

Energy Audit Certificate

GV/EA/06-23/89

Is awarded for **2021-22** and **2022-23(Analyzed for 2 years)** to the Esteemed Institution

Sufa Educational and Welfare Society's

DSR College of Education

Gut No.17, Sharnapur Railway Crossing, Wanjarwadi, Aurangabad. MS- 431005

As part of the Institution's initiatives for a Healthy & Sustainable College the audit was conducted.
We appreciate the immense efforts taken by Staff and students towards the Energy Management and Conservation.

Issued on **16 June 2023** valid till **June 2024**



Director

Architect, IGBC Accredited Professional, ISO Certified I.A.(IMS) GEM
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GREEN AUDIT

Study Period (TWO YEARS) 2021-22 & 2022-23

Sustainability study

AUDIT REPORT

Studied for

SUFA EDUCATIONAL AND WELFARE SOCIETY'S

D.S.R. College of Education

Gut No:17, Near Sharnapur Railway Crossing, Wanjarwadi Road, Aurangabad. MS - 431005



Studied by

Greenvia
Solutions

Valid till June 2024

Disclaimer

The Audit Team has prepared this report for the **Sufa Educational and Welfare Society's D S R College of Education** Located at Gut No.-17, Sharnapur Railway Crossing, Wanjarwadi, Aurangabad. MS – 431005 based on input data submitted by the College and analyzed by the team to the best of their abilities.

The details have been consolidated and thoroughly studied as per the various guidelines for Green Buildings available in National and International Standards; the report has been generated based on a comparative analysis of the existing facilities and the prerequisites formulated by various standards. The inputs derived are a result of the inspection and research. These will further enhance and develop a Healthy and Sustainable Institution.

These can be implemented phase-wise or as a whole depending on the decision taken by the Hon'ble Management and College. The warranty or undertaking, expressed or implied is made and no responsibility is accepted by Audit Team in this report or for any direct or consequential loss arising from any use of the information, statements, or forecasts in the report.

The audit is a thorough study based on the inspection and investigation of data collected over a while and should not be used for any legal action. This is the property of Greenvio Solutions and should not be copied or regenerated in any form.

Greenvio Solutions

Developing Healthy and Sustainable Environments

We are an Environmental and Architectural Design Consultancy firm

Sustainable Academe is our department for conducting Audits

Palghar District, Maharashtra- 401208

Acknowledgment

The Audit Assessment Team thanks the **Sufa Educational and welfare society's D S R College of Education** for assigning this important work of Energy Audit. We appreciate the cooperation extended to our team during the entire process.

Our special thanks are due to **Dr. Shaikh Ramzan**, Chairman; **Mr. Anwar Husain** Secretary; **Mr. Shaikh Bashir**, Member; and everyone from the Management.

Our heartfelt thanks to the Chairperson of the entire process **Dr. Syed Azaz Ali**, Principal for the valuable input.

We are also thankful to **College's Taskforce and the faculty members** who have collected data required– **Dr. Shaikh Mohammadi**. and **Dr. Syda Qudsiya, Mr. Kakasaheb Randive, Dr. Shirin Riyaz Patel (Special mention for the excellent coordination)**

We highly appreciate the assistance of **Mr. Fazel Ahmed Khan and the entire Teaching, Non-teaching, and Admin staff** for their support while collecting the data.

Sustainable Academe

Brand of Greenvio Solutions, Palghar District, Maharashtra- 401208

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1. Introduction

About the Institution

D S R College of Education has always been a hub of innovative activity and is continuously on the lookout for opportunities to collaborate the industry as with well as other academic institutions the world over.

Innovation and research at the Institute has been given a fillip with the establishment of Centers of Excellence in various areas ranging from Public Policy and Corporate Governance to Insurance to Financial Markets and Risk Management. The D S R College of Education was conceptualized as the University's response to the manpower needs of labor market that was rapidly overtaken by advances in the field of Managements.

A feature that sets apart D S R College of Education from other T-colleges is the carefully selected mix of students with diversity as a stated objective so that students can leverage from each other's experience in addition to theoretical studies in the classroom, thereby creating a truly enriching learning experience.

As the global business scenario gets increasingly complex and dynamic, D S R College of Education prepares students to manage and lead in such dynamic business situations by providing a diverse and challenging environment where they can learn and grow and finally walk out, ready to lead and inspire.

The College has a motto of “*Quality teacher Education for Minority Community*” It provides the Teacher Training program. The College works towards training young men and women to be competent, committed, and compassionate, and lead in all walks of life.

Statements of the Institution

Vision

The institute envisions to *The vision of the College states, 'No Profit No Loss Bases Quality Education for minority community'.*

Mission

The College seeks to realize its Vision with a Mission to:

The mission of Our College is to be a better future for all and to provide innovative educational environment, opportunity and experiences individuals from minority communities

The surrounding premises around the Institution

The Premises is situated amidst the landscape serene **Aurangabad region of Maharashtra state** with immense peace and calmness in the surroundings as there are residential areas around the premises. The location of the College is feasible to the nearby essential amenities such as Public Health Center, Fire Station, Civic body-Public administrative buildings, Recreational gardens, and Police Station which are not too close but nearby.

Assessment of the College

Affiliations and approvals

The College has all its courses **approved by NCTE, recognized by Government of Maharashtra & Affiliated to Dr. Babasaheb Ambedkar Marathwada University.**

Certification

- **AISHE** – The code is c-34380

2. Institution overview

Populace analysis for the Academic year 2021-22

Students data

The student data (shared by the College) shows there were a total of **67 Boys and 46 Girls students**, thus there were **a total of 123 students** on the premises.

Staff data

Type	Male	Female	Total
Admin Staff	2	0	2
Teaching Staff	4	6	10
Non-Teaching Staff	5	2	7
Total Staff Members	11	8	14

The staff data shows the premises had a total of **19** Staff Members.

Populace analysis for the Academic year 2022-23

Students data

The student data (shared by the College) shows there were a total of **57 Boys and 54 Girl students**, thus there were **a total of 111 students** on the premises.

Staff data

Type	Male	Female	Total
Admin Staff	2	0	2
Teaching Staff	13	8	21
Non-Teaching Staff	7	1	8
Total Staff Members	22	9	31

The staff data shows the premises had a total of **31** Staff Members.

Total College Area & College Building Spread Area

The **total site area is 3 acres** and the **total Built-up area of the College is 37,997 sq. ft.** for a **total of 159 footfalls.**

College Infrastructure

Establishment

The college is established in 2003. The college is located pretty close to nature and hence has a very fresh environment which is absolutely pollution free and healthy. The Building is a Reinforced Cement Concrete (RCC) framework building.

Spatial Organization

The overall ambiance of the College is warm and inviting. The classrooms and other Spaces have ample natural ventilation in the form of clear glass windows with fresh air ventilation. The architecture of the building is quite well designed. The color palette not just helps the building to stand out but also provides an Institutional arena. There are provisions for lifts and a staircase for accessibility on the premises, whereas there are amenities such as CCTV, Fire extinguishers, smoke detectors, a first aid box, etc.

Operation and Maintenance of the premises

The interview session was held with the staff regarding the operation and working hours. The Institution is open from Monday to Saturday. The first and third Saturdays are off. The schedule is mentioned below.

S. No.	Section	Spaces	Time	Hours/ day	Days in a year
1	Main Institutional College	Student areas and Teaching faculty	10:00 a.m. to 05:00 p.m.	6	280
2	General areas	Admin areas and library, Passage, staircase, toilet	09:30 a.m. to 05:00 p.m.	7.5	300

3.Green Building Study Audit

About the Green Building Study Audit

It is a systematic study of the aspects which make the Institution a sustainable and healthy premises for its inhabitants.

