SRI VENKATESWARA COLLEGE OF ENGINEERING

(Autonomous)

Karakambadi Road, Opposite LIC Training Centre, Tirupati – 517 507.
Accredited by NBA (B.Tech – CSE, ECE,EEE,Mech.,Civil and IT) & NAAC with 'A' Grade
Approved by AICTE, New Delhi permanently affiliated to JNTUA, Ananthapuram.

7.1.6 Quality audits on environment and energy regularly Undertaken by the Institution

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- **Energy Audit**

As part of the Institution Initiatives for a Healthy and Sustainable Institute the audit was conducted. We appreciate the efforts taken by the Staff and students towards the Energy Management and Conservation. The ENERGY AUDIT CERTIFICATE issued by Green Building Council Certified Professional.

- **Energy Audit Certificate:**

GV/EA/07-23/197

Energy Audit Certificate (As per Green Building Parameters)

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It is awarded for **2021-2022 and 2022-2023** to the Esteemed Institution

(Analysed for 2 years and extended validity for 1 year, thus total 3 years)

Council for Social Development Trust's

Sri Venkateswara College of Engineering (Autonomous)

Karakambadi Road, Tirupati – 517507,

Andhra Pradesh, India

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Issued on **Friday, 28 July 2023** and valid till **30 June 2024**

Ar. Nahida Abdulla Shaikh
"Elite 100 Green Architects of India" Econaur, 2022
Registered Architect, P.G.D.R.D, ISO Certified I. A. (IMS)
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- **GREEN AUDIT**

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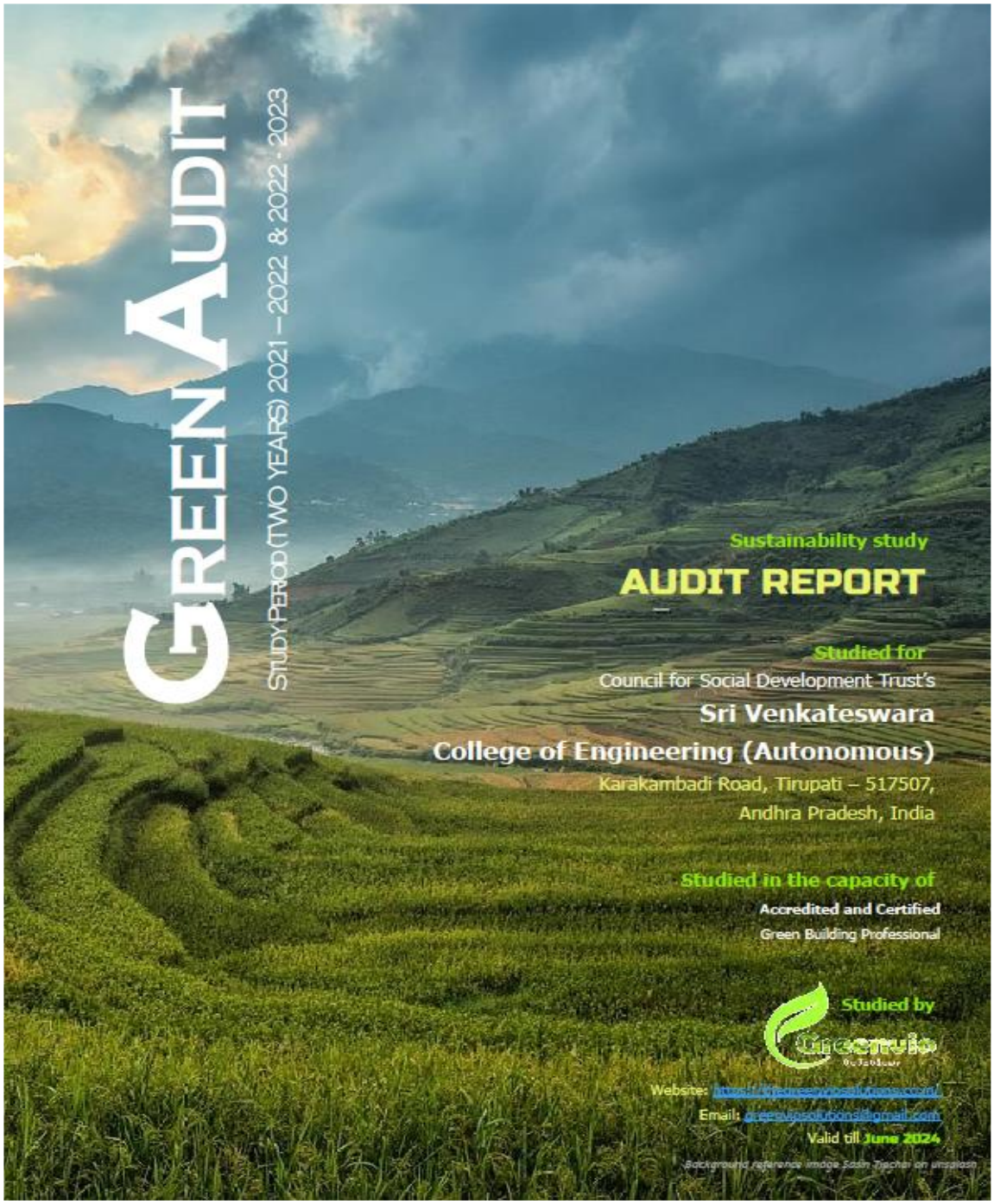
- **Green Audit Report**



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- **Environment Audit Certificate:**

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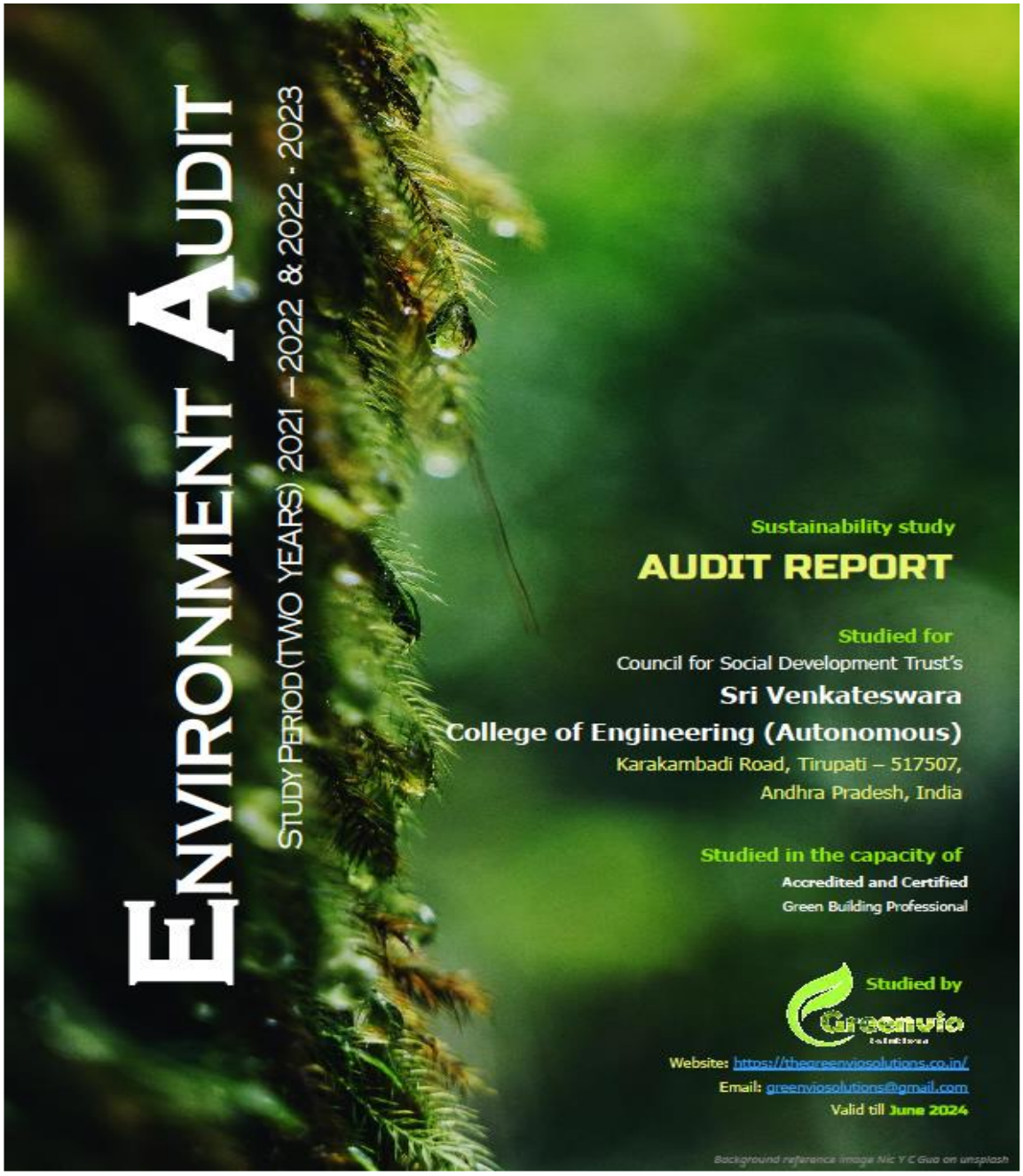

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GREEN AUDIT

STUDY PERIOD (TWO YEARS) 2021 – 2022 & 2022 - 2023

Sustainability study

AUDIT REPORT

Studied for

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Sri Venkateswara

College of Engineering (Autonomous)

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Andhra Pradesh, India

Studied in the capacity of

Accredited and Certified

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Valid till **June 2024**

Background reference image Sasin Tipchai on unsplash

Disclaimer

The Audit Team has prepared this report for the **Council for Social Development Trust's Sri Venkateswara College of Engineering (Autonomous)** located at *Karakambadi Road, Tirupati – 517507, Andhra Pradesh, India* based on input data submitted by the Institute analysed 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 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 Institute. 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 period of time 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.

