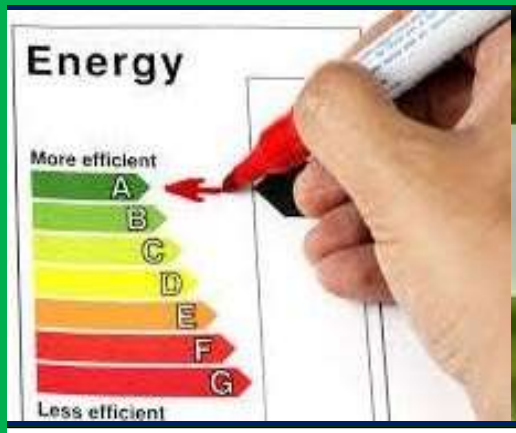
Energy Audit, Green Audit & Environment Audit of Ghanshyam Singh Arya Kanya Mahavidyalaya, Durg



Conducted & Prepared By :-

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... ...dedicated in energy conservation

1. INDEX

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3. ACKNOWLEDGEMENTS

We express our sincere thanks to Shri Digvijay Singh Gupta, President-Ghanshyam Singh Arya Kanya Mahavidyalaya, Durg for his kind support and giving us the assignment to contribute in their effort towards Green initiatives & efficient energy management in the college.

We are highly indebted to Smt. Abha Rani Gupta, Vice President for their guidance, intellectual advice and his kind support in completing the project.

Our boundless gratitude to Dr. Mridula Verma, Principal, Mrs. Neetu Singh- Vice Principal and Dr. Trupti Khanang & other teaching and non-teaching staff associated with this Energy Audit, Environment Audit & Green Audit study of Ghanshyam Singh Arya kanya Mahavidyalaya, Durg 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

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Nothing in this disclaimer notice excludes or limits any warranty implied by law for death, fraud, personal injury through negligence, or anything else which it would not be lawful for to exclude.

We trust the data provided by the Ghanshyam Singh Arya Kanya Mahavidyalaya, Durg , personnel is true to their best of knowledge.

5. CERTIFICATE

RAJ ENERGY SERVICES
dedicated in energy Conservation
62 & 81, Daya Nagar, Risali, Bhilai Nagar, 490006 (C.G.)
Mob.: 9826179597 Email:resbhilai@gmail.com

ENERGY AUDIT,ENVIRONMENTAL AUDIT & GREEN AUDIT CERTIFICATE

This is to certify that M/s. Raj Energy Services has conducted Energy Audit, Environmental Audit & Green Audit of Ghanshyam Singh Arya Kanya Mahavidyalaya, Durg and submitted report under their Policy for Green Campus of the Institute.

Name of the Educational Institute	Ghanshyam Singh Arya Kanya Mahavidyalaya Arya Nagar, Durg, Chhattisgarh, PIN 491001
Contact Details	0788-2216599, 9993684118, 9770477381 E- Mail: gsakm1978@yahoo.com Website: https://gsakm.com/home.php
Name of Principal	Dr. (Mrs.) Mridula Verma
Details of facilities Audited	Office, all departments, computer labs, classrooms, Seminar Hall, Library, Electrical Systems, Sanjivani Vatika and complete installations including Rain Water Harvesting System etc.
Date of Audit Conducted	12th,13th & 14th December 2023
Name of Certified Energy Auditor	Sanjay Kumar Mishra
Registration Number	EA- 8696

For, Raj Energy Services

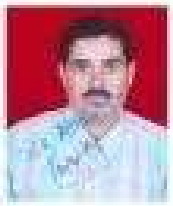
Date: December 16,2023

(Sanjay Kumar Mishra)

Certified Energy Auditor from Bureau of Energy Efficiency, Ministry of Power, Government of India, New Delhi
EA- 8696

6. AUDITOR'S CERTIFICATE

BUREAU OF ENERGY EFFICIENCY



Examination Registration No. : EA-8696 Serial Number: 5435

Certificate Registration No. : 5435

Certificate For Certified Energy Manager

This is to certify that Mr./Mrs./Ms. Sanjay Kumar Mishra Son/Daughter of Mr./Mrs. R. B. Mishra who has passed the National Examination for certification of energy manager held in the month of May 2008 is qualified as certified energy manager subject to the provisions of Bureau of Energy Efficiency (Certification Procedures for Energy Managers) Regulations, 2010.

This certificate shall be valid for five years with effect from the date of award of this certificate and shall be renewable subject to attending the prescribed refresher training course once in every five years.

His /Her name has been entered in the Register of certified energy manager at Serial Number 5435 being maintained by the Bureau of Energy Efficiency under the aforesaid regulations.

Mr./Mrs./Ms. Sanjay Kumar Mishra is deemed to have qualified for appointment or designation as energy manager under clause (/) of Section 14 of the Energy Conservation Act, 2001 (Act No.52 of 2001).

Given under the seal of the Bureau of Energy Efficiency, this 7th day of February, 2013

Digitally Signed: RAKESH KUMAR RAI
Sun Mar 01 10:31:41 IST 2020
Secretary, BEE New Delhi

Secretary
Bureau of Energy Efficiency
New Delhi

Dates of attending the refresher course	Secretary's Signature	Dates of attending the refresher course	Secretary's Signature
22.01.2019			

7 INTRODUCTION

Ghanshyam Singh Arya Kanya Mahavidyalaya established in the year 1978. The growth of institution has been remarkable. This college is started with an aim to provide higher education within the reach of every strata of society.

Shri Ghanshyam Singh Gupta, a freedom fighter was a front rank follower of Swami Dayanand Saraswati, was also president of Sarwadeshik Arya Pratinidhi Sabha, who strongly took the task of spreading the principles of Arya Samaj World Wide.Girl's education is one of the main principles of this samaj. He founded Dayanand shiksha Samiti and opened the first girl's college in Durg, so the institution has been named after him as Ghanshyam Singh Arya Kanya Mahavidyalaya which is an epitome for girls education and upliftment.

Environment of the college is very healthy and peaceful. Teachers of the institution are qualified, experienced and committed. This college carves the students who can change the world, and have awareness of their productive role in the society. The rich tradition

of holistic arya samaj ideals and commitment towards high moral values make Ghanshyam Singh Arya Kanya Mahavidyalay the prototype of value education.

Vision

1. To motivate students to achieve high academic standards.
2. To develop positive attitude interest and passion towards serving in different realms like education and all.
3. To make the teacher capable of following recent trends in the teaching learning process.

Mission

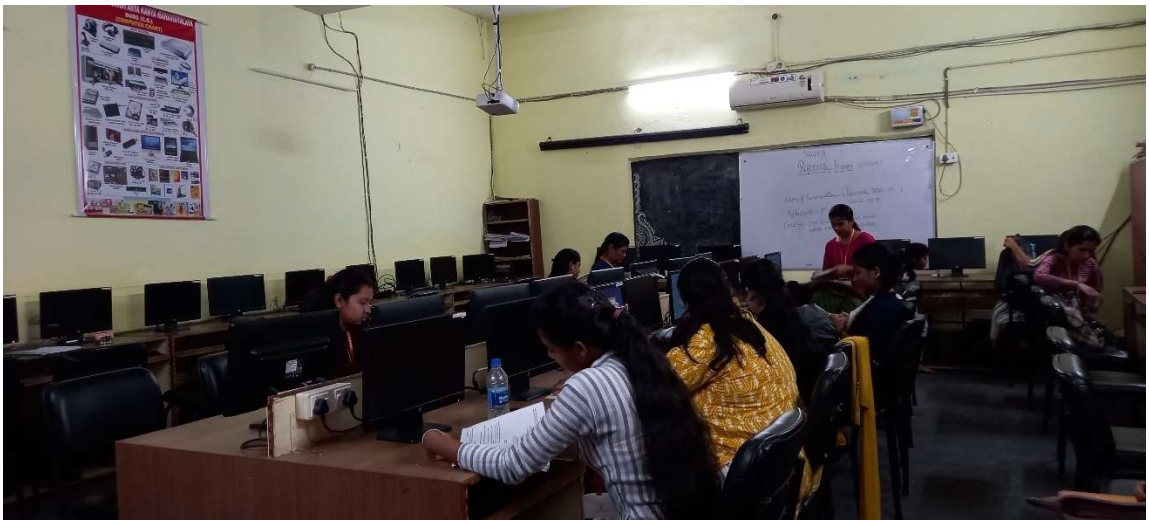
1. To develop intellectual excellence cultural and national integrity of students.
2. To give the students proper establishment social glorious and reputation.
3. To develop students self expressive and constructive skills for upliftment of future.
4. To encourage economically weaker students and rural girls students for higher education.
5. To provide equal opportunity of Education to all regardless their socio economic background.

Ghanshyam Singh Arya Kanya Mahavidyalaya, Durg, Chhattisgarh has keen concern in

research field. Institute is having separate Research Committee consists with faculty members from various departments of the institute. This committee works for smooth and efficient coordination of research activities in the institute for overall growth. The collage and faculty encourages and provoke the students to become a research scholar.

The senior faculty is prone to keep exchanging their deep knowledge and career guidance to the students and faculty in the form of their dissertation works, Ph.D. course work classes and precious career guidance as well. The faculty is able to render the best efforts to the college as research guide number of two as they are connected to research centers. Our faculty is also published many research papers, journals and others.

Under the heading of extension activities, NSS unit of college is there which maintains it's functioning by organizing different group activities like Rally, Survey, Community camp, Cultural activity, Yoga, NSS camps etc. These type of activities inspire them to become self-dependent for their earning resources. In the calculating way the three spheres of Research, Innovation and Extension activities make the institution inspiring and beneficial to the students.



The college has adequate infrastructure and physical facilities like classrooms, laboratories, common room, girls' hostel, well furnished seminar halls, playground and parking area. The classrooms and seminar halls have proper audio-visual provisions like LCD projectors, OHPs, speaker systems and are ICT enabled. To provide the students and faculty with an efficient technology-enabled academic environment, the college puts significant effort in keeping its ICT infrastructure up-to-date. The computer labs has 48 computers with proper hardware configuration and software. All the computers in the administrative offices, HoD cabin, Principal's cabin, Director's cabin, the laboratories and the library are networked into a campus-wide wifi LAN. The college treats the library as the gateway of knowledge and culture. The college library has 14204 books, journals and magazines. It provides access to several free open access journals, national digital resources and other electronic Internet resources.

