7.1.3: Quality audits on environment and energy regularly undertaken by the Institution. The institutional environment and energy initiatives are confirmed through the following

1. Green audit / Environment audit
2. Energy audit
3. Clean and green campus initiatives
4.Beyond the campus environmental promotion activities

DVV Clarification:

Provide Report on environmental promotional activities conducted beyond the campus with geo tagged photographs with caption and date.

Response:

Kindly refer to the supportive documents attached herewith.

Sr.No.	List of Documents	Page No
1	The detailed Environment Audit Report alongwith promotional activities conducted beyond the campus with geo tagged phrotographs with caption and date	2-43

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Environment Audit Report

A step towards protecting the environment

S.P.D.M. Arts, S.B.B. And S.H.D. Commerce and S.M.A. Science College

Shirpur, Dist. Dhule,

Maharashtra, India

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ACKNOWLEDGEMENT

Vikram GeoInfo Tech thanks the management of S.P.D.M. Arts, S.B.B. And S.H.D. Commerce and S.M.A. Science College, Shirpur for assigning this important work of Environment Audit. Vikram GeoInfo Tech appreciate the co-operation for completion of study. Our special thanks are due to:

- Principal of the college
- IQAC Members
- Environment Audit coordinator
- Teaching & Supporting Staff of College

For giving us necessary inputs to carry out this very vital exercise of Environment Audit. We are also thankful to other staff members who were actively involved while collecting the data and conducting field measurements.

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DISCLAIMER

Vikram GeoInfo Tech has prepared this report for ***S.P.D.M. Arts, S.B.B. And S.H.D. Commerce and S.M.A. Science College, Shirpur*** based on input data submitted by the representatives of the College complemented with the best judgment capacity of the expert team.

It is further informed that the conclusions have arrived following best estimates and no representation, warranty or undertaking, express or implied is made and no responsibility is accepted by Vikram GeoInfo Tech in this report or for any direct or consequential loss arising from any use of the information, statements or forecasts in the report.

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CV M. Agone.

Report by: Lead Auditor

(Dr. Vikram Agone)

Founder & CEO

Vikram GeoInfo Tech

VIKRAM GEOINFO TECH

REVEALING EARTH INFORMATION

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ENVIRONMENT AUDIT ASSESSMENT TEAM

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INTRODUCTION

S.P.D.M. Arts, S.B.B. And S.H.D. Commerce and S.M.A. Science College, Shirpur aim at creating awareness about environmental awareness. The college takes lead to organizing different events of green practices to know the knowledge amongst students, teachers, and nonteaching staff. This green message in the form of environment audit report being transferred along with its practical dimensions among the families, societies and thereby to the stakeholders, forms a chain and network to spread the message at large. College is additionally geared toward giving resolution to the various burning topics associated with the environment, its awareness still as its protection. As the government is taking initiative to inform about environmental protection, newer concepts are being introduced to make colleges eco-friendly. To create and conserve the environment within the S.P.D.M. Arts, S.B.B. And S.H.D. Commerce and S.M.A. Science College campus and to solve the environmental problems such as raising of the energy savings and conservation, water reduction, water harvesting, solid waste management, improvement in the air quality of the campus, control on noise pollution, and minimizing the use of Plastic, etc. is one of the prime objectives of the college.

Environmental auditing is essentially an environmental management tool for measuring the effects of certain activities on the environment against set criteria or standards. An Environment audit provides an assessment of the environmental performance of a business or organization. The environment audit report is one such initiative that has been introduced to create the college environmentally sustainable and active in spreading the education concerning constant. it's a tool to assess general practices enforced by the organization in terms of the impact on the environment. The report additionally aims to unfold awareness on the adverse practices that are accountable for the degradation of the environment and the way powerfully the institute is concerned in curtailing those practices. It helps in recognizing the necessity for colleges to figure round the year for environmental sustainability. Thus, the Environment audit forms the baseline survey to decide for the Green policy.

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ENVIRONMENT AUDIT: A STEP TOWARDS PROTECTING THE ENVIRONMENT

The rapid urbanization with economic development at the local, regional and global level has led to numerous environmental and ecological catastrophes. Environment auditing is the process of documentation and determination of the institution's practices in creating awareness and practising environment-friendly measures. Over the period overexploitation of natural resources like energy, water, soil, vegetation, etc. has resulted in environmental degradation which will be a crisis in future. It is necessary to check whether our way of living and handling resources is not going to cause detrimental effects in our surroundings.

In this context it becomes essential to adopt the system of the Green Campus for the college which will lead to sustainable development and at the same time decrease a sizable amount of atmospheric pollution from the environment, conserve water and many more. The National Assessment and Accreditation Council, New Delhi (NAAC) has made it compulsory that all Higher Educational Institutions should submit an annual Green Audit/ Environment Audit Report. Moreover, it is part of the Corporate Social Responsibility of the Higher Educational Institutions to ensure that they contribute towards the reduction of global warming through carbon footprint reduction measures. Environment audit Report aims at summarising the college's contribution and its activeness in creating awareness and consciousness in practically applying the environmentally friendly measures towards an institute in A.Y. 2020-21.

ENVIRONMENTAL SETTING OF THE COLLEGE

The college has a sprawling pollution-free campus on the west side of Shirpur town. Shirpur is a town and taluka in Dhule district of Nashik Division, Maharashtra, and It is located on National Highway No. 3. The Arunavati River and Tapi river flows through the city. Shirpur is a developing city in North Maharashtra. It is famous for Balaji Temple, Vighnaharta Parshvatnath Shvetambar Mandi, Khanderao Malhar temple, Priyadarshini Sahakari Soot Girani and the Educational campus. In Shirpur, the wet season is hot, oppressive, and mostly cloudy and the dry season is sweltering and mostly clear. Over the year, the temperature typically varies from 14°C to 41°C and is rarely below 11°C or above 44°C while the average annual rainfall is 691 mm.

The college campus is spread over 15.88 acres which include about 4.50-acre sports ground and 2.41-acre green area situated at the 158 m MSL. College is easily accessible by road for the rural area which is 20 km away. Although the campus is located in a residential area, the presence of a green belt including gardens, lawns and a botanical garden has considerably

reduced noise pollution and provided fresh air on the campus. The College campus area has an academic building, an indoor sports stadium, a girl's hostel facility, IMD automatic meteorological gauging station and Soak pit Rainwater Harvesting and Groundwater Harvesting System.

OVERVIEW OF INSTITUTE

Kisan Vidya Prasarak Sanstha's S.P.D.M. Arts S.B.B. & S.H.D. Commerce And S.M.A. Science College was established in 1961 in impart education to the needy and backward inhabitants in Satpura ranges.The institution has been trying to provide all kinds of facilities to the downtrodden and backward classes to improve their stratum in the society.The students belong to the stratum should be benefited and be responsible citizens and civilized human beings.

Shirpur is a big commercial centre. Shirpur occupies a place of great importance in educational, cultural and social life of the State of Maharashtra. Most struggled personality great Freedom Fighter Gandhian Patriotic, Karmveer V. T. Randhir known pains and patience of common human with educational foresight and real concern for the welfare of tribal and weaker students. He decided to form an academic institution. As a result Kisan Vidya Prasarak Society (KVPS) was established on 15th June 1941.

SPDM College was started by this Society in 1962. KVPS has since grown into a large educational trust providing academic series through its multifarious branches. Today it is an eminent educational institution in Khandesh and is known as a profound academic movement. It occupies 308 acres of lands and thousands of square feet of buildings and facilities. It has a combine students' strength of more than 15000 and 1200 Employees.

The establishments and running of various institutions of KVPS was only possible due to the zealous and ardent efforts of Trustees of Sanstha. It was their fervor and commitment that has made Kisan Vidya Prasarak Society as what we see today Their vision was unparalleled and so was the practical and hands-off approach. Their legacy endures and is still the guiding force behind all the activities of Kisan Vidya Prasarak Society (KVPS).

