ENERGY AUDIT REPORT

Mother Teresa Pharmacy College,

Sathupally, Khammam Dist

Telangana State PIN - 507033

PREPARED BY

EMPIRICAL EXERGY PRIVATE LIMITED
Flat No. 201, OM Apartment, 214 Indrapuri Colony, Bhawarkuan,
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(2022-23)

CONTENTS

ACKNOWLEDGEMENT

We would like to thank the Mother Teresa Pharmacy College, Sathupally, Khammam Dist. Telangana Our appreciation and gratitude to the management for granting us permission to conduct green audit for the college.

We are genuinely touched by the helpful attitudes and cooperation displayed by all the faculty members and technical staff involved in the audit. Their valuable assistance and cooperation significantly contributed to the successful execution of the audit.

Rajesh Kumar Singadiya

(Director)

M.Tech (Energy Management)
Accredited Energy Auditor [AEA-0284]
Certified Energy Auditor [CEA-7271]
(BEE, Ministry of Power, Govt. of India)
Empanelled Energy Auditor with MPUVN, Bhopal M.P.

CERTIFICATE OF ACCREDITATION

ENERGY IS LIFE
BEE
CONSERVE IT

BUREAU OF ENERGY EFFICIENCY

Examination Registration No.: EA- 7271

Accreditation Registration No.: AEA-284

Certificate of Accreditation

This is to certify that Mr./Ms. Shri. Rajesh Kumar Singadiya having its trade/registered office at ..... has been given accreditation as accredited energy auditor. The certificate shall be effective from 9th day of May, 2018

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Given under the seal of the Bureau of Energy Efficiency, Ministry of Power, this 5th day of October, 2018

Secretary,
Bureau of Energy Efficiency
New Delhi

ENERGY AUDIT TEAM

The Audit team constituted by the following senior technical executives from the **Empirical Exergy Private Limited,**

- **Mr. Rajesh Kumar Singadiya** [Director & Accredited Energy Auditor AEA-0284]
- **Ms. Laxmi Raikwar** [Energy Expert and Report Reviewer]
- **Mr. Charchit Pathak** [Sr.Project Engineer]
- **Mr. Praveen Punasiya** [Field Engineer]

EXECUTIVE SUMMARY

The executive summary of the energy audit report presented in this section briefly outlines the identified energy conservation measures and other recommendations proposed during the project. These measures can be implemented in phases to conserve energy and enhance productivity within the college campus. The expected total annual energy saving potential is 10216 (kWh) units.

INITIATIVE TAKEN BY THE COLLEGE

- **Lighting System**
  - The college has already taken steps to install energy-efficient lighting within the premises. This includes the replacement of conventional tube lights with energy-efficient LED lights. However, there remains significant potential for further improvement.

ENERGY AUDIT RECOMMENDATION

- **Ceiling fan**
  - ECM-1: There is a good potential to replace 62 number of (70W+20W) conventional ceiling fan by 28W BLDC fan. The expected energy saving potential is 7,688 units per year.
  - ECM-2: There is a good potential to replace 8 number of (90W) exhaust fan by 40W BLDC fan. The expected energy saving potential is 800 units per year.
- **Split ACs**
  - ECM-3: There is a good potential to install Airtron intelligent microprocessor energy saver in 2 numbers of 1 to 1.5 ton star rated units. The expected energy saving potential is 1728 units per year.
- **Reduction in contract Demand from 500 kVA to 140 kVA**
  - ECM-4: It is recommended to reduce the contract demand from 140 kVA to 95 kVA, there is a good potential for money saving Rs. 1,93,800 annually.

- **Timer-Controller and Motion sensor**
  - It is recommended to install "timer controller and motion sensor in faculty cabins, offices, and non working areas.
- **Energy Monitoring System**
  - It was observed that there is a requirement of monthly energy consumption monitoring system to find out the annual energy consumption of the center, which should be based on a cloud-based (IoT) energy monitoring system.
  - The above system is highly recommended on solar plant and main electrical panel of the department. It serves both energy monitoring purposes and can act as a demonstration project for students and the management.
- **Awareness and Training program**
  - Conduct awareness and training program, poster presentation to promote energy saving activities in the center.

ENERGY CONSERVATION MEASURES

ECM	Identification	Observation	Recommendation	Annual Energy Saving (kWh)	Annual cost saving (Rs.)	Investment (Rs.)	Simple Payback period (Year)
ECM:1	62 no. of ceiling fan	Conventional fan (60W+20W)	Replaced by BLDC fan (28W)	7688	84568	173600	2.1
ECM:2	8 no. Exhaust fan	Conventional fan (90W)	Replaced by BLDC fan (40W)	800	8800	18400	2.1
ECM:3	2 no. 1 to 1.5 ton Star rated ACs	inefficient operation	Installation of Airtron 'Intelligent Microprocessor' energy saver	1728	19008	15000	0.8
ECM:4	Contract Demand Reduction	Present Contract demand 140 kVA	it is recommended reduce the demand up to 95 kVA	-	19380	nil	immediate
				10,216	**1,31,756/-**	**2,07,000/-**	**1.6**

Note: Energy saving will be depend on working hours and load factor of the equipments

Chapter-1
INTRODUCTION

1.1 About College

MOTHER TERESA PHARMACY COLLEGE (MOTP) was established in the year 2009 by MCMSOCIETY, the college has been making remarkable progress in the field of Pharmacy education under the exemplary leadership of the dynamic Secretary and correspondent Sri CHALASANI SAMBASHIVA RAO. The college is situated in a peaceful and beautiful campus which is conducive for providing quality education, career building and helpful for gaining professional knowledge in pharmacy field. The college has imparting excellent credentials in pharmacy career with a clear focus on the untroubled learning environment and sophisticated infrastructure in rural area. The main aim of institution is making Pharmacy professionals to be an integral part of the society through community service, research, innovation for their holistic development which in turn helps to achieve the academic excellence. Its main focus is to encourage and empower young aspirant pharmacist to take up advanced programs and careers in Pharmacy to cater to the needs of the society in health care sector. Student centre teaching practices, various in-house activities aimed at their holistic development along with the extension programmes strive towards achieving at academic excellence in tune with integrity of character.

The College is approved by PCI, affiliated to JAWARHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD, approved by TELANGANA state. It is self financed and offers both UG and PG programs with an approved intake of 90students each year as follows: 60 seats in B. Pharmacy (4 years), 15 seats in M. Pharmacy (2 years) in Pharmaceutics and 15 seats in Pharmaceutical Analysis.

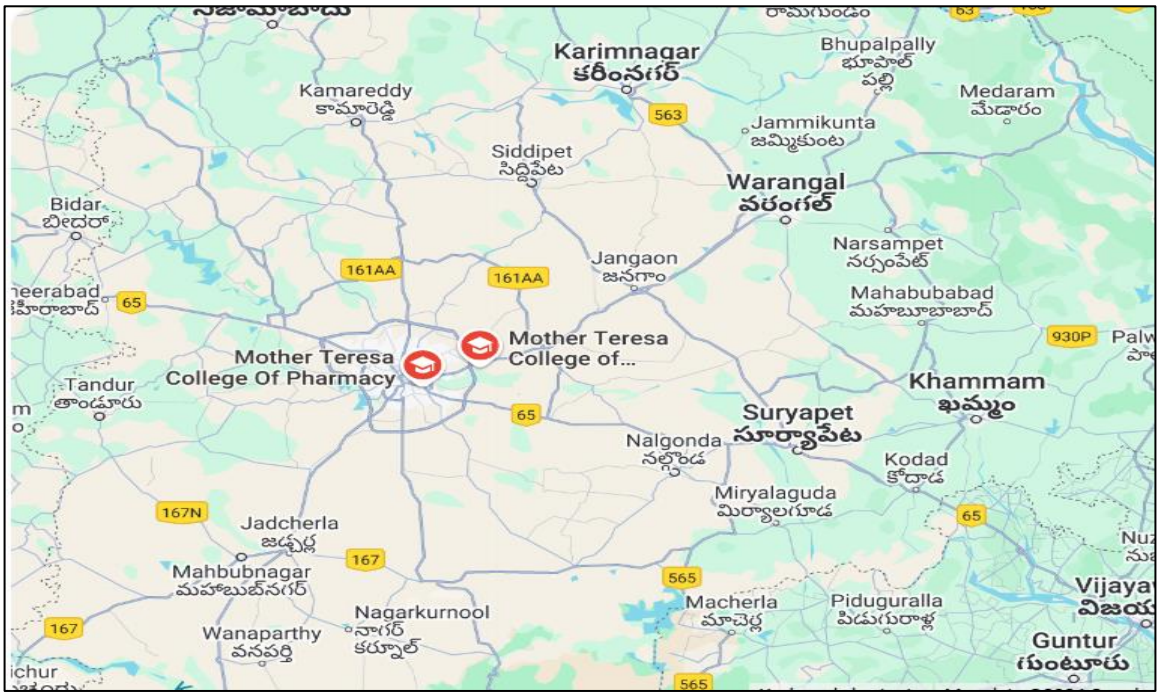


Fig. 1.1 Source: Satellite Image of Mother Teresa Pharmacy College

Vision

To be the best institute in the field of pharmacy in rural area by providing excellent education to achieve overall development of the pharmacy professionals to provide the needs of the profession and society.

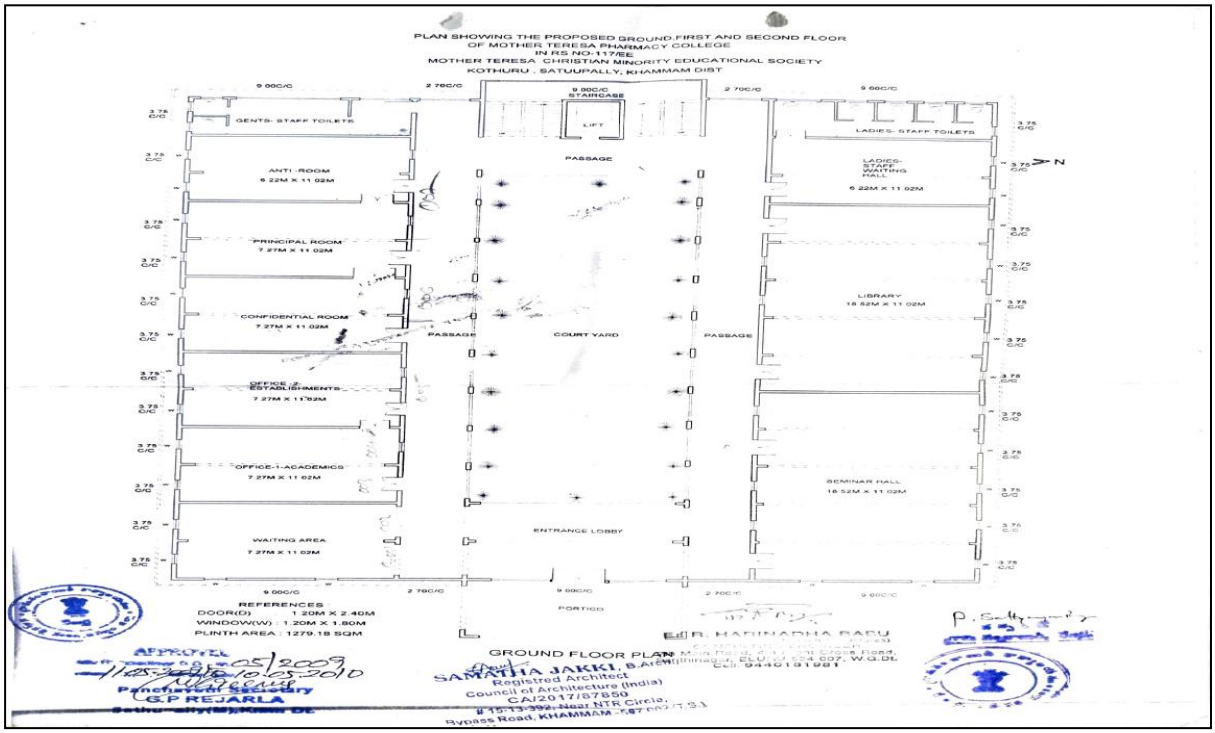
Mission

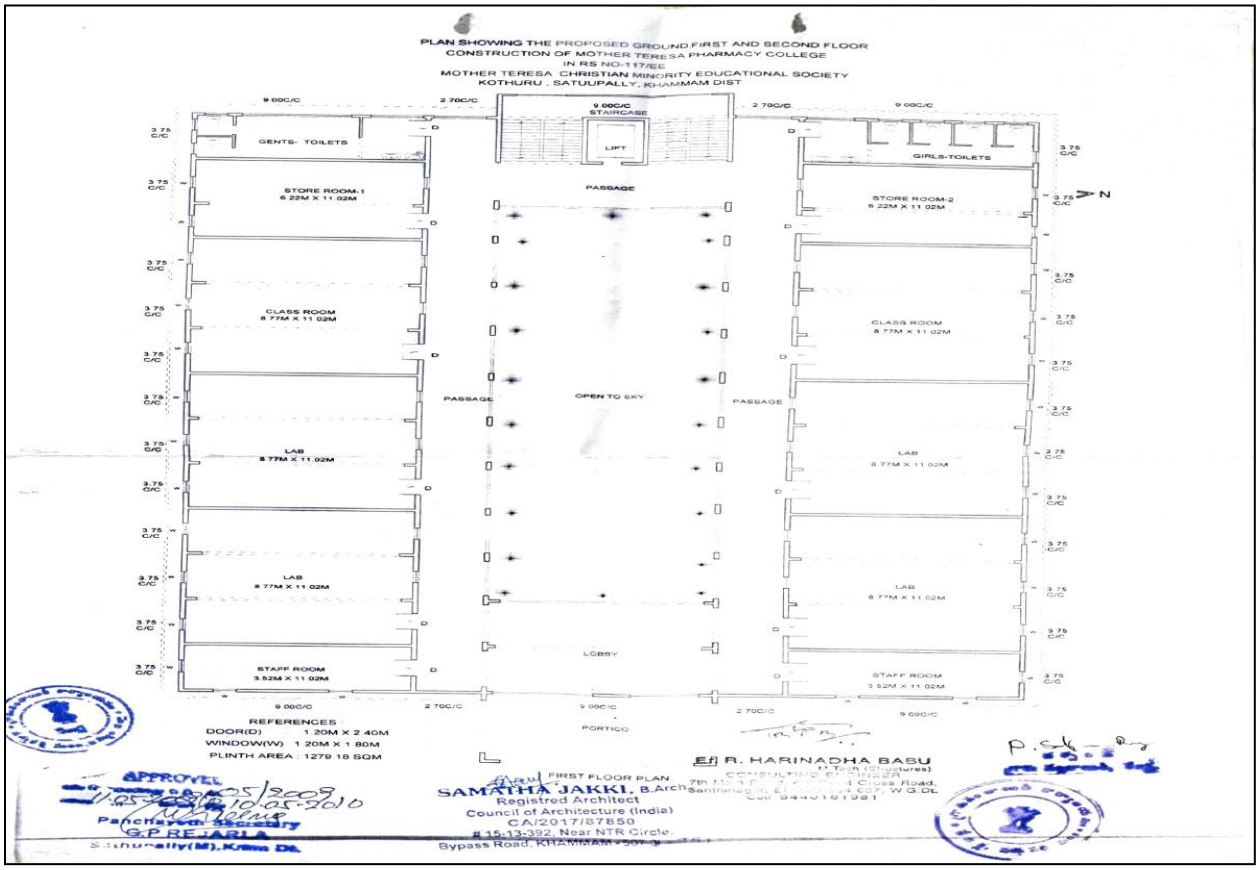
- To encourage and empower the students by providing value based education in Pharmaceutical sciences.
- To provide high quality standards and support health care and industrial needs.
- To provide innovative learning environment, with strategically planned quality pharmacy education consistent with the policies of state and nation.
- To produce innovators and entrepreneurs.
- To promote employability, leadership, research aptitude and entrepreneurship in pharmaceutical industry by innovative teaching-learning process, training activities and research facilities.