The Report is prepared by the Team of Greenvio Solutions under their brand and department – Sustainable Academe as Consultancy firm with the Project Head - Ar. Nahida Shaikh who is as an Accredited and Certified Green Building Professional-Architect. Green Building consultancy is her forte and she is one of the most sought after names when it comes to providing excellent quality services within the stipulated time frame.

The Study is conducted in capacity of Accredited & Certified Green Building Professional with extensive experience.

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

sustainableacademe@gmail.com

Acknowledgement

The Audit Assessment Team thanks the **Council for Social Development Trust's Sri Venkateswara College of Engineering (Autonomous), Andhra Pradesh** for assigning this important work of Green Audit. We appreciate the cooperation extended to our team during the entire process.

Our special thanks are extended are due to **Hon'ble A. Gangi Reddy, Hon'ble Prakash Ambavaram, Hon'ble Pradeep Ambavaram** and **everyone from the Management.**

Our heartfelt thanks are extended to the Chairperson of the entire process **Dr. N. Sudhakar Reddy** (Principal) for the valuable inputs.

We are also thankful to Institute's Task force the faculty members who have played a major role in data collection – **Dr. K. Sudheer,** (IQAC Convenor) *(Special mention for the excellent coordination)*.

We highly appreciate the assistance of 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

Contents

1. Introduction

1.1 About the statements of the Institute

1.1.1 Vision

The Institute proposes *"To be a centre of excellence focusing on high quality technical education, research and technical services with global leadership competence to succeed in employment and higher education with ethical, social, entrepreneurial aspects updating to the real time requirements."*

1.1.2 Mission

The Institute adheres and focuses

- *To impart high quality technical education by providing the state-of-the art infrastructure, core instruction.*
- *Advanced research and technical consultancy services with qualified and senior faculty.*
- *To prepare the students professionally deft and intellectually adept possessing excellent skill, knowledge and behaviour with global competence.*

1.2 Assessment of the Institute

1.2.1 Affiliations

The Institute is affiliated to **Jawaharlal Nehru Technological Institute, Anantapur;** a state University in the city of Anantapur, State of Andhra Pradesh in India.

1.2.2 Certification

The Institute has received the **All India Survey of Higher Education (AISHE) code** which is **C-26990**.

1.2.3 Approvals

The technical courses provided by the Institute have taken required approvals **All India Council for Technical Education (AICTE), New Delhi.**

1.2.4 Recognitions

The Institute has upgraded in the teaching level – Under graduate to Post graduate in the **section 2(f) and section 12 (B) of the University Grants Council Act, 1956** Govt. of India, New Delhi.

1.2.5 Accreditation

The degree program is accredited by National Board of Accreditation (NBA), Govt. of India.

2. Overview

2.1 Summarised Populace analysis (Academic year 1)

2.1.1 Students data

The data (shared by the Institute) shows there were a total of **2,853 male and 1,822 female students.**

2.1.2 Staff data

S. No.	Type	Male	Female	Total
1	Admin staff	05	01	**06**
2	Teaching staff	212	156	**368**
3	Non-Teaching staff	157	125	**282**
Total Staff Members		**374**	**282**	**656**

Table 1: Staff data of the Institution for (Academic year 1)

The staff data shows the Institute premises had a total of **656 Staff Members.**

2.2 Summarised Populace analysis (Academic year 2)

2.2.1 Students data

The data (shared by the Institute) shows there were a total of **3,455 male and 2,538 female students.**

2.2.2 Staff data

S. No.	Type	Male	Female	Total
1	Admin staff	06	01	**07**
2	Teaching staff	197	190	**387**
3	Non-Teaching staff	201	171	**372**
Total Staff Members		**404**	**362**	**766**

Table 2: Staff data of the Institution for (Academic year 2)

The staff data shows the Institute premises had a total of **766 Staff Members.**

2.3 Total Institute Area & Institute Building Spread Area

The **site area is 15.09 acres** and the **Built-up area is 21,470 sq. ft.** for an approximately **6,759 footfalls.**

2.4 Institute Infrastructure

2.4.1 Establishment

The Institute was established in **2007**.

2.4.2 Spatial Organisation

There are provisions for staircase for accessibility on the premises, whereas there are amenities such as CCTV, a first aid room, etc.

The Institute is located prettyclose 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.

2.5 Operation and Maintenance of the premises

The interview session and data collection session was held with the staff regarding the operation and working hours. The schedule shared by the team shows that the Institute is working Monday to Saturday beginning at 09:00 hours up to 16:00 hours.

3. Research

3.1 About the Green Building Study Audit

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

3.2 Analysis of the Green Building Study Audit

The procedure included detailed verification as follows:

- Investigation
- Technical discussion with team
- Observations
- Inferences

3.3 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.

3.4 Activities undertaken for the Green Building Study Audit

- Discussion with the Institute
- Allotment and Initiation by the Institute
- Data collection
- Submission of the files

4. Documentation

4.1 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.

4.1.1 Green practices

We observed the following points during the process.

- **Fresh environment** – *The College provides an eco-friendly ambience with fresh air and soothing environment which helps to maintain a physical and mental balance. This kind of a space it a must for an educational specially technical institute which is inviting and gives the stakeholders an opportunity to explore indoor and outdoor learning to a great extent.*

- **Team work** – *The best quality of the College which sets it apart is its coordinating, cooperative staff members; for a building the foundation plays the most important role for its future similarly for an educational institute its staff members do.*

4.1.2 Community development

The College conducts environmental initiatives documented as follows:

S. No.	Event	Particulars	Type	Date
Academic year 1 (2021-22)				
1	Clean India	With the aim of promoting cleanliness, hygiene & sanitation across the country	Physical	01-10-21 to 31-10-21
2	Plantation	With the aim of promoting environment conservation.	physical	21-12-2021
Academic year 2 (2022-23)				
1	Plantation	Improving the ecological balance of the environment	Physical	25-03-2023
2	Distribution of water bowls	Initiative that can help improve the well belong of animals & promote compassion & kindness towards them	Physical	18-04-2023

Table 3: Details of the events undertaken by the Institute

4.2 Waste Audit

Waste is an inevitable part of our lives. The audit provides an approximation of the types of waste generated, location of waste collections, disposal techniques used, waste segregation methodologies adopted. The waste management strategies are studied and ways that can be adopted aiming to make the premise clean and sustainable are proposed.

4.2.1 Waste produced

S. No.	Type	Quantity (Daily basis)	Management details
1	Solid waste (Toilets)	300-350 kgs/year(3-5.5Kgs/Day)	Wastage is moved to a separate place and Municipal Corporation collects the Waste on weekly basis
2	Organic waste (Regular)	20-30Kgs/Week	Waste is collected and dumped in dump yard
3	Liquid waste (Toilets, wash basins)	500-1000 Ltrs/Day	Diverted through canals and then to Sewage Treatment plant
4	Chemical waste from laboratories	20-30 litres/Week	Moved to Synthetic storage in underground. Preserved till its diluted and the moved to canals.
5	Toxic waste from laboratories	NA	Nil
6	E-waste	20-40Kgs/Year	Waste is collected and moved to dump yards
7	Plastic waste	330-450kgs/Year	Plastic Waste is collected separately and moved to dump yards
8	Bio-waste (Sanitary)	NA	Nil
9	Medical waste (Pharmacy etc.)	5-10Kgs/Year	Medical Waste is collected separately and moved to dump yards
10	Construction waste and reuse (Only if applicable)	NA	Depends whenever building Construction needed

Table 4: Details of the waste management practices adopted by the team

4.3 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 effective usage of water without any wastage should be a mandatory practice. Understanding the techniques as per site context to increase water conservation in terms of awareness and practice can be identified and executed as part of this exercise.