Dedicated men who have established their credentials in their respective field and who have done yeoman service to the society started this SPDM College with very high ideals. This college has completed 46 years of useful service to society. Golden jubilee celebration is on with a decisive rededication for quality and excellence.

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VISION

"To impart quality education for rural and tribal students to meet new challenges of life and to make them good, self-reliant and capable citizens of the society and the country."

MISSION

"The mission of the college is to sustain the unsustainable boys and girl's students from the socially and economically backwards society from the rural and tribal area."

GOAL (VALUES)

"The goal of the institution is "*Duritanche Timir Jawo*" means through good education a man should be free from the shackles of darkness of social, cultural religious, political, educational ignorance and restrictions."

AIMS AND OBJECTIVE

S.P.D.M. Arts, S.B.B. And S.H.D. Commerce and S.M.A. Science College conducted an Environment auditing survey for the year 2018-2019. Following were the goals:

- A baseline survey to recognize the real status of green practices.
- Identification of the problems faced while practising green practices on the college campus.
- Inspection of the current practises that have an impact on the environment such as natural resource utilization, waste management, energy conservation etc.
- Analysis and suggestion for the plausible solutions for problems identified from the Audit Report.
- Increasing and spreading the awareness for environmental awareness and sustainable use of resources amongst the students, teaching and non-teaching staff members.
- Identification and assessment of any environmental risk if any inside the college campus.
- Enhancement of College profile.
- Improving environmental standards of the institute.
- Financial savings through a reduction in resource use.
- Giving direction and guidance working on local environmental issues.

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DATABASE AND METHODOLOGY

The present study is based on visits to the college, personal observations, primary database that were collected using sets of questionnaires and other survey tools. The audit report was divided into different areas viz, Carbon footprint, Electricity and Energy audit, water and water management audit, waste management audit, etc. For proper survey whole campus was divided into different sections, based on data requirement, sets of questionnaires about electricity consumption, water consumption, fuel waste, solid waste collection etc. The WorldView-3's satellite 31cm resolution multi-spectral data is used for supervised classification for preparing a Land use map. The software ERDAS-2015 and ArcGIS Pro 2.9 is used for data processing. Calculating carbon footprint using following formulas,

Electricity: use (kWh/yr) * EF (kg CO_2e/kWh) = emissions (kg CO_2e/yr)
Fuel Oil: use (litres/yr) * EF (kg CO_2e/litre) = emissions (kg CO_2e/yr)
Where EF = emissions factor

Noise measuring app, Noise test pro, was used to measure the noise level. Noise test pro detects any noise, music or sound in your surroundings. It will show maximum, minimum and average decibels. Light intensity measured using Lux Meter app.

ANALYSIS OF THE DATABASE

The database has been prepared for statistical analysis for Environment audit using Minitab and IBM SPSS statistical software. The surveys from each group were tabulated in Excel spreadsheets. The tabulated data were further analyzed through statistical analysis and computing. For a better understanding of the results and to avoid complications, averages and percentages of the tables were taken. A graphical representation of these results was made to give a summarized picture of the status. The outcome was interpreted with the overall consequences, conclusion and plausible solutions or steps for them.

Environment Audit Analysis

CARBON FOOTPRINT

A carbon footprint is the total greenhouse gas emissions caused directly and indirectly by an individual, organization, event or product. A carbon footprint is the total amount of greenhouse gases including carbon dioxide and methane that are generated by our actions. carbon footprint, amount of carbon dioxide (CO_2) emissions associated with all the activities of a person or other entity e.g., building, corporation, country, etc. It includes direct emissions, such as those that result from fossil fuel combustion in manufacturing, heating, and transportation, as well as emissions required to produce the electricity associated with goods and services consumed. It is calculated by summing the emissions resulting from every stage of a product or service's lifetime. The calculations for CO2 emission were done using method reported in the methodology. CO2 emission has been calculated annually by vehicle category of college staff and students.

The highest CO_2 emissions (6361.64 kg) has been reported by Two-wheeler while due to the Covid-19 pandemic lock down situation students are not allowed attain to the college physically classes, that's why public transport has not been reported any CO_2 emission. Total CO2 emission for the year 2020-21 of all the vehicles is 8285.39 kg by the college into the atmosphere. Campus has a diesel generator (DG) of capacity 100 KVA. DG set is used only in case of emergency when there is power cut-off.

Table 1 Aggregate CO_2 emission for the year 2020-21 of all the vehicles

Vehicles	*No of vehicles*	*CO_2 (kg/yr.)*
Four-Wheeler	15	1705.35
Two-Wheeler (Staff)	83	6361.64
Bicycles	70	0.00
Electrical vehicles	00	0.00
Public Transport (Students)	65	0.00
Two-Wheeler (Students)	200	0.00
Diesel Generator	01	218.40

(Source: CO_2 emissions were calculated by using counting of vehicles)

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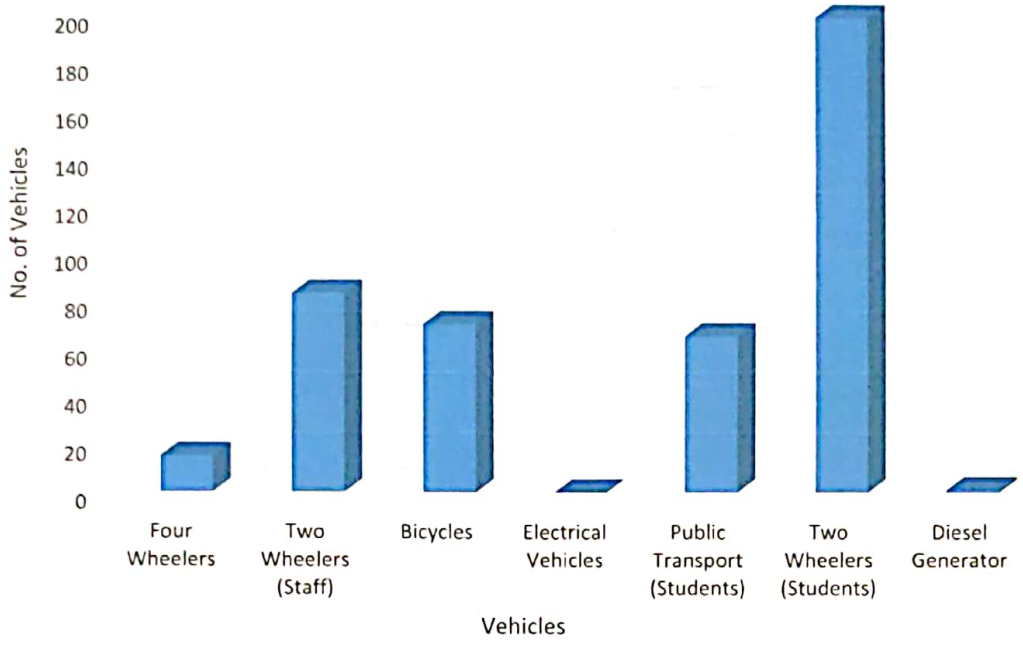

