavidyalaya a NAAC accredited and ISO 9001:2015 certified institution affiliated to Hemchand Yadav Viswavidyalaya, Durg (C.G.) and recognized by Govt. of Chhattisgarh and under section 2(f) and 12 (B) of the UGC Act, 1956 which is located in prime area of Bhilai, it commenced in 1997 with first batch of 80 students and now its strength is more than 2500 students a growth of 262 percentage. Since its Inception it has been imparting education in the field of Commerce, Science, Education, Computer, Arts and Management at both undergraduate and postgraduate levels. Institution tries to provide strong foundation to its students for their professional career in order to ensure all round development care has been taken to give advocate exposure to both staff and students in various fields. The college campus has area of 1.56 acre (Khasra No.97/2) and built up area of college is 2387.45 Sq. meter.

Green Audit

The main objective of the green audit is to promote the Environment Management and Conservation in the College Campus.

The study covered the following areas to summarise the present status of environment management in the campus:

- Water Management
- Energy Conservation
- Waste Management
- E-waste Management
- Green Area Management
- Bioenzyme Management

Water Management

Shri Shankaracharya Mahavidyalaya, Junwani gets water from two sources-one is from Municipal pumping system and another is from its own bore wells. College pays water tax to Municipal Corporation.

College has installed Water level indicator to avoid overflow from water tank. Waste water is used in cleaning or for watering plants. Chemical waste water from labs is not mixed with ground water. Chemical water has separate dedicated pit. Labs are practicing green chemistry method. Total water consumption of water in Shri Shankaracharya Mahavidyalaya is 14,950 litres per day.

The college has a rain water harvesting system and the total amount of water received through rainfall is about 2292 Cu. Meter.

Energy Management

Shri Shankaracharya Mahavidyalaya, Junwani has contract Demand of 60 KVA with Chhattisgarh State Power Distribution Company Limited; college has also installed a grid connected solar power plant of 60 KWp on the rooftop. A DG set of capacity 125 KVA is installed in campus for emergency power supply.

The total connected load of SSMV Junwani, Bhilai Campus is about 99 KW. The air conditioner has about 39% load share among all the electrical equipment.

The management has started replacement of conventional light with energy efficient LED light fittings. Thus, total Percentage of Lighting Power requirement met through LED lights is about 47%.

The total gross generation of solar power plant was 81594 KWH during the year 2019. The average generation performance of solar power plant was 3.73/day/KW during last year. The total power of contract demand is completely met with solar power plant. Percentage of Power requirement met by Renewable Energy Sources is 100%. Although, nominal quantity of energy is consumed in the form of LPG.

Waste Management

Shri Shankaracharya Mahavidyalaya Junwani practices solid waste management which includes segregation of waste, the most important step in waste management. College encourages the process of eco-friendly waste disposal method. Maximum waste generated is recycled and reused. Non-biodegradable waste like plastics, metal, glass etc. is collected in a dig and handed over to Bhilai Municipal Corporation, Bhilai.

To reduce paper consumption, college is using both side of paper. No waste is polluting surface/ground water. A machine is available in college for sanitary napkin waste.

College has a good idea for growing small leafy vegetables and herbs in unused plastic water bottles. This **plastic bottle vertical garden** is made of by stringing the bottles horizontally in a grid along the wall of the campus which then filled up by substrate and herb.

Various waste such as wet waste generated from canteen & Tiffin of students and teachers and dry waste i.e. papers, coconut peels, huge amount of garden waste which is mostly in the form of Green Audit & Energy Audit of Shri Shankaracharya Mahavidyalaya, Junwani, Bhilai (C.G.)

leaves are used for composting (in composting pit) to form manure and fertilizers and further used for organic farming in college campus.

Green Campus Management

Shri Shankaracharya Mahavidyalaya, Junwani, Bhilai has established an Pallavan Eco Club of its own from the session 2013-14. In last session, Pallavan Eco Club has conducted Plantation & poster competition at ssmv campus. Pallavan Eco Club has taken the initiative of giving “Botanical Names” to the trees, planted in the college campus.

Pallavan Eco Club prepares Green calendar of each session and celebrate all important days related to environment protection and sustainability. The campus has 76 full grown trees and 52 semi grown tree in the campus.

Carbon Footprint

A carbon footprint is an amount of greenhouse gases—primarily carbon dioxide— released into the atmosphere by an individual, event, organization, service, or product, expressed as carbon dioxide equivalent.

Total carbon absorption by trees planted by Pallavan Eco Club is 969 Kg of CO₂ and Total oxygen produced by trees is 16,758 Kg in one year.

Bioenzyme Management

Bio Enzymes (also referred to as Garbage Enzyme or Fruit Enzyme) is a multi-purpose, natural cleaner produced from vegetable/fruit peels (usually citrus) or waste. It is an effective alternative to harsh chemicals such as bleach, phenyl, and other chemical solutions we typically use in households and other establishments to wash bathrooms, clean toilets, wipe floors, tiles and other surfaces.

Chemically, Bio Enzymes is a mixture of complex organic substances such as proteins, salts and other materials that are by-products of the bacteria/yeast (naturally occurring) that we will use to make the Bio Enzyme. These organic substances are capable of breaking down chemical and other organic waste resulting in removing stains, odour, getting rid of other harmful microbes, etc. They also greatly neutralize toxins and pollutants.

5. INTRODUCTION

In its endeavour the college runs under the aegis of Shri Gangajali Education Society a community integrated trust which was established in the year 1994 with the motto of '*परहित सरिस धर्म नहीं भाई, परपीड़ा सम नहीं अधमाई*' means *Charity, beneficence and benevolence are key to religion, whereas afflicting pain on others leads to the path of Sin*. At present the Trust is running ten educational institutions with virtually all courses from Doctorate, Medicine, Pharmacy, Engineering, Nursing, Commerce, Arts, Computer Application, Management and Science. The trusts institutions (including SSMV) have emerged as strong brand in the Central India.

Shri Shankaracharya Mahavidyalaya is located in prime area of Bhilai, it commenced in 1997 with first batch of 80 students and now its strength is more than 2500 students a growth of 262 percentage. Since its Inception it has been imparting education in the field of Commerce, Science, Education, Computer, Arts and Management at both undergraduate and postgraduate levels.



Institution tries to provide strong foundation to its students for their professional career and in order to ensure all round development, due care has been taken to give advocate exposure to both staff and students in various fields.

Shri Shankaracharya Mahavidyalaya enjoys the distinction of being the first college in the region to give *saplings* instead of bouquet during the seminars/Conferences/Workshops/Guest Lectures /Sports events/ Cultural events etc. organized in the college campus since 2007 and so far college has distributed **more than 10,000 (Ten Thousand)** saplings. The college's NSS, NCC units and Pallavan Eco Club are actively involved in environmental awareness programmes including plantation drives, solid waste management, rain water harvesting, training of preparation of Bioenzymes by staff and students in the adopted and other villages.