Analysis of the Green Building Study Audit

The procedure included detailed verification for the following:

Energy Audit

- Analysis of the Lights, Fans, AC, Equipment
- Renewable energy
- Scope for reducing the current energy bills if any
- Improvement in the thermal comfort of the campus

Green Audit

- Green initiatives
- Hygiene audit
- Water Audit - Analysis of the current water consumption of campus; Scope to include Rainwater harvesting and Wastewater treatment on the premises.
- Waste Audit - Current waste produced, its segregation, and usage; Strategies to be adopted for waste management and awareness

Environmental Audit

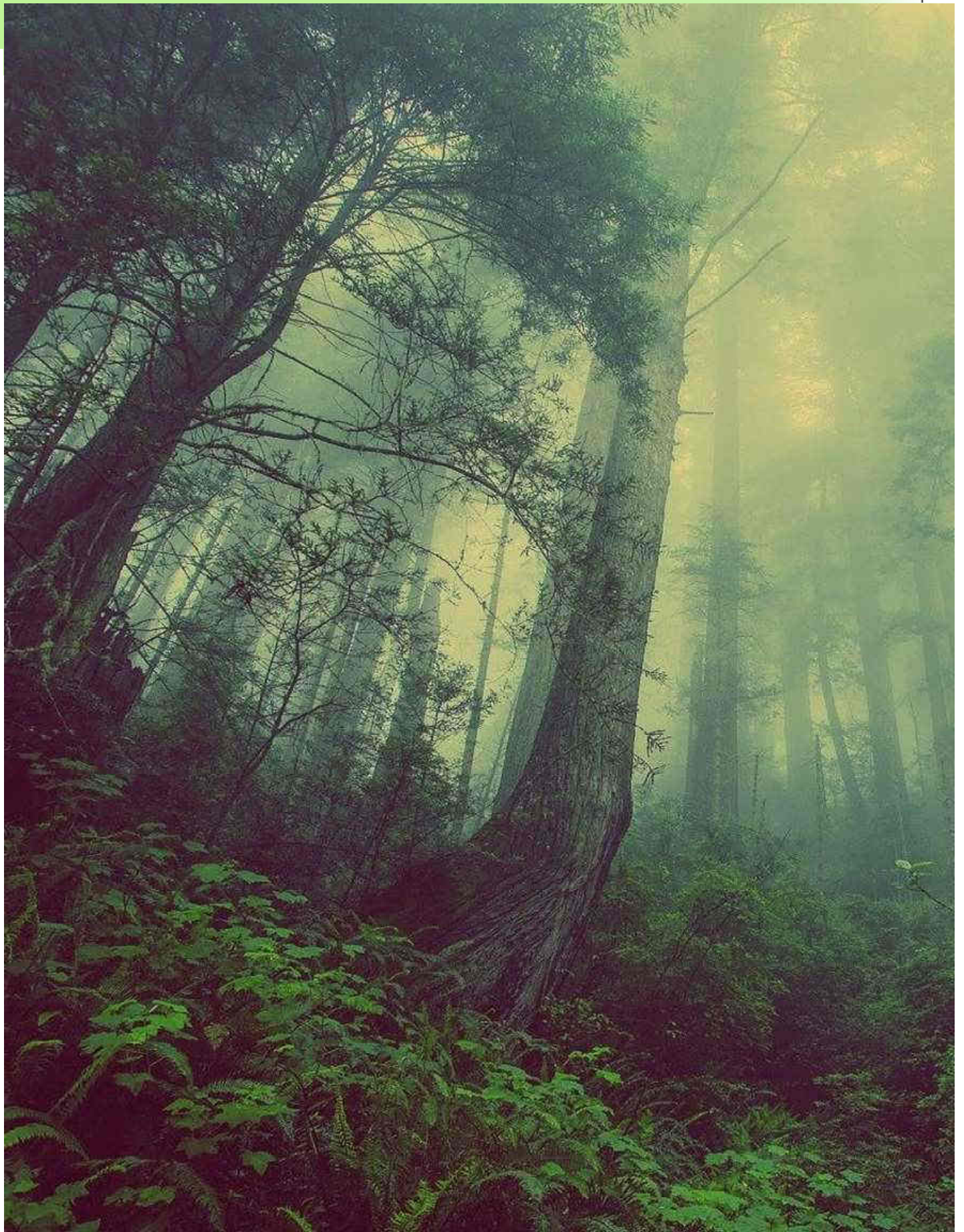
- Analysis of the current landscape of the premises
- Analysis of the flora and fauna of the premises
- Strategies adopted at present to enhance vegetation
- Measures that can be adopted for ecological improvement of the premises.

Strategy adopted for Green Building Study Audit

The strategies included data collection from the admin department, actual inventory, investigation to check the operation and maintenance, analysis of the data collection, and preparation of the Report.

Timeline of the activities for the Green Building Study Audit

- | | |
|----------------|---|
| • 02 May 2022 | – Allotment and Initiation by the College |
| • 23 May 2022 | – Induction Meeting |
| • 31 May 2022 | – Data submitted by College |
| • 09 June 2022 | – Submission of the Repo |



1. Green Practices Audit

The increasing global warming and climate change have made us realise that apart from the enormous strategies the individual small efforts need to be taken by individuals and Educational Institutes as the younger generations are the future of the world and once they are taught about these practices only then can we assume a better future.

Green practices

We observed the following points during the Site investigation and data verification of the premises; these are common for all the Buildings on the premises.

- **Architecturally planned and designed landscaped garden spaces.**
- There is the **availability of open space on the premise in addition to the provision of multiple varieties of flora.**
- The students and college authorities **jointly conduct initiatives for upgrading the premises from an environmental view.**
- **Lectures/workshops conducted on green practices and green infrastructure.**

Community development

The College has an Team that conducts initiatives for the upliftment of the rural community in nearby areas. The various community development programs conducted include Tree Plantation, Life Learning, Employability Skill program introduced for the youth, Blood Donation Camp, Food Kit Distribution Program to the neighborhood community, and Relief fund programs.

A lot of efforts are involved right from planning to execution. The main motive behind these is social welfare. This kind of thought process is highly admirable. We respect and congratulate the Institute for the same.

Eco-friendly initiatives undertaken

The Institution has undertaken the following initiatives through **excellent efforts** toward saving environment measures. The data has been documented as presented below:

- **Tree Plantation event is conducted at campus on 15. August 2021**
- **Outdoor Tree Plantation event is conducted at Wanjarwadi village -05-09- 2021**
- **Tree Plantation Event is conducted at DSR College on 19.08.2021**

It is very much evident that the College takes full efforts to spread awareness and provide outreach for sections of events such as Gender Equality, Health, Eco-efficiency, and National significance. However, due to the lockdown more social events could not take place.

Recommendations for a Sustainable Habitat Solutions

a) Plant as a gift

As a kind gesture, the guests visiting the premise can be asked to plant a small plant on the premise itself and they can be even given plants/bouquets from the flowers of the plants on the premise as a gift.

b) Environmental awareness

There can be various artworks on the compound wall giving the message of saving the environment through the joint efforts of the students and staff thereby making the student socially and environmentally responsible citizens.

c) Tree adoption scheme

The college can adopt the One Faculty – One tree adoption scheme which is one of its kind practice, this can be very beneficial, especially during the summer season.

d) Signages on the plants mentioning scientific names

The practice of having the names of each plant and tree will provide awareness among the staff and students.

Waste Audit

Background reference image Polina Tankilevitch on pexels

2. Waste Audit

Waste is an inevitable part of our lives. Over the years the awareness about waste management techniques has given a rise to rethink how the waste can be avoided being sent to the landfills. The audit provides an approximation of the types of waste generated, location of waste collections, disposal techniques used, waste segregation methodologies adopted, and waste management strategies that are implemented in addition to the newer ways that can be adopted aiming to make the premise clean and sustainable. Here sustainability refers to a broader aspect to analyse whether the current techniques are having a positive or negative effect on the stakeholders of the premises.

Waste produced

Types and disposal of waste on premises

The types of waste and their current practice are summarized below:

S. No.	Type of waste	Source and quantity	Current Disposal method	Can be treated/ recycled?	Methodology
1	Solid waste	Toilets–Biodegradable waste of 15-20 kg per week	Led in the storm water drains	Yes	TREATED - Small biogas plant can be proposed in open space
2	Paper waste	Newspaper and other paper	Sold to vendor	Yes	CONTINUE - with the current practice
3	E-waste	Computers - Non-biodegradable waste as per the annual year usage	Given to vendor	Yes	CONTINUE - with the current practice
4	Dry waste in form of leaves	Open space & plantations, papers - Non-biodegradable waste of 8-10 kg per week	Municipality	Yes	TREATED – A common pit can be set up
5	Liquid waste (Black-grey)	Toilets, washbasins – Around 100 – 120 liters per week during general times and 50 liters at present	Led in the storm water drains	Yes	TREATED – A treatment plant can be setup
6	Organic regular waste	Dust, and dirt usually dry waste from Canteen and all sources – approx. 3 to 5 kg	Vermicompost	Yes	TREATED – A common pit can be set up
7	Bio-waste	Sanitary pads	Dustbins and Municipality	Yes	TREATED – An incinerator and vending machine

Table 4: Summary of the types of waste produced on the premises

Bins summary

There are 14 Dustbins on the premises with a volume of 7 liters (small) and more than 30 liters (large-sized). The material of the bins is plastic. The analysis of dustbins is presented below.