Table: 1.1 College Populations

Sr. No.	Teaching Staff (No.)	Non -Teaching Staff (No.)	Student (No.)
1	25	20	245

College Layout




PLAN SHOWING THE PROPOSED GROUND,FIRST AND SECOND FLOOR
CONSTRUCTION OF MOTHER TERESA PHARMACY COLLEGE
IN RS NO-117/EE
MOTHER TERESA CHRISTIAN MINORITY EDUCATIONAL SOCIETY
KOTHURU , SATUUPALLY, KHAMMAM DIST
GENTS- TOILETS
GIRLS-TOILETS
LIFT
PASSAGE
STORE ROOM-1
6.22M X 11.02M
STORE ROOM-2
6.22M X 11.02M
CLASS ROOM
8.77M X 11.02M
LAB
8.77M X 11.02M
OPEN TO SKY
LOBBY
STAFF ROOM
3.52M X 11.02M
PORTICO
REFERENCES
DOOR(D) 1.20M X 2.40M
WINDOW(W) 1.20M X 1.80M
PLINTH AREA : 1279.18 SQM
FIRST FLOOR PLAN
SAMATHA JAKKI, B.Arch
Registred Architect
Council of Architecture (India)
CA/2017/87850
R. HARINADHA BABU
APPROVED
10.05.2010
Panchayath Secretary
G.P. REJARLA
Bypass Road, KHAMMAM

College Infrastructure

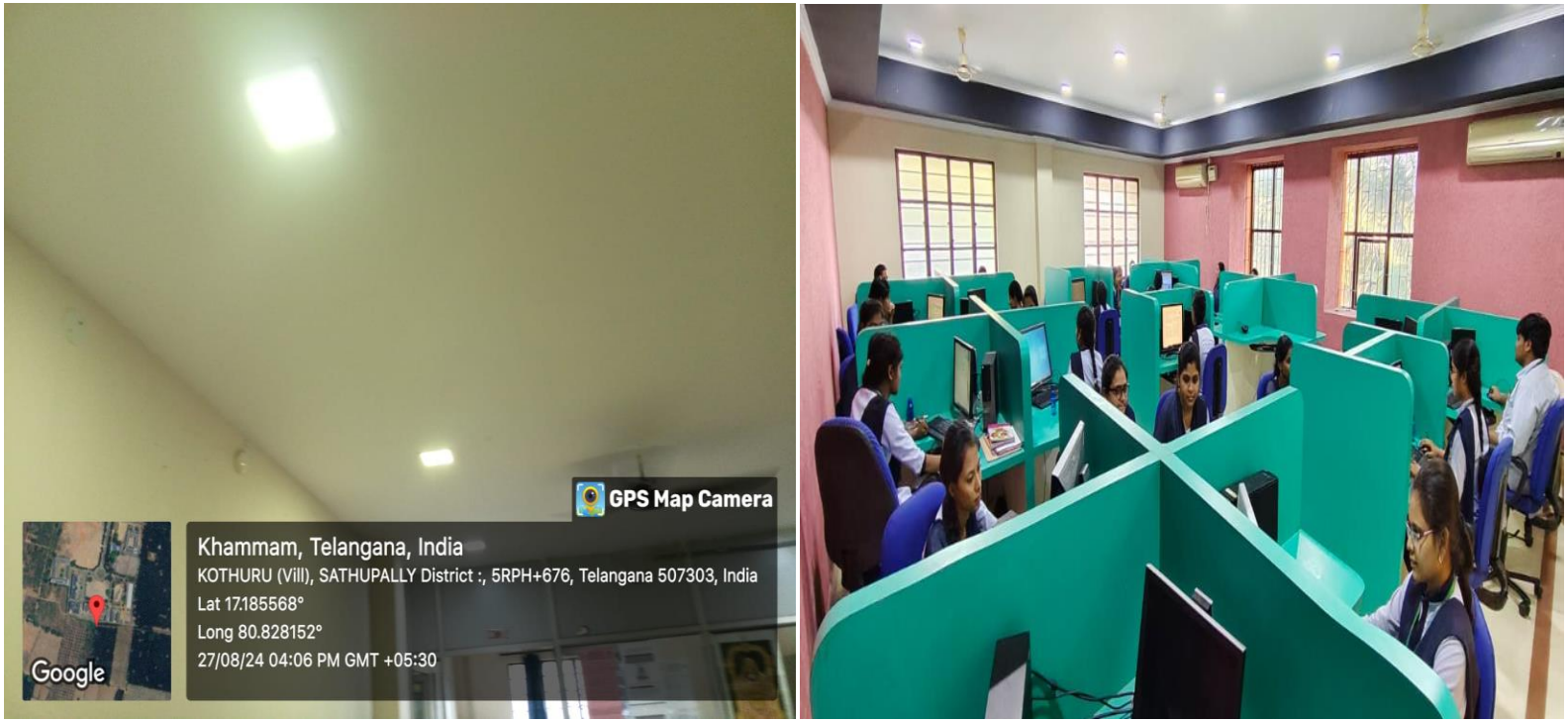


Fig. 1.2 LED Lighting

Fig.1.3 Star Rated Air Conditioner and Computer System

1.2 About Energy Audit

An energy audit serves to enhance understanding about how energy is utilized within a college , aiding in the identification of areas susceptible to waste and potential areas for improvement. The overall energy efficiency, from generation to the end consumer, stands at 50%. Therefore, conserving one unit by the end user is equivalent to two units produced at the power plant.

An energy audit represents the most effective approach to discerning the strengths and weaknesses of energy management practices, while also offering solutions to existing issues. It embodies a professional means of responsible utilization of economic, financial, social, and natural resources. Energy audits contribute value to management control and serve as an evaluative method for systems.

Empirical Exergy Private Limited (EEPL), based in Indore, Madhya Pradesh, conducted an "Energy Audit" on-site to identify gaps in the energy consumption pattern at College of Pharmacy, Sathupally, Khammam Dist. Telangana. A technical report has been prepared in accordance with the requirements of the college.

1.3 Objectives of Energy Auditing

Energy auditing provides a critical information foundation for an all-encompassing energy conservation initiative, encompassing energy utilization analysis and the evaluation of energy-saving measures.

Its objectives include:

- Identifying the cost and quality of different energy inputs
- Evaluating the current energy consumption patterns across various operational cost centers
- Establishing connections between energy inputs and production outputs.
- Identifying potential areas for thermal and electrical energy conservation.
- Pinpointing areas of major wastage.
- Setting energy-saving targets for individual cost centers.
- Implementing measures for energy conservation and realizing savings.

1.4 Methodology

The methodology employed to achieve the designated objectives, encompassing the assessment of current operational status and potential energy savings, encompasses the following steps:

- Engaging in discussions with relevant officials to identify key areas of focus and related systems.
- Sending a team of engineers to the site for discussions with concerned officials and supervisors, aiming to gather data and information regarding plant operations and load distribution across the premises. The collected data were analyzed to establish a baseline energy consumption pattern.
- Utilizing suitable instruments for measurements and monitoring, including continuous and/or time-lapse recording as appropriate, coupled with visual observations to discern energy usage patterns and system losses.
- Conducting trend analysis for costs and consumption patterns.
- Carrying out capacity and efficiency tests on major utility equipment, wherever applicable.
- Estimating various forms of losses.
- Performing computations and in-depth analysis of the gathered data, utilizing computerized analysis and relevant techniques where appropriate, to derive conclusions and formulate an effective energy conservation plan to enhance and reduce specific energy consumption.

CHAPTER-2
POWER SUPPLY SYSTEM

2.1 Power supply system

There is a common feeder to draw the power from the Northern power Distribution Company of TS Limited. The M/S Mother Teresa Christian Minority Society (Mother Teresa Institute of Science & Technology) draw the power from the above feeder. It is also observed that there is a requirement of the energy meter for the measurements of energy consumption of the college for the pharmacy separately. Energy audit team has analyzed overall electricity bill to calculate annual energy consumption of the college. The details of the unit consumption and billing amount is given in the table 2.1

Table 2.1: Monthly Energy Consumption Year 2022-23

Sr. No	Month	Total Unit (kWh)	Total Unit (kVAh)	Current Month Billing Amount (Rs.)
1	Jul-22	1197	10199	140232
2	Aug-22	14837	14837	175353
3	Sep-22	18255	18261	203380
4	Oct-22	9121	9121	102252
5	Nov-22	11995	11996	107124
6	Dec-22	11527	11613	121757
7	Jan-23	9727	9790	92549
8	Feb-23	10017	10019	102736
9	Mar-23	11066	11793	143907
10	Apr-23	12404	12405	118222
11	May-23	8680	8709	118273
12	Jun-23	11829	11836	144505
		1,30,655	**1,40,579**	**15,70,290**

Observation:

- The annual energy consumption from the grid is 1,40,579 units is given in the table 2.1
- The average per unit charges paid annually Rs. 11.35.

Table 2.2: Monthly Demand Consumption Year 2022-23

Sr. No	Month	Contact Demand (KVA)	MD Recorded (KVA)	Billing Demand (KVA)
1	Jul-22	140	70.7	112
2	Aug-22	140	78.2	112
3	Sep-22	140	95	112
4	Oct-22	140	86.1	112
5	Nov-22	140	51.5	112
6	Dec-22	140	93.6	112
7	Jan-23	140	42.6	112
8	Feb-23	140	43.9	112
9	Mar-23	140	62	112
10	Apr-23	140	85.5	112
11	May-23	140	88.5	112
12	Jun-23	140	89.4	112

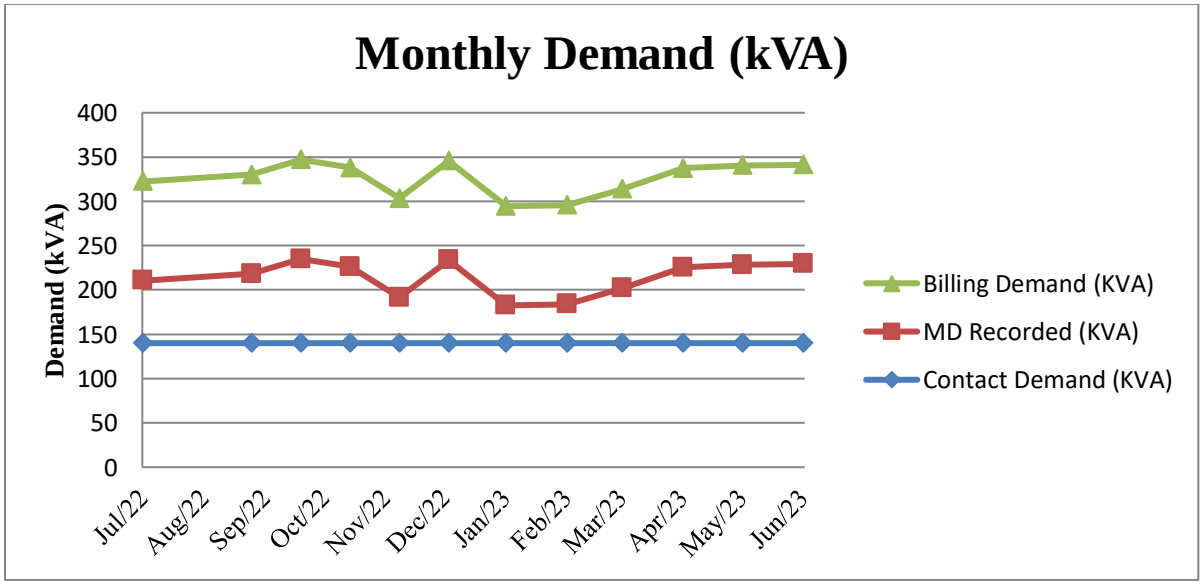


Fig. 2.1 Monthly Energy Demand Consumption Pattern

2.2 Renewable Energy

The college has installed a rooftop solar system with a capacity of 110 kWp, generating a total of 47,115 units in the year 2022-23. This is commendable. Given in the table 2.3

Table 2.3 Solar unit generation year 2022-23

Sr. No	Month	solar unit
1	Jul-22	686
2	Aug-22	1161
3	Sep-22	1541
4	Oct-22	3767
5	Nov-22	6110
6	Dec-22	13791
7	Jan-23	5431
8	Feb-23	4636
9	Mar-23	1752
10	Apr-23	3301
11	May-23	3132
12	Jun-23	1807
		47115

Fig. 2.2 Solar System

CHAPTER-3
CONNECTED LOAD ANALYSIS

3.1 Connected Load

During the energy audit, the details of the electrical appliances at Mother Teresa Pharmacy College were verified. The power consumption of the appliances was measured, and the details of the electrical appliances, along with their power consumption in watts, are provided in Table 3.1.

Table-3.1 Details of the lighting, cooling and other office load

Sr. No.	Appliances	Unit Power (Watt)	Quantity	Total Power	Load Share (%)
1	LED tube (T-5)	20	95	1900	10.4
2	Ceiling fan	90	62	5580	30.6
3	Computers	75	75	5625	30.8
4	Printer	50	3	150	0.8
5	Photocopy M/c	550	1	550	3.0
6	Exhaust Fan	90	8	720	3.9
7	Water cooler	150	1	150	0.8
8	Split AC (1.5 Ton) without star rating	1785	2	3570	19.6
				18245	**100.0**

Table-3.2 Percentage Share (%) of the lighting, cooling and other office load

Sr. No.	Appliances	Load Share (%)
1	Lighting Load	10.4
2	Ceiling fan and Exhaust Fan	34.5
3	Computers	30.8
4	Printer and Photocopy M/c	3.8
5	Air Conditioning Load	19.6
6	Water cooler	0.9
		100

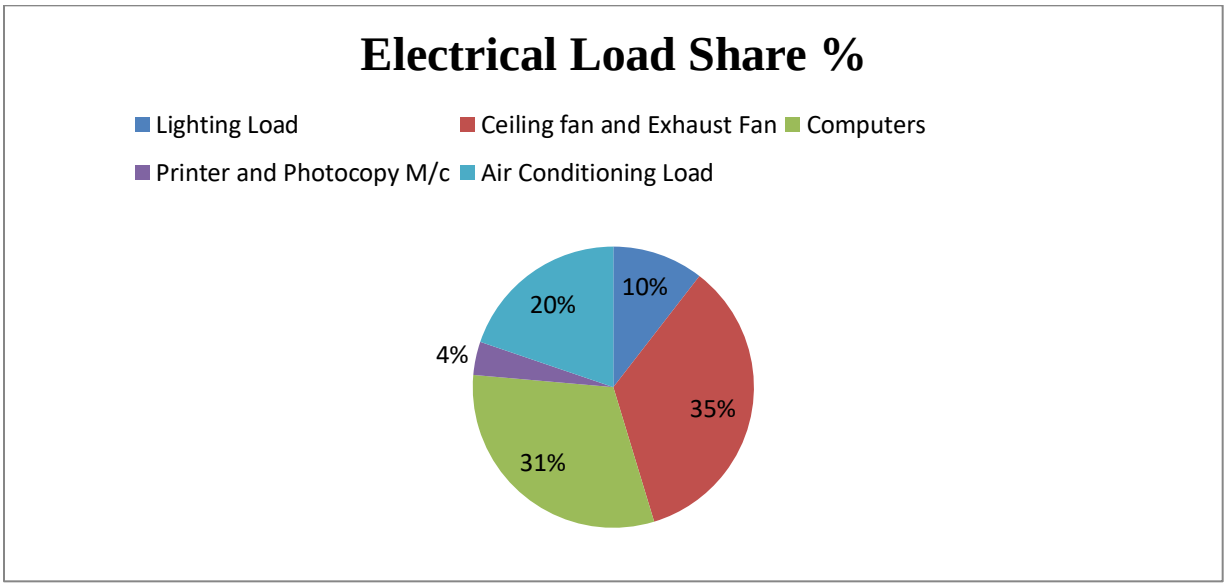


Fig.3.1: Load Share of the college Building

Observation:

It is observed that lighting load is 10.4%, ceiling fan and Exhaust fan load 34.5%, and Air-conditioning load 19.6%

CHAPTER-4
ENERGY CONSERVATION MEASURES

This chapter describes the energy conservation measures that can be implemented in a phase manner to optimize energy consumption in the building.