SSMV Junwani, Bhilai Campus has decided to replace conventional Tube lights with LED in phased manner since 2015-2016. Our college campus is Plastic Free since last session 2018-2019 and also installed 60 KWp Roof Top Solar Photo Voltaic On-grid Power Plant and in this way we have avoided 180 Tons of Co₂.

SSMV Junwani, Bhilai Campus enjoys the blessing of His holiness *Shankaracharya Swami Swaroopanand Saraswati, Dwarika Sharda Pithadhish*. College has been ranked **FIRST** in two consecutive years in the performance index of affiliating University (in 2014-15 & 2015-16) for Quality Management. NSS unit has also stood **FIRST** among 1100 units in Chhattisgarh (2015-16). We stood **THIRD** in clean campus competition conducted by the affiliating university (Hemchand Yadav Vishwavidyalaya, Durg). The Collectorate office has given Institutes nodal officer award in two consecutive years for successfully conducted SVEEP (Systematic Voters' Education and Electoral Participation)



The result of college has been excellent with 178 meritorious students, since its inception. Several

teachers and students have received awards in academics sports and cultural fields.

The college has MoU with NUSSD (Subsidiary of TISS) for skill development programs it has also signed MoU with nineteen other institutions of National and International repute. No report of ragging and women harassment has ever been registered in the college campus. College also arrange spiritual discourses and lays emphasis on ethical, moral and spiritual values. Till date college has organize more than 24 National seminar / workshop in various fields sponsored by UGC /CG COST/NAAC/NGO.



Total Campus Area & College Building Spread Area

Campus Area	1.56 Acre (Khasra No.97/2)
Total Built up Area	Block A : 641.10 Sq. Meter Block B : 1178.21 Sq. Meter Block C : 568.93 Sq. Meter Total Area : 2387.45 Sq. Meter

Table 1 : Total Campus Area & College Building Spread Area

6. GREEN AUDIT

Green Audit can be defined as systematic identification, quantification, recording, reporting and analysis of components of environmental diversity. The 'Green Audit' aims to analyse environmental practices within and outside the College campus, which will have an impact on the eco-friendly ambience. It was initiated with the motive of inspecting the work conducted within the organizations whose exercises can cause risk to the health of inhabitants and the environment. Through Green Audit, one gets a direction as how to improve the condition of environment and there are various factors that have determined the growth of carrying out Green Audit.

Objectives of the Study

The main objective of the green audit is to promote the Environment Management and Conservation in the College Campus. The purpose of the audit is to identify, quantify, describe and prioritize framework of Environment Sustainability in compliance with the applicable regulations, policies and standards.

The main objectives of carrying out Green Audit are:

- To introduce and aware staff and 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 extent of resource use of 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 requiring high cost.
- To bring out a status report on environmental compliance.

Methodology

We had discussed in detail with Pallavan Eco Club members, staff members and Principal. The discussion was focused on identifying the attitudes and awareness towards environmental issues at the institutional, district, national and global level. The discussion revolved around three key questions: Do the members of the group consider themselves eco-conscious? Do they consider the Institution to be eco-friendly? What do they think are the issues that need to be given top priority? In order to perform green audit, the methodology included different tools such as preparation of questionnaire, physical inspection of the campus, observation and review of the documentation, interviewing key persons and data analysis, measurements and recommendations.

The study covered the following areas to summarise the present status of environment management in the campus:

- Water Management
- Energy Management
- Waste Management
- E-waste Management
- Green Campus Management
- Bioenzymes Management

6.1 Water Management

This indicator addresses water consumption, water sources, irrigation, storm water, appliances and fixtures. Aquifer depletion and water contamination are taking place at unprecedented rates. It is therefore essential that any environmentally responsible institution should examine its water use practices.

Shri Shankaracharya Mahavidyalaya, Junwani gets water from two sources- one is from Municipal pumping system and another is from its own bore wells. College pays water tax to Municipal Corporation. Two pumps are operating to fulfil the daily needs of college. College has a sump well of cubical size 21 feet x 11 feet x 12 feet and also our water storage tank each having

capacity of 2000 litre. Daily, 8000 litre of water is pumped to water storage tank.



College has installed Water level indicator to avoid overflow from water tank. In case of small overflow of water, the water is used in water harvesting system. The depth of recharge well of rain water harvesting system is 8 feet. Waste water is used in cleaning or for watering plants. Chemical waste water from labs is not mixed with ground water. Chemical

water has separate dedicated pit. Labs are practicing green chemistry method.

There are four water coolers with Aquaguard/RO facility installed in college which provides clean and hygienic drinking water facility installed in each floor of the block for the benefit of the students. There are total 8 bathrooms for staff and 12 bathrooms for students. Beside these, there Green Audit & Energy Audit of Shri Shankaracharya Mahavidyalaya, Junwani, Bhilai (C.G.) Page 14

are two more bathrooms, which are used during sport event or election period for 10 days maximum in a year. Two taps are in canteen and total 300 litres of water per day is used in canteen. Also for garden use, about 300 litres of water per day is used for garden purpose. The garden is watered once in two days.

There is no signs of addressing people to turn off water taps in the campus. There is no waterless toilets and also no water fountains. However, we have identified one place near two wheeler stand where water leakage is found through one of water tap.

It was expected of litre water loss per day. This water leakage was immediately informed to concerned person and it was rectified during the field study of Green Audit activity. During field visit, we have found leakage in a tap near to vehicle stand. This wastage of water is bring in kind notice of concerned authority.



6.1.1 Water Consumption at SSMV Junwani, Bhilai

Water audit at Shri Shankaracharya Mahavidyalaya Junwani, Bhilai Campus					
1	2	3	4	5	6
Activity	Average litres of water used per activity in litres	Number of times activity done each day	Total water used by a person each day (liters)	Number of people in the College using water	Water Consumption per day
Wash hands and face	1.5 litres	One times a day	1.5	1000	1500
Bath	80 – 150	once	100	10	1000
Toilet flush	6 To 21	once	8	1000	8000
Drinking (cup)	0.25	twice	0.5	1700	850
Washing dishes (hand)	Basin	Once	5	400	2000
Leakage of tap	300	continuous	300	-	300
Garden (m2/ day)	10	once	10	30 Sq. Metre	300
Canteen (Av. For 5 people breakfast)	2		2	500	1000
Total Consumption of Water Per Day					14950

Table 2 : Total Water Consumption Per Day

The college has a rain water harvesting system

6.1.2 Rain Water Harvesting System

Rainwater harvesting is a technology used to collect, convey and store rain water for later use from relatively clean surfaces such as a roof, land surface or rock catchment. RWH is the technique of collecting water from roof, Filtering and storing for further uses. Rainwater Harvesting is a simple technique of catching and holding rainwater where its falls. Either, we can store it in tanks for further use or we can use it to recharge groundwater depending upon the situation. RWH system provides sources of soft, high quality water reduces dependence on well and other sources and in many contexts are cost effective.