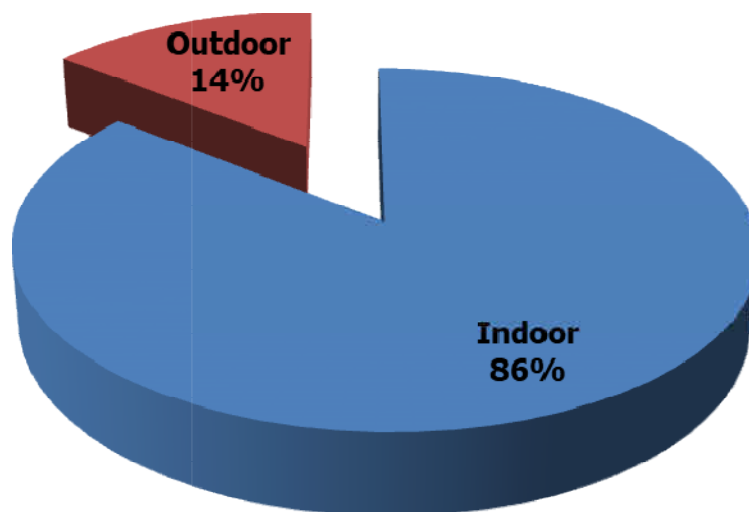


Figure 1: Analysis of dustbins location wise in the premises

The above analysis shows that **86% are present indoors and 14% outdoors.**

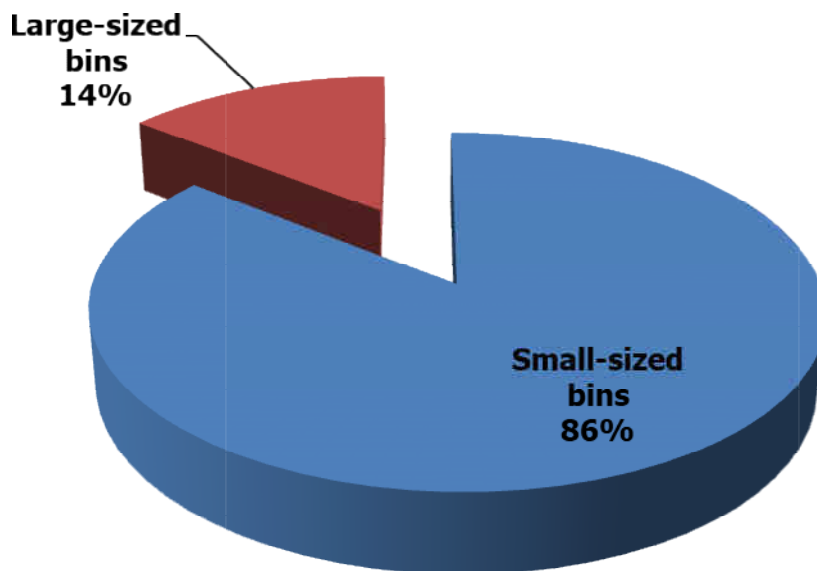


Figure 2: Analysis of dustbins size-wise in the premises

Among the dustbins that are present in the indoor areas, **86% are small-sized bins** and **14% are large-sized bins.**

Waste handling

Quantification wise as per Interview and survey it was found the following type of waste is Solid, Liquid, Hazardous Waste, Dry leaves, E-Waste, Canteen waste, and Unused Equipment waste is collected. The waste produced on-premises is segregated. It is collected every week. The waste is handed over to the local municipality van.

Waste management

The following practices are adopted on the premises at present.

- The College reuses the papers.
- Ample measures are taken to maintain hygiene.
- No smell problems or health-related issues due to the waste are there.
- There are adequate numbers of bins present in all parts of the building.
- The waste does not pollute the ground or surface water.
- There is no problem of air pollution from waste as informed.
- The wastes from toilets are discharged to main drains through underground covered channels (Safety Tanks), then to STP & WTP thus avoiding any incident.
- **Vermi compost project is done at institute compost. 12X4X2 ft. HDPE Sheet is used for this.**

As per our analysis, the current practices are good, however, there is scope for improvement.

Recommendations for a Sustainable Habitat

a) Zero Waste practice adoption

The College can undertake a zero organic waste protocol. The following practices can be adopted as part of the same.

- The food waste generated by the students and staff is taken by them to their own homes, so that, minimum waste is generated inside the premises.
- The organic waste generated in the canteen is used as feed for a biogas plant and the biogas is used as fuel in the College canteen.

- Vegetable waste and other leaf litter can be used to feed in the vermicompost pit and the resulting vermin cast is used as manure in the garden.
- The chemicals from the laboratories are disposed of in a sealed tank along with water so that the chemicals undergo neutralization with the water.

As part of the above, there will be a requirement for a Biogas plant, vermin-compost pit, awareness signages, sealed tank for wastewater from the chemical laboratory.

- b) Incinerators** - The Incinerators should be installed in Girl's toilets for disposal of sanitary napkins
- c) Signages** - Messages about avoiding wastage should be placed at appropriate locations.
- d) Material of the dustbin** - The current plastic dustbins should be replaced with eco-friendly material.

Water Audit



Background reference image Vlad Chetan on
pexels

3. Water Audit

Water is one of the basic needs. Pure drinking water is a resource that needs to be preserved efficiently. A water audit helps to identify the sources of water consumption, and the water requirement by the premises is met by these sources. The points and effective usage without any wastage. Understanding the techniques which are best suited to the site to increase water conservation in terms of awareness and practice.

Water availability and consumption

Sources of Primary watersupply

The College requires water from the Local Municipality for drinking water purposes. There are 3 water tanks of 1,000 litres each on Terrace. Thus, 3,000 litres water capacity water tank is available.

Sources of Secondary watersupply

The college uses the following sources of water supply for secondary usages such as watering plants, kitchen, toilets, and wash basins connected to the labs and other spaces. The specific sources is **1 borewell which is available on the site.**

Water requirement

The main areas of water requirement and type of usage are as follows

- **Drinking water** – Consumption of around 2,000 liters of water through RO water plant available on the premise, the taps, and water cooler.
- **Toilet blocks**– General usage by occupants in toilets, urinals, bathrooms, and washbasins using approx. 1,000 liters of water daily
- **Cleaning of the premises** – The entire Institution is very well maintained concerning hygiene and cleaning is one of the major uses of water requirement. The toilet areas are cleaned twice daily.
- **Garden and surrounding open space** – Cleaning, and watering the plants require approximately more than a good amount of water, keeping in mind the scale of the open spaces there is a supply system connected directly, and the

plants and trees are hardly watered regularly. Though they are watered on alternate days in the winter season and about 2-3 times a day in the summer season on a regular climate day it is watered 3 days a week and in the rainy season, it is dependent on the monsoon showers. The regular tap and a pipe system are practiced at present.

Areas of water usage

Based on the inventory done and data shared by the staff it was found that the premise has the following facilities:

- Urinals – 10 Nos.
- Toilets – 08 Nos.
- Washbasins – 03 Nos.
- Taps (Indoors) – 07 Nos.
- Taps (Outdoors) – 03 Nos.

As per the data shared by the College and on-site observation, it was noted that there is no water wastage of water in the form of Cleanliness of toilets.

Site investigation about water management.

The College has an excellent management system which is very appreciable. We have observed the following points.

- There is **no water leakage in the entire premise;** the pipes are well maintained with adequate hygiene.
- **The premise has efficient water management in terms of operations and maintenance.**
- The toilets are kept very tidy and are cleaned every day.
- The **wastewater does not mix with groundwater and gets directed to storm-water drains.**
- There is a sufficient number of taps on the premise.