ECM: 4.1 Replacement of conventional Ceiling fans 90W by BLDC fan 28W

Sr. No	Item	Parameter	Unit
1	Rated Power of Conventional Ceiling Fan	90	W
2	No. of Fan	62	Nos
3	Working Hrs./Day	8	Hrs./Day
4	Working Days/Year	250	Days/Year
5	Rated power of Energy Efficient BLDC Fan	28	W
6	Energy Saving Potential	7688	kWh/Year
7	Load Factor	1	%
8	Expected Annual Energy Saving	7688	kWh/Year
9	Overall Per Unit Charges for calculation	11	Rs/kWh
10	Expected Annual Monetary Saving	84568	Rs./Year
11	Cost of BLDC Celling Fan	2,800	Rs./Pices
12	Investment on BLDC Fan Purchasing	173600	Rs.
13	Simple Pay Back Period	2.1	Year

ECM: 4.2 Replacement of Exhaust fan (90W) by BLDC fan 40W

Sr. No	Item	Parameter	Unit
1	Rated Power of Exhaust Fan	90	W
2	No. of Fan	8	Nos
3	Working Hrs./Day	8	Hrs./Day
4	Working Days/Year	250	Days/Year
5	Energy Efficient BLDC Fan Rated power	40	W
6	Energy Saving Potential	800	kWh/Year
7	Load Factor	1	%
8	Expected Annual Energy Saving	800	kWh/Year
9	Per Unit Charges	11	Rs/kWh
10	Expected Money Saving	8800	Rs./Year
11	Cost of New BLDC Exhaust Fan	2,300	Rs./Pices
12	Investment on New Fan Purchasing	18400	Rs.
13	Simple Pay Back Period	2.1	Year

ECM: 4.3 Installation of Airtron 'intelligent' microprocessor energy saver

Sr. No	Items	Parameters	Units
1	Average power consumption of 1.5 ton AC	1800	Watt
2	No of AC	2	Nos.
3	Working Hrs./Day	8	Hrs./Day
4	Working Days/Year	200	Days/Year
5	Expected saving @ 30% of power consumption of AC	540	W
6	Expected Annual Energy Saving	1728	kWh/Year
7	Overall, Per Unit Charges	11.00	Rs./kWh
8	Expected Money Saving	19008	Rs./Year
9	Cost of Airtron 'intelligent' microprocessor energy saver	7500	Rs./ Pices
10	Total Investment on energy saver	15000	Rs.
11	Simple Pay Back Period	0.8	Year

ECM: 4.4 Reduction in contract Demand from 140 kVA to 95 kVA

Sr. No	Description	Parameters	Units
1	Present contract Demand	140	kVA
2	Billing Demand @ 80% of the contract demand	112	kVA
3	Annual Billing Demand loss	3353.8	kVA
4	Annual Fixed Demand charges loss @ Rs. 475 per kVA	1593055	Rs./ Year
5	Recommended contract Demand	95	kVA
6	New Billing Demand @ 80% of the new contract demand	76	kVA
7	Expected Billing Demand Saving	17	kVA
8	Expected fixed Demand charges Saving @ Rs. 475 per kVA	19380	Rs./ Year
9	Expected Investment	Nil	
10	Simple payback	Immediate	

Annexure-I: BLDC ceiling and exhaust fan product catalog

Sweep (mm)	Power (W)	Input Voltage (V)	RPM	Air Delivery CMM (m^3/min)	Power Factor	Service Value (CMM/W)	MRP (₹)
900	28	140-285	470	157	0.99	5.6	3590
1050	32	140-285	430	235	0.99	7.4	3690
1200	28	140-285	340	235	0.99	8.4	3690
1400	32	140-285	275	270	0.99	8.4	4090

Annexure-III: Airtron intelligent microprocessor energy saver product catalog

ENVIRONMENT AUDIT REPORT

Mother Teresa Pharmacy College,

Sathupally, Khammam Dist.,

Telangana State PIN: 507303

PREPARED BY

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Flat No. 201, OM Apartment,214 IndrapuriColony,Bhawarkuan,
Indore – 452 001 (M. P.), India0731-4948831, 7869327256
Email ID:eempirical18@gmail.com
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(BEE, Ministry of Power, Govt. of India)
Empanelled Energy Auditor with MPUVN, Bhopal M.P.
Lead Auditor ISO50001:2011 [EnMS) from FICCI, Delhi
Certified Water Auditor (NPC, Govt. of India)
Chartered Engineer [M-1699118], The Institution of Engineers (India)
Member of ISHRAE [58150]

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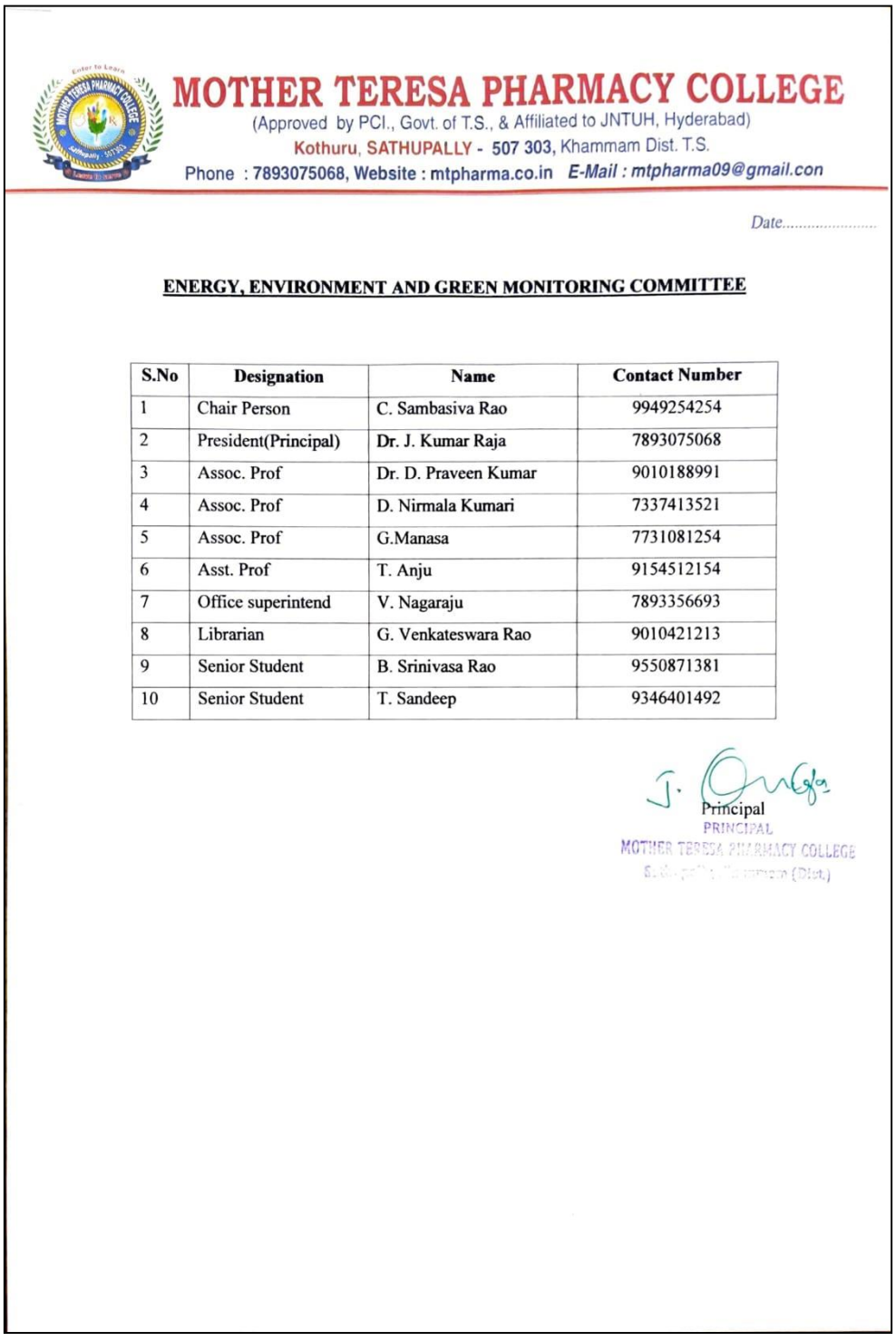
Given under the seal of the Bureau of Energy Efficiency, Ministry of Power, this 5th day of October, 2018

Secretary,
Bureau of Energy Efficiency
New Delhi

GREEN MONITORING COMMITTEE



MOTHER TERESA PHARMACY COLLEGE
(Approved by PCI., Govt. of T.S., & Affiliated to JNTUH, Hyderabad)
Kothuru, SATHUPALLY - 507 303, Khammam Dist. T.S.
Phone : 7893075068, Website : mtpharma.co.in E-Mail : mtpharma09@gmail.con

Date.....

ENERGY, ENVIRONMENT AND GREEN MONITORING COMMITTEE

S.No	Designation	Name	Contact Number
1	Chair Person	C. Sambasiva Rao	9949254254
2	President(Principal)	Dr. J. Kumar Raja	7893075068
3	Assoc. Prof	Dr. D. Praveen Kumar	9010188991
4	Assoc. Prof	D. Nirmala Kumari	7337413521
5	Assoc. Prof	G.Manasa	7731081254
6	Asst. Prof	T. Anju	9154512154
7	Office superintend	V. Nagaraju	7893356693
8	Librarian	G. Venkateswara Rao	9010421213
9	Senior Student	B. Srinivasa Rao	9550871381
10	Senior Student	T. Sandeep	9346401492

Principal
PRINCIPAL
MOTHER TERESA PHARMACY COLLEGE

ENVIRONMENT AUDIT TEAM

The audit team constituted by the following senior technical executives from the **Empirical Exergy Private Limited,**

- **Mr. Rajesh Kumar Singadiya** [Director & Accredited Energy Auditor AEA-0284]
- **Ms. Laxmi Raikwar** [Energy Expert and Report Reviewer]
- **Mr. Charchit Pathak** [Sr.Project Engineer]
- **Mr. Praveen Punasiya** [Field Engineer]

ENVIRONMENT POLICY

MOTHER TERESA PHARMACY COLLEGE
(Approved by PCI., Govt of T.S., & Affiliated to JNTUH, Hyderabad.)
Kothuru, SATHUPALLY-507303, Khammam Dist., T.S.
Phone: 7893075068, 7801041193, E-Mail : mtpharma09@gmail.com

Environment Policy

Policy Statement:

The green campus and environment policy has an aims to provide to education and awareness in a clean and green environment to the stakeholders with regards to environmental compliance.

Policy making:

Cleanliness on the campus is maintained through proper disposal of wastes and steps taken to recycle the wastes. Utilization of eco-friendly supplies and an effective recycling programme to maintain the campus free from hazardous wastes. The concept of eco-friendly culture is disseminated among the students as well as rural community through various awareness programmes, seminars, reuse and recycle the waste materials. Attempts are made to limit energy usage and also replace non-renewable energy sources with renewable energy sources.

The main objectives are as follows:

- To grow a large number of plants which are producing more amounts of oxygen and absorbing more amount of carbon-di-oxide in the campus.
- To create a pollution-free environment through a proper waste management system and to set a procedure for disposal of all kinds of waste and green cover provides pollution free air, working as a carbon sink.
- To conserve energy by using alternative energy resources such as solar energy, and other power-efficient equipment to reduce the electrical energy.
- To encourage the application of rainwater harvesting system among students for future needs which in turn useful to raise the ground water level.
- To ensure that the campus should be in greenish in terms of planting a largenumber of trees, herbs, shrubs, climbers, twins and lawns which in turn not only to reduce the environmental pollution and soil erosion but also useful for biodiversity conservation, landscape management, proper water irrigation & natural topography.
- Promoting & benchmarking for environmental protection initiatives.
- To encourage projects on environmental assessment.
- To impact awareness about green clean campus.
- To initiate sustainability practices in the campus and among stakeholders.

Effective measures:

Green campus:

- Land Scaping and more than 25% green cover area planted with trees, shrub sand herbs.
- Creating a nature ecosystem containing native and wild plants and birds.
- Grow a large number of oxygen producing and carbon-di-oxide absorbing plants.
- Pollution-free environment and greenish campus.
- Biodiversity conservation, landscape management, natural topography and vegetation.

Environmental friendly campus:

- Providing eco-friendly atmosphere to the stakeholders.
- Providing good drinking water facility to the students and staff.
- Use of organic manure, cow dung and vermin compost for the cultivation of plants.
- Eliminate campus of all non-compostable, single-use disposable plastic items.
- Avoidance of single-use plastic utensils, plastic straws and stirrers, singleuse plastic.
- Education on the commitment to plastic-free alternatives for all incoming and current students, staff and faculty.
- Reduction of use of papers alternated with e-services and e-circulars, etc.
- Proper disposal of wastes, recycling and suitable waste management system.

PRINCIPAL
MOTHER TERESA PHARMACY COLLEGE
Sathupally, Khammam (Dist)

EXECUTIVE SUMMARY

The executive summary of the environment audit report presented in this section briefly outlines the identified water conservation measures and recommendations proposed during the project.

WATER CONSERVATION PROJECT TAKEN BY COLLEGE

- **Rainwater Harvesting System**

The college has successfully installed a "Rainwater Harvesting System" on the college, for all buildings to maintain the groundwater level. This system saves about 80 to 85 % of the building's rooftop rainwater. It's appreciable.

ENVIRONMENT AUDIT RECOMMENDATION

- **Fresh Water Monitoring System**

  Installation of a “Cloud-based (IoT) Groundwater Extraction Monitoring System” for bore- well to quantify freshwater consumption per day in the college **or** Install water flow meters (Mechanical or Electronics) on the bore-well for quantify per day water consumption.

- **Sensor Based Water Taps**

  Installation of 'sensor-based water taps' reduces water wastage.

- **Use Efficient Urinal Taps And Sensor Based Water Taps**

  Replacing these inefficient fixtures with Water Sense-labelled flushing urinals can save between 0.5 to 0.4 litres per flush without sacrificing performance. Installing water-saving flushing urinals will not only reduce water use in facilities but also save on pumping energy costs in water bills.

- **Installation of Water over Flow Sensor in Water Tanks**

  It was observed that water overflows from the overhead tanks. Therefore, it is recommended to install a water overflow sensor to prevent overflow from the tanks."

- **Drip water irrigation system**

  Use drip water irrigation system for trees and plants.

- **Awareness and Training program**

  Conduct awareness and training program, poster presentation to promote water conservation and sustainable development activities in the college.