Figure 1 Types of Vehicles

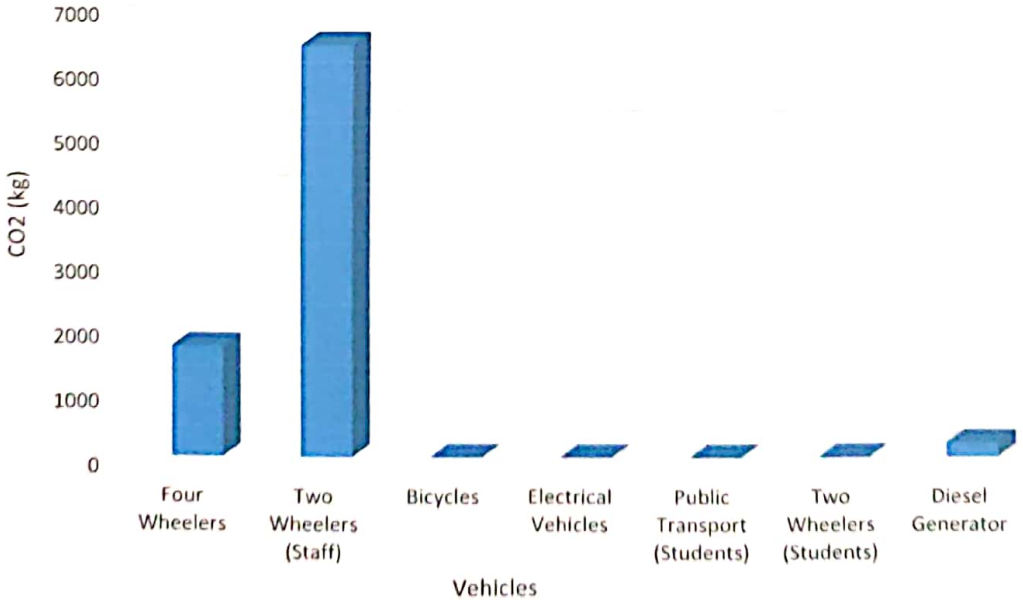

Figure 2 CO_2 Emission by Vehicles

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LAND USE ANALYSIS

The campus area 64300 m^2 (15.88 Acre) consists of the following regions as stated below for land consumption in the built-up area of college: The southern region is densely built-up having Main Administrative Block, departments, lecture rooms and auditorium. The northern region comprises of Sports Stadium and Athletic Tracks. The western region has Lawns and a Botanical Garden. The central region has Girls' hostels and canteens. The eastern boundary of the campus has various types of trees observed. Approximately 14.26 % i.e., 9167 sq. m of the region is occupied by trees and forms the part of green cover of the campus.

Table 2 Land-Use of the College campus

Land Use	*Area (Sq. m)*	*Area (Acre)*	*Area (%)*
Built-up	6375	1.58	9.91
Vegetation	9167	2.26	14.26
Bare land	48758	11.90	75.83

(Source: WorldView-3 Satellite Imagery)

Table 3 Area of the various Built-up lands

Land Use	*Area (Sq. m)*	*Area (Acre)*	*Area (%)*
Administrative Blocks & College Building	2509	0.62	3.90
Canteens	162	0.04	0.25
Girls Hostel	1295	0.32	2.01
Sports Stadium	1740	0.43	2.71
Athletic Tracks	11210	2.77	17.43
Lawns and a Botanical Garden	2185	0.54	3.40

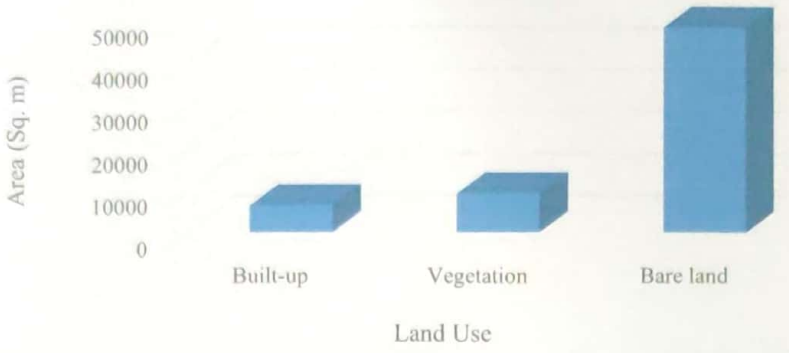

Figure 3 College Campus Land Use area

College campus geo-position is on 21° 21' 07" N latitude and 74° 52' 25" E longitude in Shirpur, Maharashtra, India. It encompasses an area of about 15.88 Acres. The area is enormously diverse with a variety of tree species performing a variety of functions. Most of these tree species are planted in different periods of time through various plantation programmes organised by the college and have become an integral part of the college. The trees of the college have increased the quality of life, not only the college society but also the people around the college in terms of contributing to our environment by providing oxygen, improving air quality, climate improvement, conservation of water, preserving of soil, and supporting wildlife, controlling climate by moderating the effects of the sun, rain and wind. Leaves absorb and filter the sun's radiant energy, keeping things cool in the summer months. Many species of birds are dependent on these trees mainly for food and shelter. The fluid of flowers and plants is a favourite of birds and many insects. Leaf covered branches keep many animals, such as birds and squirrels, out of reach of predators. Different species show an apparently endless variety of shapes, forms, textures and vibrant colours. Even individual trees vary their appearance throughout the course of the year as the seasons change. The strength, long lifespan and imperial stature of trees give them a monument–like quality. They also remind us of the glorious history of our institution in particular. We often make an emotional connection with these trees and sometimes become personally attached to the ones that we see every day. A thick belt of large shady trees in the periphery of the college has been found to be bringing down the noise and cutting down dust and storms. Thus, the college has been playing a significant role in maintaining the environment of Shirpur town in its surrounding areas. Various types of Fauna were observed at the college campus, table 4,5 & 6 show Fauna at the college campus.

Table 4 Birds observed at the college campus

Sr. no	Common name	Scientific name
1	Parrot	Psittacula krameri
2	Sparrow	Passer domesticus
3	Crow	Corvus splendens
4	Pigeon	Columba livia
5	Koel	Eudynamys scolopaceus
6	King fisher	Halcyon smyrnensis
7	Owl	Bubo bengalensis
8	Hawk	Nisaetus cirrhatus
9	Nilpankh (Indian roller)	Coracias benghalensis
10	Lavri (Indian teetar)	Ortygornis pondicerianus
11	Titodi (Red wattle lapwing)	Vanellus indicus
12	Indian white Egret	Egretta Ardea alba
13	Bulbul	Pycnonotus barbatus
14	Jungle babbler	Turdoides striata

Table 5 Reptiles observed at the college campus

Sr. no	Common name	Scientific name
1	Garden lizard	Calotes versicolor
2	Wall lizard (Gecko)	Hemidactylus frenatus
3	Varanus Indian monitor	Varanus bengalensis

Table 6 Arthropods observed at the college campus

Sr. no	Common name	Scientific name
1	Butterfly	Papilla machaon
2	Cockroach	Periplaneta americana
3	Lady bugs (lady birds beetles)	Harmonia axyridis
4	Moths (brown house moth)	Hofmannophila pseudospretella
5	Termite	Isoptera brulle
6	Ants (black carpenter ants)	Camponotus pennsylvanicus
7	Honey bee	Apis dorsata, Apis indica
8	Dragon fly	Pantala flavescens, Anax imperator