Rain Water Harvesting System at SSMV Junwani, Bhilai Campus

The runoff from the terrace of the college building is channelized into recharge well located in the campus. All the rooftop rainwater outlets discharge into storm water drains and then to the recharge Layer of bricks filled inside the recharge well ensures proper filtration of harvested waste. Shri Shankaracharya Mahavidyalaya, Junwani has 2387.5 Sq. Meter open roof area.

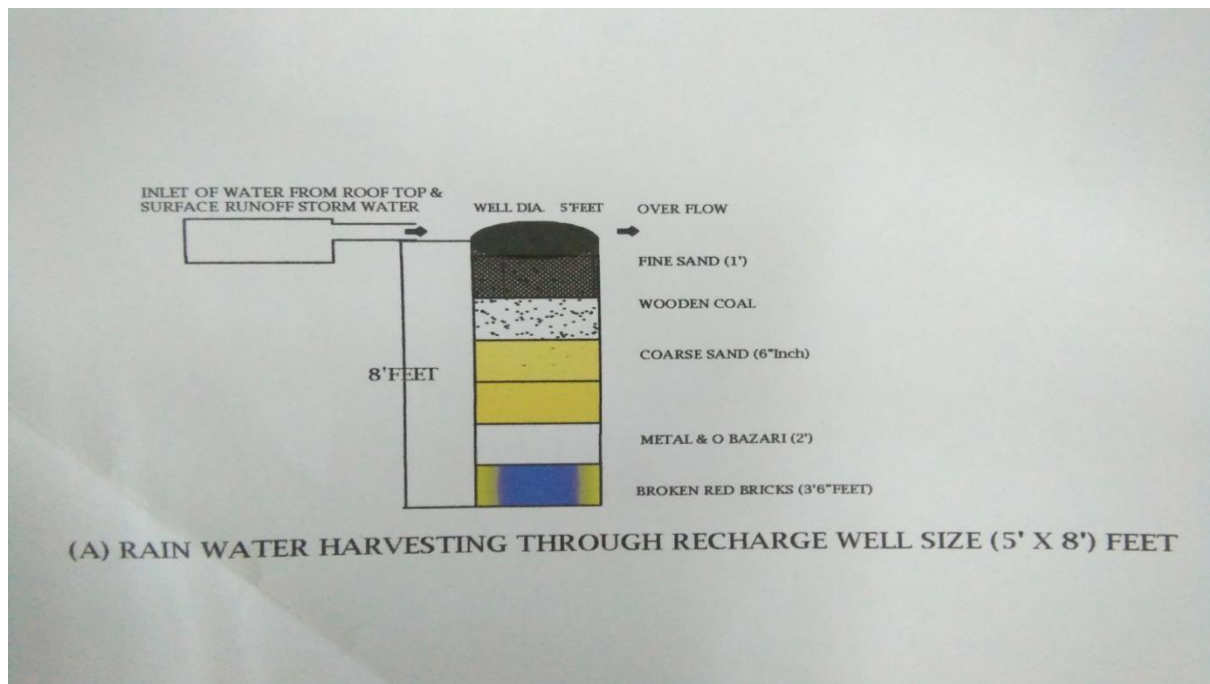


Figure :1 Rain Water Harvesting through Recharge Well

6.1.3 Amount of water received through rain

Open roof area (A)	2387.5 Sq. Meter
Average rain fall per square meter in Bhilai (B)	1200 mm or 1.20 Meter
Amount of water received through rain (C = A x B)	2864.94 Cu. Meter
Run off Coefficient factor through rain (D)	0.80
Total water received (E = C x D)	2291.95 Cu. Meter

Table 3: Amount of water received through rain

6.2 Energy Management

This indicator addresses energy consumption, energy sources, energy monitoring, lighting, appliances, and vehicles. Energy use is clearly an important aspect of campus sustainability and thus requires no explanation for its inclusion in the assessment.

Shri Shankaracharya Mahavidyalaya, Junwani uses following energy in the campus:-

- 1) Electricity
- 2) Diesel in Diesel Generator Set
- 3) Liquid Petroleum Gas

6.2.1 Electricity

There is facility of receiving Electrical Energy from these three sources:-

- a) Electricity from Distribution Company
- b) Electricity from own DG set
- c) Electricity from Grid connected Solar Power Plant of 60 KWp capacity

a) Electricity from Power Distribution Company

Shri Shankaracharya Mahavidyalaya, Junwani Bhilai Campus having Service number **1019511** and Contract Demand of **60 KVA** with Chhattisgarh State Power Distribution Company Limited;. The tariff category is **HV3GEN317**.



The college has also installed a grid connected solar power plant of **60 KWp** on the rooftop. The supply arrangement of Solar Power Plant is such that it will first meet in-house electricity consumption of college, then after it will supply surplus energy to grid, which will be recorded by Import/Export meter. We have analyzed the electricity bills of last one year.

We have noticed that exported unit to grid is not mentioned in electricity bill. However, CSPDCL should give details of exported unit in electricity bill as per regulation of Chhattisgarh State Electricity Regulatory Commission (GRID INTERACTIVE DISTRIBUTED RENEWABLE ENERGY SOURCES) Regulations, 2019 vide no. 82/CSERC/2019 dated 05 October 2019.

Electricity Bill Analysis

Month	Actual Demand in KVA	Avg. Power Factor	KVAH Consumed				KWH Consumed	Monthly Bill	Energy Cost (Rs. Per KVAH)
			On peak	off peak	Normal	Total			
Jan-19	15.24	0.45	1190	1437	1173	3800	1722	-23339.4	-6.14
Feb-19	12.12	0.52	1095	1314	872	3281	1690.5	12728.88	3.88
Mar-19	21.24	0.61	1262	1472	1094	3828	2343	35594.04	9.30
Apr-19	46.8	0.74	1310	1524	1484	4318	3175.5	38861.74	9.00
May-19	36.72	0.74	1185	1407	2195	4787	3532.5	44135.12	9.22
Jun-19	40.44	0.76	1169	1356	2519	5044	3817.5	46277.18	9.17
Jul-19	54.72	0.73	1206	1383	3575	6164	4525.5	56852.17	9.22

Aug-19	43.8	0.69	1188	1412	3264	5864	4033.5	53715.11	9.16
Sep-19	54.6	0.80	1346	1613	3744	6703	5358	71762.63	10.71
Oct-19	36.24	0.66	1229	1430	2594	5253	3457.5	47894.08	9.12
Nov-19	25.08	0.58	1077	1298	1512	3887	2272.5	37196.6	9.57
Dec-19	15.96	0.51	1154	1367	1373	3894	1989	36081.53	9.27

Table 4: Electricity Bill Analysis for year 2019

Monthly Average Power factor of Institute is poor and they should improve power factor near to unity. After improving power factor, there will be also saving in KVAH consumption.