4.3.1 Water availability and consumption

4.3.1.1 Source of Primary water supply

The College uses drinking water for daily consumption. There are facilities at various locations in the premises as documented below:

S. No.	Type	Size	Capacity (litres)	Nos.	Location
1	Underground	10 X 8 X 10	50, 000	2	7th Block , Hostel
2	Overhead	6 x 4	5,000	15	3rd, 4th , 6th & 7th Blocks
3	Fire tank	6 x 4 x 10	20,000	2	9th & 1st Block
4	RO Plant	10 x 6	3,000 per hour	1	7th Block

Table 5: Details about the water facilities in the premises

4.3.1.2 Source of Secondary water supply

The College uses the secondary sources of water supply for general usages such as watering plants, kitchen, toilets, and wash basins connected to the labs and other spaces. **At present, there are is bore well available as the secondary source.**

4.3.3.3 Source of Tertiary water supply

The tertiary source of water is the additional source of water harvesting. *The project is under practice with dedicated pits admeasuring 150 ft. a capacity of 10,000 litres each available in a total of 8 nos. in the premises.*

4.3.3.4 Source of Reusing waste water

The initiative is not under practice at present completely only the chemicals are neutralized before letting it down in the drains. **However, certain measures w.r.t. academics and**

equipment are practiced in the laboratories include fume motor usage. *We have suggested to under practices of green chemistry as per discussion to treat the waste water from the laboratories and reuse after filtering for watering the plants and the trees in the premises.*

4.3.2 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:

Particulars	Nos.
General toilet for students	28
General toilet for staff	9
Special Toilet for handicaps 1.5m x 2.5m	1
Urinals	64
Taps in laboratories	4
Taps in wash basins in toilets	56
Taps in kitchen sinks	2
Taps in Hostel mess	10
Taps in Canteen	10
Taps in the garden	20
Net watering meter	4

Table 6: Details of the water usages in the premises

4.4 Health and Hygiene Audit

The 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 in order to affect the young minds in the positive manner through better hygienic practices.

4.4.1 Facilities available

The Institution has washroom facility, hand wash, drinking water and dustbin facilities.

4.4.2 Hygiene aspects

There was no major hygiene issue observed anywhere in the premises.

5. Suggestions

Section-wise suggestions related to premises

The following suggestions are to be considered as a ***first priority*** for implementation. These **should be executed within the next 1.5 to 2.5 years from the date of the Report submission.** The Institute can execute a plan after discussion with Project Head.

5.1 Green practices Audit

- **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.

- **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.

5.2 Waste Audit

- **Signages -** Messages about avoiding wastage should be placed at appropriate locations.

- **Include better plastic/ E-waste management measures** - The Institute can celebrate one day of every month as a 'Plastic/ E-waste awareness day' The stakeholders (Students and staff members) can be asked to bring plastic/ E-waste which can be further given to an NGO for recycling or better purpose.

- **Organic compost pit maintenance methodology -** The Institute can recheck the current methodology as it can yield better results in terms o quantity if it is well maintained with the following strategies:
  - The sanitary pad incineration dust can be sent to the compost pit
  - There should be a balance of brown and green waste material
  - Shred the materials before adding them to pit
  - Add twigs and stir occasionally
  - Add water in less quantity to avoid the smell
  - Keep ample air circulation to avoid the smell
  - Regular monitoring and maintenance.

5.3 Water Audit

- **Water flow stopper -** The water flow stopper should be installed to avoid overflow and smart use of the system. Install water-saving showerheads or flow restrictors. No leakage anywhere on-premises. Water lawn only when it needs it.

- **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.

- **Rain water bunds –** There should be landscape beautification project undertaken to appropriate channelize the rain water through bunds and similar facilities.

5.4 Health and Hygiene Audit

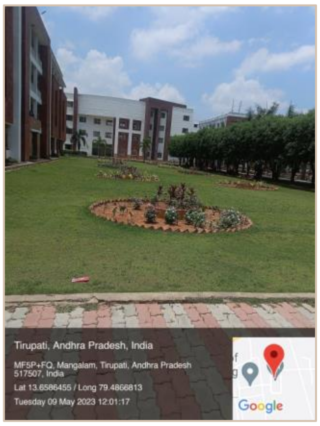
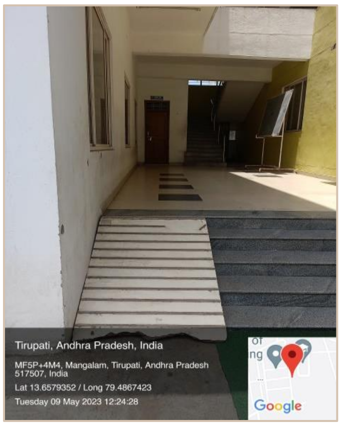
- **Pest control program -** The Institute should practice pest control programs with appropriate sanitation facilities through an appropriate agency.

- **Signboards** – The Institute should have multiple signboards about 'No smoking' and 'Healthy premises' at every nook and corner of the Institute.

- **Compound wall** – The compound wall should have awareness messages about 'No Smoking' and 'No Tobacco'

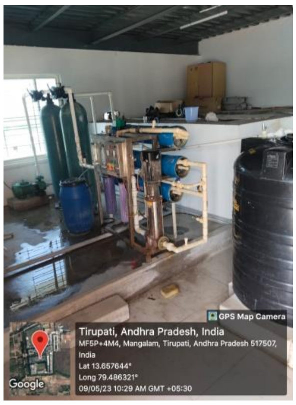
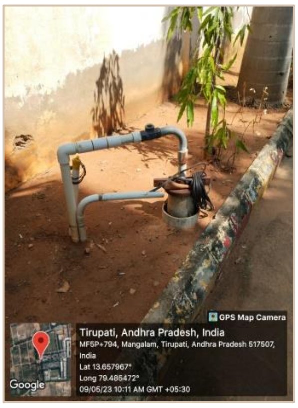
- **Sanitary vending and incinerator -** There should be provision for sanitary vending, incinerator machine and incinerator in every ladies common room, and toilet on the premises.

Investigative parameters – Energy Management – Solar panels in the premises


Investigative parameters – Ecological Management – Green cover and universally accessible premises




Investigative parameters – Water Management – Water sources and rain water harvesting system


Investigative parameters – Waste Management and cleanliness in the premises

6. Compilation

The study is based on the data collected, analysed, rechecked, and confirmed through multiple modes. For the quality study, some standards/ notes have been referred to. These are listed and noted below. However, no direct references have been used anywhere. These are used as a base to analyse and study the data collected.

- Uniform Plumbing Code – India, 2008
- IGBC Green Existing Buildings – Operation & Maintenance (O&M) Rating system, Pilot version, Abridged Reference Guide, April 2013
- IGBC Green Landscape Rating system, March 2013
- BOMA Canada Waste Auditing Guide, Best Environmental Standards, BOMA BEST – Canada
- 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 and www.umassd.edu
- The city of Cheyenne, Streetscape/ Urban Design elements - Wyoming Planning Association, Gillette, Wyoming, United States
- Images on site by Coordinators of the both teams
- Icon images used by https://www.vecteezy.com/free-vector/security-camera-icon and https://www.vecteezy.com/free-vector/electric-car-icon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SV COLLEGE OF ENGINEE

GV/EA/07-23/197

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Sri Venkateswara College of Engineering (Autonomous)

Karakambadi Road, Tirupati – 517507,
Andhra Pradesh, India

Studied in the capacity of

Accredited and Certified
Green Building Professional

Studied by

Website: https://thegreenviosolutions.co.in/
Email: greenviosolutions@gmail.com

Valid till **June 2024**

Background reference image Janko Ferlic on pexels

Disclaimer

The Audit Team has prepared this report for the **Council for Social Development Trust's Sri Venkateswara College of Engineering (Autonomous)** located at *Karakambadi Road, Tirupati – 517507, Andhra Pradesh, India* based on input data submitted by the Institute analysed 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 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.

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The audit is a thorough study based on the inspection and investigation of data collected over a period of time 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.

The Report is prepared by the Team of Greenvio Solutions under their brand and department – Sustainable Academe as Consultancy firm with the Project Head - Ar. Nahida Shaikh who is as an Accredited and Certified Green Building Professional-Architect. Green Building consultancy is her forte and she is one of the most sought after names when it comes to providing excellent quality services within the stipulated time frame.

The Study is conducted in capacity of Accredited & Certified Green Building Professional with extensive experience.