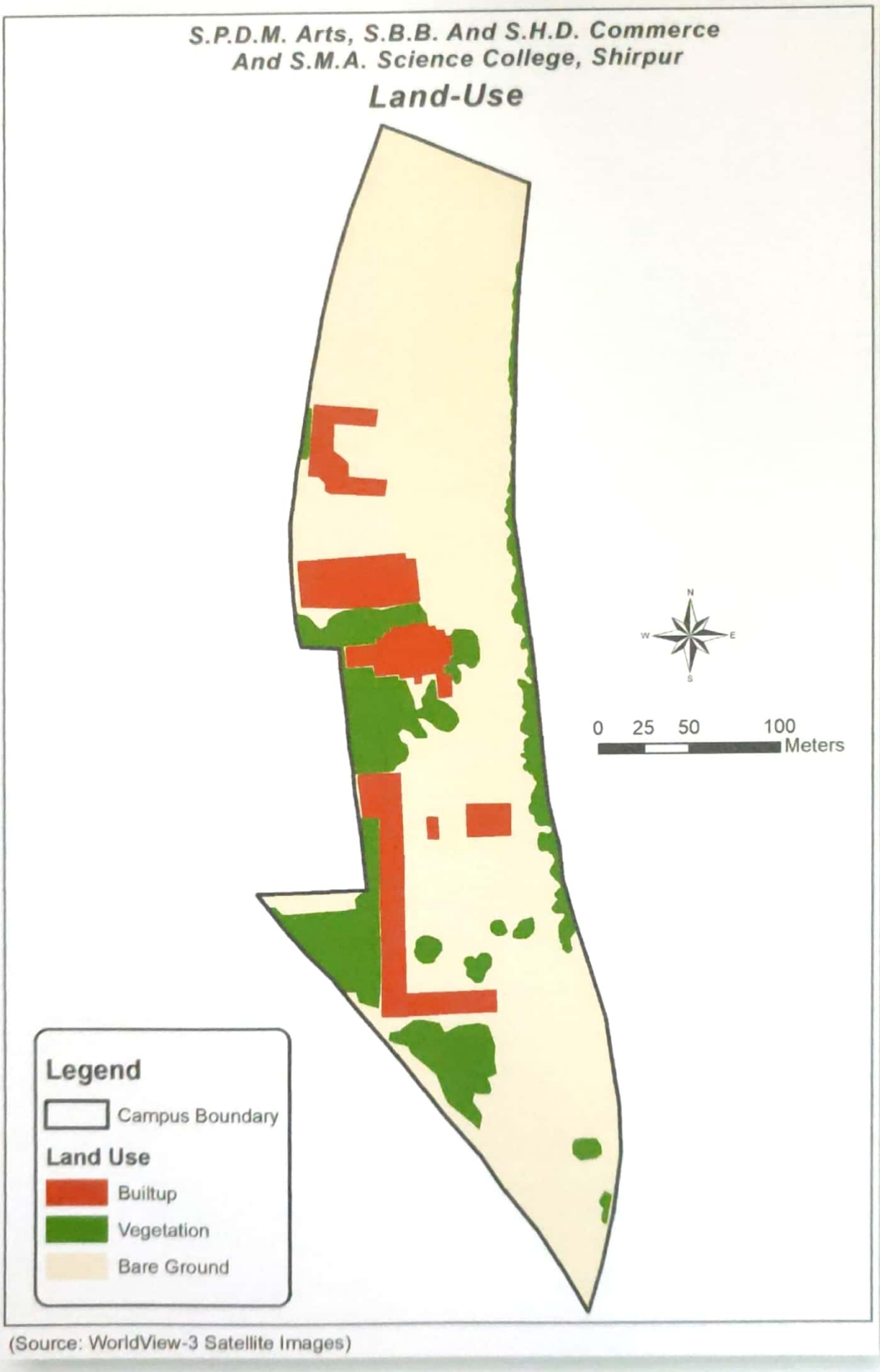

Figure 4 College Campus Land Use Map

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ENERGY AUDIT

As per the Energy Conservation Act, 2001, Energy Audit is defined as "the verification, monitoring and analysis of use of energy as well as submission of technical report containing recommendations for improving energy efficiency with cost benefit analysis and an action plan to reduce energy consumption". Effective management of energy-consuming systems can lead to significant cost and energy savings as well as increased comfort, lower maintenance costs, and extended equipment life. A successful energy management program begins with a thorough energy audit. The energy audit evaluates the efficiency of all building and process systems that use energy.

Energy use is clearly an important aspect of campus sustainability and thus requires no explanation for its inclusion in the assessment. An old incandescent bulb uses approximately 60W to 100W while an energy efficient light emitting diode (LED) uses only less than 10 W. Energy auditing deals with the conservation and methods to reduce its consumption related to environmental degradation. It is therefore essential that any environmentally responsible institution examine its energy use practices.

Two electricity meter is provided for entire campus. There is total energy consumption for the college is 1161.76 KWh per day. The major difference in Energy consumption of various departments is due to the usage of various electronic and electrical equipment. Data is shown in the table 2 & 3 below for comparison of no. of electrical appliances and energy consumption (kwh) per day in each Department. The difference in no. of electrical appliances and energy consumption (kwh) used is reflected in their respective energy consumption. The emissions per unit of electricity in India are estimated to be in the range of 0.91 to 0.95 kg/kWh, in this way college contribute 1,103.67 kg per day of CO_2 emission to the atmosphere by using electrical energy.

The graphs (Fig. 8 &9) are showing a comparative study of electricity bills and consumption of college month wise. The major difference is due to the usage of air conditioners and coolers. The peaks can be seen in the summer season in the months of March, April and May, while another peak can be observed in the month of October due to extensive heat. For the month of June and most of July, teaching is suspended and that is reflected in electricity bills and consumption.

Table 7 Department wise number of electrical appliances

Department	Light tubes	Light bulbs cfl/LED	Ceiling fans	Computers	Printers	Projectors	Servers	AC / Cooler	Xerox machine	Sound System
Physics	11	0	5	1	1	1	0	0	0	1
Physics Electronics Lab	3	0	3	0	0	0	0	0	0	0
English Language Lab	11	0	8	30	1	0	1	0	0	0
Geography	23	0	8	11	1	1	0	0	0	0
Botany	13	2	9	4	1	2	0	0	0	0
Karmveer Dalan (Hall)	0	14	15	0	0	1	0	6	0	1
Computer dept	16	1	17	31	2	1	2	1	0	0
Library	28	0	11	5	1	0	0	0	0	0
Exam department	2	1	3	0	0	0	0	0	0	0
Vice pri. Cabin	3	0	4	2	2	0	0	0	1	0
Staff room	7	0	5	0	0	0	0	0	0	0
Registrar cabin	16	0	4	0	0	0	0	1	0	0
Principal cabin	18	0	5	1	1	0	0	0	0	0
Office	11	0	9	9	3	0	0	0	0	0
Sport	20	25	6	1	1	0	0	0	0	0
Canteen	1	1	2	0	0	0	0	0	0	0
Jr vice pri. Cabin	2	0	2	1	1	0	0	0	0	0
Commerce	1	0	1	1	1	0	0	0	0	0
Economics	0	0	1	1	0	0	0	0	0	0
Language	1	0	1	1	1	0	0	0	0	0
Social science	1	1	1	1	1	0	0	0	0	0
Urdu	2	2	3	1	1	0	0	0	0	0
Zoology	1	6	4	1	1	1	0	0	0	0
General	0	0	0	0	0	0	0	0	0	0
Maths	2	0	2	1	0	1	0	0	0	0
Statistics	3	0	3	5	1	0	0	0	0	0
Chemistry	12	1	4	4	1	1	0	0	0	0
Chemistry lab. Jr	19	0	3	0	0	0	0	0	0	0
Total	227	54	139	112	22	9	3	8	1	2