The college gives a lot of importance to the sports and cultural activities for the all round development of students. The college students are stressed more than other communities, the college ensures arrangements to facilitate relaxation, rest, exercise and other extra-curricular engagements. The college has a gym and yoga hall along with other indoor and outdoor sports facilities. The students are encouraged for literary and other creative cultural activities.

For the fire safety of the buildings, fire extinguishers are installed at crucial places. CCTV cameras are in place to ensure the campus security. There is a borewell to maintain the greenery of the campus.

Tur college organizes for the conservation and preservation of "Vedic Culture" through Yajna and Havan. One of faculty member has attended International seminar and conferences. The college students have contributed regular services in "Bal Sampreshan Griha", "Vridha Ashram", "Bal Shramik Shala" and "Gramin Shiver" in Durg District for the upliftment of above institutions. The regular students have acquired Merit Positions in the Hemchand Yadav University, Durg regularly. In the field of sports our students have competed in state levels, national level sports competition.

The college has received award for environment ppt presentation from Vice Chancellor of Hemchand Yadav University.

The college has been organising different workshops, seminar, extension lecture, guest lecture etc. More than 15 members have attended National Seminars/Conferences and have presented papers.

- Auditing for Energy Management of the Ghanshyam Singh Arya Kanya Mahavidyalaya, Durg for Environmental Consciousness and Sustainability.

- Alternate Energy initiatives such as: Percentage of annual power requirement of the Institution met by the renewable energy sources.

- Percentage of annual lighting power requirements met through LED bulbs (Current year data)

8. ENERGY MANAGEMENT

Energy Management is the strategy of adjusting and optimizing energy, using systems and procedures so as to reduce energy requirements per unit of outputwhile holding constant or reducing total costs of producing the output from thesesystems"

Principle of Energy Management

- Procure energy at lowest possible price
- Manage energy use at highest energy efficiency
- Reusing and recycling energy
- Select low investment technology to meet present requirement and environmentcondition
- Make use of wastes generated within the plant as sources of energy and reducingthe component of purchased fuels and bills

8.1 Energy Scenario

Electrical energy is supplied by Chhattisgarh State Power Distribution CompanyLimited. Two energy meters are catering the electrical demand of Ghanshyam Singh Ayra Kanya Mahavidyalaya Durg.

8.2 Electricity Bill Analysis

We have analyzed the electricity bills of all the connections of college premisesand Azad hostel.

Sr. No.	Service Number	Contract Demand in KW	Tariff Category
1	1004439612	15	LV2ND2OT21
2	1000670322	15	LV2ND2OT21
Total Contract Demand		**30 KW**	

Table 3 : Details of both electrical service connections

Analysis of billings of meters of college premises

1) B.P. No.: 1000670322

Months	Maximum Demand in KW	Power Factor	Unit Consumption in KWH	Bill Amount in Rs.	Energy Cost in Rs./Unit
Apr-22	0.8	0.9	0	6688	
May-22	0.8	0.9	612	5420	8.85
Jun-22	14.2	0.88	1923	22460	11.68
Jul-22	10.5	0.99	1125	11240	9.99
Aug-22	13.6	0.98	747	8240	11.03
Sep-22	18.2	0.98	1286	17160	13.34

Oct-22	12.1	0.98	988	10910	11.04
Nov-22	4.2	0.95	488	5920	12.13
Dec-22	12.3	0.96	605	7570	12.51
Jan-23	3.2	0.96	374	4960	13.26
Feb-23	8.3	0.99	422	5190	12.29
Mar-23	6.5	0.99	410	5070	12.36
	8.725	0.955	8980	110828	12.34

Table 4 : Analysis of billings of BP No. 1000670322 for the year 2022-23

The annual average maximum demand of B.P. no. 1000670322 is 8.72 KW and the maximum demand of 18.2 KW was recorded in the month of September 2022.

2) BP No. : 1004439612

Months	Maximum Demand in KW	Power Factor	Unit Consumption in KWH	Bill Amount in Rs.	Energy Cost in Rs. /Unit
Apr-22	4	0.99	1104	11030	9.99
May-22	4.3	0.98	1096	9780	8.92
Jun-22	4.1	0.99	1001	10100	10.09
Jul-22	4	0.99	845	8650	10.24
Aug-22	3.5	0.99	82	2020	24.63
Sep-22	3.2	0.99	89	2100	23.59
Oct-22	3.2	0.99	153	2770	18.10
Nov-22	3.2	0.99	1145	12420	10.85
Dec-22	3.2	0.99	336	4630	13.78
Jan-23	3.8	0.99	363	4770	13.14
Feb-23	2.9	0.98	371	4740	12.78
Mar-23	3	0.99	346	4490	12.98
	3.53	0.99	6931	77500	11.18

Table 5 : Analysis of billings of BP No. 1004439612 for the year 2022-23

The annual average maximum demand of B.P. no. 1004439612 is 3.53 KW and the maximum demand of 4.3 KW was recorded in the month of May 2022.

Total Electricity Consumption of College

Months	Unit Consumption in KWH		Total unit consumption in KWH
	BP No. : 1000670322	BP No. : 1004439612	
Apr-22	0	1104	1104
May-22	612	1096	1708
Jun-22	1923	1001	2924
Jul-22	1125	845	1970
Aug-22	747	82	829
Sep-22	1286	89	1375

Oct-22	988	153	1141
Nov-22	488	1145	1633
Dec-22	605	336	941
Jan-23	374	363	737
Feb-23	422	371	793
Mar-23	410	346	756
Total annual electricity consumption			15,911

Graphical Representation of total electricity consumption of college for the year 2022-23

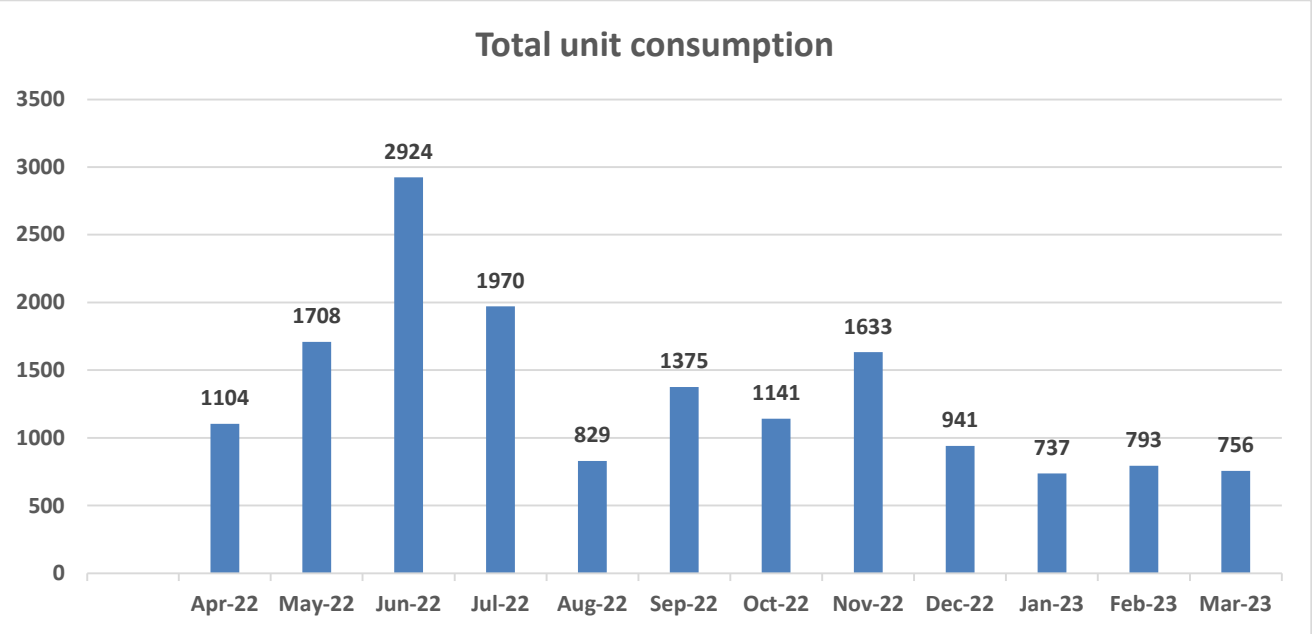


Figure 1 : Graphical Representation of total electricity consumption of college for the year 2022-23

The maximum electricity consumption was in the electricity bill of June, 2022.