Chapter-1
INTRODUCTION

1.1 About College

MOTHER TERESA PHARMACY COLLEGE (MOTP) was established in the year 2009 by MCM SOCIETY, the college has been making remarkable progress in the field of Pharmacy education under the exemplary leadership of the dynamic Secretary and correspondent Sri CHALASANI SAMBASHIVA RAO. The college is situated in a peaceful and beautiful campus which is conducive for providing quality education, career building and helpful for gaining professional knowledge in pharmacy field. The college has imparting excellent credentials in pharmacy career with a clear focus on the untroubled learning environment and sophisticated infrastructure in rural area. The main aim of institution is making Pharmacy professionals to be an integral part of the society through community service, research, innovation for their holistic development which in turn helps to achieve the academic excellence. Its main focus is to encourage and empower young aspirant pharmacist to take up advanced programs and careers in Pharmacy to cater to the needs of the society in health care sector. Student centre teaching practices, various in-house activities aimed at their holistic development along with the extension programmes strive towards achieving at academic excellence in tune with integrity of character.

The College is approved by PCI, affiliated to JAWARHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD, approved by TELANGANA state. It is self financed and offers both UG and PG programs with an approved intake of 90students each year as follows: 60 seats in B. Pharmacy (4 years), 15 seats in M. Pharmacy (2 years) in Pharmaceutics and 15 seats in Pharmaceutical Analysis.

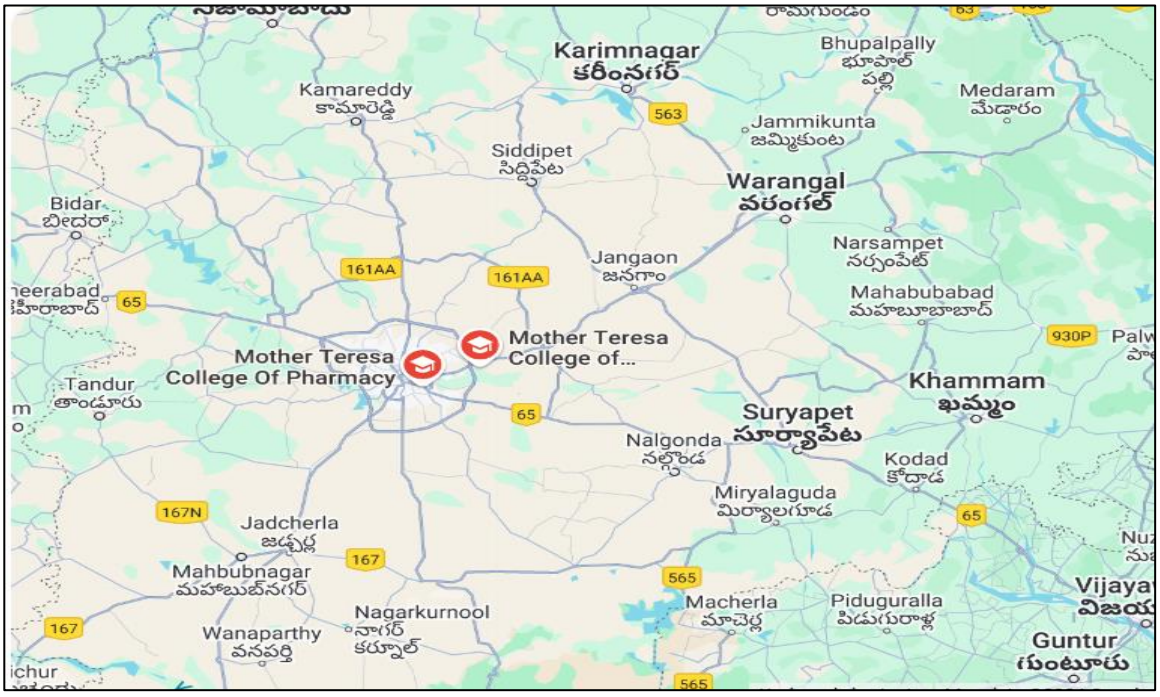


Figure1.1-Source: Satellite Image of Mother Teresa Pharmacy College

Vision

To be the best institute in the field of pharmacy in rural area by providing excellent education to achieve overall development of the pharmacy professionals to provide the needs of the profession and society.

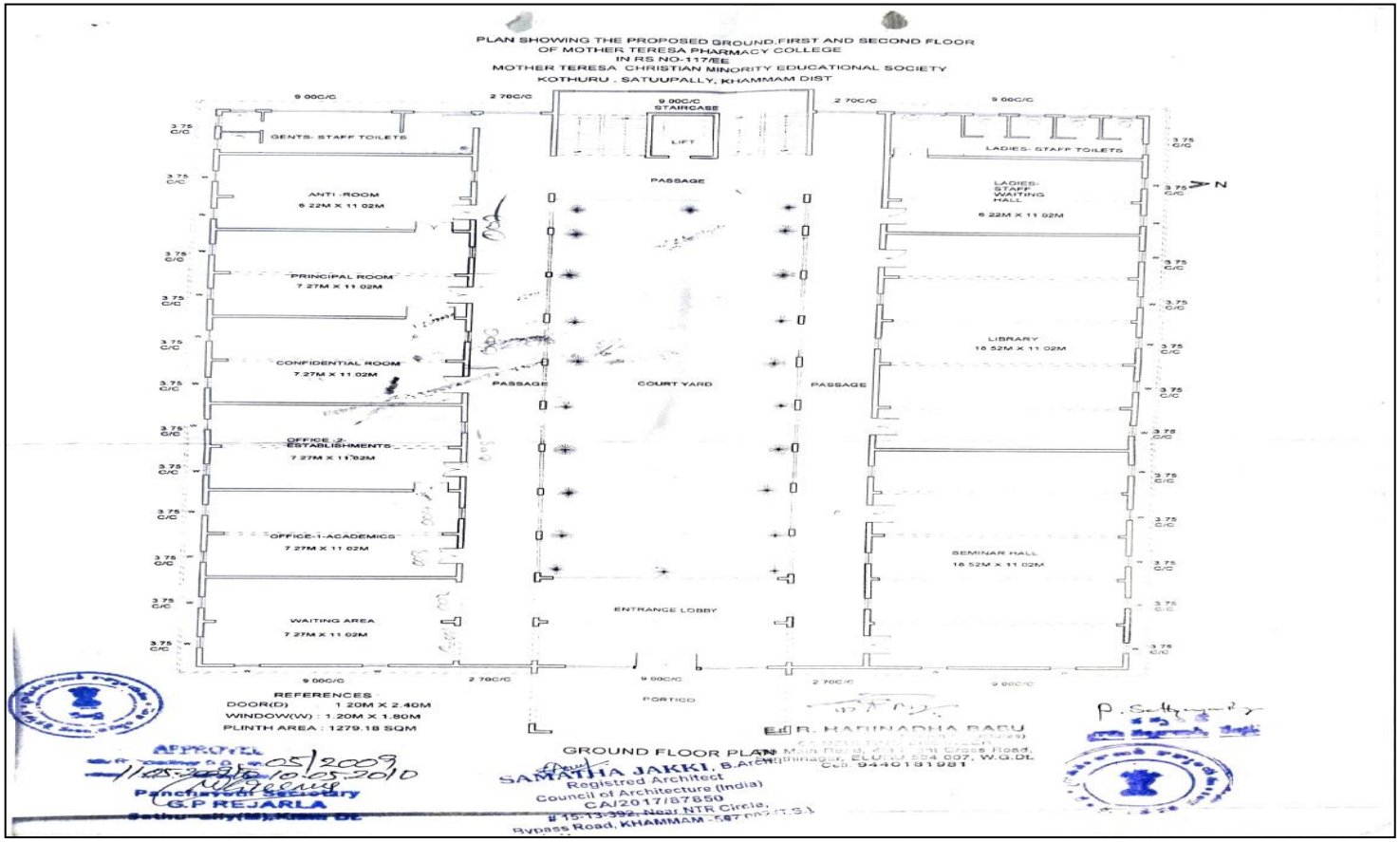
Mission

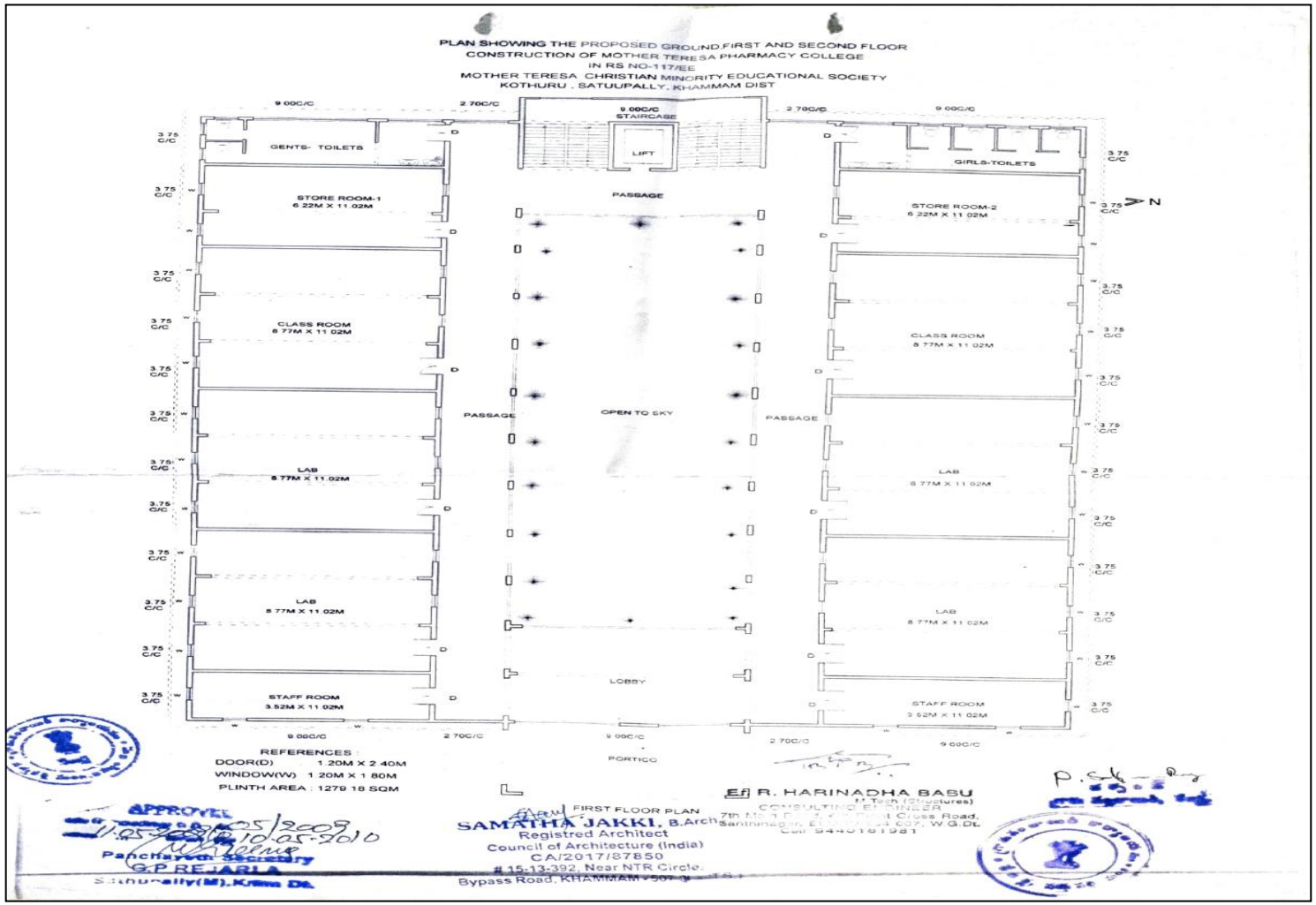
- To encourage and empower the students by providing value based education in Pharmaceutical sciences.
- To provide high quality standards and support health care and industrial needs.
- To provide innovative learning environment, with strategically planned quality pharmacy education consistent with the policies of state and nation.
- To produce innovators and entrepreneurs.
- To promote employability, leadership, research aptitude and entrepreneurship in pharmaceutical industry by innovative teaching-learning process, training activities and research facilities.

Table: 1.1 College Population

Sr. No.	Teaching Staff (No.)	Non -Teaching Staff (No.)	Student (No.)
1	25	20	245

CollegeLayout

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KOTHURU , SATUUPALLY, KHAMMAM DIST
STAIRCASE
LIFT
GENTS- TOILETS
GIRLS-TOILETS
STORE ROOM-1
6.22M X 11.02M
STORE ROOM-2
6.22M X 11.02M
PASSAGE
CLASS ROOM
8.77M X 11.02M
OPEN TO SKY
LAB
8.77M X 11.02M
LOBBY
STAFF ROOM
3.52M X 11.02M
PORTICO
N
REFERENCES :
DOOR(D) 1.20M X 2.40M
WINDOW(W) 1.20M X 1.80M
PLINTH AREA : 1279.18 SQM
FIRST FLOOR PLAN
R. HARINADHA BABU
CONSULTING ENGINEER
SAMATHA JAKKI, B.Arch
Registred Architect
Council of Architecture (India)
CA/2017/87850
APPROVED
Panchayath Secretary
G.P.REVARLA

1.2 About Environment Audit

An environmental audit can be a highly valuable tool for education colleges and the universities in a wide range of ways to improve their energy, environmental, and economic performance while reducing waste and operating costs. Environmental audits provide a basis for calculating the economic benefits of water conservation projects by establishing the current rates of water use and their associated costs.

1.3 Objectives of Environment Audit

The general objective of environment audit is to prepare a baseline report on water conservation measures to mitigate consumption, improve quality and sustainable practices.
The specific objectives are

- To monitor the water consumption and water conservation practices.
- To assess the quantity of water, usage, quantity of waste water generation and their reduction within the campus.

1.4 Target Areas of Environment Audit

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

1.5 Methodology followed for conducting Environment audit

Step 1: Walk through the survey

- Understanding of existing water sourcing, storage, and distribution facility.
- Assessing the water demand and water consumption areas.
- Preparation of a detailed water circuit diagram.

Step 2: Secondary Data Collection

- Analyse historical water use and wastewater generation
- Field measurements for estimating current water use
- Metered & unmetered supplies.
- Understanding of "base" flow and usage trends at site
- Past water bills
- Wastewater treatment scheme & costs etc.

Step 3: Site Environment Audit Planning (based on-site operations and practices)

- Preparation of a water flow diagram to quantify water use at various locations
- Wastewater flow measurement and sampling plan

Step 4: Conduction of Detailed Environment Audit and Measurements

- Conduction of field measurements to quantify water/wastewater streams
- Power measurement of pumps/motors
- Preparation of water balance diagram
- Establishing a water consumption pattern
- Detection of potential leaks & water losses in the system
- Assessment of productive and unproductive usage of water
- Determine key opportunities for water consumption reduction, reuse & recycle.

Step 5: Preparation of Environment Audit Report

- Documentation of collected &analyzed water balancing and measurement details
- Projects and procedures to maximize water savings and minimize water losses.
- Opportunities for water conservation based on reduce/recycle/reuse and recharge option

CHAPTER- 2
WATER CONSUMPTION AND WASTEWATER SOURCES

2.1 Details of the source of fresh water and use areas

The main source of the freshwater for the college is bore-well. Freshwater is primarily used for drinking, housekeeping, gardening, and domestic activities. The college has one bore-well campus. Details of the bore well are given in Table 2.1

Table 2.1: Fresh Water sources in the college

Sr. No.	No. of bore-well	Rated (HP)
1	2	2

2.2 Water Accounting and Meter system

It was observed that there is requirement of water flow meters on bore-wells to quantify per day ground water extraction from bore-well.