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

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Acknowledgement

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2. Overview

2.1 Summarised Populace analysis (Academic year 1)

2.1.1 Students data

The data (shared by the Institute) shows there were a total of **2,853 male and 1,822 female students.**

2.1.2 Staff data

S. No.	Type	Male	Female	Total
1	Admin staff	05	01	**06**
2	Teaching staff	212	156	**368**
3	Non-Teaching staff	157	125	**282**
Total Staff Members		**374**	**282**	**656**

Table 1: Staff data of the Institution for (Academic year 1)

The staff data shows the Institute premises had a total of **656 Staff Members.**

2.2 Summarised Populace analysis (Academic year 2)

2.2.1 Students data

The data (shared by the Institute) shows there were a total of **3,455 male and 2,538 female students.**

2.2.2 Staff data

S. No.	Type	Male	Female	Total
1	Admin staff	06	01	**07**
2	Teaching staff	197	190	**387**
3	Non-Teaching staff	201	171	**372**
Total Staff Members		**404**	**362**	**766**

Table 2: Staff data of the Institution for (Academic year 2)

The staff data shows the Institute premises had a total of **766 Staff Members.**

2.3 Total Institute Area & Institute Building Spread Area

The **site area is 15.09 acres** and the **Built-up area is 21,470 sq. ft.** for an approximately **6,759 footfalls.**

2.4 Institute Infrastructure

2.4.1 Establishment

The Institute was established in **2007**.

2.4.2 Spatial Organisation

There are provisions for staircase for accessibility on the premises, whereas there are amenities such as CCTV, a first aid room, etc.

The Institute is located prettyclose 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.

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The interview session and data collection session was held with the staff regarding the operation and working hours. The schedule shared by the team shows that the Institute is working Monday to Saturday beginning at 09:00 hours up to 16:00 hours.

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3.1 About the Green Building Study Audit

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

3.2 Analysis of the Green Building Study Audit

The procedure included detailed verification as follows:

- Investigation
- Technical discussion with team
- Observations
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3.3 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.

3.4 Activities undertaken for the Green Building Study Audit

- Discussion with the Institute
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4. Documentation

The premise uses following sources of energy consumption.

4.1 Primary sources of energy consumption

- **Electrical (Metered) –** Light, Fans, Equipments, Pumps comprise these sources.
- **Alternate sources of energy –** There are multiple sources available in the premises as documented below:

S. No.	Name	Nos.
1	Solar panels	1,250
2	Solar hot water heater system	14

Table 3: Details of the alternate sources of energy

4.2 Secondary sources of energy consumption

The premise uses batteries, inverters & UPS as backup for administrative purposes. The details of the existing sources are documented below:

S. No.	Name	Nos.
1	UPS	19
2	Batteries	19

Table 4: Details of secondary sources of energy consumption

4.3 Actual electrical consumption as per bills

The Institute has solar panels on the rooftop through which on an average 12% of the energy required is consumed by the installed sources. This is a good practice.

S. No.	Month	Year	Amount	(A) Total units consumed	(B) Solar units generated	(C = A-B) Gross units consumed after deduction
Academic year 1						
1	June	2021	1,91,346	9,028	7,770	2,840

2	July	2021	1,93,087	17,760	15,572	2,188
3	August	2021	5,64,900	51,022	2,200	48,822
4	September	2021	3,22,380	38,240	12,050	26,190
5	October	2021	3,72,823	44,220	12,514	31,706
6	November	2021	4,68,041	47,172	104	47,068
7	December	2021	4,68,000	47,160	110	47,050
8	January	2022	1,41,813	24,992	23,536	1,456
9	February	2022	3,22,392	38,240	12,058	26,182
10	March	2022	5,58,165	50,412	110	50,302
11	April	2022	4,87,239	61,206	15,772	45,434
12	May	2022	8,48,658	72,250	1,968	70,282
Academic year 2						
13	June	2022	10,83,614	87,656	1,008	86,648
14	July	2022	9,44,436	78,152	96	78,056
15	August	2022	8,00,774	73,628	1,554	72,074
16	September	2022	6,28,562	56,816	1,740	55,076
17	October	2022	5,96,402	51,718	5,050	46,668
18	November	2022	7,74,649	69,474	90	69,384
19	December	2022	7,62,911	69,092	1,288	67,804
20	January	2023	5,51,805	49,684	5,970	43,714
21	February	2023	4,91,948	44,776	8,154	36,622
22	March	2023	5,76,326	51,962	5,750	46,212
23	April	2023	7,28,539	76,786	5,506	71,280

Table 5: Details of the electrical consumption

4.4 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 collected 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 conditioner, and equipment. The inventory and data collection for sources of energy consumed in the premise in summarised in the following sections.

The following documentation is based on the consumption practice of the premises on a regular working day.

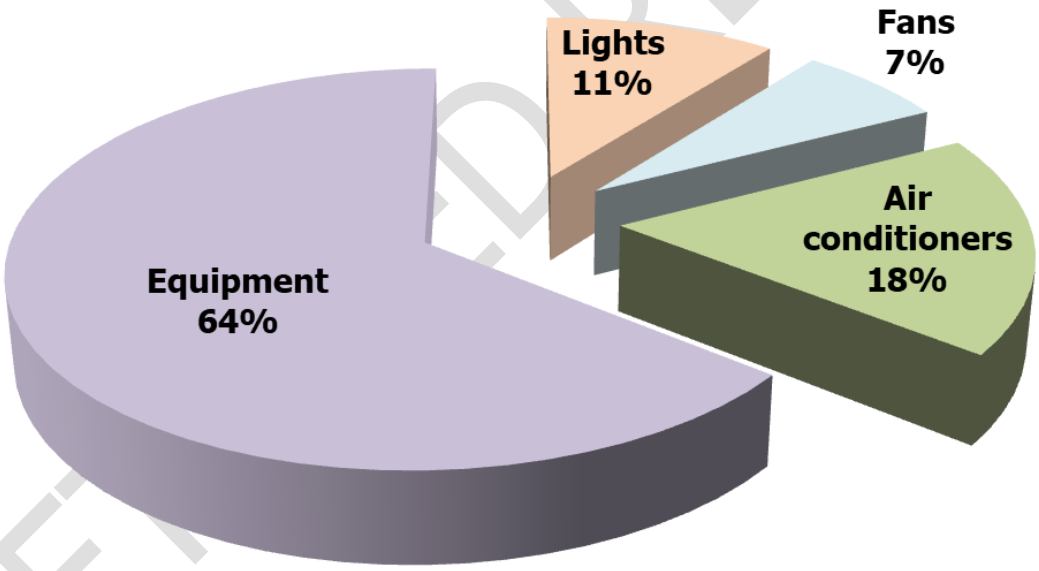


Figure 1: Summary of the calculated electrical consumption as per inventory

The above graph shows that equipment consumes 64% whereas the air conditioners consume 18% while the lights consume 11% and the fans consume 7% of the total calculated electrical energy.

4.5 Lights

4.5.1 Types of lights based on the numbers

There are a total of **2,009 lights on the premises;** the following table shows the various types of lights on the premises.

S. No.	Type	Nos.
1	**CFL lights** (Non-Energy efficient appliance)	616
2	**Halogen lights** (Non-Energy efficient appliance)	45
3	**Non-LED lights** (Non-Energy efficient appliance)	982
4	**LED lights** (Energy efficient appliance)	366

Table 6: Summary of the types of lights on-premise

4.5.2 Types of lights based on the power consumption

The energy consumption of lights is **1,77,119 kWh** of energy.

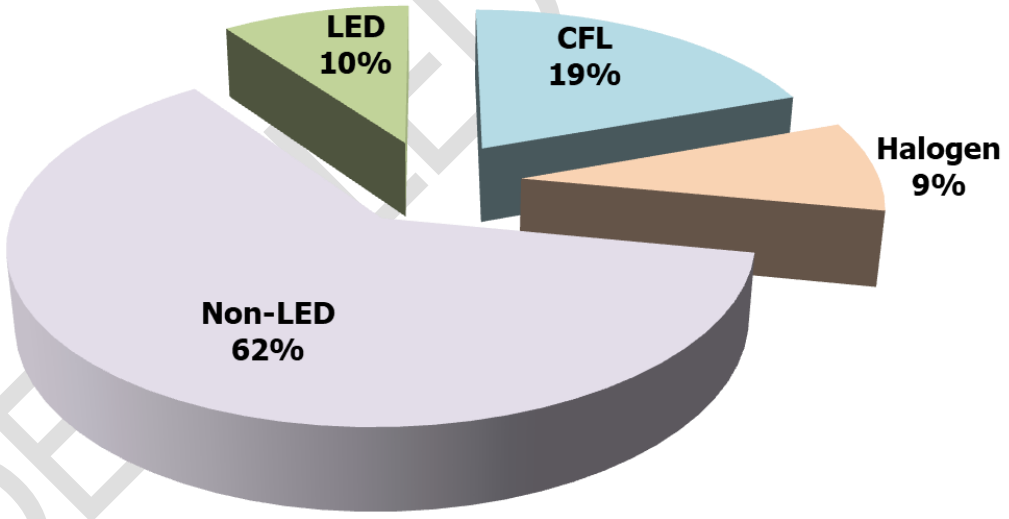


Figure 2: Energy consumed by types of lights in the premise based on the usage study

The analysis of the types of Lights on-premises shows **Non-LED lights consume 62%** whereas the **CFL lights consume 19%** while the **LED lights consume 10%** and the **Halogen lights consume 9%** of the total power consumed by lights.