8.3 Connected Load of College premises

Segment	Electrical Equipment	Average Load (Watts)	Quantity	Total load in Watt
Lighting	LED Tube light	22	63	1386
	LED Bulb	15	16	240
	LED Downlight	15	36	540
	LED Seminar Hall	100	3	300
	LED Street Light	70	4	280
		150	2	300
		250	2	500
	Conventional Tube Light	40	42	1680
	Total Lighting Load			5226
HVAC	Fan	70	96	6720
	Air Cooler	250	6	1500

	Exhaust Fan	150	5	750
	Air Conditioner 1.5 T	5	1600	8000
	Air Conditioner 2 T	8	2100	16800
	Total Heating, Ventilation and Air Conditioning Load			33770
Office Equipment	Computer	100	17	1700
	Printer	500	5	2500
	Photo Copy Machine	600	3	1800
	Total Office Equipment Load			6000
Water Supply	Mono block pump	1125	1	1125
	Total Water Supply Load			1125
Others	Water Cooler	650	2	1300
	Computer for lab	100	44	4400
	Projector	150	3	450
	Refrigerator	300	3	900
	Others			5000
	Total Other Connected Load			12050
Total Connected Load in Watt				58171

Table 6 : Connected load of college

8.4 Segment wise connected load and their percentages

Segment	Total Connected load in Kilo Watt
Lighting	5.22
HVAC	33.77
Office Equipment	6
Water Supply	1.13
Others	12.05

Graphical Representation of Connected Load

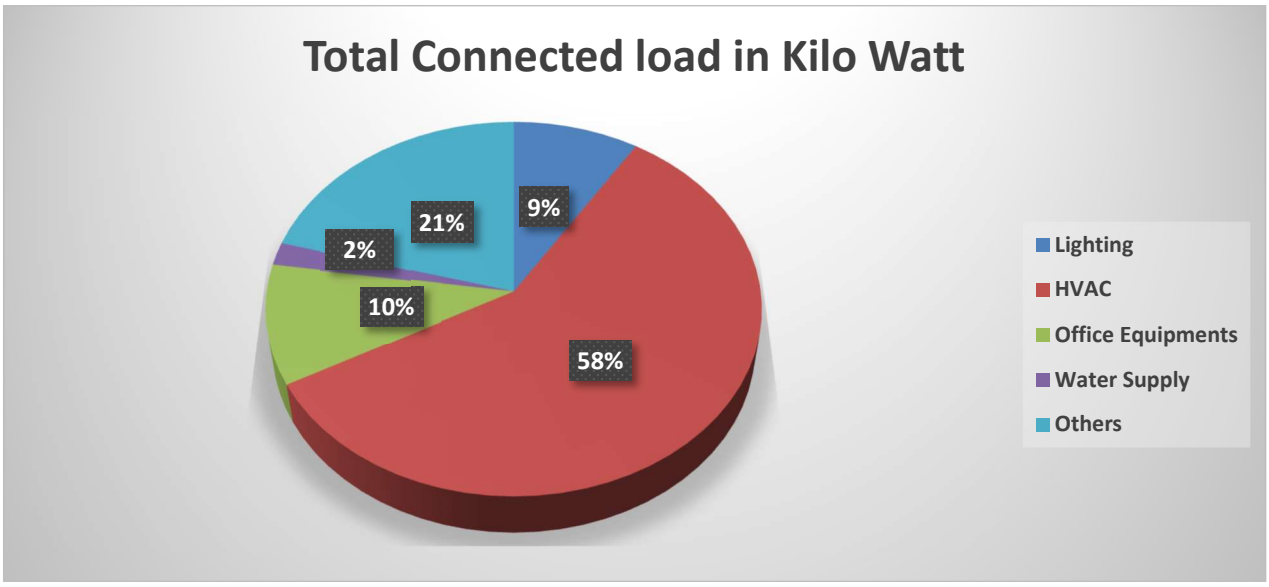


Figure 2 : Total connected load

8.5 Percentage of annual power requirement of the Institutionmet by the renewable energy sources.

The total contract demand required for college premises is 30 KW. At present, renewable energy source is not utilized in the college, however, the management is planning to install a grid connected solar power plant of 10 KW capacity.

8.5 Percentage of annual lighting power requirements met through LED bulbs.

Type of Lights	Load in watts
Load of Energy Efficient LED Light	3546
Load of Conventional Light	1680

Table 7 : Percentage of annual lighting power requirements met through LED bulbs

Graphical Representation of Percentage of annual lighting power requirementsmet through LED bulbs

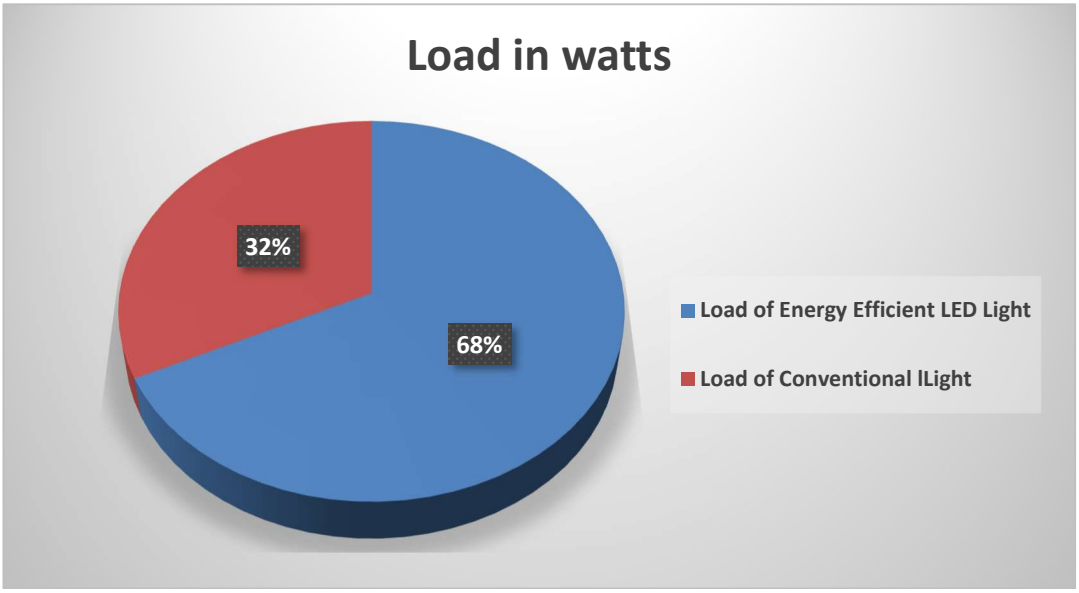


Figure 3 : Graphical Representation of Percentage of annual lighting power requirements met through LED bulbs

Thus, LED lighting covers 68% of total lighting power requirement.

Water Management

- Auditing for Water Management of the institute for Environmental Consciousness and Sustainability

- Rain water harvesting structures and utilization in thecampus

9. WATER MANAGEMENT

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

Ghanshyam Singh Arya Kanya Mahavidyalaya, Durg gets water from a bore well situated in the campus. A water pump having rating of 1.5 HP is operated to supply water in water storage tanks.. College has presently 4 nos. overhead water storage tanks. The total water storage capacity is 3000 liter.

Sl. No.	Water Tank Capacity	Numbers	Total Capacity in litre
1	1000	2	2,000
2	500	2	1,000
Total Consumption of water in Litre			3000

Table 8: Overhead water storage tank capacity in college

9.1 Water Consumption

Water Audit at Ghanshyam Singh Arya Kanya Mahavidyalaya, Durg					
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 (litres)**	**Number of people in the College using water**	**Water Consumption per day**
Wash hands and face	1.5 litres	Once	1.5	160	240
Bath	60-120	Once	75	2	150
Toilet / Urinal flush	6 To 21	Once	6	200	1200
Drinking	0.3	Three	0.9	200	180
Washing dishes (hand)	Basine	Once	1	100	100
Overflow of water & Leakage				-	80
Gardening		once	750	1	750
Canteen	1		1	300	300
Total Consumption of water in liter (A)					3000

Table 9 : Total water consumption in college

9.2 Rain Water Harvesting System

Rainwater harvesting is a technology used to collect, convey and store rain water forlater 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 whereits 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, highquality water reduces dependence on well and other sources and in many contextsare cost effective.

9.3 Rain Water Harvesting System at Ghanshyam Singh Arya Kanya Mahavidyalaya

The college has a rain water harvesting system near main gate of the college.

The size of rain water harvesting pit is 4′ x4′ x6 ‘ i.e. 96 sq. ft.

Rain water collection area	25 ft. x 100 ft.	2500 sq. ft
Size of RWH	96 sq. ft.	9 Sq. meter

Potential of Rain water Collection

Floor Details	Area in Sq. meter
Ground Floor	1615
First Floor	618
Total	2233

The roof area of 2,233 sq. meter is untapped for rain water collection.

9.4 Amount of water received through rain

Open roof area (A)	2233 Sq. Meter
Average rain fall per square meter in Durg (B)	1200 mm or 1.20 Meter
Amount of water received through rain(C = A x B)	2680 Cu. Meter
Run off Coefficient factor through rain (D)	0.80
Total water received (E =C x D)	2144 Cu. Meter

Table 10: Amount of water received through rain

9.5 Quantities of water taps

Particulars	Quantity	Water Taps/ flush
Wash Basin	9	9
Bathrooms	3	6
Toilet	8	16
Urinals	7	7
Water Cooler	2	4
Total No. of taps		42

Table 11: quantities of water taps

9.6 Recommendations for Water Management

a) Water Harvesting/Conservation Awareness Drive

To create awareness of water conservation and water harvesting among students, several competitions like Slogan competition, Poster competition, Essay competition should be organized on water conservation day.

b) Potted plants should be placed below the outlets of Air Conditioners so that the water discharge from these outlets canbe utilized properly.

C) It is recommended to utilized maximum roof area for rain water harvesting. The roof area of Educational block and main block can be planned for next rain water harvesting project.

Waste Management

- **Auditing for Waste Management of the institute for Environmental Consciousness and Sustainability.**
- **Waste Management steps including: • Solid waste management • Liquid waste management • E-waste management**

10. 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 needof elaboration. To reduce waste at institute, students and staff are educated onproper waste management practices through lectures, advertisement on noticeboards, displaying slogan boards in the campus.

Waste is collected on a daily basis from various sources and is separated as **dry and wet waste**. Colour coded dustbins are used for different types of wastes.Green for wet and blue for solid waste.

Daily garbage is collected by housekeeping personnel and handed over to authorized personnel of Municipal Corporation, Durg for further processing.

10.1 Solid Waste management

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 wastethat 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 Plastic bucket = 15 Nos. Big
Plastic Bucket = 08 Nos.
Total daily Production of Solid Waste (Bio degradable) : 2-3 Kg

Total Production of Solid Waste (Non Bio degradable) : Less than half Kg.

The college also have a Wending Machine installed in wash rooms of students.

10.1.1 Non Bio degradable Waste – Plastic Bottles / Waste Paper etc.

- Non- biodegradable are those waste, which cannot be decomposed bybiological processes . 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.

Waste material like plastic, papers etc. are collected and sold out to scrap vendor from time to time.

- College has also planned for compost pit to produce compost manure from the canteen solid waste and waste from other sources. Manure will be used for the purpose of botanical garden, Swami Vivekanand Garden, herbal garden as wellor for planted tree.

10.2 Liquid waste management:

There is no chemistry lab in the college, hence no hazardous chemicals are produced.

10.3 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 solidwaste 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.