Recommendations for a Sustainable Habitat

Below mentioned are a few suggestions for better water management practices in the premise.

a) Universal Toilet

At least 1 toilet should be made specially-abled as per universal design norms.

b) Wastewater from toilets

This should be collected and a wastewater treatment plant can be installed in the open space wherein this water can be treated and reused for gardening and toilet flushing.

c) Signages

Messages about avoiding water wastage should be placed at appropriate locations.

d) Waterless urinals

There can be the provision of waterless urinals as a Green Building initiative in the premise, either the existing ones can be replaced with such a facility or new toilets can be constructed in this manner.

Health & Hygiene Audit



Background reference image Curology on unsplash

4. Health and Hygiene Audit

Hygiene is a part and parcel of our daily life. It is extremely essential to keep the surroundings clean in the same manner as we would want our houses to be. Educational Institutes have a bigger role to play to affect the young minds positively through better hygienic practices.

Facilities available

The Institution has the following facilities as part of the premise.

- Washroom facility in each of the buildings.
- Hand wash facility
- Drinking water facility in the form of Water coolers and taps
- Ample number of dustbins on the premise

Smoke Exposure

As per the Site visit, the following analysis **has a positive impact on-premises.**

- The College has No Smoking on its compound wall as part of the awareness.
- The canteen uses Gas cylinders for cooking, there is no utilization of firewood. Thus **there is no smoke from the burning of firewood and any health issues related to the same.**
- The **garbage on-premise is not burnt** and there is no air pollution because of it.
- The Institution is a tobacco and smoke-free campus which helps in adapting to a Healthy Institution
- There is parking provision inside the campus there is a slight issue of dust owing to the same but it is **balanced with the good vegetation on the premise.**

Hygiene

As per the Site visit, the following analysis **has a positive impact on-premises.**

- For the overall hygiene of the students and staff, there are facilities such as a Washroom facility on the ground floor and hand washing. The hygiene of the toilet

areas is well maintained. **The entire premises are cleaned twice daily. It is very appreciative that there is only a few Maintenance staff who strive their best to take care of the entire premise in the most excellent way possible.**

- The staffs keep a regular check on the operation and maintenance of the equipment on each floor.
- Water management initiative with appropriate hygiene is undertaken. The areas of water tanks on-site on the ground floor are clean and no mosquito breeding spots are there.
- There is a pest controls program practiced with appropriate sanitation facilities done by a local municipality on a seasonal basis to avoid seasonal diseases.
- The food premises and equipment are cleaned as per schedule with special care taken to avoid any water stagnation. The food waste and other refuse are removed periodically from food handling areas to avoid accumulation.
- As part of the Tree Plantation program, the initiative of **Swachh Bharat Abhiyan of Govt. of India** is undertaken on various occasions.
- There are appropriate storage areas that are well maintained.

On-site investigation

During the physical verification of the site, the following points were noted.

- All the facilities are cleaned daily.
- The Maintenance staff is allotted the responsibility of the washroom hygiene and they do a very commendable and excellent job to maintain the hygiene of the premise.

Recommendations for a sustainable habitat

As per site verification for this audit, the efforts of the College are highly appreciable as they are very well maintained. However, the college should practice having provisions for sanitary vending machines and incinerator machines.

On-site investigation and physical verification
Facilities related to water and waste practices in the premises



5. Towards a Healthy & Sustainable Institution

Recommendations based on the study

In addition to the recommendations provided in each section; the College can adopt the following strategies for Healthy and Sustainable Institution practices.

- a) **Cutlery in the Canteen** – The regular plastic and steel plates, and spoons used in the Canteen can be replaced with eco-friendly/ organic leaves, paper straws, disposable plates, and edible spoons made out of sugarcane waste or bamboo.
- b) **Eco clubs** – There can be an eco-club with students working on pilot projects toward the environment and surrounding up-gradation.
- c) **Terrace farming** - There can be a provision for terrace farming; this would enhance the biodiversity, increase awareness, and food grown can be used in Canteen.
- d) **Signages** – In addition to the signages being in regular language there can be additional signages in braille language for the specially-abled students.

6. References

1. Uniform Plumbing Code – India, 2008
2. IGBC Green Existing Buildings – Operation & Maintenance (O&M) Rating system, Pilot version, Abridged Reference Guide, April 2013
3. IGBC Green Landscape Rating system, March 2013
4. BOMA Canada Waste Auditing Guide, Best Environmental Standards, BOMA BEST – Canada
5. Used only for understanding Universal design - Universal Accessibility Guidelines for Pedestrian, Non-motorized vehicle and Public Transport Infrastructure – Report guidelines by Samarthyam (National center for Accessible Environments) – an initiative supported by Shakti Sustainable Energy Foundation.
6. U.S. Energy Information Administration



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Disclaimer

The Audit Team has prepared this report for the **SUFA EDUCATIONAL AND WELFARE SOCIETY'S D S R College of Education** located at Gut No:17, Near Sharnapur Railway Crossing, Wanjarwadi Road, Aurangabad based on the data submitted by the College and analyzed by the team to the best of their abilities. The details have been consolidated and thoroughly studied as per the various guidelines for Green Buildings available in National and International Standards; the report has been generated based on a comparative analysis of the existing facilities and the prerequisites formulated by various standards. The inputs derived are a result of the inspection and research. These will further enhance and develop a Healthy and Sustainable Institution. These can be implemented phase-wise or as a whole depending on the decision taken by the Hon'ble Management and College. The warranty or undertaking, expressed or implied is made and no responsibility is accepted by Audit Team 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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Greenvio Solutions

We are an Environmental and Architectural Design Consultancy firm
Maharashtra- 401208

Acknowledgment

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Our heartfelt thanks to the Chairperson of the entire process **Dr. Syed Azaz Ali**, Principal, for the valuable input.

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Sustainable Academe

Brand of Greenvio Solutions, Palghar District, Maharashtra- 401208

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1. Introduction

About the Institution

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Innovation and research at the Institute has been given a fillip with the establishment of Centers of Excellence in various areas ranging from Public Policy and Corporate Governance to Insurance to Financial Markets and Risk Management. The D S R College of Education was conceptualized as the University's response to the manpower needs of labor market that was rapidly overtaken by advances in the field of Managements.

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The College has a motto of ***“Quality teacher Education for Minority Community”***. It provides the Teacher Training program. The College works towards training young men and women to be competent, committed, and compassionate, and lead in all walks of life.

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Vision

The institute envisions to *The vision of the College states, 'No Profit No Loss Bases Quality Education for minority community'.*

Mission

The College seeks to realize its Vision with a Mission to:

The mission of Our College is to be a better future for all and to provide innovative educational environment, opportunity and experiences individuals from minority communities

The surrounding premises around the Institution

The Premises is situated amidst the landscape serene **Aurangabad region of Maharashtra state** with immense peace and calmness in the surroundings as there are residential areas around the premises. The location of the College is feasible to the nearby essential amenities such as Public Health

Center, Fire Station, Civic body-Public administrative buildings, Recreational gardens, and Police Station which are not too close but nearby.

Assessment of the College

Affiliations and approvals

The College has all its courses **approved by NCTE, recognized by Government of Maharashtra & Affiliated to Dr. Babasaheb Ambedkar Marathwada University.**

Certification

- **AISHE** – The code is c-34380

2. Institution overview

Populace analysis for the Academic year 2021-22

Students data

The student data (shared by the College) shows there were a total of **67 Boys and 46 Girls students**, thus there were **a total of 123 students** on the premises.

Staff data

Type	Male	Female	Total
Admin Staff	2	0	2
Teaching Staff	4	6	10
Non-Teaching Staff	5	2	7
Total Staff Members	11	8	14

The staff data shows the premises had a total of **19** Staff Members.

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The staff data shows the premises had a total of **31** Staff Members.

Total College Area & College Building Spread Area

The **total site area is 3 acres** and the **total Built-up area of the College is 37,997 sq. ft.** for a **total of 159 footfalls.**

College Infrastructure

Establishment

The college is established in 2003. The college is located pretty close to nature and hence has a very fresh environment which is absolutely pollution free and healthy. The Building is a Reinforced Cement Concrete (RCC) framework building.

Spatial Organization

The overall ambiance of the College is warm and inviting. The classrooms and other Spaces have ample natural ventilation in the form of clear glass windows with fresh air ventilation. The architecture of the building is quite well designed. The color palette not just helps the building to stand out but also provides an Institutional arena. There are provisions for lifts and a staircase for accessibility on the premises, whereas there are amenities such as CCTV, Fire extinguishers, smoke detectors, a first aid box, etc.