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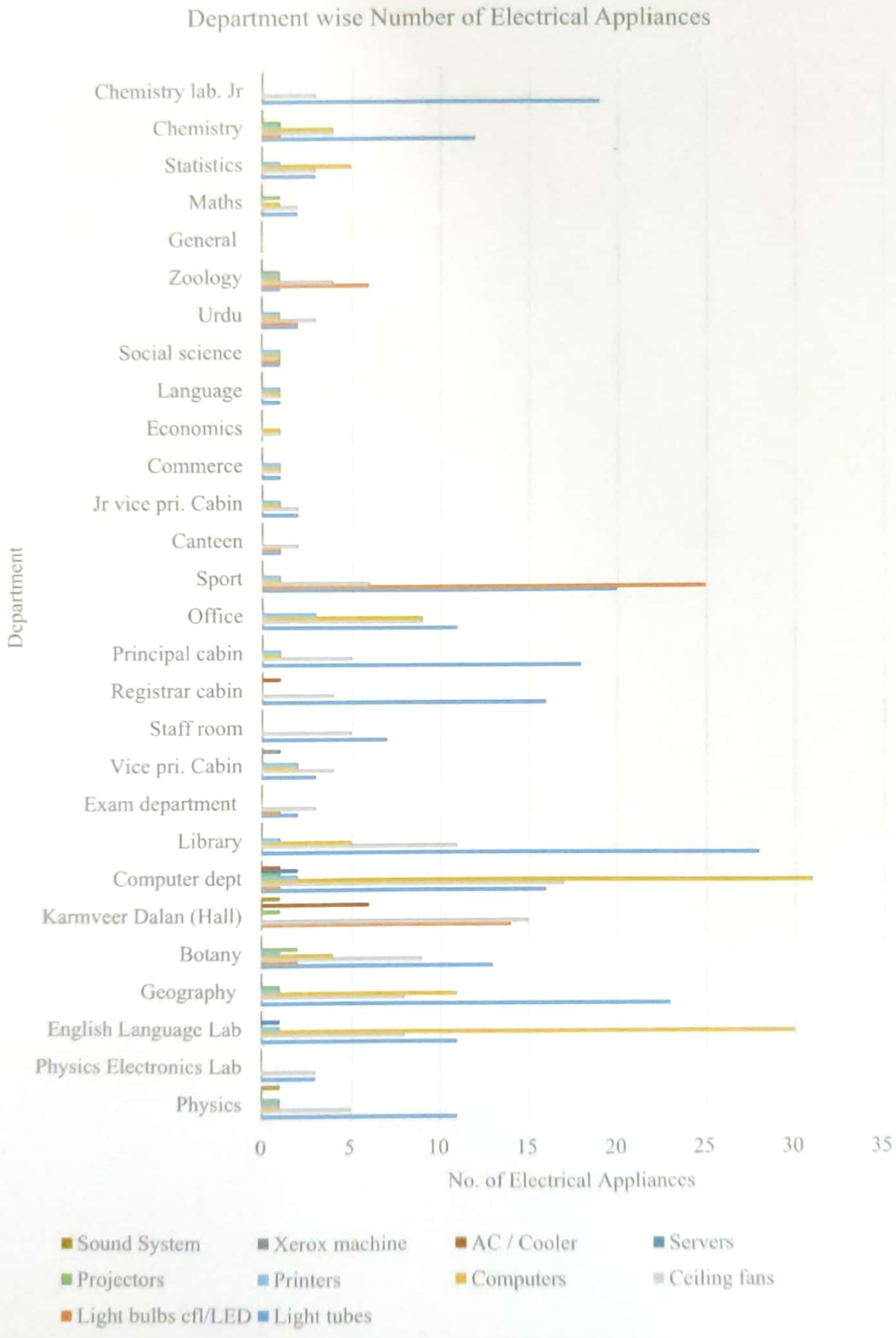

Figure 5 Department wise Number of Electrical Appliances

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Table 8 Department wise Energy Consumption per day (kwh)

Department	Light tubes	Light bulbs cfl/LED	Ceiling Fans	Computers	Printers	Projectors	Servers	AC / Cooler
Physics	0.22	0	0.1875	0.6	0.15	0	0	0
Physics Electronics Lab	0.06	0	0.045	0	0	0	0	0
English Language Lab	0	0	0.3	6	0.15	0	1.25	0
Geography	0.46	0	0.3	2.2	0.3	0.8	0	0
Botany	0.52	0.04	0.3375	0.8	0.15	0.8	0	0
Karmveer Dalan (Hall)	0	0	0.5625	0	0	0.4	0	0
Computer dept	0.32	0	1.275	6.2	1.2	0.8	12	36
Library	0.56	0	0.825	1	0.15	0	0	0
Exam department	0	0	0	0	0	0	0	0
Vice pri. Cabin	0.12	0	0.6	0.08	0.6	0	0	0
Staff room	0.28	0	0.75	0	0	0	0	0
Registrar cabin	0.16	0	0.15	0	0	0	0	0
Principal cabin	0.36	0	0.375	0.4	0.15	0	0	0
Office	0.44	0	1.35	3.6	1.8	0	0	0
Sport	0	0.5	0	0.2	0.15	0	0	0
Canteen	0.02	0.01	0.075	0	0	0	0	0
Jr vice pri. Cabin	0	0	0.15	0.2	0.3	0	0	0
Commerce	0	0	0.075	0.2	0.15	0	0	0
Economics	0	0	0.075	0.1	0	0	0	0
Language	0	0	0.075	0.4	0.3	0	0	0
Social science	0	0	0.075	0.2	0.15	0	0	0
Urdu	0	0	0.225	0.2	0.15	0	0	0
Zoology	0	0	0.3	0.2	0.15	0.8	0	0
General	0	0	0	0	0	0	0	0
Maths	0.04	0	0.075	0.2	0	0	0	0
Statistics	0.06	0	0.1125	1	0.15	0	0	0
Chemistry	0.12	0.01	0.15	0.8	0.3	0.8	0	0
Chemistry lab. Jr	0.19	0	0.1125	0	0	0	0	0
Total	3.93	0.56	8.5575	24.58	6.45	4.4	13.25	36

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Figure 6 Department wise Energy Consumption per day (kwh)

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Table 9 Energy Consumption by others Electrical Appliances per day (kwh)

Particulars	*No. of Appliances*	*Energy Consumption (kwh)*
Xerox Machine	1	1.1
Sound System	2	0.2
UV Photospectrometer	2	0.1
Chiller	1	460
Exhaust Fan	4	3.36
Weather Station Power Supply	1	0.05
Weighing Machine	1	0.01
Soil Testing	1	0.01
Focus (Sport)	10	2.5
Focus (Sport Ground)	3	0.75
Tubes Inside College	10	0.2
Focus Inside College	10	2.5
Focus At Entrance of College	6	1.5
CCTV	41	14.76

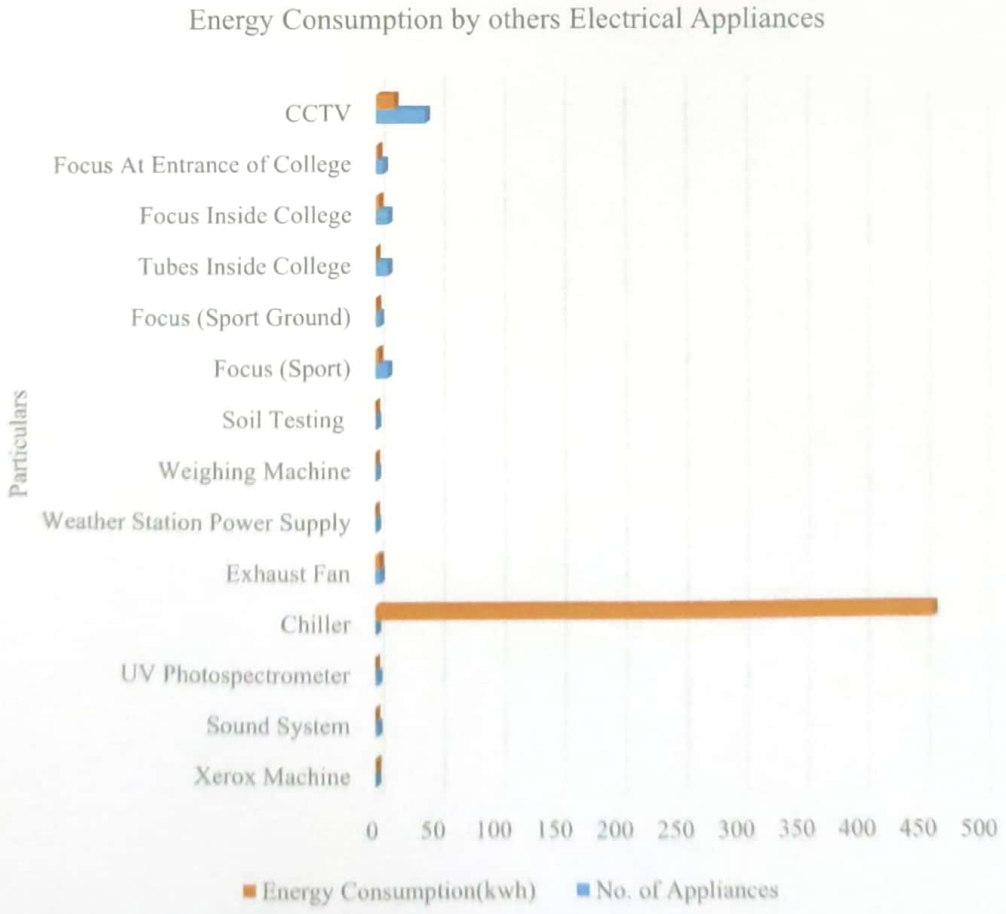

Figure 7 Energy Consumption by others Electrical Appliances

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Table 10 Electricity bills & consumption of the college month wise across the year