We have noted that CSPDCL has charged 100% of contract demand as demand charges in electricity bill in spite of charging 75% of contract demand as demand charges. Therefore, energy cost is on higher side.

Connected Load

Segment	Equipment	Wattage	Quantity	Total	Total
Lighting	Conventional FTL	40	158	6320	6320
	LED Fittings	20	190	3800	
	LED Fittings	150	4	600	
	LED Fittings	200	6	1200	
Heating Ventilation & ACs	Fan	70	346	24220	64920
	AC 2 T	2200	2	4400	
	AC 1.5 T	1600	21	33600	
	Air Cooler	300	9	2700	
Office	Computer	70	136	9520	17820
	Printer	300	24	7200	
	Photo Copy Machine	1100	1	1100	
Others	Water Cooler	1200	4	4800	9800
	Others			5000	
Total				98140	

Table 5: Connected Load of SSMV Junwani, Bhilai Campus

The total connected load of SSMV Junwani, Bhilai Campus is about 99 KW. The maximum share of connected load is in HVAC segment, which is 62% and alone air conditioner has about 39% load share among all the electrical equipment.

Segment	Load in watt
Lighting	11920
HVAC	64920
Office Equipment	17820
Others	9800

Table 6 : Segment wise Connected Load of SSMV Junwani, Bhilai Campus

Graphical representation of Connected Load

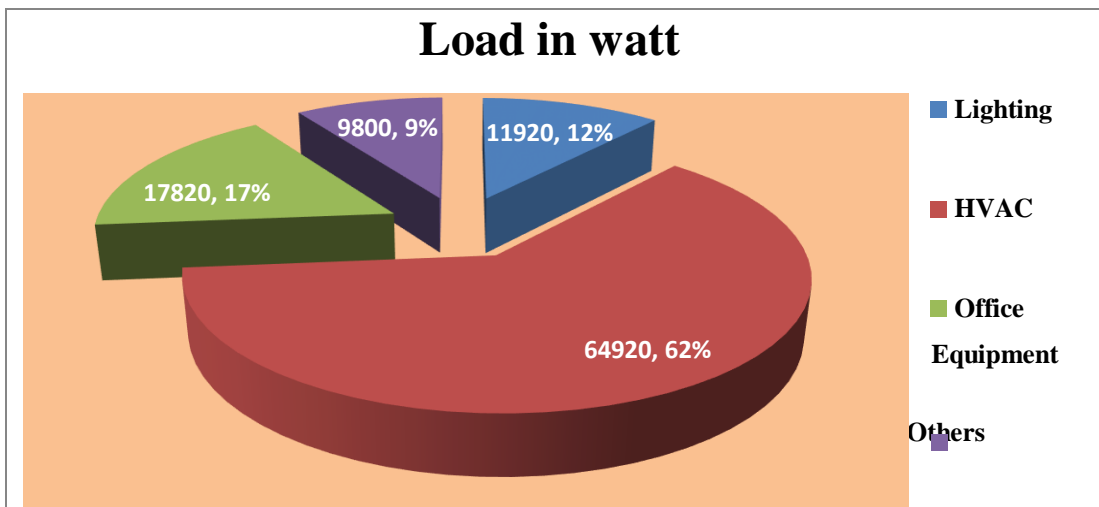


Figure 2 : Graphical representation of connected Load

As per requirement, we have calculated installed load of LED light fittings and Conventional light fittings.

Types of Light Fittings	Load in Watt
LED Light Fittings	5600
Conventional Light Fittings	6320

Table 7 : Connected Load of LED light fittings & Conventional fittings at SSMV Junwani, Bhilai Campus

6.2.2 Percentage of Lighting Power requirement met through LED lights

LED Lighting Load in Watt	5600
Total Lighting Load in watt	11920
Percentage of Lighting Power requirement met through LED lights	46.98 %

Table 8: Percentage of Lighting Power requirement met through LED lights

Thus, total Percentage of Lighting Power requirement met through LED lights is about 47 %.

Graphical representation of Percentage of Lighting Power requirement met through LED lights

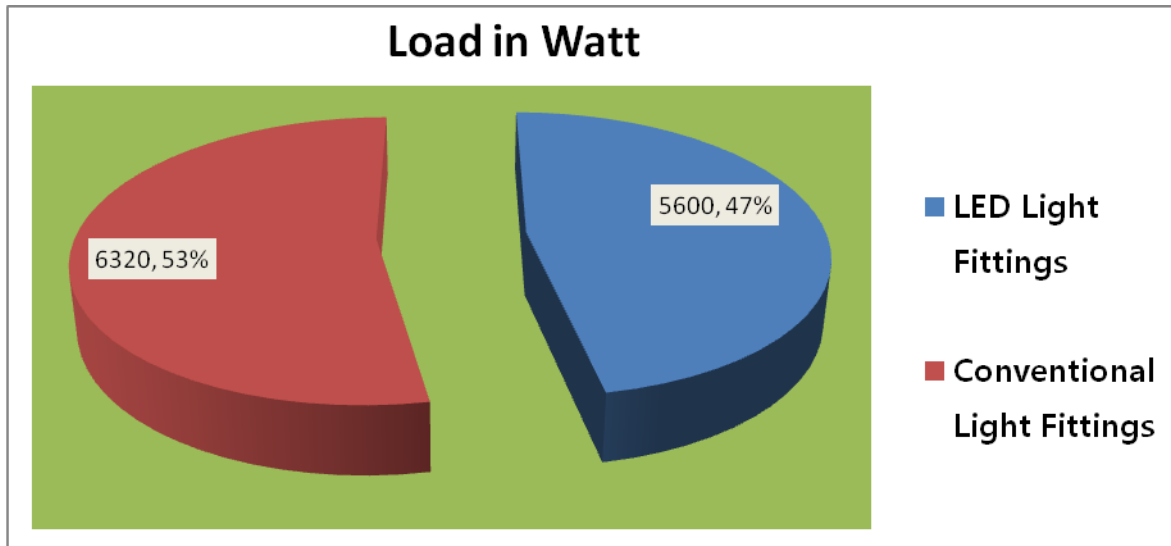


Figure 3 : Graphical representation of Percentage of Lighting Power requirement met through LED lights

b) Electricity from own DG set

6.2.3 Electricity from Diesel Generator Set

A 125 KVA capacity of DG set of KOEL Power Engineers are kept to provide emergency power during load shedding period. The unit generated by DG set is not recorded by college, however they maintain a log book to record diesel consumption and operational hours of DG set.