4.6 Fans

4.6.1 Types of fans based on the numbers

There are a total of **1,389 fans** on the premises as follows:

S. No.	Type	Nos.
1	Ceiling fans	1,193
2	Large Motor exhaust fans	37
3	Medium Motor exhaust fans	15
4	Pedestal fans	43
5	Small Motor Exhaust fans	36
6	Table fans	35
7	Wall Mounted fans	30

Table 7: Summary of the types of fans in the premises

4.6.2 Types of fans based on the power consumption

The energy consumption of fans is **1,14,199 kWh** of the energy.

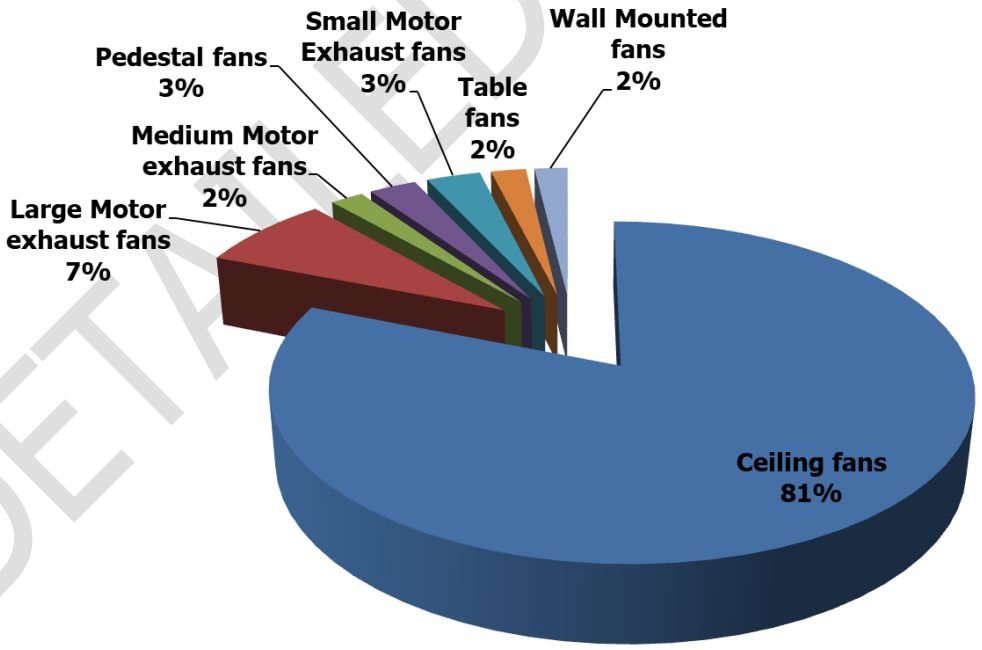


Figure 3: Types of fans based on power consumption

The above analysis shows the **Ceiling fans consume 81%** whereas the **large motor exhaust fans consume 7%** while the **pedestal and small motor exhaust fans consume 3% each** whereas the **medium motor exhaust fans, wall mounted and table fans consume 2% each** of the total power consumed by fans.

4.7 Air conditioners

4.7.1 Types of air conditioners based on the numbers

There are **142 air conditioners** on the entire premises**.**

4.7.2 Building-wise consumption analysis

The energy consumption of air conditioners is **3,02,316 kWh** of energy.

4.7.3 About the replacement of current air conditioners

- The current air conditioners are well maintained.
- Though there is not an immediate requirement for replacement.
- Whenever the Institute undergoes redevelopment there can be provisions for replacement with energy-efficient appliances or new air conditioners that require less power consumption.

4.8 Equipment

4.8.1 Types of Equipment

There are **1,968 nos. of equipment** in the Educational sector.

4.8.2 Types of equipment as per their energy contribution

The energy consumption of equipment is **10,75,189 kWh** of energy.

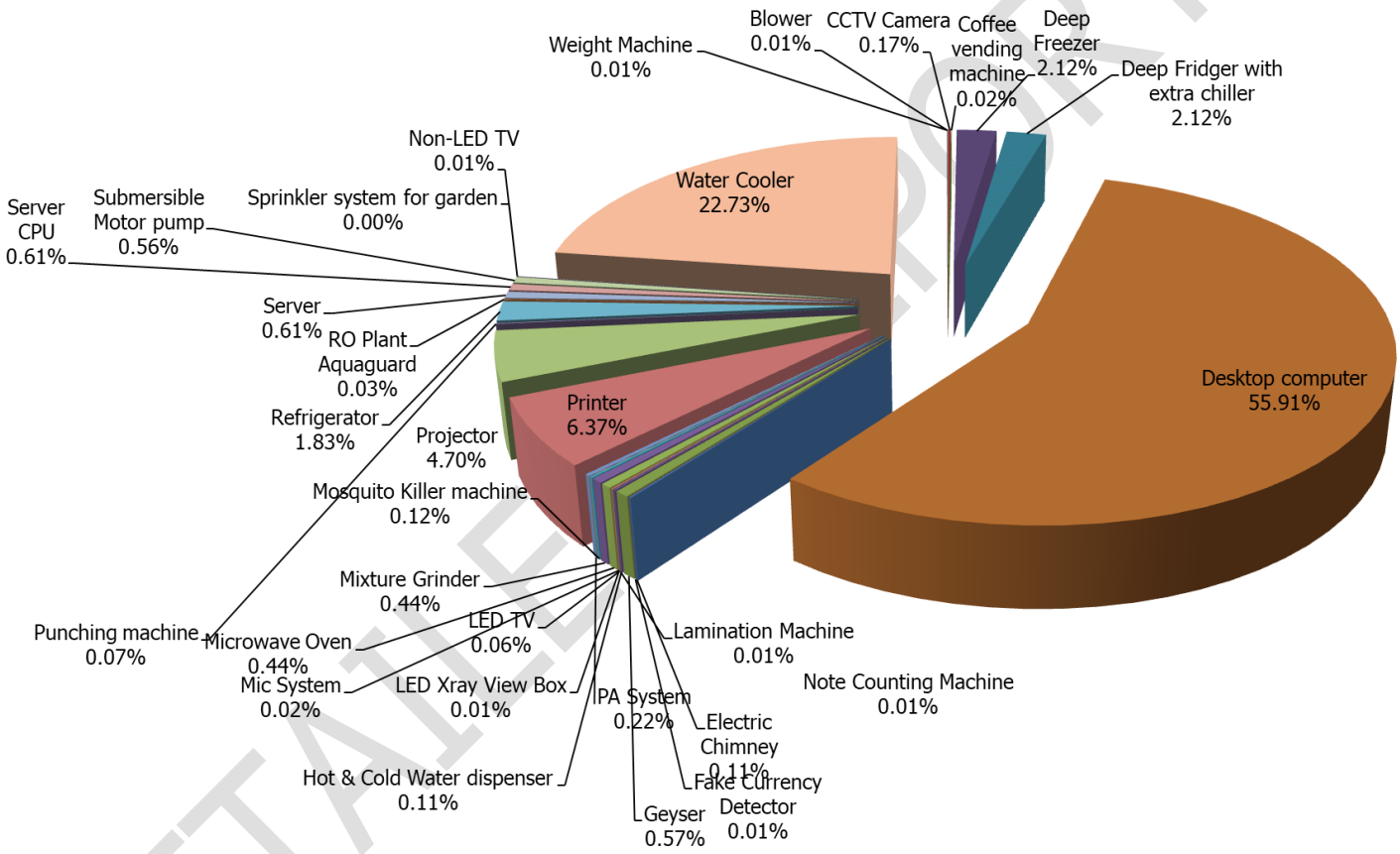


Figure 4: Energy consumed by types of equipment in the educational sector based on the usage study

The above summary shows that the **desktop computer consumes more energy at 55.91%** while the **water cooler consumes 22.73%** the **printer consumes 6.37%** and the **projector consumes 4.70%** these are the maximum consumers as compared to other equipment.