Month	*Electricity Consumption (Unit)*	*Bill in rupees*
Feb-21	2113	9900
Jan-21	1602	9850
Dec-20	2064	6520
Nov-20	622	4310
Oct-20	2896	17140
Sep-20	702	4770
Aug-20	544	3890
Jul-20	527	3800
Jun-20	675	4600
May-20	2789	15490
Apr-20	2887	17490
Mar-20	2480	15540

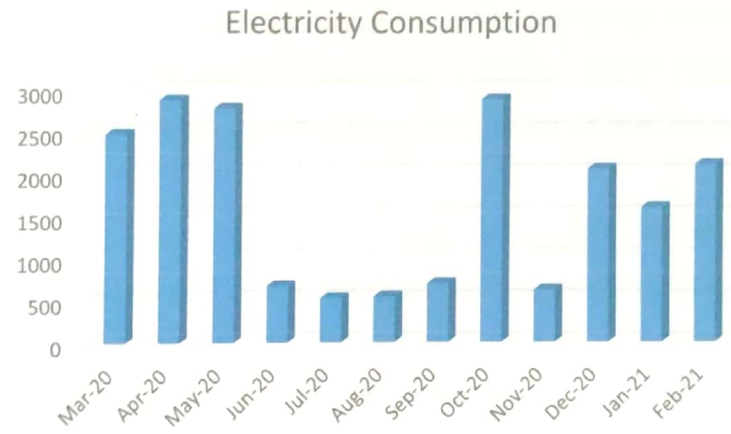

Figure 8 Electricity consumption of the college month wise across the year

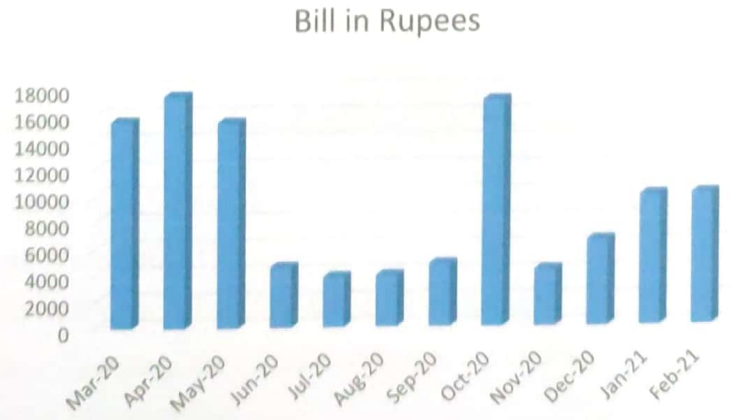

Figure 9 Electricity Bills of the college month wise across the year

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AIR EMISSIONS

Air Emissions is the term used to describe the gases and particles which are put into the air or emitted by various sources. Ambient air quality mentions to the condition or quality of air surrounding us in the outdoors. Diesel generators, exhausts from canteen kitchen and chemical vapours in chemistry department laboratory produce emissions. Four exhaust fans are provided in the chemistry department laboratory. Exhaust fans are not provided in the washroom and canteen kitchen. No vehicle entry is allowed on the College campus except for dignities & differently-abled students. A separate parking area for vehicles is available at the entry of the college campus. Classrooms in the college Campus are Well Ventilated, while the Window Floor ratio of the classroom is very good. This fact proves that there is no need for Exhaust fans in classrooms.

INDOOR AIR QUALITY

Indoor Air Quality (IAQ) refers to the air quality within and around buildings and structures, as it relates to the health and comfort of building occupants. Common indoor pollutants are;

- Carbon monoxide – Sources of carbon monoxide are incomplete combustion of fossil fuels
- Volatile organic compounds (VOCs) – VOCs are emitted by paints and lacquers, paint strippers, pesticides, office equipment such as copiers and printers, correction fluids and carbonless copy paper, graphics and craft materials including glues and adhesives, permanent markers, and photographic solutions etc.
- Carbon dioxide – Due to human respiration
- Particulate matter (PM) – Due to construction and maintenance activities, vehicular pollution
- Nitrogen Oxides- Due to vehicular pollution

In the Canteen area, parameters responsible for affecting indoor air quality are,

- Type and quantity of fuel used
- Medium of cooking
- Type of cooking e.g., roasting, frying, steaming etc.
- Duration of cooking, the quantity of food being cooked
- Efficiency of ventilation

Indoor air quality should be monitored at least once a year and results should be compared with The Indian Society of Heating, Refrigerating and Air Conditioning Engineers (ISHRAE) standards for indoor air quality.

In classrooms, ventilation is natural draft through windows and is enhanced by fans. In corridors, cross-ventilation is observed. Air conditioners are used in some offices and computer laboratories. ACs are serviced regularly to ensure indoor air quality by the college. Exhaust fans are provided in Chemistry laboratories. Green belts have been set up in the campus area, plants are present near the College building which helps in maintaining ambient air quality. In the Canteen for food processing used LPG fuel, which is less pollutant.

LIGHTS AND ACOUSTICS

The human ear is constantly being beset by man-made sounds from all sides, and there remain few places in crowded areas where relative quiet prevails. There are two basic properties of sound Loudness and Frequency. Loudness is the strength of sensation of sound apparent by the individual. It is measured in terms of Decibels. Just audible sound is about 10 dB, a whisper about 20 dB, library place 30 dB, normal conversation about 35-60 dB, heavy street traffic 60-100 dB, boiler factories 120 dB, jet planes during take-off is about 150 dB, rocket engine about 180 dB. The loudest sound a person can stand without much discomfort is about 80 dB. Sounds beyond 80 dB can be safely regarded as Pollutants as it harms the hearing system. According to WHO, 45 dB is the safe noise level for a city. For international standards, a noise level up to 65 dB is considered tolerated. Loudness is also expressed in sones. One sone equals the loudness of 40 dB sound pressure at 1000 Hz. Frequency is defined as the number of vibrations per second. It is denoted as Hertz (Hz).

Collage campus located in city area; vehicular noise pollution is minimum in the premises probably due to tree cover in the campus. Noise levels are between 42-75 dB in the premises. Light intensity is between 44 - 350 Lux. Light intensity and noise levels were monitored at 28 different locations and the results are presented in Table 11.

As per the Occupational Safety and Health Administration (OSHA) standards, permissible noise exposure for 8 hours/day is 90 dB(A). Colleges, schools, hospitals and courts come under silent zone. Permissible noise limits in and near the College is 50 dB during day time. Noise levels monitored during the audit are above the permissible limits at all locations. The

illumination (Lux) levels were adequate or less in few areas that is because lights are kept switched off in rooms, laboratories which are not occupied and receive natural sunlight.