Fig.2.1: Fresh Water source (Bore-wells) in the campus

2.3 Water storage capacity in the college

The college has different types of water storage tanks, including PVC and RCC. Details of the tanks are given in the table.2.2

Table: 2.2 Details of Water Storage Tanks

Sr.No.	Location	Type of Tank	Unit Capacity (Lit.)	Quantity (No's)	Total Capacity (Lit.)
1	College top floor	Concrete	12000	4	48000
Total Water Storage Capacity					**48000**

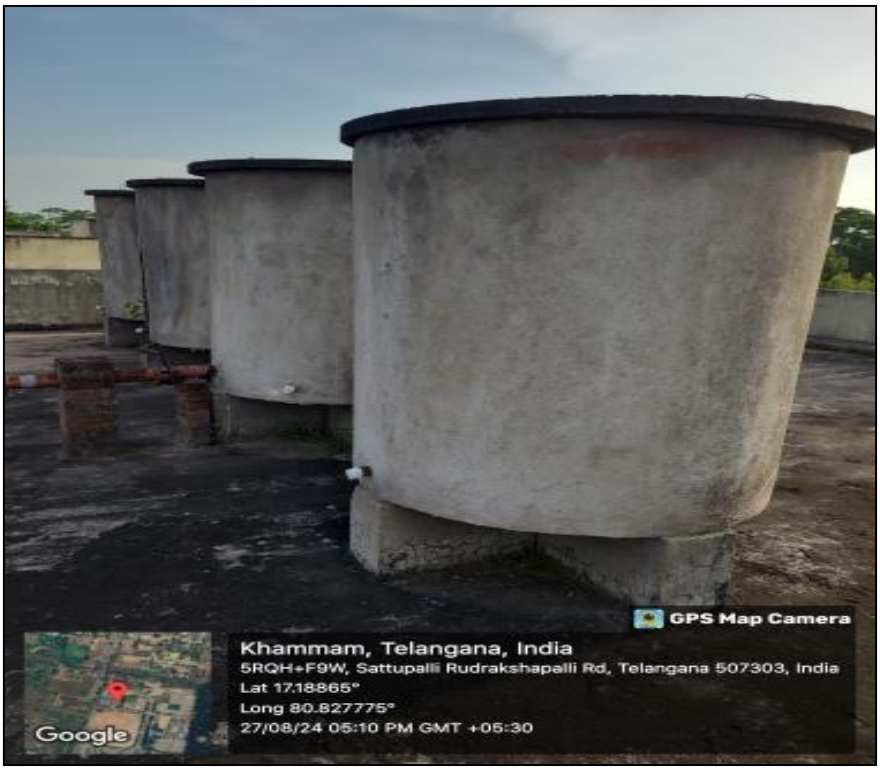

Fig.2.3: Water storage tank in the campus

2.4 Water Use Areas in the college

Water is preliminary used for drinking, domestic, and gardening. The environment audit team visited various departments and buildings to determine appliances. The details of the washroom, toilet, and taps are given in the table 2.3

Table: 2.3 Details of washroom and use taps in various areas

Sr.No.	Location	Urinal	Washbasin	Taps
1	Admin building	5	2	5

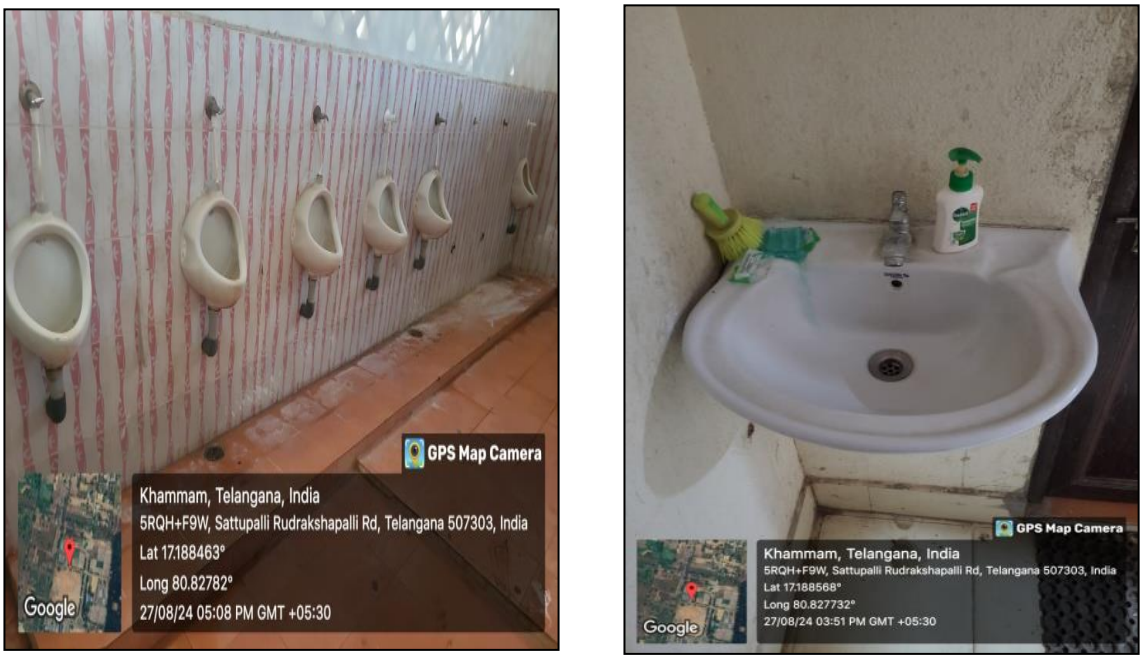

Fig.2.4: Wash basin and Urinal in the college

2.5 Water coolers in the college

The management has installed water cooler in college building. Details are provided in Table 2.4.

Table 2.4: Water cooler Location and Numbers

Sr. No.	location	Quantity(No's)
1	College building	1

2.6 Fresh water Garden Area

The management has installed water sprinkler system for efficient water utilisation in garden. **It's appreciable.**

Recommendation:

The one of major contribution of fresh water consumption is watering for plants and gardening in college campus. There is good potential for water saving by adopts "Automatic Watering 360 adjustable misting nozzle irrigation Dripper's system" for plants. Adjustable drip irrigation tools to provide different amounts of water depending on the water requirements of different plants. The drip speed can be set as for indoor and outdoor plants.

Figure: - 2.7 Recommended "Drip irrigation System" for Watering in the plant

2.7 Wastewater Generation Sources

At present, wastewater is generated from various departments and other activities such as washrooms and hand washing. Details of the wastewater generation sources and their locations are provided in the table 2.5

Table: 2.5 Waste Water Generation Sources

Sr. No.	Location	Type of water used	Water consuming activities
1	Ground floor	Fresh water	Drinking, washrooms activities
2	First floor	Fresh water	Drinking, washrooms activities, Lab activity
3	Second floor	Fresh water	Drinking, washrooms activities, Lab activity

CHAPTER- 3
RAINWATER HARVESTING SYSTEM

3.1 Rainwater Harvesting systems

Rainwater harvesting is a technique to capture the rainwater when it precipitates, store that water for direct use or charge the groundwater and use it later.

There are typically four components in a rainwater harvesting system:

- Roof Catchment.
- Collection.
- Transport.
- Infiltration or storage tank and use.

If rainwater is not harvested and channelized it runoffs quickly and flows out through storm-water drains. For storm-water management, the recharge pits, percolation pits, and porous trenches are constructed to allow storm water to infiltrate inside the soil.

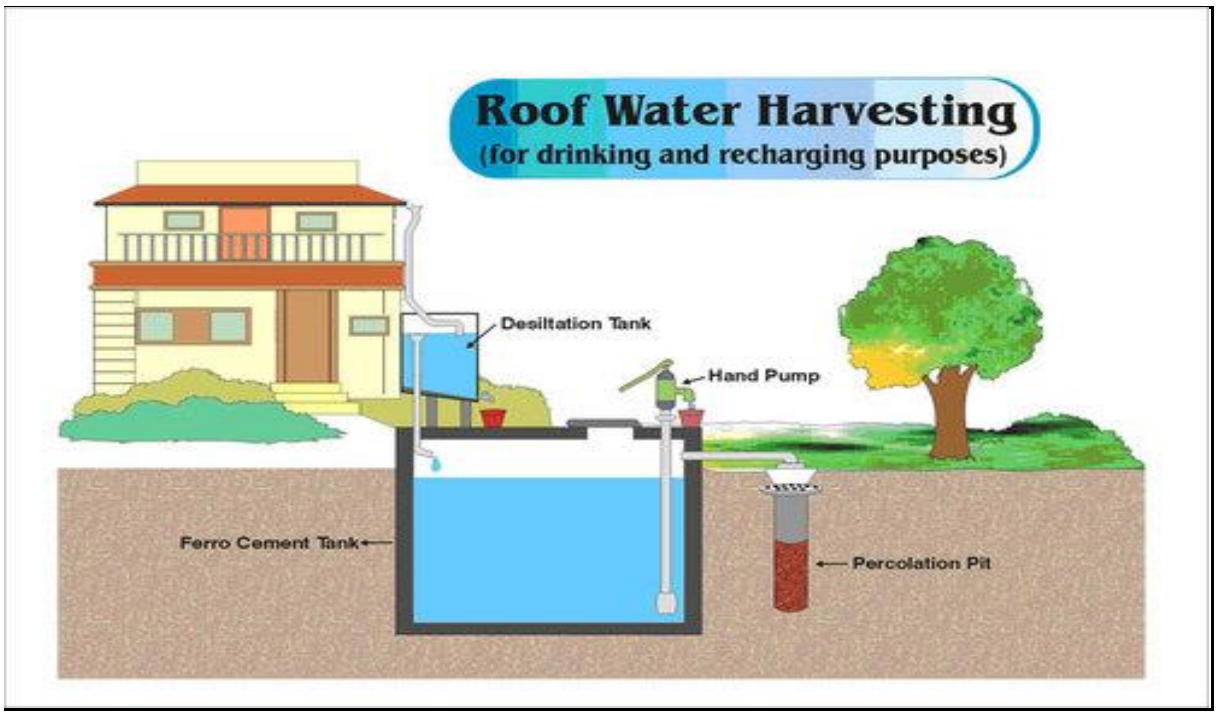

Fig. 3.1 Rain Water harvesting structure

3.2 Rainwater Harvesting System in the college

Rain water harvesting system in the college campus **It's appreciable**

Figure: - 3.1 Rainwater harvesting in the college

END OF THE REPORT

THANKS

GREEN AUDIT REPORT

Mother Teresa Pharmacy College,

Sathupally, Khammam Dist.,

Telangana State PIN - 507303

PREPARED BY

EMPIRICAL EXERGY PRIVATE LIMITED
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Indore – 452 001 (M. P.), India0731-4948831, 7869327256
Email ID:eempirical18@gmail.com
www.eeplgroups.com

(2022-23)

CONTENTS

ACKNOWLEDGEMENT

We would like to thank the **Mother Teresa Pharmacy College**, Sathupally, Khammam Dist. Telangana Our appreciation and gratitude to the management for granting us permission to conduct green audit for the college.

We are genuinely touched by the helpful attitudes and cooperation displayed by all the faculty members and technical staff involved in the audit. Their valuable assistance and cooperation significantly contributed to the successful execution of the audit.

For- Empirical Exergy Private Limited

Rajesh Kumar Singadiya

(Director)

M.Tech (Energy Management),
Accredited Energy Auditor [AEA-0284]
Certified Energy Auditor [CEA-7271]
(BEE, Ministry of Power, Govt. of India)
Empanelled Energy Auditor with MPUVN, Bhopal M.P.
Lead Auditor ISO50001:2011 [EnMS) from FICCI, Delhi
Certified Water Auditor (NPC, Govt. of India)
Chartered Engineer [M-1699118], The Institution of Engineers (India)
Member of ISHRAE [58150]

CERTIFICATE OF ACCREDITATION

ENERGY IS LIFE
BEE
CONSERVE IT

BUREAU OF ENERGY EFFICIENCY

Examination Registration No.: EA- 7271

Accreditation Registration No.: AEA-284

Certificate of Accreditation

This is to certify that Mr./Ms. Shri. Rajesh Kumar Singadiya having its trade/registered office at ..... has been given accreditation as accredited energy auditor. The certificate shall be effective from 9th day of May, 2018

The certificate is subject to the provisions of the Bureau of Energy Efficiency (Qualifications for Accredited Energy Auditors and Maintenance of their List) Regulations, 2010.

This certificate shall be valid until it is cancelled under regulation 9 of the Bureau of Energy Efficiency (Qualifications for Accredited Energy Auditors and Maintenance of their List) Regulations, 2010.

On cancellation, the certificate of accreditation shall be surrendered to the Bureau within fifteen days from the date of receipt of order of cancellation.

Your name has been entered at AEA No. 284 in the register of list of accredited energy auditors. Your name shall be liable to be struck out on the grounds specified in regulation 8 of the Bureau of Energy Efficiency (Qualifications for Accredited Energy Auditors and Maintenance of their List) Regulations, 2010.

Given under the seal of the Bureau of Energy Efficiency, Ministry of Power, this 5th day of October, 2018

Secretary,
Bureau of Energy Efficiency
New Delhi

GREEN MONITORING COMMITTEE

MOTHER TERESA PHARMACY COLLEGE
(Approved by PCI., Govt. of T.S., & Affiliated to JNTUH, Hyderabad)
Kothuru, SATHUPALLY - 507 303, Khammam Dist. T.S.
Phone : 7893075068, Website : mtpharma.co.in E-Mail : mtpharma09@gmail.con

Date.....

ENERGY, ENVIRONMENT AND GREEN MONITORING COMMITTEE

S.No	Designation	Name	Contact Number
1	Chair Person	C. Sambasiva Rao	9949254254
2	President(Principal)	Dr. J. Kumar Raja	7893075068
3	Assoc. Prof	Dr. D. Praveen Kumar	9010188991
4	Assoc. Prof	D. Nirmala Kumari	7337413521
5	Assoc. Prof	G.Manasa	7731081254
6	Asst. Prof	T. Anju	9154512154
7	Office superintend	V. Nagaraju	7893356693
8	Librarian	G. Venkateswara Rao	9010421213
9	Senior Student	B. Srinivasa Rao	9550871381
10	Senior Student	T. Sandeep	9346401492

Principal
PRINCIPAL
MOTHER TERESA PHARMACY COLLEGE

GREENAUDIT TEAM

The audit team constituted by the following senior technical executives from the **Empirical Exergy Private Limited,**

- **Mr. Rajesh Kumar Singadiya** [Director & Accredited Energy Auditor AEA-0284]
- **Ms. Laxmi Raikwar** [Energy Expert and Report Reviewer]
- **Mr. Charchit Pathak** [Sr.Project Engineer]
- **Mr. Praveen Punasiya** [Field Engineer]

EXECUTIVE SUMMARY

The executive summary of the green audit report presented in this section briefly outlines the statistics of plants, trees in the campus, and carbon foot print status of the college.

GREEN INITIATIVES TAKEN BY THE COLLEGE

- **Campaign of Plantation And Green Campus**

  The college has around 2140 trees on campus. It is a good initiative taken by the management for creating a green campus under the plantation campaign. This effort is commendable.

- **Solar System**

  The college has 110 kWp roof top grid connected system. It is appreciable.

- **Vermi compost pit**

  The college has Vermicompost pit for all type of agriculture waste are dispose in pit. It is appreciable.

GREEN AUDIT RECOMMENDATION

- **QR Code System on Tree**

  While the world seems to be going digital, people lack the time to read books and process the information they contain. Therefore, the college can provide QR codes on the trees to share information and leverage this rapidly growing platform for a unique purpose.

- **Installation Organic Waste Composting Machine**

  There is good potential for installation of organic waste composting machine to treat organic waste generated from trees and lawn area of the college campus. The output of above organic waste composting machine is good manure for garden and plants in the campus.

- **Five Dust bin System**

  It is observed that the college has adopted a two dustbin system for all kinds of waste generated on campus. It is recommended to implement a five-dustbin system for the segregation of different types of waste.