The E-waste collected is stored in store room and planned to disposed by selling it to vendor.The total e-waste kept in college is about 15 Kg.

- **Green Campus Management and Carbon Footprint of the institute for Environmental Consciousness and Sustainability.**
- **Green Practices**
- **Students, staff using a) Bicycles b) Public Transport c) Pedestrian friendly roads**
- **Plastic-free campus**
- **Paperless office**
- **Green landscaping with trees and plants**

11. 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 isthe 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 dioxidein the air, and replace it with the oxygen we need for healthy living. This systemof 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 greenmaterial called Chlorophyll within the leaves change the carbon-dioxide into food for themselves. When doing this they release oxygen into the air which isvital 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 theoxygen. However, at night although photosynthesis does take place the plantsalso rest, so that little oxygen is absorbed from the air and very little harm canbe done to the ones sleeping in the room

The roots of trees dig deep into the earth and hold it together so that the rainand wind cannot wash or blow it away. This is very important as the earth hasonly a very thin layer (seldom more than one foot) of fertile soil covering it. If thisis 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 preventsoil erosion. One of the most important ways is creating by planting more trees.

Trees send up water vapour into the atmosphere through their leaves. Whenthis vapour meets the cool air above it turns into drops of water which then fallas rain. They give us beauty, colour and

greenery. This is something which weoften forget and fail to appreciate. They are the homes of many birds, animalsand insects. Each of these is important in maintaining the balance of nature.

11.1 Green Audit

Green Audit defined as documented, verification process of specified environmental activities, events, conditions, management system. Green Audit can create awareness in college staff as well as students which are our responsibility too, to save our environment and also can find the ways to improve environmental issues which are increasing day by day. Environmental problems such as recycling of waste, water conservation and recycling, pollution control, plantation, biodiversity conservation etc. can solve through Green Auditing. Good growth come from good education as well as good mental and physical health if we protect our environment, we can also protectour health.

Green Audit means of assessing environmental performance. It is a systematic documented periodic, and objective review by regulated entities of facility operations and practices related to meeting environmental requirement. It is otherwise the systematic examination of the interactions between any operation and its surroundings. This includes all emissions to air, land and water, legal constraints, the effects on the neighbouring community, landscape andecology, the public's perception of the operating company in the local area. Green audit does not stop all compliance with legislation. Nor is it a 'green washing' public relations exercise. Rather it is a total strategic approach to the organisation's activities.

Why Green Audit

The excessive environmental degradation is creating the "Environmental poverty". Thus, academic leaders should initiate the knowledge and benefits of resources so that their institutions respond to environmental issues and challenges. We believe that there is an urgent need to address these problems and reverse the trends of environment degradation.

OBJECTIVES -

- To assess environmental performance
- To promote environmental awareness
- To improve health

- To conserve resources
- To reduce waste
- To improve environmental standards
- To sustainable use of natural resources
- To develop responsibility about environment
- To enhance college profile

To keep the greeneries in the campus, the college regularly maintain the gardens. Moreover, every year the college try to plant new trees. Seasonal flower garden and Sanjivani Vatika are also a unique feature of this college. There are so many plants are present in college, which are categorized below-

Particulars of Flora	**Numbers**
Full grown Tree	15
Semi Grown Tree	22
Quarter grown plants	290

Table 12 : Type and quantity of flora

11.2 Recommendations

1) There is no Green Campus policy of college. We recommend a draft Green Campus Policy for Ghanshyam Singh Arya Kanya Mahavidyalaya, Durg

Draft Green Campus Policy of College

Ghanshyam Singh Arya Kanya Mahavidyalaya, Durg is committed to develop its campuses as places where education is combined with environmental friendly practices to promote Sustainable Development by o restricted entry of automobiles, promoting the use of Bicycles and provision of Pedestrian Friendly pathways , ban on use of disposable Plastics in line with the State Government Guidelines. creating awareness with stakeholders on the need for maintaining greenery in the campus for sustainable ambience, encouraging all stakeholders to support and participate in ensuring green cover in the campus. preserving age old trees and protect them to have prolonged life. enhancement of green cover by landscaping with trees andplants. conduct of green audit at regular intervals and implement the suggestions towards creating green campus .The faculty, staff and studentsare encouraged to contribute collectively to develop an eco-friendly sustainable campus and disseminate the concept of eco friendly culture to the nearby community and wherever possible.

Ghanshyam Singh Arya Kanya Mahavidyalaya, Durg envisions a clean and green university campus where ecological friendly practices and education combine to encourage sustainable and eco- friendly systems in the campus and beyond the campus. The green campus offers the organization a prospect to take the lead in redefining its green culture through promotingenvironmental ethics among students and staff The Institute also promotes clean and green campus through adopting, practicing and promotingenvironmentally friendly practices among students and staff to generate Eco consciousness among them and in the world around them.

Objectives of the policy : To compose students by understanding the importance of environment and its problem areas Important function of the policy .

- To train students to create responsiveness amongst public.
- To encourage students to keep environment safe and clean.
- To encourage students to adopt environment friendly practices whichinclude paper bags, save .
- To help the students to minimize the use of polluting product.

- **Scope 1 : Direct Green House Gases Emission**
- **Scope 2 : Indirect Green House Gas Emission from Purchased Electricity**
- **Scope 3 : Other Indirect Green House Gas Emission**

12. CARBON FOOTPRINT

India's National Determined Contribution

India's Nationally Determined Contributions (NDCs) commit to reduce its emission intensity per unit GDP by 33 to 35% below 2005 by 2030 under the Paris Agreement. This has resulted in the need for various sectors to come up and report their carbon emissions so that appropriate measures can be adopted. Reporting the emissions will enable them to set practical targets for carbon reduction in upcoming years. An educational institution plays an influential role in both local and national policymaking, both by informing society through research and educating graduates. It sets ground for imparting responsible perspectives to the young minds who act as successful incubators for innovation, from which many sustainability initiatives originate.

12.1 Green Credit Programme

India's environment ministry has proposed a Green Credit Programme under which individuals, organisations and industries can earn and sell credits for certain environment-friendly activities, which can then be traded.

Objectives of the Green Credit Programme

The main objectives of the Green Credit Programme are as follows: -

a. Create a market-based mechanism for providing incentives in the form of Green Credits to individuals, Farmer Producer Organizations, cooperatives, forestry enterprises, sustainable agriculture enterprises, Urban and Rural Local Bodies, private sectors, industries and organizations for environment positive actions;

b. Create mass movement around environment positive actions and realize the vision of "Mission LiFE" through pro-planet-people and entities. Sectors identified for the Programme with respective objectives are as follows:

i. Tree Plantation-based Green Credit:

To promote activities for increasing the green cover across the country through tree

plantation and related activities.

ii. Water-based Green Credit:

To promote water conservation, water harvesting and water use efficiency/savings, including treatment and reuse of wastewater.

iii. Sustainable Agriculture based Green Credit:

To promote natural and regenerative agricultural practices and land restoration to improve productivity, soil health and nutritional value of food produced.

iv. Waste Management based Green Credit:

To promote sustainable and improved practices for waste management, including collection, segregation and treatment.

v. Air Pollution Reduction based Green Credit:

To promote measures for reducing air pollution and other pollution abatement activities.

vi. Mangrove Conservation and Restoration based Green Credit:

To promote measures for conservation and restoration of mangroves.

vii. Eco mark based Green Credit:

To encourage manufacturers to obtain Eco mark label for their goods and services.

viii. Sustainable building and infrastructure based Green Credit:

To encourage the construction of buildings and other infrastructure using sustainable technologies and materials.

12.2 Scopes of Carbon Footprint Project

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.

Scope 1, 2 and 3 is a way of categorizing the different kinds of carbon emissions a company creates in its own operations, and in its wider value chain.

a) Physical boundary

- *Location of the Building* : Ghanshyam Singh Arya Kanya Mahavidyalaya, Arya Nagar, Durg PIN – 491001
- *Description of areas excluded from GHG accounting:* Girls Hostel.