Diesel Consumption and Operational Hour details of DG set

Months	2018		2019	
	Operational minutes	Diesel Consumption in litre	Operational Hours	Diesel Consumption in Litre
January	435		370	100
February	10		110	
March	20		30	
April	130		170	
May	180	100	505	
June	225		205	50
July	165		60	
August	120		0	
September	110	50	410	50
October	0		120	50
November	50		60	
December	130		150	*50
Total	1575		2190	
Total Hours	26 Hours 15 Minutes	150	36 Hours 30 Minutes	300
Diesel consumption per hour	5.71		6.85	

Table No. 9 : Diesel consumption and Operational hours details of DG set

***Diesel filled in December 2019 is not consumed in that month.**

C) 6.2.4 Electricity Generation from Grid connected Solar Power Plant of 60 KWp capacity

Chhattisgarh State Power Distribution Company Ltd. has finalized power purchase agreement dated 15/05/2018 for purchase of 60 KWp solar power from Shri Shankaracharya Mahavidyalaya for a period of 25 years. The seller sell energy maximum up to 49%. The supply arrangement of Solar Power Plant is such that it will first meet in-house electricity consumption of college, then after it will supply surplus energy to grid, which will be recorded by Import/Export meter.



Solar Power Plant Generation Panel Room

Months	2018		2019	
	Solar Generation in KWH	Per Day Per KW Generation	Solar Generation in KWH	Per Day Per KW Generation
January	-	-	6237	3.5
February	-	-	7510	4.47
March	-	-	8953	4.81
April	-	-	8711	4.84
May	-	-	8110	4.36
June	7685	4.27	7484	4.16
July	5052	2.72	5613	3.02
August	3815.1	2.05	5561	2.99
September	7403	4.11	5350	2.97
October	7423.8	3.99	6630	3.56
November	6853	3.81	5906	3.28
December	5328	2.86	5529	2.97
Total	43559.9	3.39	81594	3.73
No. of Days	21	4	365	

Table 10: Solar Power Plant Generation

6.2.5 Alternative Energy Initiative: Percentage of Power requirement met by Renewable Energy Source

Power Requirement met by Solar	60 KWp
Total Power Requirement	60 KW
Percentage of Power requirement met by Renewable Energy Source	100 %

Table 11: Alternative Energy Initiative: Percentage of Power requirement met by Renewable Energy Source

LPG Consumption in Laboratories

Only 6 numbers of gas cylinders of 19 Kg capacity is consumed in last two years. It means 3 cylinders are used in the 2019

Total LPG Consumed in a year	$19 \times 3 = 57$ Kg
------------------------------	-----------------------

6.3 Waste Management

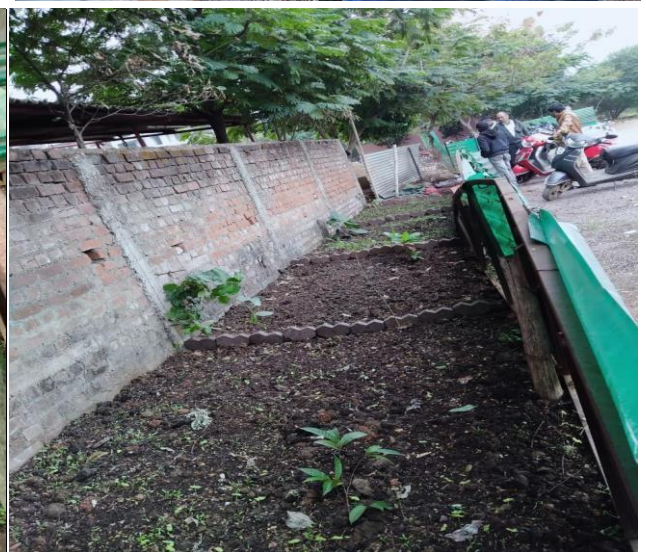
This indicator addresses waste production and disposal, plastic waste, paper waste, food waste, and recycling. Municipal solid waste has a number of adverse environmental impacts, most of which are well known and not in need of elaboration.

Shri Shankaracharya Mahavidyalaya Junwani practices solid waste management which includes segregation of waste, the most important step in waste management.

College encourages the process of eco-friendly waste disposal method.

6.3.1 Composting Pit

Maximum waste generated is recycled and reused. Various waste such as wet waste generated from canteen & Tiffin of students and teachers and dry waste i.e. papers, coconut peels, huge amount of garden waste which is mostly in the form of leaves are used for composting (in composting pit) to form manure and fertilizers and further used for organic farming in college campus. Waste is generated in canteen and also due to Tiffin of students and teachers



Non-biodegradable waste like plastics, metal, glass etc. Is collected in the dig and handover to Bhilai Municipal Corporation, Bhilai.

To reduce paper consumption, college is using both side of paper. No waste is polluting surface/ground water.



Solid waste can be divided into two categories: general waste and hazardous waste. General waste includes what is usually thrown away in homes and schools such as paper, plastics tins and glass bottles. Hazardous waste is waste that is likely to be a threat to one's health or the environment like cleaning chemicals and petrol. Small bucket and big buckets

are used for solid waste

Small bucket = 50 Nos.

Big Bucket = 12 Nos.

Total Production of Solid Waste (Bio degradable) : 25-30 Kg

Total Production of Solid Waste (Non Bio degradable) : 2-3 Kg A

machine is available in college for sanitary napkin waste.

Non Bio Waste – Plastic Bottles / Waste Paper etc.

Non- biodegradable waste, which cannot be decomposed by biological processes is called non-biodegradable waste. These are of two types - Recyclable: waste having economic values but destined for disposal can be recovered and reused along with their energy value. e.g. Plastic, paper, old cloth etc. Non-recyclable: waste which do not have economic value of recovery. e.g. Carbon paper, thermocol, tetra packs etc. Disposal of non-biodegradable waste is a major concern, not just plastic, a variety of waste being accumulated. There are a few ways to help non-biodegradable waste management. The impact of non-biodegradable waste on the environment and also focus on its safe disposal for sustainable environment.

6.3.2 Plastic Bottle Vertical Garden

College has a good idea for growing small leafy vegetables and herbs in unused plastic water bottles. This plastic bottle vertical garden is made of by stringing the bottles horizontally in a grid along a wall, which then filled up by substrate and herbs.



Unscientific landfills may contain harmful contaminants that leach into soil and water supplies, and produce greenhouse gases contributing to global climate change.

Disposal method a composting pit is highly essential for the treatment of bio-degradable waste generated from the canteen, office, vegetable garden and from the college campus cleaning

operations. Further, unused Papers are filled in a pit and one pipe is also attached in the pit for removal of gases in paper waste pit and compost is prepared.