Chapter-1
INTRODUCTION

1.1 About College

MOTHER TERESA PHARMACY COLLEGE (MOTP) was established in the year 2009 by MCMSOCIETY, the college has been making remarkable progress in the field of Pharmacy education under the exemplary leadership of the dynamic Secretary and correspondent Sri CHALASANI SAMBASHIVA RAO. The college is situated in a peaceful and beautiful campus which is conducive for providing quality education, career building and helpful for gaining professional knowledge in pharmacy field. The college has imparting excellent credentials in pharmacy career with a clear focus on the untroubled learning environment and sophisticated infrastructure in rural area. The main aim of institution is making Pharmacy professionals to be an integral part of the society through community service, research, innovation for their holistic development which in turn helps to achieve the academic excellence. Its main focus is to encourage and empower young aspirant pharmacist to take up advanced programs and careers in Pharmacy to cater to the needs of the society in health care sector. Student centre teaching practices, various in-house activities aimed at their holistic development along with the extension programmes strive towards achieving at academic excellence in tune with integrity of character.

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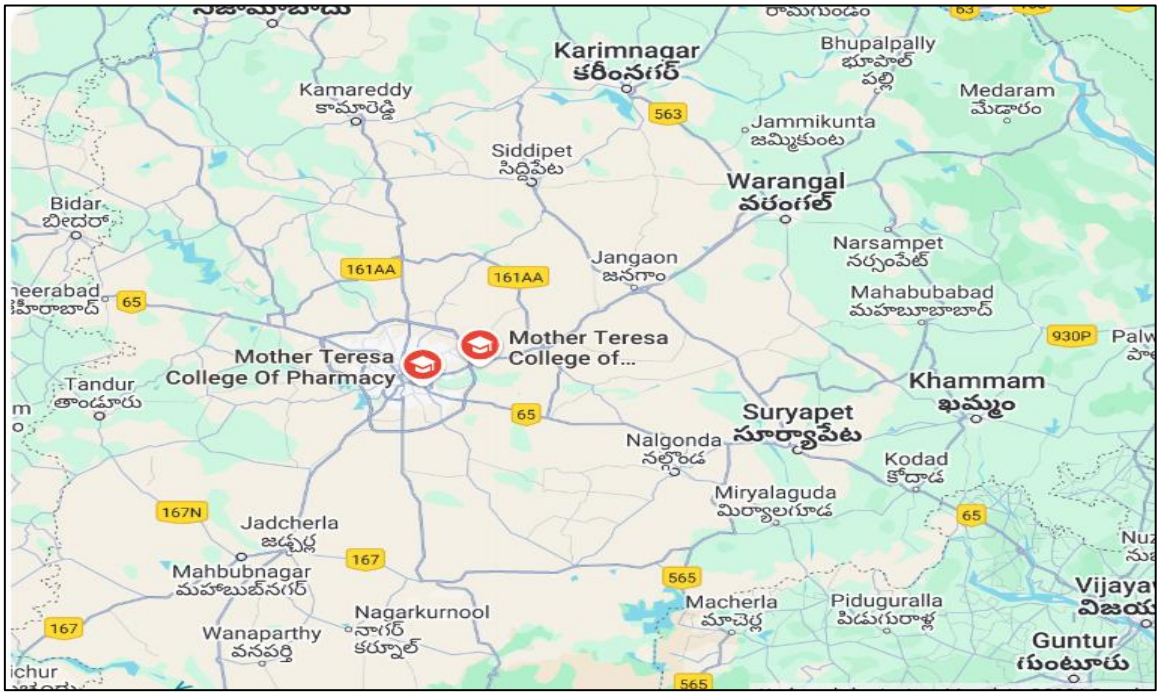

Figure1.1-Source: Satellite Image of Mother Teresa Pharmacy College

Vision

To be the best institute in the field of pharmacy in rural area by providing excellent education to achieve overall development of the pharmacy professionals to provide the needs of the profession and society.

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Table: 1.1 College Populations

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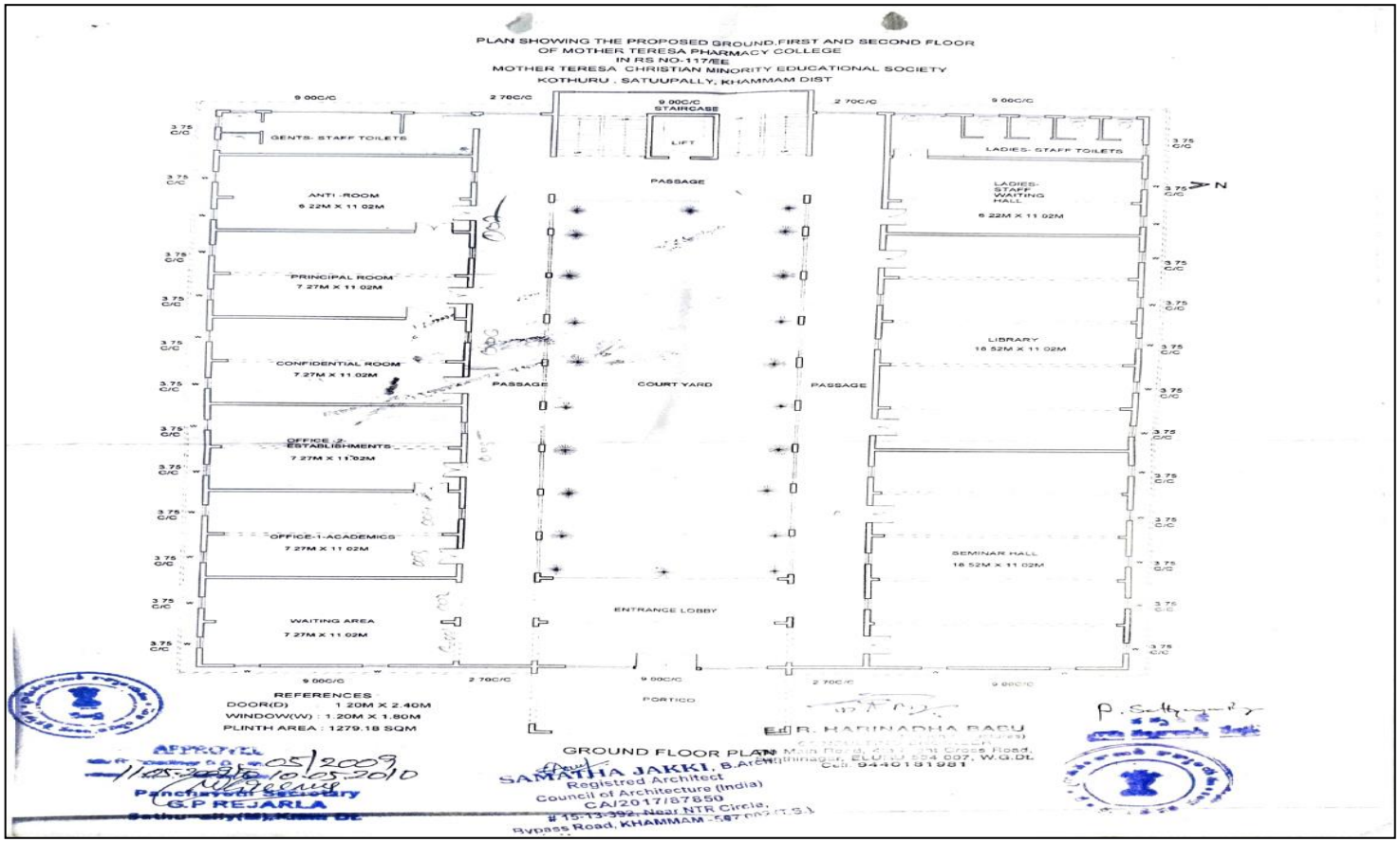
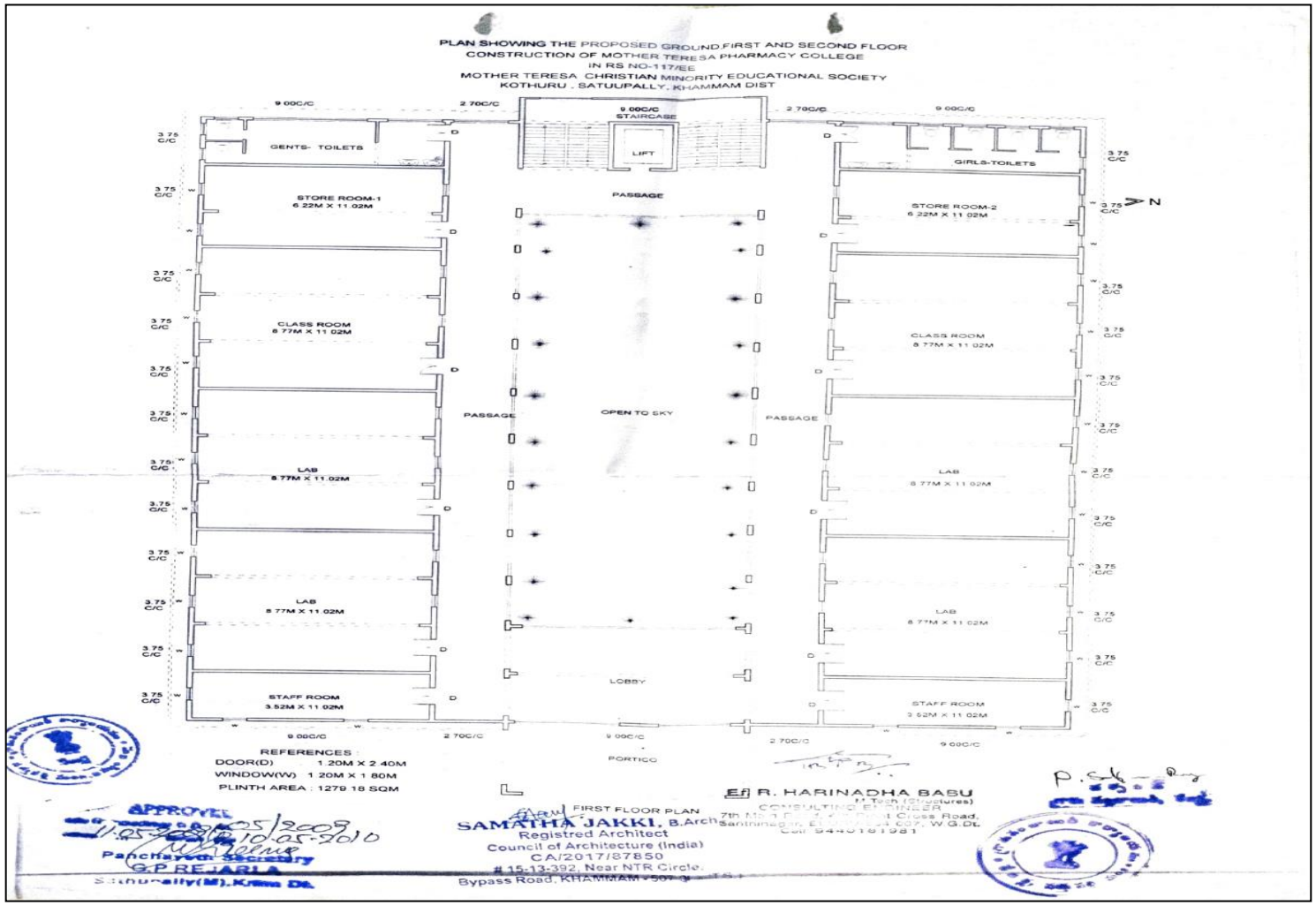
College Layout

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FIRST FLOOR PLAN
SAMATHA JAKKI, B.Arch
Registred Architect
Council of Architecture (India)
CA/2017/87850
R. HARINADHA BABU
CONSULTING ENGINEER
APPROVED
Panchayath Secretary
G.P.REJARLA

1.2 About Green Audit

Eco campus is concepts implemented in many educational institutions, all over the world to make them sustainable because of their mass resource utilization and waste discharge in to the environment.

Green audit means to identify opportunities to sustainable development practices, enhance environmental quality, improve health, hygiene and safety, reduce liabilities achieve values of virtue. Green audit also provides a basis for calculating the economic benefits of resource conservation projects by establishing the current rates of resource use and their associated costs.

Green auditing of Mother Teresa Pharmacy College Sathupally, enables to assess the life style, action and its impact on the environment. This green audit was mainly focused on greening indicators like utilisation of green energy (solar energy) and optimum use of secondary energy sources (petrol and diesel) in the College campus, vegetation, and carbon foot print of the campus etc. The aim of green auditing is to help the institution to apply sustainable development practices and to set examples before the community and young learners.

1.3 Objectives of Green Audit

The general objective of green audit is to prepare a baseline report on "Green campus" and alternative energy sources (solar energy), measures to mitigate resource wastage and improve sustainable practices.

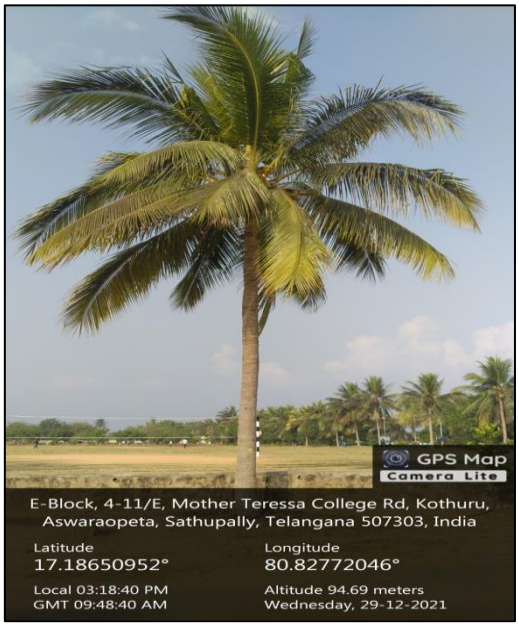
The specific objectives are:

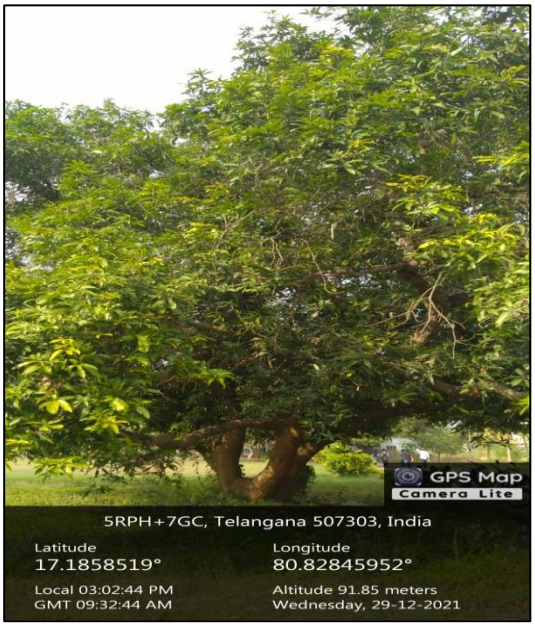
- To inculcate values of sustainable development practices through green audit mechanism.
- Providing a database for corrective actions and future plans.
- To identify the gap areas and suggest recommendations to improve the green campus status of the colleges.

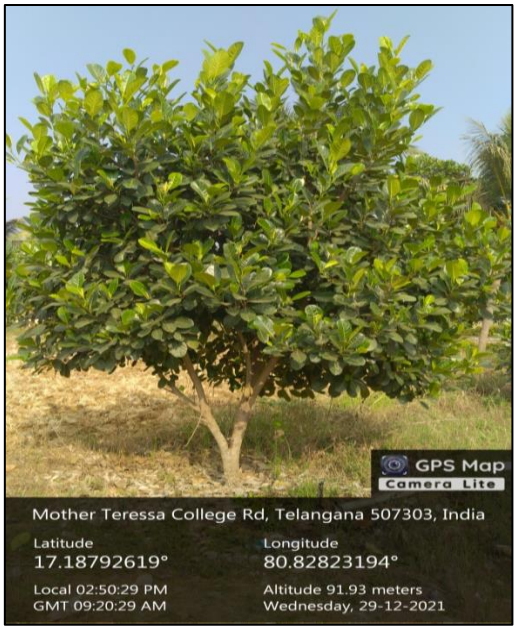
CHAPTER- 2
GREEN CAMPUS AND SUSTAINABLE DEVELOPMENT

2.1 Green Audit

In the survey, the focus has been given to the assessment of the present status of plants and trees on the college and efforts made by the management authorities for nature conservation. The campus is in the vicinity of approximately more than 2140 trees.