b) Operational boundary

- *Scope 1 Direct GHG emissions from:*

- Combustion of fuels in stationary sources – LPG consumption in canteen

- *Scope 2 Indirect emissions from:*

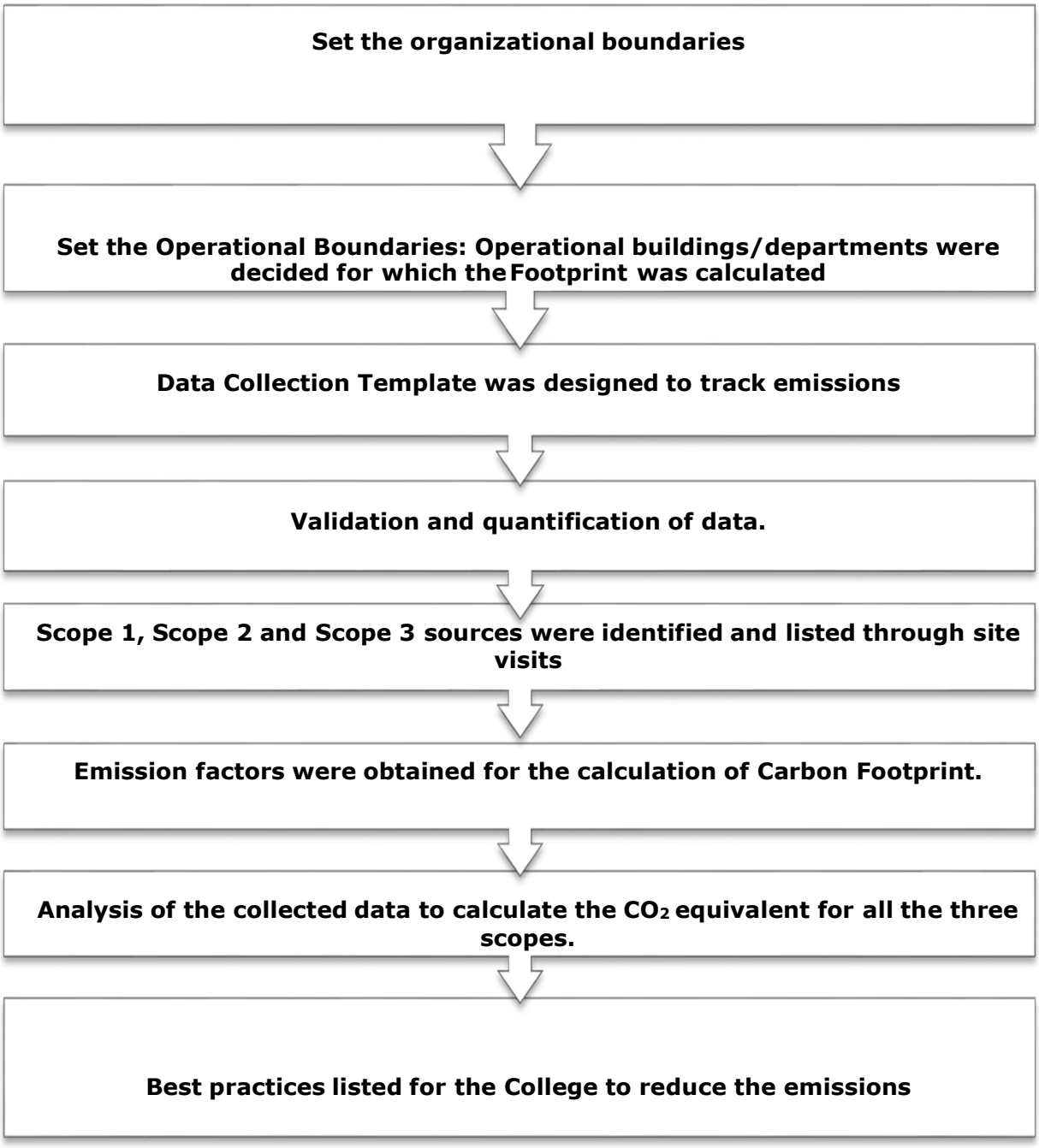
  - Purchased electricity

- *Scope 3 Other Indirect GHG emissions from:*

  - GHG emissions due to daily commuting of Teaching Staff, Non-Teaching Staff and Students to and from college

  - GHG emissions due to paper consumption

12.3 Methodology for GHG Quantification



Flowchart showing adopted methodology for estimation of Carbon Footprint

Both qualitative and quantitative data was collected for the project on the basis of data collected, Emission factors were obtained for the calculation of Carbon Footprint. Scope 1, Scope 2 and Scope 3 sources were identified and listed through site visits Validation and quantification of data. Data Collection Template was designed to track emissions Set the Operational Boundaries: Operational buildings/departments were decided for which the Footprint was calculated

12.4 Data Collection

Scope 1 Direct GHG Emissions

Direct GHG emissions occur from sources that are owned or controlled by the organization, for example, emissions from combustion by LPG cylinders in canteen.

Scope 2 Electricity Indirect GHG Emissions

Scope 2 accounts for the GHG emissions from the generation of purchased electricity consumed by the organization.

Scope 3 Other Indirect GHG Emissions

It includes emissions from outsourced activities i.e. from the activities of members of the organization but occurred at sources owned/controlled by another organization. (E.g. commuting activities, paper consumption etc.)

Sr. No.	GHG accounting activity	Activity subset	Data collection sources	Units
1	**Purchased Electricity**	Units of electricity used during one year	Monthly Electricity Bills	KWh per year
2	**Paper Consumption**	Amount of paper (fresh & recycled) used	Data Shared by College Administration	Kg of Paper Consumption per year.
3	**Students, Management, College vehicles, Teaching, Non-teaching & Supporting staff Commuting**	Distance travelled; Mode of Transport used	Online Survey through google form and log book of college vehicles	Fuel consumption in liters per year

Table 13:- GHG accounting activity in college

Use of Google Form

Data of Students, Teaching, Non-teaching & Supporting staff Commuting, an Online Survey through google form. Total about 350 responses received from students through google form.

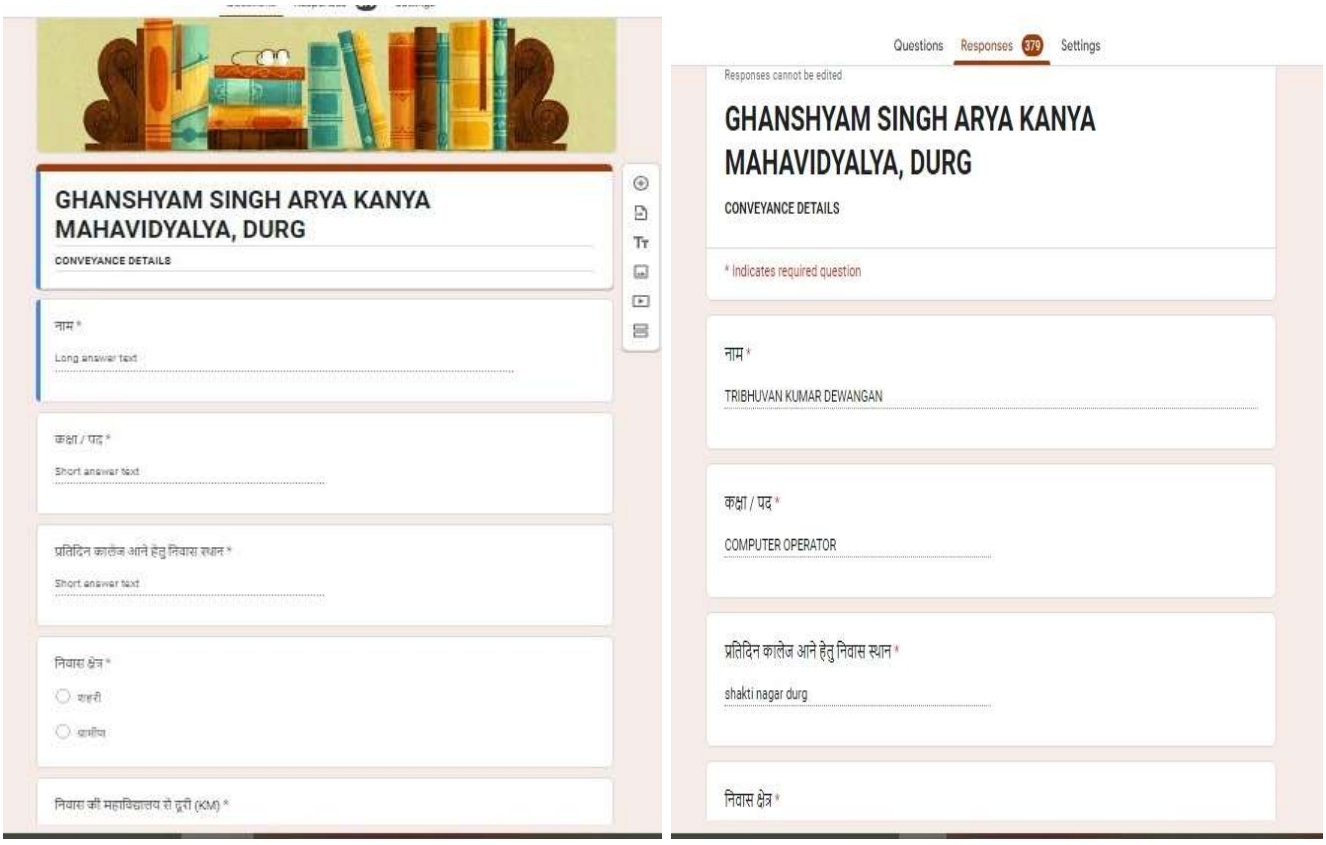


Figure 4 : Google Survey form

Online survey for conveyance among students, supporting staff, Non-teaching staff and teaching staff through google form.

12.5 GHG Emission

12.5.1 Scope-1

LPG cylinders are used in college premises. About 114 KG of LPG is consumed in the college.

Parameter	Emission Factor (A)	Total LPG consumed in KG (B)	Total emission (C= A x B)
LPG 19 Kg Cylinder- 6 Nos	0.2983	114	34
Total CO_2 Emission by LPG cylinders			**34**

Table 14 : Carbon Emission by LPG cylinders

Scope 2

12.5.2 Purchase Electricity From CSPDCL: Carbon Emission by Electricity

Electricity is purchased from CSPDCL. As per electricity bills of one-year, total electricity consumption for the year 2022-23 is 15,911 unit.

Parameter	Emission Factor	Unit in KWH	Total emission in KG CO_2 equivalent Per Year
Grid Electricity	0.82	15911	13,047

Table 15: Carbon Emission by Electricity

Thus, total emission by purchased electricity is 13,047 KG CO_2 eq. Per year.

Scope 3

12.5.3 a) Paper Consumption: Paper consumption in printing.

Parameter	Emission Factor	Annual Consumption in Kg	Total emission in KG CO_2 equivalent Per Year
Paper Consumption	3.4	210	714

Table 16 :- Paper consumption

b) Students, Management, Teaching, Non-teaching & Supporting staff Commuting : Carbon Emission by commutation

It was also noticed that a good number of the students come by walk.

12.5.4 Carbon Emission by Transportation

The two major fuels used in commuting college are petrol and diesel. These fuels contain 80-85% of carbon by weight.

Particulars	Mode of conveyance	Average Numbers	A Number of vehicles used	B Milage in KM/ liter	C Mean distance in KM (To & Fro)	D= C/B Fuel Consumed per Day per Vehicle in liter	E Total working days	F=E x D Fuel Consumption Per Vehicle in a year	G Emission factor	H=G x F x A Total emission by college students/faculty
College Vehicles	Scooter	1	1	40	6375	159.375		159.4	2.65	422
	Car	1	1	20	2865	143.25		143.25	2.65	380
Students	On foot	82								
	Bicycle	14								
	Two-Wheeler	116	90	40	18	0.45	210	94.5	2.65	22538
	Auto	34	20	25	14	0.56	210	117.6	2.65	6233
	Car	3	3	20	35	1.75	210	367.5	2.65	2922
	Bus	33	5	6	50	8.33	210	1749.3	2.65	23178
	Train	4	2		40		210		0.035	16800
Management	Car	2	2	20	3	0.15	210	31.5	2.65	167
Teaching Staff	On foot	2								
	Car	2	2	10	10	1	210	210	2.65	1113
	Two-Wheeler	17	17	8	8	1	210	210	2.65	9461
	Auto	4	4	20	20	1	210	210	2.65	2226
Non-teaching & Supporting Staff	Bicycle	2								
	Two-Wheeler	11	11	40	4	0.1	210	21	2.65	612
	Bus	1	1	6	90	15	210	3150	2.65	8348
Total Co2 emission in KgCo2 eq per Year										**94,400**

Table 17: Carbon emission by transport

Thus, total emission by the transport is 94,400 KG CO_2 eq. Per year

Graphical representation of mode of Conveyance used by Students

The graph shows that maximum students, about 41%, comes college by Two-wheelers, then followed by walk which is about 29%. Bicycle is used by about 5% of students.