6.4 E-Waste Management

Waste Electrical and Electronic Equipment (WEEE) or E-waste is one of the fastest growing waste streams in the world. In developed countries, it equals 1% of total solid waste on an average. In developing countries, it ranges from 0.01% to 1% of the total municipal solid waste generation. In countries like China and India, though annual generation per capita is less than 1 kg, it is growing at an exponential pace. Presently, a very small amount of E waste from offices and glass waste from labs is generated in SSMV Junwani, Bhilai Campus.

6.5 Green Campus Management

All plant and animal species - including humans - are linked together in a complex web of life; we depend upon biodiversity for our survival. Biodiversity is the key to healthy ecosystems and ultimately a healthy planet. It keeps the air and water clean, regulates our climate and provides us food, shelter, clothing, medicine and other useful products. Each part within this complex web diminishes a little when one part weakens or disappears.

The trees work hard to keep the air we breathe clean and healthy. They are like sponges. Their leaves take in much of the poisonous unwanted carbon dioxide in the air, and replace it with the oxygen we need for healthy living. This system of absorbing gases on which all plants rely for their food is called photosynthesis. In this process, the plants with the help of sunlight, water, minerals and the green material called Chlorophyll within the leaves change the carbon-dioxide into food for themselves. When doing this they release oxygen into the air which is vital for all life on earth. At night when there is no sunlight the plant no longer makes food, so it does not

release the same amount of oxygen. One is often told not to sleep with plants in one's room, as they will use up all the oxygen. However, at night although photosynthesis does take place the plants also rest, so that little oxygen is absorbed from the air and very little harm can be done to the sleeper.

The roots of trees dig deep into the earth and hold it together so that the rain and wind cannot wash or blow it away. This is very important as the earth has only a very thin layer (seldom more than one foot) of fertile soil covering it. If this is washed, blown or worn away leaving rock or sand on which no plants can grow then the earth would become a desert. The removal of this top-soil is called soil erosion. Scientists, all over the world are trying to find ways to prevent soil erosion. One of the most important ways is creating by planting more trees.

Trees send up water vapour into the atmosphere through their leaves. When this vapour meets the cool air above it turns into drops of water which then fall as rain. They give us beauty, colour and greenery. This is something which we often forget and fail to appreciate. They are the homes of many birds, animals and insects. Each of these is important in maintaining the balance of nature. Trees give us food, and juice to drink. Ropes, medicines, wood, paper, and so many other things we use in our daily life, or which are necessary for our health, are made from trees.

Shri Shankaracharya Mahavidyalaya, Junwani, Bhilai has established the **Pallavan Eco Club** of its own in the session 2013-14.

6.5.1 Annual Report of Pallavan Eco Club for the Session 2019-20

Pallavan Eco Club of SSMV Junwani, Bhilai Campus has been initiated & characterized with its objectives, viz.:-

1. To create awareness of biodiversity conservation and local environmental issues among college children.
2. To create a 'clean and green consciousness' among students through various innovative methods.
3. To involve Pallavan Eco Club students in open-orientation programmes in college and nearby vicinity areas.

4. To organize, encourage & motivate everyone in the public to help save the mother Earth planet by encouraging the plantation.
5. Reduce the use of plastic in the community.

Following Activities were organized by the Pallavan Eco Club:

- Plantation was done (Teaching and Non-teaching Staff) on 18th July 2019 at ssmv campus.
- Poster competition was held at ssmv, Bhilai. On the topic “World Ozone Day”
16th Sep2019.
- Pallavan Eco Club enhance fully given “Botanical names” to the tress, planted in the college campus.

Pallavan Eco Club prepares Green calendar of each session and celebrate all important days related to environment protection and sustainability. Green calendar for the session 2019-20 is mentioned below.

6.5.2 Green Calendar (2019-2020)

Dates	Event	Departments	Celebration
August 02	Hareli Celebration	Non- Teaching Staff	Sapling distribution and plantation
September 05	Environment Education day-Teacher’s Day	All Department	Cultural programme and Felicitation of teacher by Sapling
September 16	World Ozone Day	Science Department	Poster and Slogan Competition
October 04	World Animal Day	Science Department	Visit to Zoo and Garden to understand balance in nature
October 05	World Habitat Day	Science Department/Arts	Model and Poster Competition on Conservation of Water, Pollution Control and Sanitation Lecture on Career Counselling
October 14	International Day for Natural Disaster Reduction	Commerce/NSS	Lectures on Environment Awareness
October 24	International day of Climate Action	Arts/ Commerce	Rally
November 06	International Day for Preventing the	NCC/NSS	Lectures/Seminar/Skit, Street Play

	Exploitation of the Environment in War and Armed Conflict		
February 28	National Science Day	Science Department	Lectures/Poster and Model display, Planetarium show arrange for school college and nearby villagers
March 20	World Sparrow Day	Non- Teaching Staff	Different activities by Non-Teaching staff to protect Sparrows
March 21	World Forestry Day	All Departments	Pledge, rally and distribution of sapling, Lectures/Seminar
March 22	World Water Day	Non- Teaching Staff	
April 22	Earth Day	All Departments	Pledge, rally and distribution of saplings
April 26	No Horn Day	All Departments	Rally and Lectures
May 22	International Day for Biological Diversity	Science Department	Display of yearlong activities in Audi/Lab
June 05	World Environment Day(Pallavan Diwas)	Institution	Plantation and Field visit, Skit to save environment/ Street play

Table 12 : Green Calendar for the session 2019-20

6.5.3 Various Activities Performed by Pallavan Eco Club during the session 2019-20

a) Plantation by Teaching and Non-teaching Staff on 18th July 2019





b) Poster competition- on the topic “World Ozone Day” 16th Sep2019.



c) Pallavan Eco Club enhance fully given “Botanical names” to the trees, planted in our college campus.



6.5.4 Numbers of Trees planted by Pallavan Eco Club

Particulars of Flora	Numbers/ Area
Full grown Tree	76 Nos.
Semi Grown Tree	52 Nos.
Bushes included floriculture plants	162 Nos.

Table 13: Numbers of Trees planted by Pallavan Eco Club

6.6 Carbon Footprint

A carbon footprint is the amount of greenhouse gases—primarily carbon dioxide— released into the atmosphere by an individual, event, organization, service, or product, expressed as carbon dioxide equivalent. In addition to the water, waste, energy and biodiversity audits we can also determine what our carbon footprint is, based on the amount of carbon emissions created. The release of carbon dioxide gas into the Earth’s atmosphere through human activities is commonly known as carbon emissions.

An important aspect of doing an audit is to be able to measure our impact so that we can determine better ways to manage the impact. In addition to the water, waste, energy and biodiversity audits we can also determine what our carbon footprint is, based on the amount of carbon emissions created.