2.2 List of the trees

College has **2140 trees** in the campus. This is good initiative taken by management for green campus under the campaign of plantation. **It's appreciable.**

Table: 2.1 List of the trees

Sr. No.	Botanical Name	Family	Common Name	No. of trees
1	Cistus faurifolius	Apocynaceae	Rose- laurel	55
2	Castanea sativa	Fagaceae	Sweet chest nut	4
3	Anacardium occialentate	Anacardiaceae	Cashew tree	1
4	Malvaviscus	Malvaceae	Sleeping hibiscus	10
5	Hedyehium coronarium	Zingiberaceae	Butterfly ginger	5
6	Bongainvillea glabra	Nyetaginaceae	Paper flower	4
7	Rosa	Rosaceae	Wild rose	7
8	Ligustrom lucidum	Oleaceae	Small –leaf privet	5
9	Grewia flavescenes	Malvaceae	Donkey -berry	2
10	Morraya paniculata	Rutaceae	Orange jasmine	1
11	Cotinus	Anacardiaceae	Smoke tree	1
12	Ulmos parvifolia	Ulmaceae	Chinese elm	2
13	Lipandra poly sperma	Amaranthaceae	Manyseed goose foot	10
14	Ixora coccinea	Rubiaceae	Jungle -geranium	57
15	Tamirindaus indica	Leguminosae	Tamarind	3
16	Coccinia gronolis	Cucurbitaceae	Little gourd	1
17	Jasminom sambac	Oleaceae	Arabian jasmine	2
18	Antigenon leptopy	Malvaceae	Rose of china	2
19	Petrea	Verbenaceae	Purple -wreath	3
20	Lantania lontarodis	Arecaceae	Red latan palm	1
21	Photinia glabra	Rosaceae	Japanese photinia	1
22	Duranta erecta	Verbenaceae	Golden dew drop	1100
23	Codiacum variegatum	Euphorbiaceae	Garden croton	9
24	Aucuba japonica	Garryaceae	Spotted laurel	4
25	Plumeria pudica	Apocynaceae	Bridal bouquet	2
26	Alstonia seholoris	Apocynaceae	Devil tree	5
27	Cocos nucifera	Arecaceae	Coconut tree	115
28	Azadirachta indica	Meliaceae	Neem tree	5
29	Delonix regia	Leguminosae	Royal poinciana	4
30	Hibiscus rosa –sinesas	Malvaceae	Chinese hibiscus	10
31	Lantana camara	Verbenaceae	Shrub verbena	7
32	Rubia peregrine	Rubiaceae	Common wild madder	90
33	Plumbago auriculata	Plumbagunaceae	Cape leadwort	5
34	Phalaris arundinacea	Poaceae	Reed canarygrass	7

Sr. No.	Botanical Name	Family	Common Name	No. of trees
35	Artocarpushetero phyllus	Moraceae	Jack fruit	40
36	Tectona grandis	Lamiaceae	teak	8
37	Magnolia champaca	Magnoliaceae	champak	7
38	Mangifera indica	Anacardiaceae	Mango tree	5
39	Euonymus japonicus	Celastraceae	Spindle tree	8
40	Phyllanthus emblica	Phyllanthaceae	Indian goose berry	1
41	Acealypha wilkestana	Euphorbiaaceae	Copper leaf	8
42	Citrus limon	Rutaceae	Lemon tree	37
43	Plumeria obtusa	Apocynaceae	White frangipani	7
44	Dictyosperma album	Arecaceae	Princess palm	9
45	Fiscus benjamina	Moraceae	Weeping fig	15
46	Fiscus religiosa	Moraceae	Bodhi tree	1
47	Tecoma stans	Bignoniaceae	Trumpet flower	9
48	Syagrus romanzoffiana	Arecaceae	Queen palm	8
49	Dwarf white bauhinia	Legominosae	White orchid -tree	13
50	Paradisaeidae	Strelitzaiareginae	Bird of paradise	150
51	Dogbanes	Apocynaceae	Yellow allamanda	30
52	Otameria oculiti	Rubiaceae	Coffee, madder	4
53	Euphorbias	Euphorbiaceae	Copper leaf	125
54	Asian Palmyra palm	Arecaceae	Wine palm	2
55	Cistus landanifer	Cistacea	Popular leaved cistus	1
56	Boswellia saera	Burseraceae	Olibanum -tree	1
57	Styphnolobium japonium	Apocynaceae	Pagada - tree	7
58	Cyeas revolota	Arecaceae	Sago plam	12
59	Macadamia	Proteaceae	Queen sand nut	1
60	Alnus	Betulaceae	Alder	3
61	Salix alba	Salicaceae	White willou	1
62	Quercus coccifera	Fagaceae	Kermes oak	11
63	Burbidgca	Lamiaceae	Ginger brush	1
64	Urtica dioica	Urticaceae	Burning nettle	1
65	Salix alba	fagaceae	Evergreen oak	2
66	Graptophyllum pictum	Acanthaceae	Caricature plant	1
67	Glechoma hedcracea	Lamiaceae	Ground iry	1
68	Salix viminalis	Salicaceae	Basket willou	1
69	Amaranthus	Amaranthaceae	Green amaranth	7
70	Platanus occidentalis	Plantanaceae	American sycamore	2
71	Argyreia nervosa	Convolvulaceae	Baby wood rose	1

Sr. No.	Botanical Name	Family	Common Name	No. of trees
72	Musa	Musaceae	Banana	6
73	Eugenia unifrora	Myrtaceae	Pitanya	1
74	Cleama serrulata	Compositae	Bee weed	1
75	Ricinjus communis	Euphorbiaceae	Caster –oil –plant	1
76	Llex aquifolluim	Aquifoliaceae	English holly	2
77	Tilia platyphyllos	Malvaceae	Broad leaf lime	2
78	Hamameliu	Hamamelidaceae	Witch –hazel	1
79	Nerium oleander	Apocynaceae	Oleander	20
80	Albizia	Leguminosae	Large –leaved albizia	1
81	Ginkgo biloba	Ginkgoaceae	Ginkgo	1
82	Populusx caneseens	Salicaceae	Black popular	5
83	Mimosa pudica	Balsaminaceae	Touch –me –not	1
84	Silver lace vine	Polygonaceae	Chinese fleece vine	1
85	Jaearanda mimosifolia	Bignoniaceae	Jacaranda	3
86	Gmelina arborea	Lamiaceae	Malay bush –beech	1
87	Triflrum	Leguminosae	Bean clover	1
88	Phragmito australis	Poaceae	Ditch reed	1
89	Saecharum officinavum	Poaceae	Sugarcane	1
90	Acacia cultformi	Leguminasae	Knife acacia	1
91	Combretaceae	Campynenataceae	Campynemanthe neocaledonica	7
92	Mimosa pudica	Leguminosae	Hairy caterpillar-rod	1

CHAPTER-3
CARBON FOOT PRINT ASSESSMENT

3.1 About Carbon Foot Print.

Climate change is one of the greatest challenges facing nations, governments, institutions, business and mankind today.

Carbon footprint is a measure of the impact your activities have on the amount of carbon dioxide (CO_2) produced through the burning of fossil fuels and is expressed as a weight of CO_2 emissions produced in tones.

We focus on consumption in each of our five major categories: housing, travel, food, products and services. In addition to these we also estimate the share of national emissions over which we have little control, government purchases and capital investment.

For simplicity and clarity all our calculations follow one basic method. We multiply a use input by an emissions factor to calculate each footprint. All use inputs are per individual and include things like fuel use, distance, calorie consumption and expenditure. Working out your inputs is a matter of estimating them from your home, travel, diet and spending behaviour.

Although working out our inputs can take some investigation on your part the much more challenging aspect of carbon calculations is estimating the appropriate emissions factor to use in your calculation. Where possible you want this emissions factor to account for as much of the relevant life cycle as possible.

We all have a carbon footprint…

3.2 Methodology and Scope

The carbon footprint gives a general overview of the College greenhouse gas emissions, converted into CO_2 -equivalents and it is based on reported data from internal and external systems. The purposes of the carbon indicators are to measure the carbon intensity per unit of product, in addition to showing environmental transparency towards external stakeholders. The carbon footprint reporting approach undertaken in this study follows the guidelines and principles set out in the "Greenhouse Gas Protocol Corporate Accounting and Reporting Standard" (hereafter referred to as the GHG Protocol) developed by the Greenhouse Gas Protocol Initiative and international standard for the quantification and reporting of greenhouse gas emissions -ISO 14064. This is the most widely used and accepted methodology for conducting corporate carbon footprints. The study has assessed carbon emissions from the College Campus. This involves accounting for, and reporting on, the GHG emissions from all those activities for which the company is directly responsible. The items quantified in this study are as classified under the ISO 14064 standards: The report calculates the greenhouse gas emissions from the College. This includes electricity, as well as emission associated with diesel consumption in the College vehicle. The emission associated with air travel, waste generation, administration, and marketing related activities has been excluded from the current study. Emissions from business activities are generally classified as scope 1, 2 or 3 areas classified under the ISO 14064 standards.

3.3 Carbon emission from electricity

Direct emissions factors are widely published and show the amount of emissions produced by power stations in order to produce an average kilowatt-hour within that grid region

Unlike with other energy sources the carbon intensity of electricity varies greatly depending on how it is produced and transmitted. For most of us, the electricity we use comes from the grid and is produced from a wide variety of sources. Although working out the carbon intensity of this mix is difficult, most of the work is generally done for us.

Electricity used in the site is the significant contributors towards GHGs emission from the unit. Electricity used onsite is the most direct, and typically the most significant, a contributor to a unit's carbon footprint. Thus, using an average fuel mix of generating electricity, carbon dioxide intensity of electricity for national grid is assumed to be 0.9613 $KgCO_2/KWh$.

Table 3.1: Emission due to Electricity from Grid Unit

Sr. No.	Year	Total Unit Consumption	Unit	Emission Factor kg CO_2e/kVAH	Emission ton CO_2 e/ year
1	2022-23	91905	kVAh	0.9613	88.34

Table3.2: CO_2 Neutralized by Solar Unit

Sr. No.	Year	Solar Unit	Unit	Emission Factor kg CO_2e/kWh	Emission reduction Ton CO_2 e/ year
1	2022-23	47115	kWh	0.9613	45.29

3.4 Carbon emission from DG set

The college has one DG set use for emergency power supply. Annual diesel consumption for year 2021-22 was 1270 and for the year 2022-23 was 500 lit.

- CO_2 Emissions from a Lit. of diesel: 2689.56 grams CO_2/ lit.
- Diesel consumption Year 2022-23 = 500 Lit.
- Diesel consumption Year 2022-23 = 500 x 2689 =1.34 Ton /Year

3.5 Biomass Calculation and CO_2 Sequestration of the Trees

1. Estimation of above-ground biomass (AGB)

$$K= 34.4703 – 8.0671D + 0.6589 D^2$$

Where = K is above-ground biomass.

D is Breast height diameter in (cm)

2. Estimation of below ground biomass (BGD) = AGB x 0.15

3. Total Biomass (TB) = AGB + BGB

4. Calculation of carbon dioxide Weight sequestered in the tree in Kg.

$$C = W \times 0.50$$

5. Calculation the weight of CO_2 sequestered in the tree per year in Kg.

$$CO_2 = C \times 3.666$$

Where: -

AGB = above ground biomass.
D = Diameter of tree breast height.
BGB = Below Ground Biomass.
C = Carbon
TB = Total Biomass.

Table: 3.3 CO_2 Sequestered Calculation of tree (Year 2022-23)

Sr. no.	Tree Name	Average Diameter CM (10 to 100)	AGB	BGB	Total	Carbon Storage	Amount of CO_2 Sequestered	Total	Total Amount of CO_2 Sequestered	Annually CO_2 Sequestered amount (Ton/year)
1	Cistus faurifolius	18	109.2	16.4	125.6	62.8	230.2	55	12664	0.17
2	Castanea sativa	32	471.5	70.7	542.2	271.1	993.9	4	3976	0.05
3	Anacardium occialentate	40	798.0	119.7	917.7	458.9	1682.2	1	1682	0.02
4	Malvaviscus	36	623.9	93.6	717.5	358.7	1315.2	10	13152	0.18
5	Hedyehium coronarium	12	35.4	5.3	40.7	20.4	74.7	5	373	0.01
6	Bongainvillea glabra	34	545.0	81.8	626.8	313.4	1148.8	4	4595	0.06
7	Rosa	20	144.7	21.7	166.4	83.2	305.0	7	2135	0.03
8	Ligustrom lucidum	28	340.9	51.1	392.0	196.0	718.5	5	3592	0.05
9	Grewia flavescenes	14	54.6	8.2	62.8	31.4	115.1	2	230	0.00
10	Morraya paniculata	12	35.4	5.3	40.7	20.4	74.7	1	75	0.00
11	Cotinus	24	231.9	34.8	266.7	133.3	488.9	1	489	0.01
12	Ulmos parvifolia	26	283.7	42.5	326.2	163.1	598.0	2	1196	0.02
13	Lipandra poly sperma	10	21.7	3.3	24.9	12.5	45.7	10	457	0.01
14	Ixora coccinea	12	35.4	5.3	40.7	20.4	74.7	57	4257	0.06
15	Tamirindaus indica	40	798.0	119.7	917.7	458.9	1682.2	3	5047	0.07
15	Coccinia gronolis	46	1099.9	165.0	1264.9	632.5	2318.6	1	2319	0.03
16	Jasminom sambac	12	35.4	5.3	40.7	20.4	74.7	2	149	0.00
17	Antigenon leptopy	20	144.7	21.7	166.4	83.2	305.0	2	610	0.01

Sr. no.	Tree Name	Average Diameter CM (10 to 100)	AGB	BGB	Total	Carbon Storage	Amount of CO_2 Sequestered	Total	Total Amount of CO_2 Sequestered	Annually CO_2 Sequestered amount (Ton/year)
18	Petrea	28	340.9	51.1	392.0	196.0	718.5	3	2155	0.03
19	Lantania lontarodis	64	2299.0	344.8	2643.8	1321.9	4846.1	1	4846	0.07
20	Photinia glabra	32	471.5	70.7	542.2	271.1	993.9	1	994	0.01
21	Duranta erecta	30	403.5	60.5	464.0	232.0	850.5	1100	935544	12.76
22	Codiacum variegatum	24	231.9	34.8	266.7	133.3	488.9	9	4400	0.06
23	Aucuba japonica	16	79.2	11.9	91.1	45.5	166.9	4	668	0.01
24	Plumeria pudica	14	54.6	8.2	62.8	31.4	115.1	2	230	0.00
25	Alstonia seholoris	48	1211.4	181.7	1393.2	696.6	2553.7	5	12768	0.17
26	Cocos nucifera	30	403.5	60.5	464.0	232.0	850.5	115	97807	1.33
27	Azadirachta indica	42	893.2	134.0	1027.2	513.6	1882.9	5	9414	0.13
28	Delonix regia	44	993.9	149.1	1143.0	571.5	2095.0	4	8380	0.11
29	Hibiscus rosa –sinesas	40	798.0	119.7	917.7	458.9	1682.2	10	16822	0.23
30	Lantana camara	16	79.2	11.9	91.1	45.5	166.9	7	1169	0.02
32	Rubia peregrine	28	340.9	51.1	392.0	196.0	718.5	90	64665	0.88
33	Plumbago auriculata	14	54.6	8.2	62.8	31.4	115.1	5	575	0.01
34	Phalaris arundinacea	10	21.7	3.3	24.9	12.5	45.7	7	320	0.00
34	Artocarpushetero phyllus	46	1099.9	165.0	1264.9	632.5	2318.6	40	92745	1.26
35	Tectona grandis	48	1211.4	181.7	1393.2	696.6	2553.7	8	20429	0.28
36	Magnolia champaca	30	403.5	60.5	464.0	232.0	850.5	7	5953	0.08