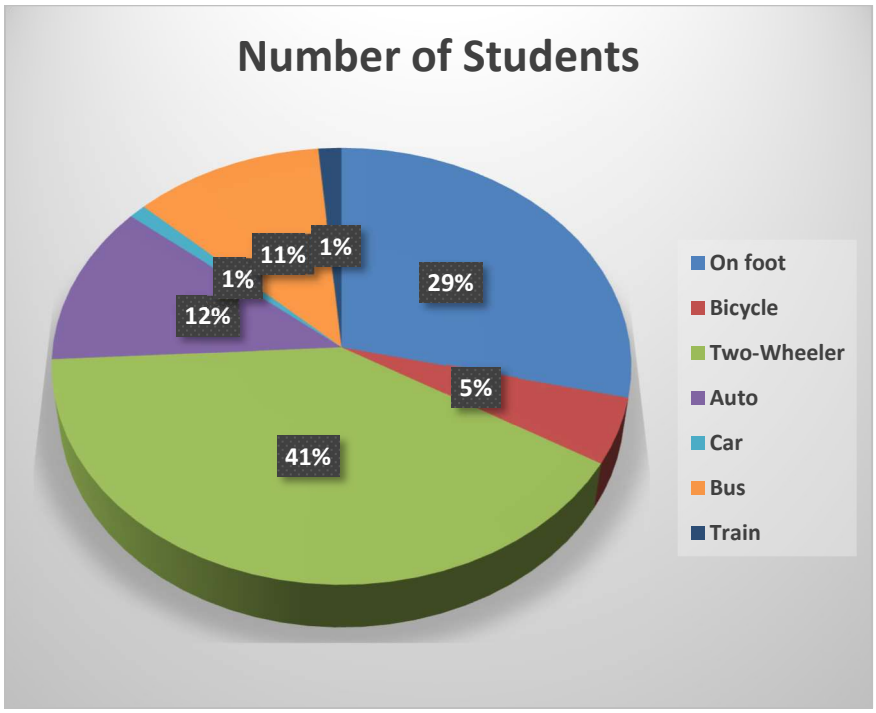


Figure 5: Mode of Conveyance used by Students

Graphical representation of mode of Conveyance used by Teaching, Non- Teaching & Supporting Staff

The graph shows that maximum staff use two wheeler for coming college, then followed by auto rikshaw, which is about 10%. 17% staff (supporting staff) come college by walk and bicycle. It's a good number in view of reducing Carbon footprint of the Institution.

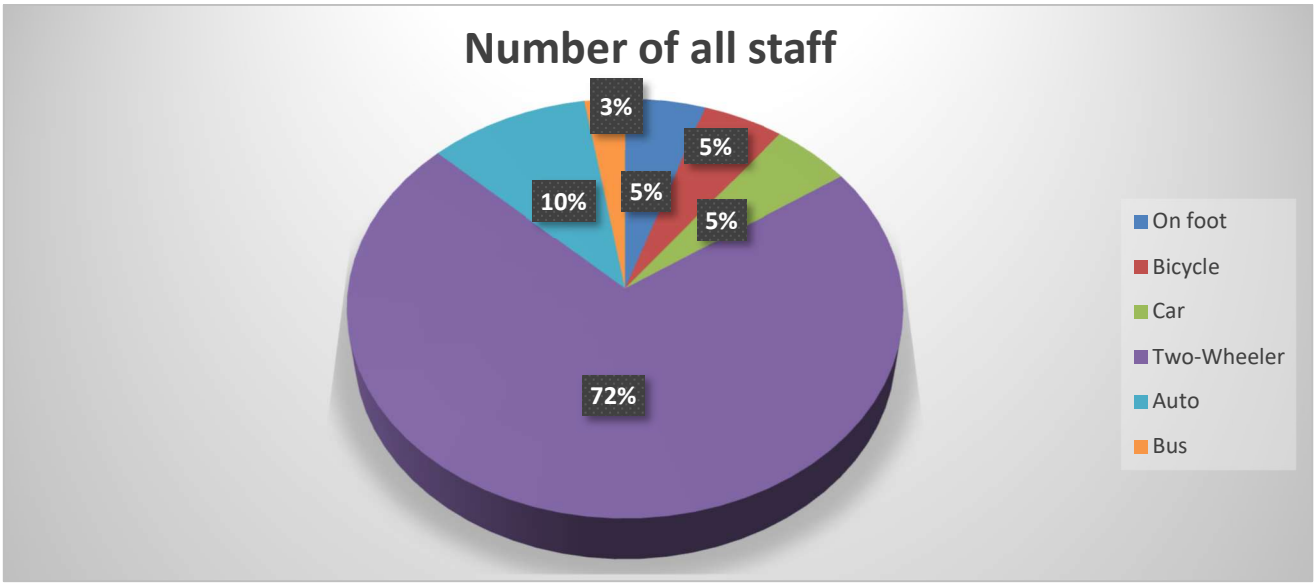


Figure 6: Mode of conveyance used by Teaching, Non- Teaching & supporting staff

Per Capita CO_2 Emission in Commuting

The category wise CO2 emission and per capita CO2 consumption is mentioned below :-

Particulars	Annual CO2 emission	Average Numbers of Students	Per capita CO2 consumption
Students	71,671	286	251
Management	167	2	84
Teaching	12,800	25	512
Non-Teaching Staff &Supporting Staff	8,960	14	640

Table 18:- Category wise CO2 emission and per capita CO2 consumption

Percentage share of annual CO2 emission in commuting

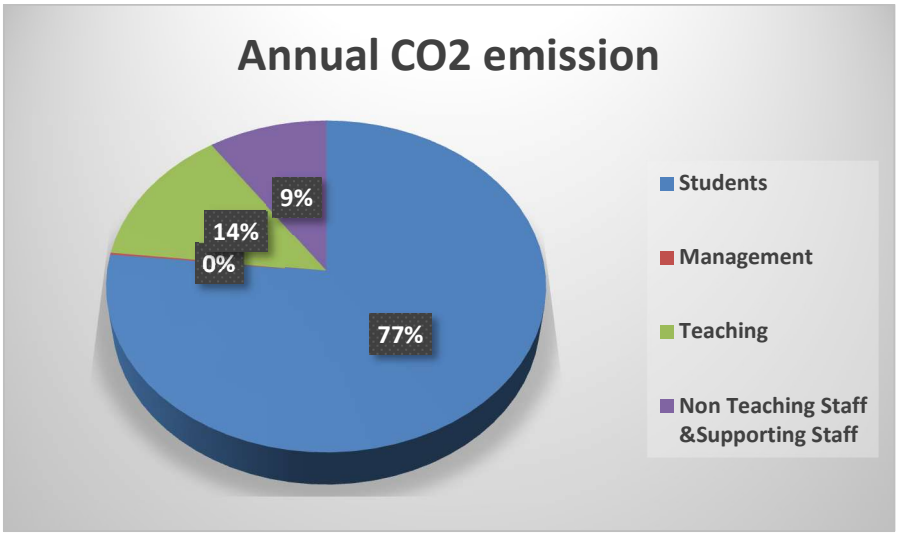


Figure 7: Annual CO2 emission in commuting

The maximum share of Carbon emission is done by students, which is about 77%.

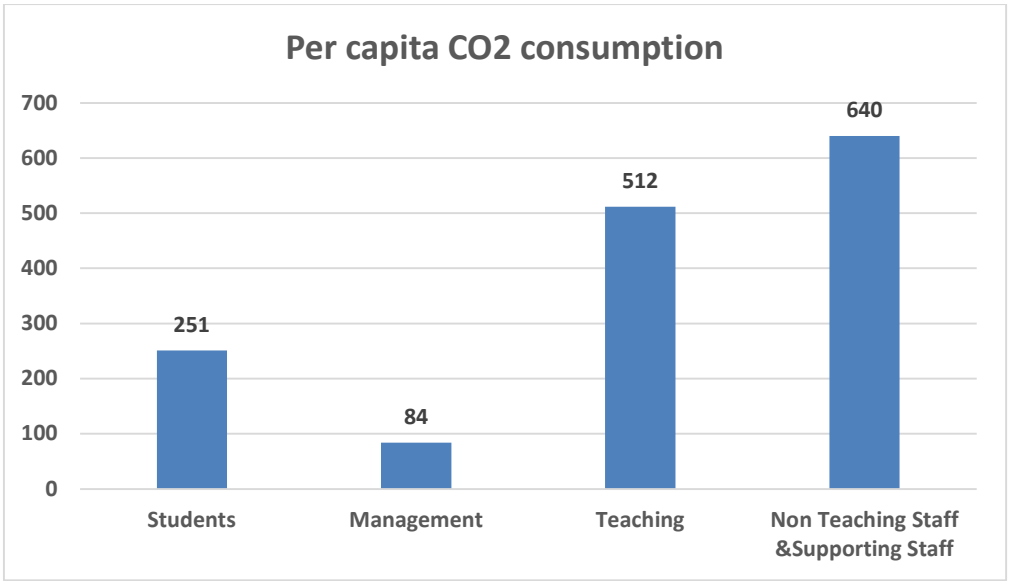


Figure 8: Per capita CO2 Emission in commuting

Though the absolute emissions indicate maximum commuting emissions from students, however the intensity calculations conclude that maximum emissions are done by the non-teaching staff & supporting staff (640kgCO2e per non teaching staff),followed by teaching staff (512 kgCO2e per students) and least by management (84 kgCO2e per person).