Table 11 Light intensity and noise levels monitoring results

Department	*Noise level (dB)*	*Light Intensity (Lux)*
Physics	60	250
Physics Electronics Lab	63	317
English Language Lab	42	95
Geography Dept	59	75
Botany	62	350
Karmveer Dalan (Hall)	55	200
Computer Dept	62	44
Library	55	112
Exam Department	52	161
Vice Pri. Cabin	65	100
Staff Room	70	98
Registrar Cabin	59	123
Principal Cabin	61	110
Office	67	115
Sport	72	161
Canteen	75	155
Jr Vice Principal Cabin	70	130
Commerce	68	120
Economics	68	120
Language	55	180
social science	54	196
Urdu	50	90
Zoology	64	156
General	50	57
Maths	50	57
Statistics	50	57
Chemistry	65	50
Chemistry lab. Jr.	62	178

Major water source for college is borewell in the campus. Data related to water audit was collected by circulating a proforma based on water user profiles. The college has 2097 students enrolled in different courses, and more than 119 employees. The assessment of water requirement comprises of sanitation, laboratory, kitchen, drinking, washing, etc. For assessment of water management, the college has been divided into four blocks: Academic block, Botanical Garden, Hostel, and teaching and non-teaching staff room

As it can be seen, the consumption of water by canteen is 12.85 % as compared to 8.80 % for the academic departments. The collective consumption of water by departments (comprising of Chemistry, Botany, Zoology and Geography) is 8.80 %. In the academic departments the major consumers are Chemistry Department. Highest utilisation of water in the Hostel and for Trees and Botanical Garden. College utilises approximately 8000 litre per day water. Water consumption of the College works out to be 4 Litre /Person/Day. As per IS 1172 standards for non-residential institutions, water consumption should be maximum 45 Litre /Person/Day. Thus, water consumption is well under limit.

Table 12 Utilizations of water per day in liters.

Particulars	*Utilisation of water (litres / per day)*	*Utilisation of water (%)*
Chemistry Department	500	6.42
Botany Department	100	1.28
Zoology Department	60	0.77
Geography Department	25	0.32
Staffroom	100	1.28
Common Toilet block	1000	12.85
Hostel	2000	25.69
Trees and Botanical Garden	2000	25.69
Canteen	1000	12.85
Drinking Water for Students	1000	12.85

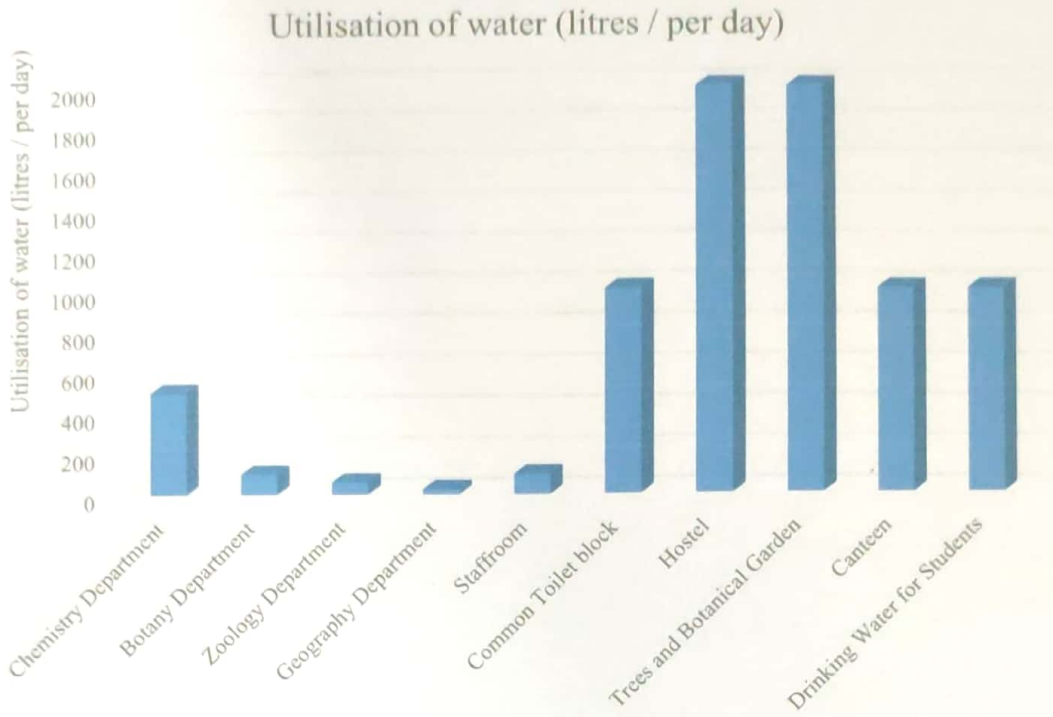

Figure 10 Utilizations of water per day in liters

BEST PRACTICES / INITIATIVES FOR ENVIRONMENT

- **Flora and fauna conservation**

College has lush green campus which provides habitat to various species. Recently conducted Flora and fauna survey reports Parrot, Sparrow, Crow, Pigeon, Koel, King fisher, Owl, Hawk, Nilpankh, Indian Teetar, Red wattle lapwing, Indian white Egret, Bulbul, Jungle babbler, Garden lizard, Wall lizard, Varanus Indian monitor, Butterfly, Cockroach, lady birds beetles, Moths, Termite, black carpenter ants, Honey bee and Dragon fly.

- **Tree Plantation Drives**

Every Guest is honoured by Tree Plantation at Campus. Periodically the plantation drove by students and staff of the campus.

- **Pollution Reduction**

Personal Vehicles of Students are not allowed at the campus. By this way reduction in Air Pollution through vehicular emission.

- **Solid Waste Management**

Lifting of garbage from campus on alternate day by Municipal Corporation.

- **Environment Awareness**

The National Service Scheme (NSS) of the college undertakes projects for environment, rural development, education awareness, healthcare etc. Various activities like cleanliness drive, tree-plantation, seminars and workshops are organised by NSS increase the awareness and sensitivity among students and faculty.

Students participate in field visit to biodiversity parks and other places of ecological importance are also being arranged by college various department. In the current scenario when academic activities are taking place virtually, College arranges webinars, online conferences pertaining to environment.

CONCLUSION

All the indicators of the Environment audit were properly studied and information about the indicators was collected, analysed and concluded. This Environment audit involved extensive consultation with all the campus team, interactions with key personnel on a wide range of issues related to Environmental aspects. The audit has identified several observations for making the campus premise more environmentally friendly. LPG is handled in the science building section for Chemistry and in the canteen area for practical purposes. Per unit, consumption is still less. Electricity consumption is more in some sections that have instruments. Other departments have minimal usage of electricity. There are several trees and plants of different varieties and species that serve the greenery of the college. Students and staff of the college are encouraged on using public or pool sharing to minimize fuel energy consumption for daily work. However, on average most per cent of student's travel using buses. Staff travelling long distances also prefer coming by public transportation. Air quality on the campus is good.

The recommendations are also mentioned with observations for the campus team to initiate actions. The audit team opines that the overall site is maintained well from an environmental perspective. There are no major observations but a few things that are important to initiate urgently are waste management records by the monthly inventory of hazardous waste, rainwater harvesting recharge; water balance cycle and periodic inspection of buildings housekeeping and environment policy.

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RECOMMENDATIONS

1) The world is in front of problems due to climate change leading to global warming, water scarcity and sustainable resource management. Creating awareness on mitigation of adverse impacts on the environment, sustainable resource management and conservation of the ecosystem, has increased importance in any educational institute. It is necessary to create as much awareness as possible and sensitize students. Awareness sessions help students to understand the effect of their actions & inactions on the environment, build knowledge and skills necessary to address complex environmental issues and encourage them to keep our environment healthy and sustainable.
2) Consider setting up an environmental advisory committee with students' involvement. The discussions & information sharing among different departments can create ideas and awareness on environmental issues.
3) Adopt an environmental responsible purchasing policy and work towards creating and implementing a strategy to reduce environmental impact.
4) CFL lamps can be used in all sections and classrooms to minimize the usage of fluorescent tubes.
5) Waste water management still needs to be practiced and designed in the campus.
6) Drinking water quality shall be as per IS:10500.
7) Drips and sprinklers can be used for watering the gardens and lawns.
8) Rainwater Harvesting System is comprised of rooftop and surface runoff. Through Rainwater Harvesting System, rainwater collected is used for recharging groundwater through recharge bores. Rainwater collected is also stored in recharge pits which are used for gardening. Rooftop rainwater harvesting is necessary for water harvesting on the college campus. Every year such rainwater harvesting pits can be maintained, designed and constructed.
9) Special days like, Teachers Day, Guru Poornima, Van Mahotsav can be celebrated by plant donations.
10) More composting pits can be prepared for proper disposal of garden waste and kitchen wastes from canteens.
11) E-waste and solid waste segregation, handling and disposal can be deployed at the campus.