Operation and Maintenance of the premises

The interview session was held with the staff regarding the operation and working hours. The Institution is open from Monday to Saturday. The first and third Saturdays are off. The schedule is mentioned below.

S. No.	Section	Spaces	Time	Hours/ day	Days in a year
1	Main Institutional College	Student areas and Teaching faculty	10:00 a.m. to 05:00 p.m.	6	280
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3.Green Building Study Audit

About the Green Building Study Audit

It is a systematic study of the aspects which make the Institution a sustainable and healthy premises for its inhabitants.

Analysis of the Green Building Study Audit

The procedure included detailed verification for the following:

Energy Audit

- Analysis of the Lights, Fans, AC, Equipment
- Renewable energy
- Scope for reducing the current energy bills if any
- Improvement in the thermal comfort of the campus

Green Audit

- Green initiatives
- Hygiene audit
- Water Audit - Analysis of the current water consumption of campus; Scope to include Rainwater harvesting and Wastewater treatment on the premises.
- Waste Audit - Current waste produced, its segregation, and usage; Strategies to be adopted for waste management and awareness

Environmental Audit

- Analysis of the current landscape of the premises
- Analysis of the flora and fauna of the premises
- Strategies adopted at present to enhance vegetation
- Measures that can be adopted for ecological improvement of the premises.

Strategy adopted for Green Building Study Audit

The strategies included data collection from the admin department, actual inventory, investigation to check the operation and maintenance, analysis of the data collection, and preparation of the Report.

Timeline of the activities for the Green Building Study Audit

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4. Site Study

The following listed are some of the positive site elements which are beneficial to the college in terms of tangible and intangible benefits.

- **Location** - The DSR College of Education is located at Gut no 17, Sharnapur Railway Crossing, Wanjarwadi Aurangabad Maharashtra 431005.
- **Neighborhood context** - The premises are surrounded by open spaces and Residential, Commercial, and Educational areas in the immediate surroundings of the site.
- **Natural physical features** – The premises includes rich biodiversity and a good number of plants in the adjacent open space. The site does not have a major difference in the land levels (contours).
- **Manmade features** – The premises are situated in an Rural area amidst areas and open spaces with appropriate proximity to necessary amenities. There is sufficient appreciation space for the entrance. The materials used for construction are RCC and the landscaping includes innumerable natural trees as well as potted plants.
- **Circulation** – There is a smooth transition of pedestrian traffic inside the premises due to the large entrance gate and the huge open space where vehicles of students and staff are parked.
- **Climate** – Aurangabad has a tropical climate. In winter, there is much less rainfall than in summer. According to Köppen and Geiger, this climate is classified as Aw. The average annual temperature in Aurangabad is 24.3 °C | 75.7 °F. The annual rainfall is 1200 mm | 47.2 inches.



5. Ecological (Environmental) Audit

The environment is an essential part of human survival. We co-exist with the environment and it cannot be termed as a separate entity. The Ecological audit helps to understand the flora, and fauna that exists and steps that can be taken to improve the same. To denote if there are problems related to sound in and around the surrounding. In terms of the carbon footprint, it helps in keeping a tab on the eco-friendly habits incorporated by the inhabitants of the premises. Health today is the topmost priority and a general understanding of the initiatives undertaken along with sufficient hygiene practices adopted. The universal design applies to all built and inbuilt spaces.

As part of our study, we could state that the Institution has developed eco-friendly practices and sustainable solutions which are well reflected in the rich biodiversity of the Premises. Being situated near the city the appreciation space towards the main entrance provides a welcoming approach to the College.

Open Space

The college has an open space used by all. The students use it as a leisure place for study and the college ground is used for sports activities. There are ample resting spaces as part of the building design which provides a resting and warm welcoming approach on the premises.

Flora audit

A flora survey was carried out to identify the total number of plants and trees.

The landscape area has a variety of plantations constituting hundreds in numbers. Most of the trees have been planted by students, staff, management, Principal non-teaching staff, and office staff on several occasions and also during the plantation drives. **A few trees have grown naturally and have been conserved at their respective locations to maintain the beauty of the premises.** The detailed study of each type of plantation is as follows.

S. No.	Plant Name	Type	Nos.	Planted by
1	Coconut	Tree	04	Chairman
2	Guava	Tree	03	Chairman

3	Badam	Tree	10	Chairman
4	Jambhul	Tree	01	Chairman
5	Gulmohor	Tree	02	Chairman
6	Ashoka	Tree	02	Chairman
7	Raintree	Tree	07	Chairman
8	Tamarind	Tree	01	Chairman
9	Mango	Plant	17	Chairman
10	Neem (Azadirecta Indica)	Tree	05	Chairman
11	Nilgiri	Tree	01	Chairman
12	Peeples- Ficus	Tree	01	Chairman
13	Saptparni	Tree	11	Chairman
14	Fycus bush	Shrubs	07	Chairman
15	Golden Duranta	Shrubs	12	Chairman
16	Banana	Shrubs	01	Chairman
17	Papaya	Shrubs	03	Chairman
18	Sagvan	Tree	12	Chairman
19	Bamboo	Tree	14	Chairman
20	Olive	Tree	02	Chairman

Table 4: Details of the Trees on the premises

At present, there are 20 types and 109 numbers of plantations on the premises. The benefits of having trees on the premises are innumerable, some of the key benefits are providing shade, reduction in noise pollution by acting as noise barriers and maintaining the silence zones, interactive outdoor learning spaces, lowering the stress levels by staying connected with the nature, and the use of dried leaves to for organic composting.

Noise Audit

Macro level

On a macro level, there are open grounds on the site. The approach road however has some traffic. As the college is oriented amidst the residential areas with sufficient vegetation the noise levels do not affect the students and staff in their day-to-day functioning. The approach road is pretty away. **Overall the noise level in terms of bad effects is moderate and there are positive outcomes as per our analysis on a macro level.**

Micro-level

The college has an adequate open space covered with huge trees prevailing naturally on the premises which act as a noise barrier; in addition, the Institution building is surrounded by Residential Buildings which further act as a benefit in reducing any noise pollution. There is no particular equipment that causes any noise effect. **Overall the noise levels inside the premises are low which is a good approach.**

Carbon Footprint Audit

Eco-friendly Commuting Practices

Based on data collection and discussion with staff the following points were noted:

- **Ease of commuting** – Owing to the proximity to public transport the access is very feasible and walkable.
- **Parent's commute** - There are 2 Parent-teacher meetings held in a year and the turn-out is around 40-60%
- **Commute details** – The students and staff commute from multiple places. The details are summarised below.

Distance from College	Student	Staff
Within 5Km	40	10
Beyond 5Km	13	0

Table 5: Details of the places students and staff commute from

Heat Island Reduction

The Institution has **adopted the following practices which are yielding positive results** in terms of the Urban Heat Island Effect which refers to an increase in temperature of the surroundings because of ineffective strategies.

- **Exposed roof areas** – The terrace is a flat roof that is absolutely clean and well maintained. There was no weathering of the roof observed. The current practices are well maintained.
- **Exposed non-roof hard scape areas** - There are pathways with natural and potted plantations which act as a buffer and help keep the harmful effects due of the urban heat island effect under control.

There are adequate measures adopted on the premises to reduce the heat island effect of Building roofs and on the site.

Outdoor Light Pollution Study

The college compound lights are not upward-looking thus, these do not cause light pollution.

Universally accessible premises

As per World Report on Disability, 2011 there are 180 million approx. Persons with Disabilities make it 15% of the total population of India.

There are ramps, handrails along the staircase, and low height risers in the staircases as part of universally accessible premise initiatives. The design of the premises is appropriate for access with corridors being wide enough in size. The doubly and singly loaded corridors are safe from the fire safety aspect.

Fire Safety

The Institution has undertaken adequate fire safety measures. Each floor has an open staircase without any barriers and fire extinguishers for fire safety measures. These staircases are free of any kind of storage or combustible material. **Our observation was that there are good measures adopted, however, measures such as sprinkler system, smoke detector, hydrant system, and fire safety specific signages should be present on the premises.**

Positive site features as per our study

a) Avoid using plastic on-premises

There are provisions for a ban on the use of plastic bags or products on the Premises.

b) Paperless technologies

The college has gone technology-friendly and paperless in the functioning of the Premises.

c) Avoid using plastic in premise

There are provisions for a ban on the use of plastic bags or products on the Premise.

d) Ample greenery

There are provisions for the garden and plenty of traditional trees on the premises.

e) User-friendly mobility on-premises

There are provisions for Ramp near the main entrance of the Building premises, also low height handrail for ease of access.