12.6 Total Annual Carbon emission by the college

Sr. No.	Classification of GHG Emission	GHG accounting activity	GHG emission in $KgCO_2eq.$
1	Scope 1	Stationary Combustion	34
2	Scope 2	Purchased Electricity	13,047
3	Scope 3	Students, Teaching, Non-teaching & Supporting staff Commuting	94,400
4		Paper Consumption	762
Total GHG emission			**1,08,243**

Table 19: Total Annual Carbon emission by the college

Activity wise GHG Emission

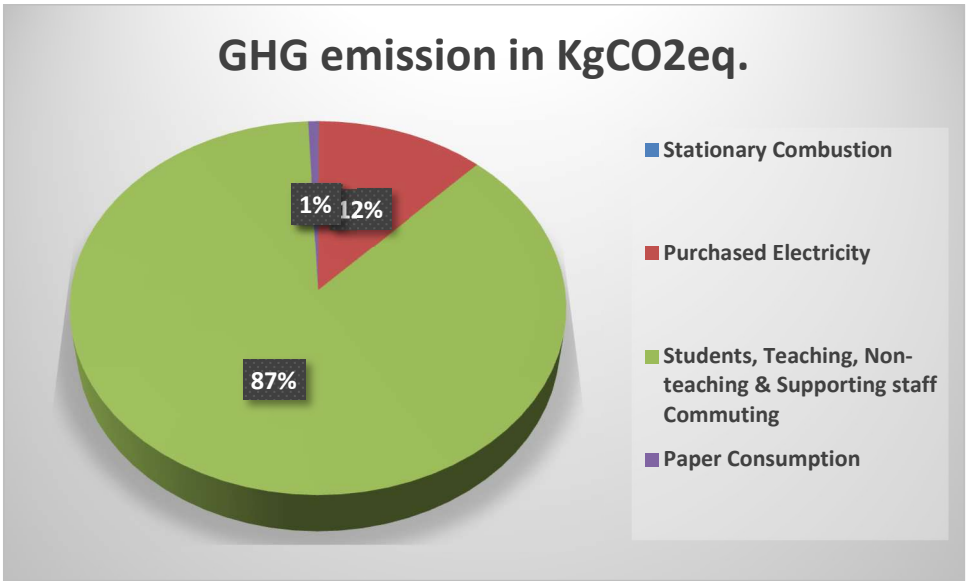


Figure 9: Activity wise total Annual Carbon emission by the college

Activity wise maximum percentage of total emissions generated by Students, Teaching, Non-teaching & supporting staff commuting is about 87 %

Scope wise GHG Emission

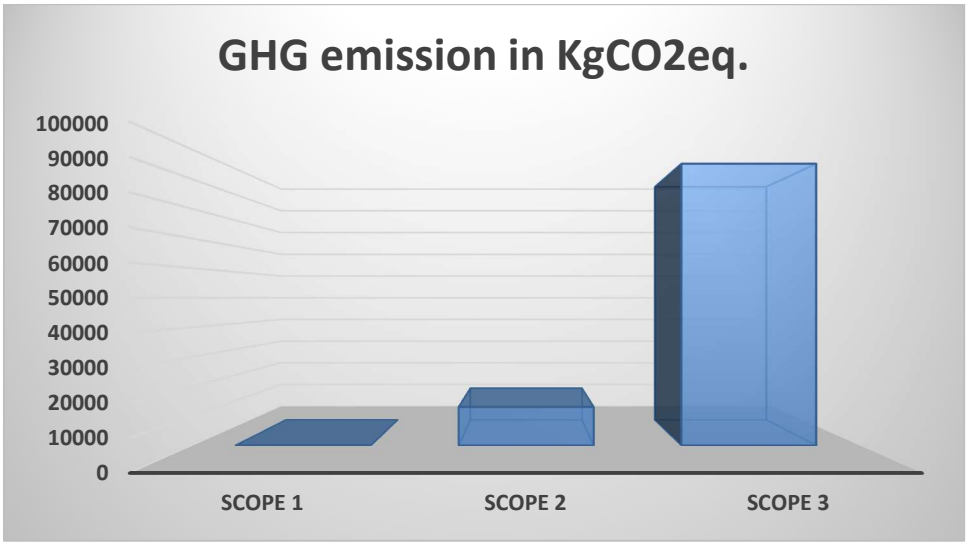


Figure 10 : Scope wise GHG Emission

Scope 3 has maximum share in total emission of the college, which is about 88%.

12.7 Reduction of Carbon Emission due to absorption of CO_2 by Tree Plantation

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

Particulars of Flora	Numbers (A)	Carbon absorption in Kg by one tree Per year (B)	Total Carbon absorption in Kg (AxB)	Oxygen Production by one tree Per year (D)	Total Oxygen produced in Kg (AxD)
Full grown Tree	15	21	315	117.6	1764
Semi Grown Tree	22	9	198	58.8	1294
Quarter grown plants	290	3	870	29.4	8526
Total			1383		11,584

Table 20: Carbon absorption and oxygen production by tree plantation.

12.8 Total Reduction in Carbon dioxide emission at Ghanshyam Singh Arya Kanya Mahavidyalaya, Durg

Area	Reduction in CO2 eq. emission in KG
Trees	1,383

Table 21: Total Reduction in Carbon dioxide emission

Total Reduction in Carbon dioxide emission at Ghanshyam Singh Arya Kanya Mahavidyalaya campus is 1,383 Kg.

12.9 Recommendation

1) It is recommended to increase the Green Cover further to more area in coming years. A continuous practice of the same will helps to conserve energy and natural resources in the campus.

2) It is suggested to display and follow Green Campus Policy / Environment Policy of the institute.

3) To reduce carbon footprint of the college, Solar Power plant should be installed.

13. RECOMMENDATIONS

13.1 Formation of ENCON Club:

We recommend to formation of the ENCON Club in Ghanshyam Singh Arya Kanya Mahavidyalaya Durg for spreading awareness on the importanceof energy conservation. ENCON 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.

Every year, India observes National Energy Conservation on December 14. The day is organized by the Bureau of Energy Efficiency (BEE) – whichoperates under the Ministry of Power, aiming to present India's stellar achievements in cost-efficient energy production and resourceconservation.

ENCON Club will celebrate "Energy Conservation Day" on 14Th December, each year. Further plans for the future may be discussed onthis day, targeting holistic development as the main goal towards mitigation of climate change. It would not only help in imparting knowledge on energy efficiency but also in its implementation inhouseholds and institutions.

Objective of ENCON Club

The objective of the club is to create awareness among the students, staffand 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.

13.2 Replacement of all conventional tube light will be replaced by energyefficient LED tube light:

Ghanshyam Singh Arya Kanya Mahavidyalaya, Durg is replacing conventional tube light with LED light fittings. However, still 671 numbers of conventional tube lights are

remain to be replaced. Replacement of tube light by energy efficient LEDtube light will not only saves electricity consumption but also saves CO_2 emission directly and indirectly.

Wattage of conventional Tube light including choke	50
Wattage of LED tube light	22
Saving in wattage	28
Quantity	671
Saving in connectd load in KW	18.788
Average Operating hours	7
No. of days in operation	210
Annual saving in unit consumption	27618
Energy Cost in Rs. Per unit	7.5
Total annual monitory saving in Rs.	207135
Price of one LED 22 Watt tube light	350
Total Investment	234850
Simple Payback period	14 months

Table 35 : Replacement of all conventional tube light will replaced by energyefficient LED tube light

The total investment is about Rs. 2,07,135 and simple payback period is about14 months

13.3 Replacement of all conventional fans by 28 watt energy efficient fans.

In college, conventional fans are installed. We have recommended to use Energy Efficient Fan in college building. All 1435 conventional fans (70 W) shall be replaced by 28 watt energy efficient fans. The total saving of this energy conservation measure is about 6.37 lakh per annum and total investment isabout 45.92 lakh. The simple payback period is 87 months.

Wattage of conventional fan	75
Wattage of Energy Efficient Gorilla Fan	28
Saving in wattage	47
Quantity	1435
Operating hours	6
No. of days in operation	210
Annual saving in unit consumption	84981
Energy Cost in Rs. Per unit	7.5
Total annual monitory saving in Rs.	6,37,358
Price of one LED 22 Watt tube light	3200

Total Investment	45,92,000
Simple Payback period	87 months

Table 36 : Replacement of all conventional fans by 28 watt energy efficient fans

Technical Description

Energy Efficient Gorilla Fan/ Super fan

Every energy efficient Gorilla/Super fan uses BLDC (Brushless Direct Current) motor. BLDC motor has no mechanical brush for commutation of the windings. Commutation is deployed with the help of smart electronics. As a result the fan runs internally at 24V and consumes just 28 W at full speed.

Key features of BLDC design:

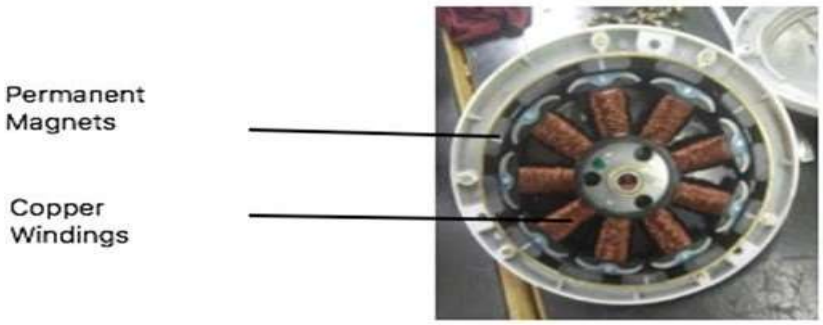
- Extremely low heat & associated power loss
- Better flexibility over controlling motor speed
- Smart motor tuning algorithm
- No spark and minimal electrical noise
- Sensor less design
- A BLDC fan takes in AC voltage and internally converts it into DC usingSMPS.
- The main difference between BLDC and ordinary DC fans is the commutation method. A commutation is basically the technique of changing the direction of current in the motor for the rotational movement. In a BLDC motor, as there are no brushes so the commutationis done by the driving algorithm in the Electronics. The main advantage is that over a period of time, due to mechanical contact in a brushed motor the commutators can undergo wear and tear, this thing is eliminated in BLDC Motor making the motor more rugged for long-termuse.