5. Suggestion

5.1 Section-wise suggestions

The following suggestions are to be considered as a ***first priority*** for implementation. These **should be executed within the next 1.5 to 2.5 years from the date of the Report submission.** The Institute can execute a plan after discussion with Project Head.

5.1.1 Electromechanical systems – Electrical and Lighting

Section 1 – CFL lights

The current light analysis shows that CFL lights consume anywhere between 25W and even more when in use; these should be replaced with LED lights which consume on an average 12-16W when in use.

Our technical research shows that there would be a reduction of an average of **52% reduction** in energy consumption through lights specifically as a part of the electro - mechanical system if all **CFL lights** are replaced with an energy efficient appliance whenever the Institute undergoes renovation.

Section 2 – Ceiling fans

The current Fans are in proper working conditions and maintained well. The ceiling fans are in more quantity and consume at least 45W when in use. These should be replaced with energy efficient fans consuming 14W when in use.

Our technical research states that is all the **ceiling fans on all floors** if replaced with star rated appliance results in a reduction of average of **69% reduction** in energy consumption if replaced with energy efficient appliance. It will be suggested to either replace these now if Institute can have certain plans else the replacement can be done when fans get damaged or are not in working condition.

5.2 General suggestions

The following details are consolidated study recommendations related to 'entire Institute' and should be considered as ***second priority*** for implementation, once the section wise recommendations are implemented. The following recommendations should be ***implemented within 2.5 to 3.5 years from the date of the Report submission.***

5.2.1 Alternatives to increase renewable energy

5.2.1.1 Solar farms

This option can be explored with due discussion with the surrounding and adjacent farmland owners. This will serve as a noble project and will provide dual benefits to farm land and Institute w.r.t to electricity bill power reduction.

Plate 1: Solar farm concept for the Institute (For reference purpose only)

Image source: Zsuzsa Bóka from Pixabay

5.2.1.2 Solar parking

The Institute can turn its existing parking areas into solar panel powered parking areas. This will provide shade and renewable energy benefit to the Institute.

Plate 2: Solar parking concept for the Institute (For reference purpose only)

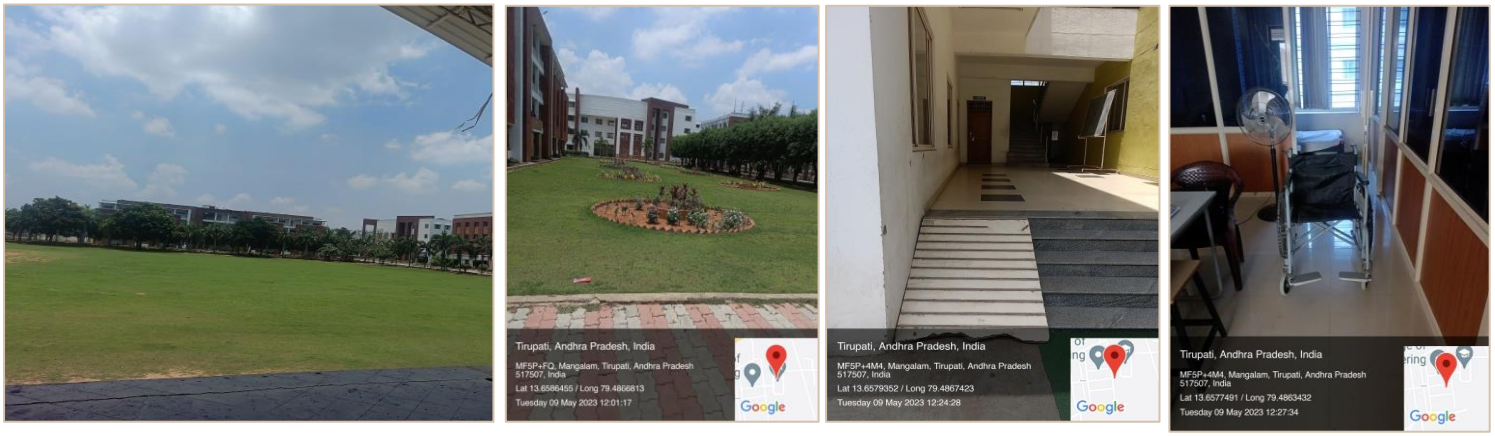
Source: Image by https://solarpowerproject.in/solar-panels-for-parking-lots.php

5.2.2 Alternatives towards Smart premises – General aspects

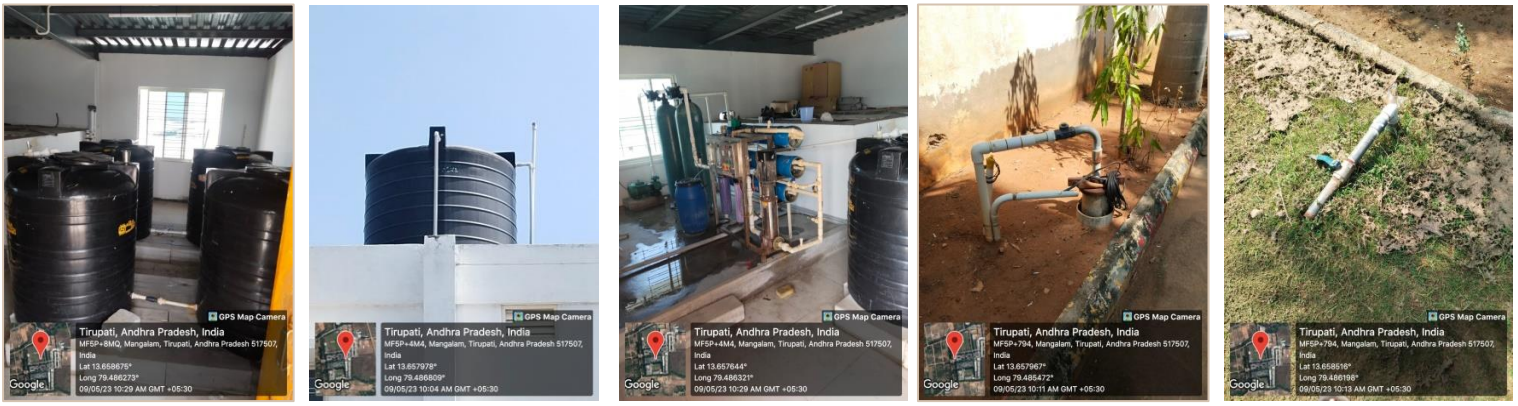
- **Laboratories spaces (Equipment)** - Use of *Microwave synthesizers, Ultrasonic bath and ultrasonic probe* to minimize consumption of electricity for research work and practical.

- **Building system spaces (Energy conservation connected via bluetooth)** – Use of *Sensor Based air conditioners in required areas.*

Investigative parameters – Energy Management – Solar panels in the premises



Investigative parameters – Ecological Management – Green cover and universally accessible premises



Investigative parameters – Water Management – Water sources and rain water harvesting system

Investigative parameters – Waste Management and cleanliness in the premises

6. Compilation

The study is based on the data collected, analyzed, rechecked, and confirmed through multiple modes. For the quality study, some standards/ notes have been referred to. These are listed and noted below. However, no direct references have been used anywhere. These are used as a base to analyze and study the data collected.

Specific references for study related to energy

- https://www.energy.gov/eere/buildings/zero-energy-buildings
- https://www.dsaarch.com/zero-net-positive-energy
- U.S. Energy Information Administration
- https://www.happysprout.com/inspiration/what-is-smart-gardening/
- https://housing.com/news/smart-gardening/
- Inference study reference image - Zsuzsa Bóka from Pixabay
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SV COLLEGES

GV/ENVT/07-23/200

Environment Audit Certificate (As per Green Building Parameters)

The study is conducted as per Indian and International Green Building Standards initiated in the capacity of an Accredited & Certified Green Building Professional

It is awarded for **2021-2022 and 2022-2023** to the Esteemed Institution

(Analysed for 2 years and extended validity for 1 year, thus total 3 years)

Council for Social Development Trust's

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

Issued on **Friday, 28 July 2023** and valid till **30 June 2024**

Ar. Nahida Abdulla Shaikh

"Elite 100 Green Architects of India" Econaur, 2022

Registered Architect, P.G.D.R.D, ISO Certified I. A. (IMS)

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Environment Audit

Study Period (Two Years) 2021 – 2022 & 2022 - 2023

Sustainability study

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4. Documentation

4.1 Open Spaces

There is an open space used by students at present for sports and cultural gatherings. **There are provisions for natural plantations enhancing the beauty of the space.**

4.2 Flora audit

A flora survey was carried out to identify the total numbers of plants and trees. The flora survey is common for the entire campus as documented below.