The following activity/utility is responsible for carbon emission:-

- Transportation
- Electricity purchased from Distribution companies.
- Diesel used in DG set

6.6.1 Carbon Emission by Transportation

Principal, Addl. Director, teaching & non-teaching staff and students comes to college either by two wheelers & four wheelers or public transport. The two major fuels used by the transport sector are petrol and diesel. These fuels are carbon intensive as they contain 80-85% of carbon by weight.

Type of Fuel	No. of Person	Mode of Conveyance	No. Of Vehicles	mileage	Average distance in KM	Fuel Consumed per Day in litre	Total working days	Total Fuel Consumption in litre	Emission factor	Total emission in KgCO ₂ eq.
Petrol	892	Two Wheeler	892	40	10	4	270	1080	2.67	2884
Petrol	14	Four Wheeler	14	17	10	1.7	270	459	2.67	1226
Diesel	185	Public Transport	4	4	10	2.5	270	675	2.67	1802
Total CO₂ emission in KgCo2 eq. per Year										5912

Table 14: Carbon Emission by Transportation

Thus, total emission by the transport is 5,912 KG CO₂ eq. Per year

6.6.2 Carbon Emission by Electricity

Parameter	Emission Factor	Unit in KWH	Total emission
Grid Electricity	0.82	37917	31092
Diesel Generator	0.59	400	236
Total Emission CO₂ in KG eq. per year			31,328

Table 15: Carbon Emission by Electricity

Thus, total emission by purchased electricity and DG set is 31,328 KG CO₂ eq. Per year.

The following installation /activity is responsible for reduction in carbon emission:-

- Ongrid Solar Power Plant of 60 KWp
- Composting

6.6.3 Reduction of Carbon Emission by Solar Power Plant

The solar power plant has generated 81,594 unit from renewable sources in the year 2019. If it is not generated from solar then it would be purchased from electricity distribution companies which will produced from burning of coals in thermal power plant, which causes carbon dioxide emission.

Parameter	Emission Factor	Unit in KWH	Total reduction of Carbon dioxide emission in KG
Solar Power Plant	0.82	81,594	66,907

Table 16: Reduction of Carbon Emission by Solar Power Plant

Thus, solar power plant has reduced 66,907 KG of CO₂eq. Per year.

6.6.4 Reduction of Carbon Emission by composting

For producing 1000 Kg of fertilizer 1700 KG of coal is required and which gives carbon dioxide emission of 2500 Kg. Compost has a natural process, thus it reduces carbon dioxide emission, which would be generated in fertilizer.

Particulars	Fertilizer Production in KG	Coal Required in KG	CO2 Emission in KG
Standard Values	1000	1700	2500
In College	25	42.5	62.5

Table 17: Reduction of Carbon Emission by composting

Thus, Carbon emission of 62.5 KG of CO₂eq. Per year is reduced by composting.

Total Carbon dioxide emission at SSMV Junwani, Bhilai Campus

Area	CO2 equivalent emission in KG per year
Electricity	31328
Transport	5912
LPG	1596
Total	38,836

Table 18 : Total Carbon dioxide emission at SSMV Junwani, Bhilai Campus

Total Reduction in Carbon dioxide emission at SSMV Junwani, Bhilai Campus

Area	Reduction in CO2 eq. emission in KG
Solar	66907
Compost	62.5
Total	66969.5

Table 19 : Total Reduction in Carbon dioxide emission at SSMV Junwani, Bhilai Campus

6.6.5 Carbon absorption and Oxygen Production by Tree Plantation

Planting is a great way to help sequester carbon emissions. Through photosynthesis trees absorb carbon dioxide to produce oxygen and wood.

Total Carbon absorption

Particulars of Flora	Numbers	Carbon absorption by a tree Per year	Total in Kg
Full grown Tree	76	6.8	516.8
Semi Grown Tree	52	3.4	176.8
Quarter grown plants	162	1.7	275.4
Total Carbon absorption by trees			969

Table 20: Total Carbon absorption by Tree Plantation

Thus, total carbon absorption by trees is 969 Kg of CO₂.

Total Oxygen Production

Particulars of Flora	Numbers	Oxygen Production by a tree Per year	Total in Kg
Full grown Tree	76	117.6	8937.6
Semi Grown Tree	52	58.8	3057.6
Quarter grown plants	162	29.4	4762.8
Total Oxygen Production by trees			16758

Table 21 : Total Oxygen Production by Tree Plantation

Total oxygen produced by trees is **16,758 Kg** in one year.

Oxygen Emission & Carbon dioxide absorption by trees planted by Pallavan Eco Club

Total Oxygen (O ₂) Production by trees	16758 KG
Total Carbon dioxide absorption by trees	969 KG

6.7 Bioenzyme Management

Shri Shankaracharya Mahavidyalaya Bhilai has decided to promote the use of Bio Enzymes amongst the stakeholders and other public at large with a concept of zero garbage "**My Waste My Maintenance**" as one of the best practices during the session 2019-2020. The study of enzymes is a part of curriculum for microbiology students at the Undergraduate level. Bio Enzymes (also referred to as Garbage Enzyme or Fruit Enzyme) is a multi-purpose, natural cleaner produced

from vegetable/fruit peels (usually citrus) or waste. It is an effective alternative to harsh chemicals such as bleach, phenyl, and other chemical solutions we typically use in households and other establishments to wash bathrooms, clean toilets, wipe floors, tiles and other surfaces. Chemically, the Bio Enzymes is a mixture of complex organic substances such as proteins, salts and other materials that are by-products of the bacteria/yeast (naturally occurring) that we will use to make the Bio Enzyme. These organic substances are capable of breaking down chemical and other organic waste resulting in removing stains, odour, getting rid of other harmful microbes, etc. They also greatly neutralize toxins and pollutants.

Department of Microbiology has taken this initiative in the month of July 2019 to produce Bio Enzymes from the vegetable/fruit peels (usually citrus) or waste. Initially the faculty started the process of producing Bio Enzymes from the waste available in the college campus. The students were encouraged to follow this practice at home and promote its use in the nearby area. The Department of Microbiology had started distributing the Bio enzymes to some of the teaching and non-teaching staff for the purpose of face wash, toilet wash, tiles cleaner and for maintenance of Home Gardens since October 2019.

The Microbiology and Zoology Department had jointly organised the Seven Day Workshop on ***“Trends in Solid Waste Management & Biology: Approaches to a Serene World”*** from (03-09) December 2019. Resource Person of the workshop Dr. Poornima Sargaonkar, Ex ISRO Scientist, horticulturist and YouTube blogger delivered a Keynote Address on Solid Waste Management and their various methodologies. Dr. Sargaonkar spoke about organic farming and commercial value of waste material. Biodegradable and non-biodegradable waste material are the two classes where biodegradable substances disintegrate and decompose and non-biodegradable substance recycle and reuse and how we use solid waste as a fertilizer and to decompose organic waste material. She gave a demonstration on how we make compost in pot and Bioenzyme technique in length which we can use in our daily life. One of the objectives of organising this Workshop was to promote the use of Bio Enzymes and compost among the Life science faculties and the students of the region as well.