Sr. no.	Tree Name	Average Diameter CM (10 to 100)	AGB	BGB	Total	Carbon Storage	Amount of CO_2 Sequestered	Total	Total Amount of CO_2 Sequestered	Annually CO_2 Sequestered amount (Ton/year)
37	Mangifera indica	44	993.9	149.1	1143.0	571.5	2095.0	5	10475	0.14
38	Euonymus japonicus	34	545.0	81.8	626.8	313.4	1148.8	8	9191	0.13
39	Phyllanthus emblica	40	798.0	119.7	917.7	458.9	1682.2	1	1682	0.02
40	Acealypha wilkestana	18	109.2	16.4	125.6	62.8	230.2	8	1842	0.03
41	Citrus limon	34	545.0	81.8	626.8	313.4	1148.8	37	42507	0.58
42	Plumeria obtusa	42	893.2	134.0	1027.2	513.6	1882.9	7	13180	0.18
43	Dictyosperma album	64	2299.0	344.8	2643.8	1321.9	4846.1	9	43615	0.59
44	Fiscus benjamina	48	1211.4	181.7	1393.2	696.6	2553.7	15	38305	0.52
46	Fiscus religiosa	44	993.9	149.1	1143.0	571.5	2095.0	1	2095	0.03
47	Tecoma stans	18	109.2	16.4	125.6	62.8	230.2	9	2072	0.03
48	Syagrus romanzoffiana	54	1578.5	236.8	1815.3	907.7	3327.5	8	26620	0.36
49	Dwarf white bauhinia	22	185.6	27.8	213.4	106.7	391.2	13	5086	0.07
50	Paradisaeidae	24	231.9	34.8	266.7	133.3	488.9	150	73328	1.00
51	Dogbanes	30	403.5	60.5	464.0	232.0	850.5	30	25515	0.35
52	Otameria oculiti	38	708.3	106.2	814.5	407.2	1493.0	4	5972	0.08
53	Euphorbias	52	1450.7	217.6	1668.3	834.2	3058.1	125	382259	5.21
54	Asian Palmyra palm	58	1850.4	277.6	2128.0	1064.0	3900.6	2	7801	0.11
55	Cistus landanifer	12	35.4	5.3	40.7	20.4	74.7	1	75	0.00
56	Boswellia saera	34	545.0	81.8	626.8	313.4	1148.8	1	1149	0.02

Sr. no.	Tree Name	Average Diameter CM (10 to 100)	AGB	BGB	Total	Carbon Storage	Amount of CO_2 Sequestered	Total	Total Amount of CO_2 Sequestered	Annually CO_2 Sequestered amount (Ton/year)
57	Styphnolobium japonium	48	1211.4	181.7	1393.2	696.6	2553.7	7	17876	0.24
58	Cyeas revolota	82	3937.9	590.7	4528.6	2264.3	8300.9	12	99611	1.36
59	Macadamia	12	35.4	5.3	40.7	20.4	74.7	1	75	0.00
60	Alnus	42	893.2	134.0	1027.2	513.6	1882.9	3	5649	0.08
61	Salix alba	34	545.0	81.8	626.8	313.4	1148.8	1	1149	0.02
62	Quercus coccifera	46	1099.9	165.0	1264.9	632.5	2318.6	11	25505	0.35
63	Burbidgca	16	79.2	11.9	91.1	45.5	166.9	1	167	0.00
64	Urtica dioica	10	21.7	3.3	24.9	12.5	45.7	1	46	0.00
65	Salix alba	46	1099.9	165.0	1264.9	632.5	2318.6	2	4637	0.06
66	Graptophyllum pictum	16	79.2	11.9	91.1	45.5	166.9	1	167	0.00
67	Glechoma hedcracea	40	798.0	119.7	917.7	458.9	1682.2	1	1682	0.02
68	Salix viminalis	14	54.6	8.2	62.8	31.4	115.1	1	115	0.00
69	Amaranthus	16	79.2	11.9	91.1	45.5	166.9	7	1169	0.02
70	Platanus occidentalis	54	1578.5	236.8	1815.3	907.7	3327.5	2	6655	0.09
71	Argyreia nervosa	10	21.7	3.3	24.9	12.5	45.7	1	46	0.00
72	Musa	14	54.6	8.2	62.8	31.4	115.1	6	691	0.01
73	Eugenia unifrora	36	623.9	93.6	717.5	358.7	1315.2	1	1315	0.02
74	Cleama serrulata	42	893.2	134.0	1027.2	513.6	1882.9	1	1883	0.03

Sr. no.	Tree Name	Average Diameter CM (10 to 100)	AGB	BGB	Total	Carbon Storage	Amount of CO_2 Sequestered	Total	Total Amount of CO_2 Sequestered	Annually CO_2 Sequestered amount (Ton/year)
75	Ricinjus communis	24	231.9	34.8	266.7	133.3	488.9	1	489	0.01
76	Llex aquifolluim	54	1578.5	236.8	1815.3	907.7	3327.5	2	6655	0.09
77	Tilia platyphyllos	40	798.0	119.7	917.7	458.9	1682.2	2	3364	0.05
78	Hamameliu	28	340.9	51.1	392.0	196.0	718.5	1	718	0.01
79	Nerium oleander	40	798.0	119.7	917.7	458.9	1682.2	20	33644	0.46
80	Albizia	50	1328.4	199.3	1527.6	763.8	2800.1	1	2800	0.04
81	Ginkgo biloba	46	1099.9	165.0	1264.9	632.5	2318.6	1	2319	0.03
82	Populusx caneseens	48	1211.4	181.7	1393.2	696.6	2553.7	5	12768	0.17
83	Mimosa pudica	26	283.7	42.5	326.2	163.1	598.0	1	598	0.01
84	Silver lace vine	24	231.9	34.8	266.7	133.3	488.9	1	489	0.01
85	Jaearanda mimosifolia	32	471.5	70.7	542.2	271.1	993.9	3	2982	0.04
86	Gmelina arborea	34	545.0	81.8	626.8	313.4	1148.8	1	1149	0.02
87	Triflrum	20	144.7	21.7	166.4	83.2	305.0	1	305	0.00
88	Phragmito australis	10	21.7	3.3	24.9	12.5	45.7	1	46	0.00
89	Saecharum officinavum	12	35.4	5.3	40.7	20.4	74.7	1	75	0.00
90	Acacia cultformi	34	545.0	81.8	626.8	313.4	1148.8	1	1149	0.02
91	Combretaceae	40	798.0	119.7	917.7	458.9	1682.2	7	11775	0.16
92	Mimosa pudica	16	79.2	11.9	91.1	45.5	166.9	1	167	0.00
Total CO_2 Sequestered										31.09

- Total number of the trees in the college campus 2140 trees on campus. This is a good initiative taken by the management for a green campus under the campaign of the plantation. It's appreciable. The total CO_2 sequestered of 31.09 Tons /Year. It's appreciable.

Table 3.6: Total CO_2 Emission by the College

Sr. No.	CO_2 (Emission &Neutralized) Sources	CO_2 Emission Ton/year (2022-23)
1	Electricity	88.34
2	DG set Diesel	1.34
3	Total CO_2 Emission	89.68
4	CO_2Emission Neutralized by Tree	31.09
5	CO_2 Emission Neutralized by Solar	45.29
6	Net CO_2 Emission of the college	13.3

3.6 Other Emissions Excluded

This study did not evaluate the carbon sequestration potential of existing from the staff commuting, food supply, official flights, paper products, water supply, and waste disposal and recycling due to limited data availability. The current study identifies areas where data monitoring, recording and archiving need to be developed for enlarging the scope of mapping of GHGs emission in the future years. Accordingly, a set of tools and record keeping procedure will be developed for improving the quality of data collection for the next year carbon foot print studies.

CHAPTER- 4
WASTE MANAGEMENT

4.1 About Waste

Human activities create waste, and it is the way these wastes are handled, stored, collected and disposed of, which can pose risks to the environment and to public health waste management is important for an eco-friendly campus. In College different types of wastes are generated, its collection and management are very challenging.

Solid waste can be divided into three categories: bio-degradable, non-biodegradable and hazardous waste. A bio-degradable waste includes food wastes, canteen waste, wastes from toilets etc. Non-biodegradable wastes include what is usually thrown away in homes and schools such as plastic, tins and glass bottles etc. Hazardous waste is waste that is likely to be a threat to health or the environment like cleaning chemicals, acids and petrol.

Unscientific management of these wastes such as dumping in pits or burning them may cause harmful discharge of contaminants into soil and water supplies, and produce greenhouse gases contributing to global climate change respectively. Special attention should be given to the handling and management of hazardous waste generated in the College. Bio-degradable waste can be effectively utilized for energy generation purposes through anaerobic digestion or can be converted to fertilizer by composting technology. Non-biodegradable waste can be utilized through recycling and reuse. Thus, the minimization of solid waste is essential to a sustainable College. The auditor diagnoses the prevailing waste disposal policies and suggests the best way to combat the problems.

Table 4.1 Different types of waste generated in the College Campus

Sr. No.	Type of Waste	Particulars
1	Solid waste	Damaged furniture, paper waste, paper plates, food wastes etc.
2	Plastic waste	Pen, Refill, Plastic water bottles and other plastic containers, wrappers etc.
3	E-Waste	Computers, electrical and electronic parts etc.
4	Glass waste	Broken glass wares from the labs etc.
5	Chemical waste	Laboratory waste etc.
6	Bio-medical Waste	Sanitary Napkin etc.

4.2 Waste management Practices adopted by the college

Audit team visited various departments, classroom and other areas, to find out waste generation area and waste collection points for further improvement. Details are given in the table.

Figure:1-Waste collection bin in college campus

Recommendation

It is recommended adopted **"5 Bin Waste Collection System"** for collect different type of waste generated in college premises. At present college uses 3 dust bin systems.

Fig. 4.2 Recommended 5 Dust Bin waste collection System

4.3 Waste Collection Points

Audit team visited various departments, class rooms, staff rooms, laboratories to find out waste generation area and waste collection points for further improvement. Details are given in the table 4.2

Table 4.2: Detailed of Waste collection Dust bin system

Sr. No.	Location	No. of dustbin(three) system
1	Ground floor	1
2	First floor	1
3	Second floor	1
Total		3

Observation

It was observed that college has 3 dustbin system. And each floor having a pair of 3 dustbin. It's appreciable.

4.4 Compost Pit

The college has Vermi compost pit, all types of agriculture and organic waste will be disposed of in this pit, and generated manure will utilized in plant and trees in the campus. It's appreciable.

Figure 4.3 Vermi compost pit in the college campus

4.5 Organic Waste Composting Machine

The audit team visited in various department and garden and discussion with the management the waste collection process. After audit we recommended for organic waste composting machine for college per day waste generated.

Fig.4.4 Organic Waste composting machine

About Composting Process

An organic waste composting machine is an independent unit that facilitates the composting process and provides better compost. It takes waste as its input and provides manure as its output. Composting without an organic waste composting machine will take a considerable amount of time.

A highly compact composting machine uses special microorganisms to break down and decompose all kinds of organic waste into compost within 24 hours, achieving a volume reduction of 85-90%. When organic waste is added, a humidity sensor detects the moisture, activating the heater, mixing blades, and exhaust system.

Recommendation

The college has great potential to install an organic waste composting machine.

4.6 Air Quality

Air Quality in a Sathupally and Mist

The ambient air quality data for Sathupally and MIST for the last one year shows that there are very less polluted particles in ambient air; AQI for SO2 & NOx parameters are within the range of Indian living standards, there are a number of factors responsible for this cleanliness, calmness and serenity in this area. Firstly, population which is most responsible for this all the problems and hurdles in smooth living is lowest here of all the district of Khammam. Secondly, in this area more trees Have been planted as compared to other cities. Furthermore, no air polluting industry is established near here. Therefore, the ambient air quality of Sathupally area falls between moderated to rich quality state. The Telangana State Pollution Control Board District Office in Kothagudem, Telangana over the various possibilities to reduce the air pollution for the improvement of ambient air quality with respect to AQI is concerned .However ,the annual average value of PM10;SO2.NOx in the ambient air quality of Sathupalli city falls in the range of 50-62 ug/m3,10-12ug/m3 for most of the months, as such ,the graded response action plan to eradicate the problem.

AIR QUALITY DETERMINATION

Parameter	Result (RANGE)
NO2 (Nitrogen Dioxide)	6 µg/m3
O3 (Ozone)	103.01 µg/m3
SO2 (Sulfur Dioxide)	12.96 µg/m3
CO (Carbon Monoxide)	380.31 µg/m3
PM2.5	37.84 µg/m3
PM10	60.56 µg/m3
Humidity	85.0 %
Barometric Pressure	1019.0 hPa
Wind Speed	9.73 m/s
Wind Direction	117.0 degrees

Satisfactory air quality index (OVERALL=58) in Sathupalli, Khammam (District), Telangana

4.7 Noise Level

Noise level in the surrounding of mtpc:

The human ear is constantly being assailed by manmade sounds from all sides, and there remain few places in populous areas where relative quiet prevails. There are two basic properties of sound:

- Loudness and
- Frequency

Loudness is the strength of sensation of sound perceived by the individual. It is measured in terms of decimals. Just audible sound is about 10 dB, a whisper about 20dB, Library place 30dB,normal conversation about 35-60 dB, Heavy street traffic is 60-120 dB, boiler factories 120 dB ,jet planes during takeoff is about 150 dB, rocket engine about 180 dB, The loudest sound a person can stand without much discomfort is about 80 dB .The sound beyond 80 dB can be safely regarded as pollutant as it harms hearing system. The WHO has fixed 45 dB as the safe noise level for the city. For international standards a noise level up to 65 dB is considered tolerate. Loudness is also expressed in sones. one sones equals the loudness of 40 dB sound pressure at 100 Hz. Frequency is defined as the number of vibrations per second. It is denoted as Hertz (Hz).

Place	Measurements (Duration in Sec)	Minimum (dBA)	Maximum (dBA)	Average (dBA)
Administrative Block (A-Block)				
G+(Ground floor)	60	58.7	71.1	65
1st floor	60	56.6	71.4	64
2nd floor	60	50.8	77.5	65

CHAPTER- 5
QR CODE SYSTEM

5.1 QR Code System

While the world seems to be going digital, people lack the time to read books and process the information they contain. Hence, College can be provided QR codes on the trees for its information and to exploit the rapidly growing platform for a unique purpose.

Fig: 6.1 QR Code System for plants

These codes can give students all the information they need to know about the tree — from its scientific name to its medicinal value. They only need to put their smart-phones to use. QR codes to them, making it easier for everybody to learn about a plant or a tree at the tip of their fingers," If any app generating a QR code, which is available for free on the online stores, can be used to avail the information of the trees.

❖ **Eco-restoration programmes**

- Frame long-term eco-restoration programmes for replacing exotic Acacia plantations with indigenous trees and need of the hour is to frame a holistic campus development plan.

END OF THE REPORT

THANKS