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12) Records of E-waste generation and disposal are to be maintained properly. College should maintain the inventory mentioning type and quantity of waste generated e.g., computer monitors, scanners, keyboards, cables, circuit boards, batteries etc.
13) Reduction in use of paper work by go digital system.
14) Water meters should be installed at college for monitoring of water consumption for gardening and landscape.
15) As practically feasible avoid use of personal vehicles inside the campus.
16) Raising awareness is crucial for energy saving. Notices/ signage can be displayed near switches, thus reminding students and staff to switch off all electricals when not in use.
17) Encourage to the solar panel electricity generator.
18) It is recommended to measure emissions from diesel generator & ambient air quality at least once a year and results should be compared with Indian Ambient Air Quality Standards.

REFERENCES

- The Environment [Protection] Act – 1986 (Amended 1991) & Rules-1986 (Amended 2010)
- The Petroleum Act: 1934 – The Petroleum Rules: 2002
- The Central Motor Vehicle Act: 1988 (Amended 2011) and The Central Motor Vehicle Rules:1989 (Amended in 2005)
- Energy Conservation Act 2010.
- The Water [Prevention & Control of Pollution] Act – 1974 (Amended 1988) & the Water (Prevention & Control of Pollution) Rules – 1975
- The Air [Prevention & Control Of Pollution] Act – 1981 (Amended 1987) The Air (Prevention & Control of Pollution) Rules – 1982
- The Gas Cylinders Rules – 2016 (Replaces the Gas Cylinder Rules – 1981
- E-waste management rules 2016
- Electrical Act 2003 (Amended 2001) / Rules 1956 (Amended 2006)
- The Hazardous Waste (Management and Handling and Trans-boundary Movement) Rules, 2008 (Amended 2016)
- The Noise Pollution Regulation & Control rules, 2000 (Amended 2010)
- The Batteries (Management and Handling) rules, 2001 (Amended 2010)
- Relevant Indian Standard Code practices
- Internal Records of the Campus

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ANNEXURE – PHOTOGRAPHS

Photo 1 Vice Principal Dr. M V Patil, A. S. Marathe and SBI officers conduct special drive of plantation.

Photo 2 Dr. A S Athawale and Mrs. Manjusha Sawle along with NSS students planting trees on 11 July Population Day

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Photo 3 Assistant Program Officer Dr. A S Athawale and NSS students planting trees on occasion of Wildlife Week.

Photo 4 NSS students planting trees on the occasion of Wildlife Week

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Photo 5 Dr. F M Bagul, Mrs. Manjusha Sawle and Prof. Radhesham Patil with NSS students planting trees on occasion of 16th September Ozone Day

Photo 6 Dr. F M Bagul, Mrs. Manjusha Sawle and Prof. Radhesham Patil with NSS students planting trees on occasion of 16th September Ozone Day

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Photo 7 Dr. Surendra Kambale, Asmit Kambale and students planting trees on hills near Shirpur.

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Photo 8 Dr. S A Athawale and his family members planting trees on foothills of Satpura Range.

Photo 9 Green belt in campus

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Photo 10 Well Ventilated corridor

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Photo 11 Green belt near corridor

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Photo 12 Botanical Garden

Photo 13 Green belt in campus

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Photo 14 Well tube light facility in Classroom

Photo 15 Classroom occupied and receive natural sunlight

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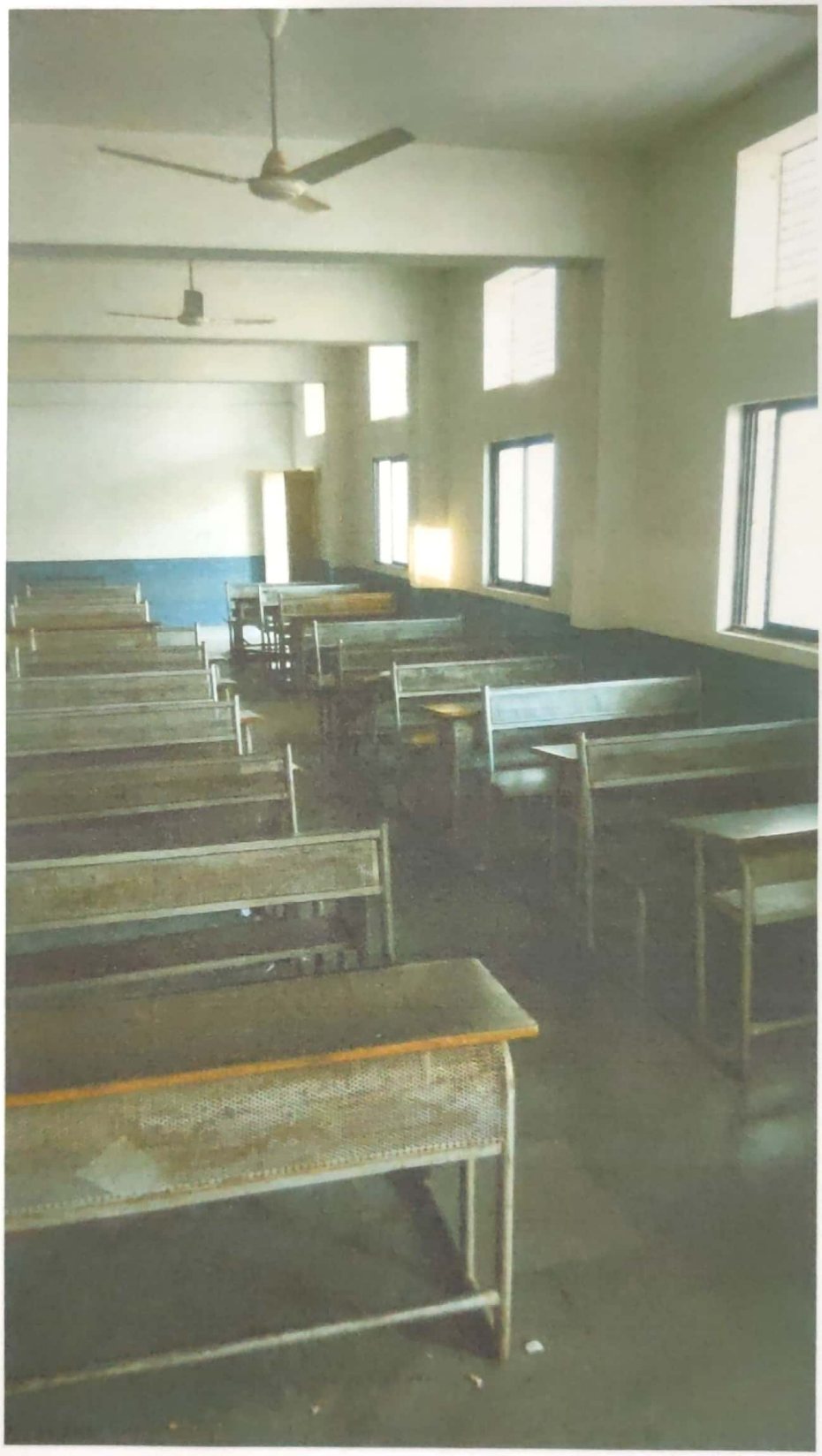

Photo 16 Classroom's ventilation is natural draft through windows

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(Source: WorldView-3 Satellite Images)

Photo 17 Satellite image of college campus.

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