S. No.	Plant Name	Type	Nos.	Planted By
1	*Royal Palm*	Tree	130	Staff & Students
1	*Foxtail Palm*	Tree	25	Staff & Students
2	*Plumeria Flower Plants 3 Colors*	Plant	10	Staff & Students
3	*Platina Plants*	Plant	100	Staff & Students
4	*Lilies 3 Colors*	Plant	500	Staff & Students
5	*Billa Ganneru*	Herb	500	Staff & Students
6	*Areca Palm*	Shrub	50	Staff & Students
7	*Christmas Tree*	Shrub	5	Staff
8	*Caesalpinia Pulcherrima Flowers*	Plant	50	Staff & Students
9	*Tecoma Yellow Plant*	Plant	60	Staff & Students
10	*Heliconia Yellow Color*	Plant	300	Staff & Students
11	*Lexophyllum*	Shrub	1,000	Staff & Students
12	*Radha Manohar*	Creepers	40	Staff & Students
13	*Acalypha 3 Colors (Green, Red, Rose)*	Herb	15,000	Staff & Students
14	*Indian Cork Tree*	Tree	5	Staff
15	*Dracaena Mahatma*	Plant	1,000	Staff & Students
16	*Ficus Panda*	Shrub	10	Staff
17	*Ficus Black*	Shrub	50	Staff & Students
18	*Canna Lilies*	Plant	500	Staff & Students
19	*Singapore Mini Ixora 3 Colors*	Plant	1,000	Staff & Students

20	*Croton Indoor Plants*	Plant	500	Staff & Students
21	*Calea Tea Corner*	Plant	20	Staff & Students
22	*Calathea Lutea Cuban Cigar*	Plant	20	Staff & Students
23	*Conocarpus*	Plant	200	Staff & Students
24	*Golden Duranta*	Shrub	1,000	Staff & Students

Table 3: Details of the Flora in the premises

At present there are 22,075 numbers of plantations comprising of plants, trees, shrubs. Timely maintenance and care has resulted in positive benefits for the surroundings.

Additionally, there are the following types of ground cover available in the premises that have enhanced the ecological footprint to a great extent.

- ***Bermuda Grass*** spread over 1,60,000 sq. ft. of area.
- ***Lexicon Grass*** spread over 20,000 sq. ft. of area.
- ***Korean Grass*** spread over 15,000 sq. ft. of area.
- ***Shade Grass*** spread over 10,000 sq. ft. of area.

4.3 Fauna audit

There are varieties of birds including ***Lesser Whistling-Duck,Eurasian Collared-Dove,Gray-Bellied Cuckoo, Western Reef-Heron, Common Kingfisher*** available as fauna in the premises.

4.4 Noise Audit

On a macro level the Institute is surrounded by public buildings and minimal residential blocks **thus there is a peaceful and noise free arena observed inside the premises.**

4.5 Carbon Footprint Audit

4.5.1 Eco-friendly Commuting Practices

- The site is located in an urban locality.
- Overall, the carbon footprint is well under control.
- Students and staff members commute using public transport.
- There are no major fossil fuels used inside the premises.

4.5.2 Heat Island Reduction

Certain measures have to be taken to keep outdoor temperatures under control.

4.5.3 Outdoor Light Pollution Study

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

4.6 Universally accessible premises

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

The following facilities are available on the premises for the specially-abled as part of universally accessible premises initiatives.

- Low height risers in the staircases
- Non-slippery floor surfaces
- Handrails for support – This should be extended to all blocks
- Ramps at the entrance – This has to be extended to all blocks
- Universal toilet – The current toilet should be upgraded with appropriate amenities including grab bars, hand rails etc.

4.7 Fire Safety

Fire and life safety are an important consideration of the National Building Code 2016. This aspect is touched upon as part of this study in the capacity of an Architect registered with the Council of Architecture. As part of the research, fire safety audit was considered from the 'Building systems' perspective.

At present, the following provisions are available in the premises.

- Fire extinguisher.
- Open staircase without any barriers and free of storage or combustible material.

5. Suggestion

The following suggestions **should be executed within the next 1.5 to 2.5 years from the date of the Report submission.** The Institute can execute a plan after discussion with Project Head.

5.1 Site beautification

- **Bird house/ Feeders -** At appropriate locations there can be provisions for drinking water and some grains for birds as they visit the site much frequently.
- **Child area -** There can be one provision where if student's or staff relative who are toddlers or senior citizens can rest and this area could have facilities accordingly.
- **Garden development -** The existing open space should be designed as an Architectural landscape. *Scientific name plates and QR codes* – The team should undertake a project to have name plates with QR codes on every plant of the premises.

5.2 Heat island reduction

- **Cool rooftops** - The Terrace rooftops should be painted with Cooltop – reflective materials to reflect the harsh sun rays and reduce the heat absorption in the top most floor and surrounding areas of the building.

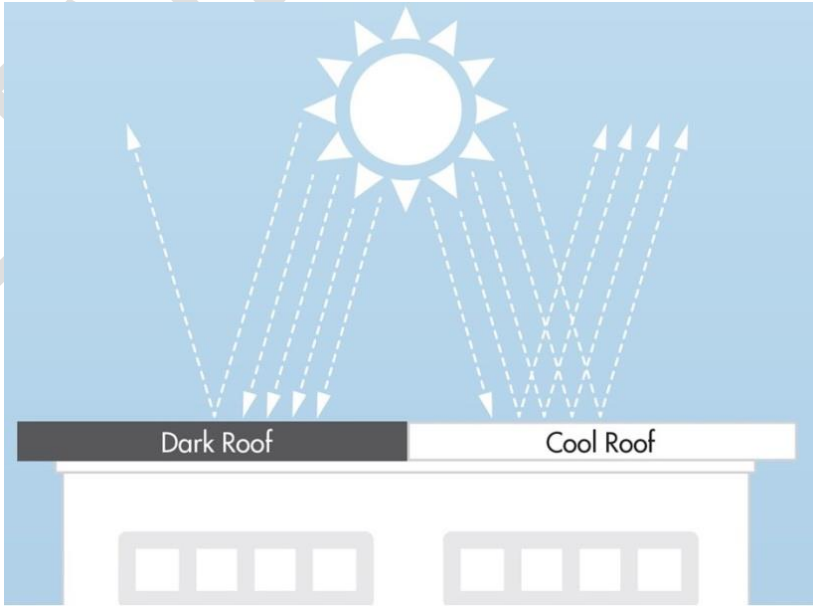
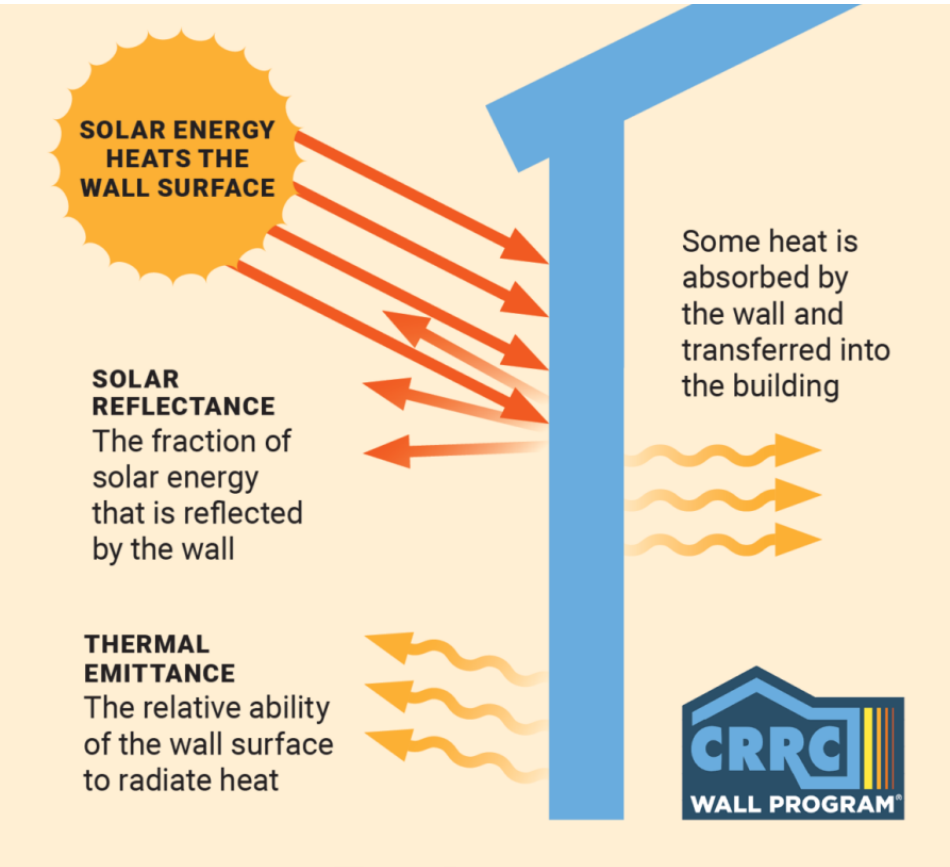


Plate 1: Cool roof comparative analysis (For reference purpose only)

Source: Image by https://www.gaf.com/en-us/blog/six-truths-about-cool-roofs-281474980105387

- **Cool walls/ Solar reflective exterior wall surface** – The exterior walls of the building can be painted in light colors as this will help in reflecting solar radiation. Thus, less heat will be absorbed in the interiors and cool temperature will be maintained.