Recommendations for a Sustainable Habitat

Site beautification

a) Low VOC Paints and Adhesives

Whenever the College undergoes repairs or renovations there should be the use of materials with low emissions to reduce the adverse health impacts on workmen and the students occupying the space thereafter.

b) Additional facilities for birds

There can be provision for drinking water and food facility for birds visiting the College premise.

c) Nutrition pits

Certain pits can be demarcated as 'Nutrition pits' where the organic food from the kitchen and Canteen fruit peels and fruits or vegetables can be degraded for making nutrition-rich soil

Heat island reduction

a) Cool rooftops

It is suggested that the College gets the Terrace roofs painted with Cooltop as it will help reduce the temperature of the spaces.

b) Grass pavers in the setback areas

The college can have grass pavers in replacement to existing paving for further heat island reduction on exposed non-roof areas

Universally accessible premises

a) Universal Toilet

There should be a minimum of 1 toilet for the specially-abled people as per guidelines prescribed by the National Building Code 2016 with size being a minimum of more than 1.5m x 1.5m

b) Resting places

There should be increased provision for resting places on-premises outdoor and indoors.

Pollution Control

a) Promote the use of Eco-friendly vehicles

There can be provision for battery-operated vehicles/ low emission vehicles such as electrically driven vehicles parking in open spaces along with battery charge points, this would inspire students to change their mode of transportation and adopt sustainable practices.

b) Bicycles as a gift

As an appreciation gesture maybe the student's toppers/ staff best performers can be awarded a bicycle occasionally.

Smart and responsible environment systems

a) Smart Gardening System

The College can undertake a Smart Gardening system using Technology such as an automated watering system. This will result in saving time by scheduling time for watering; Saving money and water as smart irrigation systems have automated water schedules in addition to tracking dampness of soil which helps the irrigation system know when and how much the garden needs. It also helps in healthier plants as with the help of apps, smart irrigation systems, or even smart growing containers, these tasks can be provided evenly and allow the plants to be healthier and more productive.



On-site investigation and physical verification

The ecologically friendly ambience with facilities such as parking, greenhouses and gardens



2. Towards a Healthy & Sustainable Institution

Recommendations based on the study

In addition to the recommendations provided in each section; the College can adopt the following strategies for Healthy and Sustainable Institution practices.

- a) **Cutlery in the Canteen** – The regular plastic and steel plates, and spoons used in the Canteen can be replaced with eco-friendly/ organic leaves, paper straws, disposable plates, and edible spoons made out of sugarcane waste or bamboo.
- b) **Eco clubs** – There can be an eco-club with students working on pilot projects toward the environment and surrounding up-gradation.
- c) **Terrace farming** - There can be a provision for terrace farming; this would enhance the biodiversity, increase awareness, and food grown can be used in Canteen.
- d) **Signages** – In addition to the signages being in regular language there can be additional signages in braille language for the specially-abled students.



3. References

1. Uniform Plumbing Code – India, 2008
 2. IGBC Green Existing Buildings – Operation & Maintenance (O&M) Rating system, Pilot version, Abridged Reference Guide, April 2013
 3. IGBC Green Landscape Rating system, March 2013
 4. BOMA Canada Waste Auditing Guide, Best Environmental Standards, BOMA BEST – Canada
 5. Used only for understanding Universal design - Universal Accessibility Guidelines for Pedestrian, Non-motorized vehicle and Public Transport Infrastructure – Report guidelines by Samarthyam (National center for Accessible Environments) – an initiative supported by Shakti Sustainable Energy Foundation.
 6. U.S. Energy Information Administration
-



Energy Audit Certificate

GV/EA/06-23/89

Is awarded for **2021-22** and **2022-23(Analyzed for 2 years)** to the Esteemed Institution

Sufa Educational and Welfare Society's

DSR College of Education

Gut No.17, Sharnapur Railway Crossing, Wanjarwadi, Aurangabad. MS- 431005

As part of the Institution's initiatives for a Healthy & Sustainable College the audit was conducted.
We appreciate the immense efforts taken by Staff and students towards the Energy Management and Conservation.

Issued on **16 June 2023** valid till **June 2024**



Director

Architect, IGBC Accredited Professional, ISO Certified I.A.(IMS) GEM
Certified Professional (Regn. No. 22/718)

Project Head and Green Building Professional-Consultant

Sustainable Academe

Sustainability Department of Greenvio Solutions, Naigaon

An environment Design and Consultancy developing Healthy and Sustainable Environments

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ENERGY AUDIT

Study Period(TWO YEARS) 2021-22 & 2022-23

Sustainability study

AUDIT REPORT

Studied for
SUFA EDUCATIONAL AND WELFARE SOCIETY'S

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4. Energy Audit

Sources of Energy consumption

The sources of energy consumption in a building comprise Lighting, Refrigeration, Ventilation, Cooling, Computers, Office equipment, cooking, space-heating, water heating, and others.

For study purposes, the sources are divided into primary and secondary sources, where the primary is considered for the generation and consumption purposes and secondary Sources are additional sources used as an alternative backup. The study emphasizes the consumption patterns, strategies adopted at present, and recommendations that can be implemented to improve the power consumption and utilization pattern.

Primary sources

These are the sources that are consumption and production

- **Electrical (Metered)** – This source studies the elements which are connected through a metered system of electrical consumption. Light, fans, air conditioners, equipment, and pumps are the consumers that comprise this category.
- **Renewable (Solar or other)** – There are no energy sources available at present.

Secondary sources

The college is located in an urban area and has minimal to zero power cuts, thus there are rare secondary sources of energy supply at present.

Inverter, UPS – These are utilized in the administrative areas and are used for 5 hours in a month. .

Site investigation analysis

The data investigated and collected through interviews are summarized below:

- The **switch-off drills are practiced at present**, and the maintenance staff and Lab Attendants put off switches of all equipment regularly.
- All the **computers are shut off after use** and also put on power-saving mode.
- There are **Ultra-violet lights used only in the scientific labs for experiment purposes, apart from these any other harmful lights used** in the premise.

Utility bill audit

Actual Billed Electrical Consumption

The admin department had shared the bills for the Meters connected to Buildings which is the main source of energy supply. The supplier is Maharashtra State Electricity Distribution Limited.

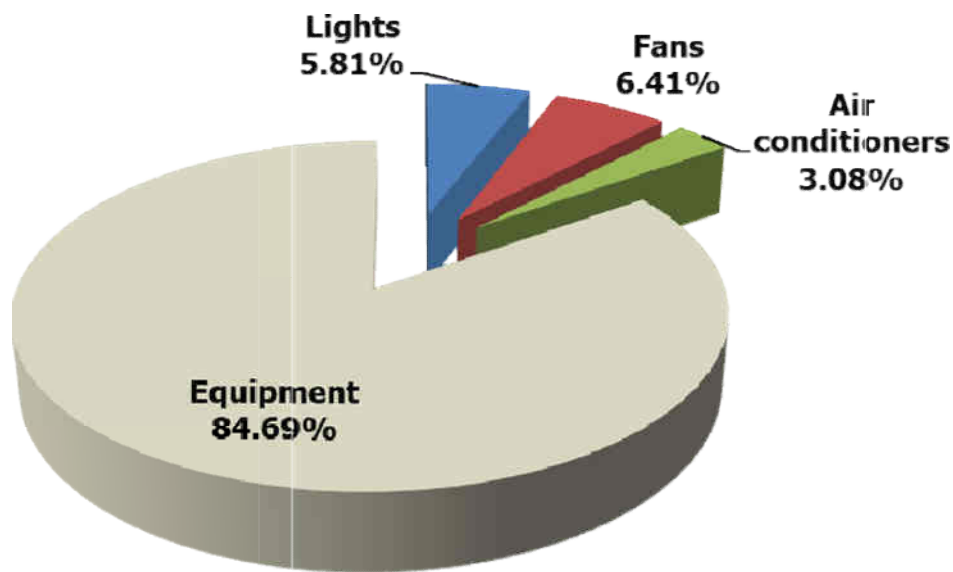
Sr. No.	Month	Units Consumed	Amount
1	May-23	718	1,2989.00
2	Apr-23	698	4,822.00
3	Mar-23	709	5,910.00
4	Feb-23	413	3,955.00
5	Jan-23	593	5,851.00
6	Dec-22	611	5,081.00
7	Nov-22	765	5,758.00
8	Oct-22	719	5,690.00
9	Sep-22	682	4,937.00
10	Aug-22	693	4,122.00
11	Jul-22	563	6,428.00
12	Jun-22	513	6,911.00
Total		7,677	72,454.00

The above data was studied further and thus it was found that the amount spent by the College on outer electrical supply was **Rs. 72,454/- annually for 7,677 units. On an average (monthly basis) Rs. 6,038/- was spent for 640 units.**

Calculated Electrical Consumption as per inventory

The electricity bills provide actual consumption data. The following is the calculated consumption. It is done to understand the percentage of energy usage in the premises by various applications. It is based on the inventory collection and interviews with the staff. The additional data such as wattage is taken from market research. In terms of electrical consumption, the main sources are lights, fans, air conditioners, and equipment. The inventory and data collection for sources of energy consumed in the premise are summarized in the following sections.