BLDC motor of Energy Efficient fan

- To explain, BLDC technology in simpler terms, BLDC uses a combination of Permanent Magnets and Electronics to achieve the kind of efficiency and performance it delivers. A BLDC fan composes of 3 main components:
- 1.Stator

  2.Rotor

3. Electronics.



- The electronics contains a driving algorithm which drives the BLDC motor. As discussed earlier in a BLDC motor the position of magnets in the fan is sensed by electronics that either uses a Hall effect sensor or back EMF.Modern BLDC motors use Back EMF for commutation due to proven disadvantages of hall effect sensor over period of time.
- To explain it in easier terms, we can take an example of a donkey whohas a carrot fixed over his head as per shown in the picture below:
- Consider the Stator to be the Carrot and the donkey to be the Magnets.The polarity of the stator will keep changing, due to attraction themagnets will create rotational moment, just like how the donkey tries hardto reach the carrot in the picture.

- Permanent magnets used in rotor are responsible for mass reduction inpower consumption compared to windings used in the stator in an ordinary induction fan. One added advantage in a BLDC fans due to useof an electronic circuit is that you can add several additional features toincrease convenience, few example of the same are sleep mode, timermode also it is compatible with Home automation

systems. Most of theBLDC Ceiling fans are operated by remote unlike traditional regulator reducing the purchase cost of regulator.

- Compared to regular induction fan, a BLDC fan can save up to Rs 1000-1500/ Year/fan. And because there is no heating of the motor, the life ofa BLDC fan is also expected to be much higher than ordinary fans.

13.4 Installation of Grid connected Solar Roof top system

Solar Roof Top Grid Connected Solar Power Plant

In a solar rooftop system, the solar panels are installed in the roof of any residential, institutional, social, Government, commercial, industrial buildings etc.

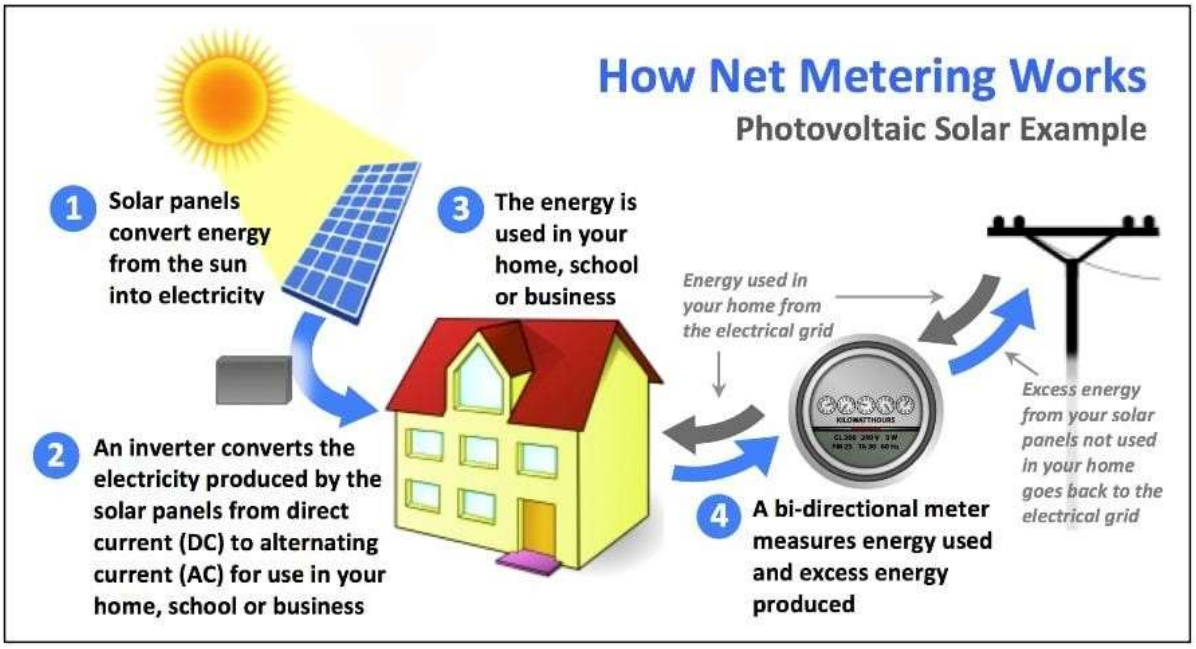
This can be of two types

a) Solar Rooftop System with storage facility using battery,

b) Grid Connected Solar Rooftop System.

In grid connected rooftop or small SPV system, the DC power generated fromSPV panel is converted to AC power using power conditioning unit/Inverter and is fed to the grid either of 440/220 Volt three/single phase line or of 33 kV/11 kVthree phase lines depending on the capacity of the system installed at residential, institution/commercial establishment and the regulatory framework specified for respective States. These systems generate power during the daytime which is utilized by powering captive loads and feed excess power to thegrid as long as grid is available. In case, where solar power is not sufficient due to cloud cover etc., the captive loads are served by drawing balance power from the grid.

Figure 9 : How Net Metering works



Main components of Solar rooftop system

- Solar PV Modules/Solar Panels – The Solar PV modules/Solar Panels convertsolar energy to electrical energy. They are available in different technologiessuch as crystalline, thin film, CIGS, CdTe, HIT, etc. Crystalline Solar PV panels are most common in use on roof tops.
- Inverter - Inverter converts DC output of Solar PV panels into AC power.
- Mounting structure – The mounting structure, is the support structure that holdsthe Solar PV panels
- Balance of System - These consist of cables, switchboards, junction boxes, meters, structures, tracking system (if required), earthing system ,circuit breaker, fuses etc.

Models for implementation of Rooftop PV systems

CAPEX Model : Here, the entire system is owned by the rooftop owners and hebears the cost of the Soalr system. Responsibility of O&M for the system lifetime(25 years) is also with the rooftop owner. Developer is responsible for installing the system and initial 2 years O&M and five years warranty.

RESCO Model : Here, the entire system is owned by the developer. Responsibilityof O&M for the system lifetime (say about 25 years) is also with the developer.Rooftop owners may consume the electricity generated, for which they have to pay a pre-decided tariff on a monthly basis. Excess generation may be exported to the grid, subject to availability of requisite state regulations.

For consumers that have adequate manpower/expertise for O&M, rooftop access concerns, availability of funds upfront, CAPEX model is better. Consumers in states that have net metering regulations can take benefit of the same in case they have substantial excess generation.

On the other hand, consumers who prefer not to take responsibility for the system O&M, do not have rooftop security concerns and prefer to pay on a monthly basis rather than bulk upfront payment may choose to go for RESCOmodel.

Net Metering

The grid connected rooftop system can work on net metering basis wherein the beneficiary pays to the utility on net meter reading basis only. Alternatively two meters can also be installed to measure the export and import of power separately. The mechanism based on gross metering at mutually agreed tariffcan also be adopted.

A Solar roof top system

We are recommending 50 KW of grid connected solar power plant.

13.5 Enhancement of Energy Efficacy of light fittings:

Cleaning of tube-lights/bulbs to be done periodically, to remove dustover It. It affects on lamp efficacy (lm/watt).

13.6 General Recommendation for Energy Saving in OfficeEquipment

Equipment	Wattage	Comments
CRT Monitor	100 - 120W (during operating condition)	CRT monitors consume a lot of power, much of which is wasted as heat, and represent the largest power consumption component in a typical desktop computer. Emit potentially harmful radiation. Fortunately, most CRT monitors these days are legacy equipment as new computers are generally supplied with LCD monitors. Unfortunately, most CRT monitorsend up in landfill.
Desktop Computer	150W (during operating condition)	Power consumption will differ significantly depending on whether a CRT or LCD monitor is used. In home andoffice situations where it is necessary to run multiple desktop computers, it may be possible to make significant power savings by running a single terminal server computer with several LCD monitors and keyboards attached. Terminal server computers can also greatly simplify network management, software upgrades, etc
Photocopier	7-30W (Sl. Mode) 40-300W (Standby) 200-1300W (op. condition)	Most of the energy used in a photocopier is consumed by the hot rollers, which are usually kept hot on stand -bay, consuming from 40 -300W. Significant energy savings (40% to 60%) can be made by ensuring that photocopiers are switched off at night and on wee kends. Some photocopiers consume up to 30 watts even when switched off, so photo copiers should be switched off at the power outlet to ensure they are really "off".
LCD Monitor	30-50W (during operating condition)	LCD monitors typically require about 30% of the power required for a CRT monitor with the same screen area. In addition, the amount of heat generated by an LCDmonitor is considerably less than a CRT monitor, resulting in a lower load on ACs. Building cooling needs may be decreased by up to 20%.

Inkjet Printer	120W (during operating condition)	Inkjet printers use relatively little power in comparison to laser printers. From an energy consumption point of view, inkjets are preferable to lasers. Unfortunately, they typically cost more to un on a cost -Per -print basis and sometimes produce less than optimum results
Laser Printer	25-80W (Standby) 150-1100W (during operating condition)	Laser printers consume significant amounts of power even when in standby mode. Over the course of an 8 - 10 hr working day, a laser printer could consume around 1kWh of energy. On the other hand, laser printers are cheaper to run on a cost -per page basis and generally produce better results. Both the number of laser printers used, and the number of hours the are operated for, should be minimized. As with printing of any kind, office procedures should be developed which minimize the need for printing to paper
Laptop Computer	15-40 W (during operating condition)	Laptop computer power consumption is typically 10% to 25% of that of a desktop computer. In situations such as an office or home office, where computers may operate for 8 to 10 hours a day, this difference issignificant and could represent an energy saving of up to 1kWh per day.

Table 37 : General Recommendation for Energy Saving in Office Equipment