This illustration describes the flow of radiant energy as heat between the sun, wall surface, building interior, and surroundings. The higher the solar reflectance, the more solar energy is reflected away from the wall surface. Some of the solar energy is absorbed by the wall as heat. The higher the thermal emittance, the more absorbed heat is radiated away from the wall surface. IMAGE CREDIT: COOL ROOF RATING COUNCIL.

Plate 2: Cool wall physics analysis (For reference purpose only)

Source: Image by https://coolroofs.org/resources/what-is-a-solar-reflective-wall

- **Water bodies** – Lily gardens in small water ponds could be developed in the outdoor areas to reduce the heat, upgrade rain water harvesting and beautify exterior areas.

Plate 3: Lily pond (For reference purpose only)

Source: Image by Author and the team

5.3 Universally accessible premises

- **Universal Toilet -** There should be a minimum of 1 toilet in every block for the specially-abled people as per guidelines prescribed by the National Building Code 2016.

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

- **Provisions for visually impaired - Audio Visual Section** – There should be dedicated section for ther visually impaired students to listen to the audio books; Abrar the audio book reader should be available.

5.4 Life safety

- **Mandate fire extinguisher in spaces** - One fire extinguisher should mandatorily be there in every space which has an air conditioner/ gas cylinder.

- **Combustible equipment** - Every space which has a gas cylinder or combustible equipment should have a provision for the barricade around the gas cylinders, appropriate safety board's mentioning 'danger sign' and 'Do not touch' with an additional small fire extinguisher close by.

5.5 Pollution Control

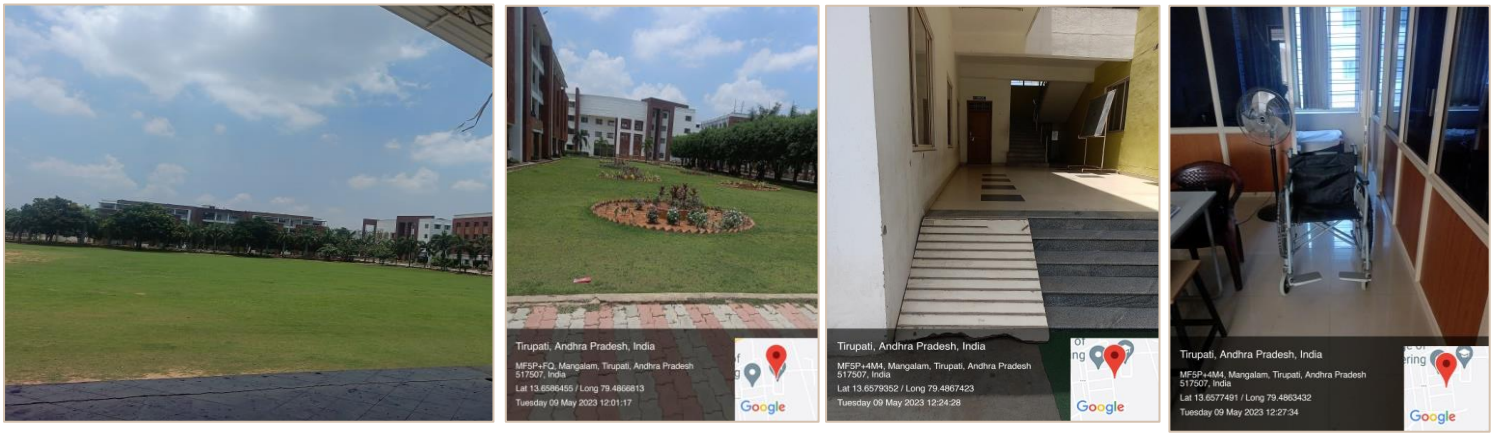
- **Promote the use of Eco-friendly vehicles -** There can be student and staff sensitization program on eco-friendly and battery-operated vehicles/ low emission vehicles for daily use.

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

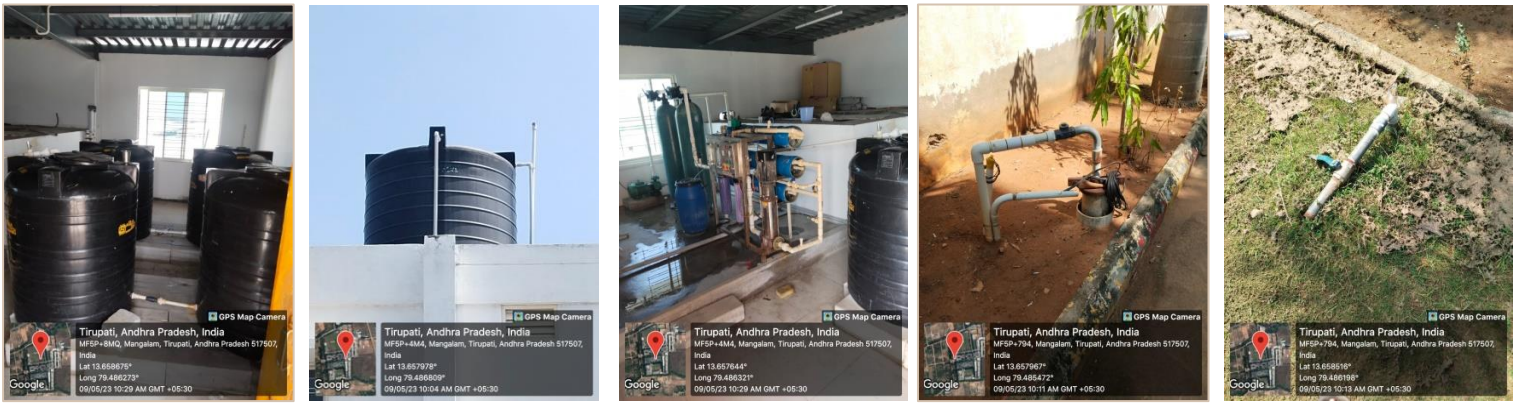
- **Avoid using plastic in premise -** There should be a provision for a ban on the use of plastic bags or products on the Premise.

- **Paperless technologies for offices -** The Institute can go technology-friendly and go paperless in the functioning of the Premise to a certain extent maybe not fully.

Investigative parameters – Energy Management – Solar panels in the premises



Investigative parameters – Ecological Management – Green cover and universally accessible premises



Investigative parameters – Water Management – Water sources and rain water harvesting system

Investigative parameters – Waste Management and cleanliness in the premises

6. Compilation

The study is based on the data collected, analysed, rechecked, and confirmed through multiple modes. For the quality study, some standards/ notes have been referred to. These are listed and noted below. However, no direct references have been used anywhere. These are used as a base to analyse and study the data collected.

6.1 National references

- Uniform Plumbing Code – India, 2008
- IGBC Green Existing Buildings – Operation & Maintenance (O&M) Rating system, Pilot version, Abridged Reference Guide, April 2013
- IGBC Green Landscape Rating system, March 2013

6.2 International references

- Form, Space and Order by Francis D. K. Ching
- BOMA Canada Waste Auditing Guide, Best Environmental Standards, BOMA BEST – Canada
- 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 and www.umassd.edu
- The city of Cheyenne, Streetscape/ Urban Design elements - Wyoming Planning Association, Gillette, Wyoming, United States
- Streetscape elements – Chapter 6 on San Francisco
- American lung association https://www.lung.org/
- Study related to air pollution https://www.airgle.com/
- Exploring the light pollution https://education.nationalgeographic.org/
- Accessibility study https://www.washington.edu/
- Urban heat island effect https://www.epa.gov/heatislands/what-you-can-do-reduce-heat-islands

6.3 Reference images for suggestions:

- https://www.gaf.com/en-us/blog/six-truths-about-cool-roofs-281474980105387
- https://coolroofs.org/resources/what-is-a-solar-reflective-wall
- https://earthbound.report/2021/07/14/5-ways-to-reduce-the-urban-heat-island-effect/
- https://www.dutchiesstonewor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