Note: The following analysis is combined for the entire premise taking into consideration the duration before the pandemic to understand the consumption pattern on a regular day.



The above graph shows that equipment consumes 84.69% followed by fans at 6.41% the lights at 5.81% and the air conditioners consume 3.08% of the total calculated electrical energy.

Lights

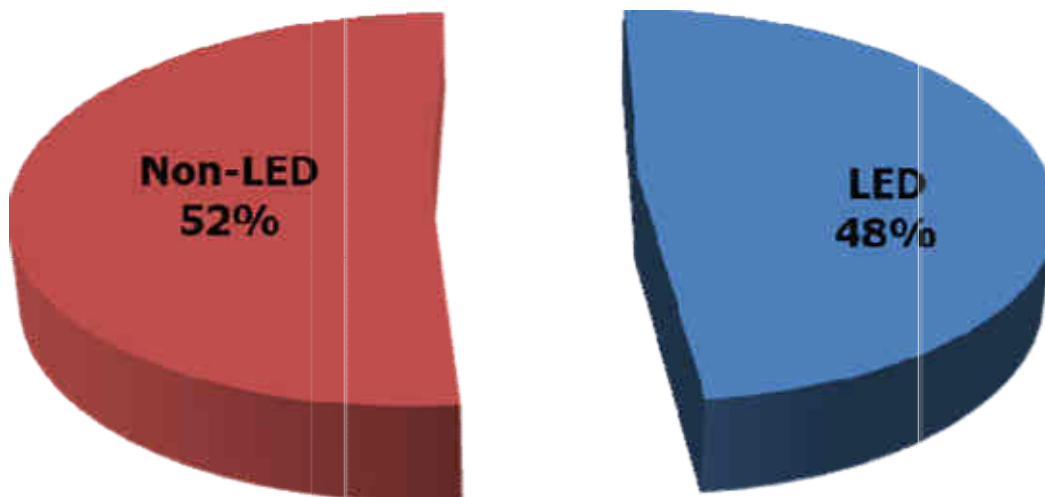
Types of lights based on the numbers

There are a total of **99 lights on the premises**; the following table shows the various types of lights on the premises.

S. No.	Type	Nos.
1	LED	68
2	Non-LED	31

Types of lights based on the power consumption

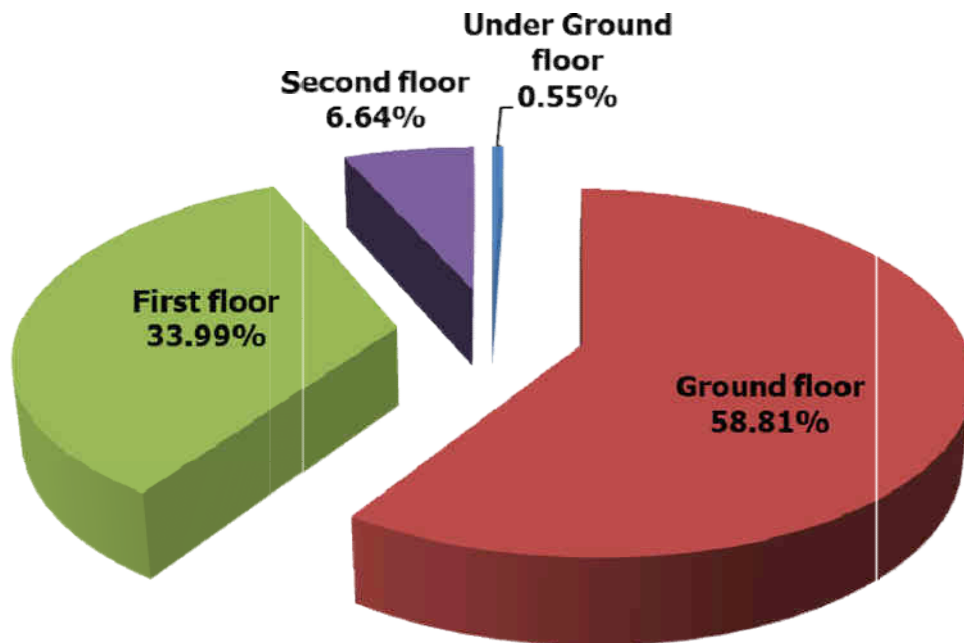
The energy consumption of fans is **1,301 kWh** of energy



The analysis of the types of Lights on-premises shows **Non-LED lights 52%** followed by **LED lights consuming 48%**

Floor-wise consumption analysis

The following graph shows the block-wise consumption.



The above analysis shows the lights on the **Ground floor consume 58.81%** and the ones on the **First floor consume 33.99%**; the **Second floor consume 6.64%** and the ones on the **Underground floor consume 0.55%** of the total power consumed by lights.

Requirement of NAAC

Alternative energy initiative

Percentage of power requirement met by renewable energy sources – There are no solar panels at present, thus zero percent of the power requirement is met by solar energy.

Percentage of lighting power requirement met through LED lights The premise has LED Lights to contribute to 69% in terms of number and **48% of the power requirement** is met through the same. As per our study, we could conclude that both of these are the highest contributions among all the types of lights.

Site investigation observations

Some of the points noticed are as follows:

1. All lights are in working conditions
2. Daily monitoring and check are done by the maintenance staff.
3. There was no fuse defect observed.

Fans

Types of fans based on the numbers

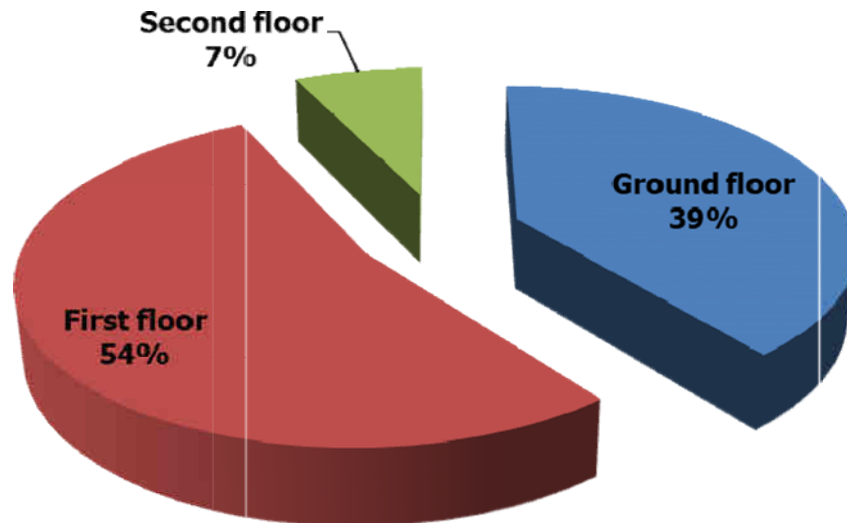
There are a total of **34 fans** on the premises.

Types of fans based on the power consumption

The energy consumption of fans is **1,435 kWh** of energy. For study purpose only the ceiling type of fans were considered as per the data shared by the College. Thus the ceiling fans consume 100% of the energy.

Floor-wise consumption analysis

The following graph shows the floor-wise consumption.



The above analysis shows the fans on the **First floor consume 54%** the ones on the **Ground floor consume 39%** and the ones on the **Second floor consume 7%** of the total power consumed by fans.