Since October 2019 the college has started using Bio Enzymes for the toilets, floor cleaning and gardening purpose. The Garden of SSMV Junwani Bhilai has flourished since and which is evident with pictures.

After December 2019 NSS volunteers of the college actively participated in the promotion of Bio Enzymes in the adopted and surrounding villages where they motivated the villagers to produce Green Audit & Energy Audit of Shri Shankaracharya Mahavidyalaya, Junwani, Bhilai (C.G.)

and use it for Eco Sustainability. The structured feedback of the staff was taken who are using the Bioenzymes for several months. The result was encouraging.



7. Recommendations

- 1) Formation of Energy Club:** We recommend to formation of the Energy Club in Shri Shankaracharya Mahavidyalaya, Junwani for spreading awareness on the importance of energy conservation. Energy Club will participate in all energy conservation activities and organize program with the support of Chhattisgarh State Renewable Energy Development Agency, (CREDA) Raipur and Bureau of Energy Efficiency,(BEE) New Delhi.

Energy Club will celebrate “Energy Conservation Day” on 16Th December, each year. It would not only help in imparting knowledge on energy efficiency but also in its implementation in households and institutions.

Objective of Energy Club

The objective of the club is to create awareness among the students, staff and teachers and equip them for efficient management of all forms of energy, to promote energy efficiency and energy conservation. The club will keen to spread “Energy Conservation Messages” in the society by conducting awareness programmes to students and public.

- 2) Replacement of all conventional tube light will replaced by energy efficient LED tube light:** As SSMV management is keen to enhance energy efficiency of the college and replacing all conventional tube light with LED light fittings, It should be continue till all conventional tube light will replaced by energy efficient LED tube light. It will not only save in electricity consumption but also to save CO₂ emission directly and indirectly.
- 3) Waste Management:** Ensure that all cleaning products used by college staff have a minimal detrimental impact on the environment, i.e. they are biodegradable and non-toxic, even where this exceeds the Control of Substances Hazardous to Health (COSHH) regulations. Composting should be adopted on at least 250 sq. ft. of land
- 4) Water Management:** Gardens should be watered by using drip/sprinkler irrigation system to minimize water use. Leakage of the taps are repaired, It is recommended to install taps with reduced water flow. Since there is no signs of addressing people to turn off water taps

in the campus it is recommended to reward the personnel informing Leaky taps, Paste Labels where ever water is expected to be wasted.

- 5) **Enhancement of Energy Efficiency:** Cleaning of tube-lights/bulbs to be done periodically, to remove dust over It
- 6) **Green Campus Management:** A Continual plantation of trees is going on. It is recommended to increase the Green Cover further to more area in coming one year.
- 7) **Bioenzyme Management:** A continuous practice of the same will helps to conserve energy and natural resources in the campus other practices like landfill waste can be reused, college can increase the number of dustbins targeting the areas with no or less no. of dustbins, waste segregation at the micro level is a necessity; separate bins for recyclable and non-recyclable wastes have to be set up throughout the campus, awareness has to be created among the staff and student through various programmes and policies, emphasis to be laid on –reduce, reuse and recycle.

Considering the fact that the institution is a non-technical college, there is a significant environmental activity both by faculty and students. The environmental awareness initiatives are substantial. The installation of ongrid solar photo voltaic panels and rain water harvesting system are noteworthy. Besides, environmental awareness programmes initiated by the administration shows how the campus is going green. Few recommendations are added to curb the menace of waste management using eco-friendly and scientific techniques. This may lead to the prosperous future in context of Green Campus and thus sustainable environment and community development.

**60 KWp On-grid Solar PV Rooftop Power Plant
A Green Audit Initiative by SSMV Junwani, Bhilai**

Minutes of Metering

In accordance with Addl. Chief Engineer, (Comml-1) O/o ED (Comml), CSPDCL, Raipur letter no. No-02-02/ACE-I/Solar/1-226/433 Raipur dated 17.5.18 the synchronization of 60 KWp Solar PV Power Plant of M/S Sri Ganga Education Society (installed on the roof top of SSM Junwani, Bhilai) with CSPDCL's grid on HT side has Raipur, CSPDCL and CREDA on date 01.6.2018 at about 12.10 hrs.

The details of supply arrangement/ metering installed at site is as given below:-

The surplus solar energy after meeting in house consumption is exported to CSPDCL grid on 33 KV and is recorded by meter installed at M/S Sri Ganga Education Society, SSM Junwani, Bhilai premises which is a bidirectional meter having facility for recording import consumption. There are 2 Nos. of Solar string invertors out of which 2 inverters are of 60 KW each and 2 installed on the main solar panels.

Details of meter of Main Solar Panel:-

	Meter No. (For <u>Solar Inverter</u>)	Meter No. 2 (For
Make	<u>Secur</u>	
SI No.	<u>X1409930</u>	
Class	<u>0.5 S</u>	
Capacity	<u>-15A</u>	
Reading of meter	<u>(I) 6 (E) 204.9</u>	
MF	<u>150/5 MF-30</u>	

Details of Grid Meter:-

	Meter No.	DF :-
Make	<u>Secur</u>	<u>1</u>
SI No.	<u>418SEM083022</u>	MF :- <u>1 300</u>
Class	<u>0.5 S</u>	KWH (I) :- <u>KVA 970.5</u>
Capacity	<u>-15A -/110V</u>	KWH (E) :- <u>0.1</u>
Reading of meter		
MF	<u>300</u>	

For, S.R. CORPORATE CONSULTANT (P) L

CREDA
सहायक अभियंता
केन्द्र विला, कार्यालय, गुा

अ.स.स.
उप-अ.स.स.
क्र.डा-3

AE, CEI

E.E. (MT) Dn.-I

Authorized Signator
SI (SR Corporate)
SRCL

CG Government
ASSISTANT ENGINEER (E.S.) &
ASSISTANT ELECTRICAL ENGINEER
M/S. SRI GANGA EDUCATION SOCIETY
AE (MT) Dn.-I
CSPDCL
Consumer Representative

EE, City Dn. (W)
(E.S.) Dn. (W)
ID No. 900000
Executive Engineer
City Dn. (West) C.S.P.D.C.L. BHILAI

AE, City Dn.,
CSPDCL

Ruchi Dave
Emp ID-13370207
AE HT Maintenance
City Dn (W)

PRINCIPAL
Shri Shankaracharya Mahavidyalaya
Junwani, BHILAI (C.G.)

Inspection by CSPDCL Team for Metering of 60 KWp On-grid
Solar PV Rooftop Power Plant Installed in SSMV Junwani, Bhilai