Site investigation observations

Some of the points noticed are as follows:

1. All fans are in working conditions
2. Daily monitoring and check are done by the maintenance staff and admin staff excellently.

Air conditioners

Types of air conditioners based on the numbers

There are **2 air conditioners** on the entire premises.

Floor-wise consumption analysis

The energy consumption of air conditioners is **690 kWh** of energy; all of the air-conditioners are located on the Ground floor, thus floor-wise study is excluded.

Site investigation observations

Some of the points noticed are as follows:

1. Daily monitoring and check are done by the maintenance staff and admin staff skillfully.
2. The Outdoor units were not properly cleaned and maintained and had dust collection problems.

About the replacement of current air conditioners

The current air conditioners are well maintained, though there is not an immediate requirement for replacement however, whenever the college undergoes redevelopment or a new floor is constructed there can be provisions for replacement with energy-efficient appliances or new air conditioners that require less power consumption.

Equipment

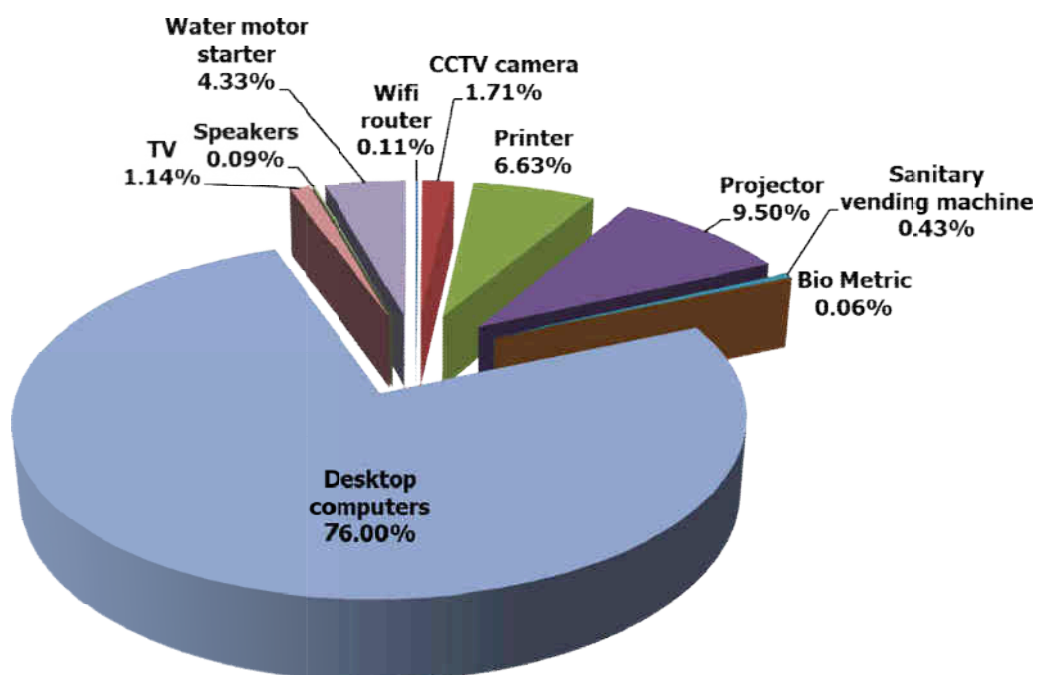
Types of equipment based on the numbers

There are a total of **10 types of equipment totaling 59 numbers** on the premise. The various types are mentioned in the table below.

S. No.	Name of the equipment	kwh
1	Wifi router	2
2	CCTV camera	12
3	Printer	3
4	Projector	4
5	Sanitary vending machine	1
6	Bio Metric	1
7	Desktop computers	32
8	TV	2
9	Speakers	1
10	Water motor starter	1

1.9.2 Types of equipment based on the power consumption

The energy consumption of equipment is **18,948 kWh** of energy.



The above summary shows that the **desktop computer consumes more energy at 76%** while the **projector consumes 9.50%** the **printer consumes 6.63%** and the **water motor starters consumes 4.33%** these are the maximum consumers as

Site investigation observations

Some of the points noticed are as follows:

1. All types of equipment are in working conditions and daily monitoring and check are done by the maintenance staff and admin staff skillfully.
2. No defect was found in any equipment of electrical consumption.

Recommendations for a Sustainable Habitat

Over time energy-efficient appliances have been a boon not only to the energy-saving parameters they adhere to but also to the eco-friendly habits it helps to inculcate. An institution such as Schools and Colleges is the best way to implement these initiatives. It creates awareness among the students at a young age. The Institutions also act as a symbol and representative of being an energy-efficient premise.

Following the analysis, we found some of the suggestions which can be implemented for an energy-efficient Institution. This would help in the reduction of the current electrical consumption by a major percentage.

Electromechanical systems - Electrical and Lighting Section

1 - Lights

Non-LED lights

The current light analysis shows that Non-LED tube lights consume anywhere between 24W, 36W, and 40W when in use; these should be replaced with LED lights which consume on an average 16-20W when in use.

Our technical analysis shows that there would be a reduction of an average of **62% reduction** in energy consumption through lights specifically as a part of the electro-mechanical system if all **Non-LED lights** are replaced on all floors with an energy-efficient appliance whenever the college undergoes renovation.

Section 2 - Fans

Ceiling fans

The current Fans are in proper working conditions and maintained well. The ceiling fans are in more quantity and consume at least 60W when in use. These should be replaced with energy-efficient fans consuming 32W when in use. Our detailed study states that all the **ceiling fans on all floors** if replaced with star-rated appliance results in a reduction of an average of **47% reduction** in energy consumption if replaced with an energy-efficient appliance. It will be suggested to either replace these now if the college can have certain plans else the replacement can be done when fans get damaged or are not in working condition.

Section 3 - Equipment

Desktop computers to laptops

Among all equipment, it suggested replacing the desktop computers with laptops as this would be energy efficient. A normal desktop computer consumes an average of 250W and it is to be connected all time when it has to be used. On the contrary, a laptop consumes 40W and has a battery backup that lasts up to 4 hours.

There is **an average 84% reduction** in energy consumption if replaced with an energy-efficient appliance which is a laptop in all the areas of Educational and Residential areas.

This replacement is however dependent on a variety of factors as follows.

- Some of the senior staff members may be more convenient with computers, replacement with a laptop might result in a change of the working patterns and hours which may affect the productivity.
- Laptops – in the case are not handled with care such as if dropped unintentionally might result in data imbalance.
- Students who are not day scholars can use a laptop at their convenience, whereas in common areas there can monitoring of the usage hours hence computers may be a preferable option then laptops in certain spaces.
- Similarly, depending on the pandemic situation in case it might be possible due to irregular usage the device might have issues while functioning.

Thus the University should analyze the above points and then devise a strategy for the replacement, essentially when the devices get damaged or are not in working condition they can surely be replaced.

As well as once they are not in working condition the proposed strategy should be linked to e-waste management as well.



5. Towards a Healthy & Sustainable Institution

Recommendations based on the study

In addition to the recommendations provided in each section; the College can adopt the following strategies for Healthy and Sustainable Institution practices.

- a) Cutlery in the Canteen** – The regular plastic and steel plates, and spoons used in the Canteen can be replaced with eco-friendly/ organic leaves, paper straws, disposable plates, and edible spoons made out of sugarcane waste or bamboo.
- b) Eco clubs** – There can be an eco-club with students working on pilot projects toward the environment and surrounding up-gradation.
- c) Terrace farming** - There can be a provision for terrace farming; this would enhance the biodiversity, increase awareness, and food grown can be used in Canteen.
- d) Signage's** – In addition to the signage's being in regular language there can be additional signage's in Braille language for the specially-a bald students.

6. References

1. Uniform Plumbing Code – India, 2008
2. IGBC Green Existing Buildings – Operation & Maintenance (O&M) Rating system, Pilot version, Abridged Reference Guide, April 2013
3. IGBC Green Landscape Rating system, March 2013
4. BOMA Canada Waste Auditing Guide, Best Environmental Standards, BOMA BEST – Canada
5. Used only for understanding Universal design - Universal Accessibility Guidelines for Pedestrian, Non-motorized vehicle and Public Transport Infrastructure – Report guidelines by Samarthyam (National center for Accessible Environments) – an initiative supported by Shakti Sustainable Energy Foundation.
6. U.S. Energy Information Administration

























