ENERGY AUDIT REPORT

Chandrakanti Ramawati Devi Arya Mahila PG College,

Diwan Bazar,

Gorakhpur, Uttar Pradesh 273001

PREPARED BY

EMPIRICAL EXERGY PRIVATE LIMITED

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(2021-22)

CONTENT

ACKNOWLEDGEMENT

Empirical Exergy Private Limited (EEPL), Indore (M.P) takes this opportunity to appreciate & thank the management of **Chandrakanti Ramawati Devi Arya Mahila P.G. College, Gorakhpur** for giving us an opportunity to conduct energy audit for the college.

We are indeed touched by the helpful attitude and co-operation of all faculties and technical staff, who rendered their valuable assistance and co-operation the course of study.

Rajesh Kumar Singadiya

(Director)

M.Tech (Energy Management), PhD (Research Scholar)
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)
Charted Engineer [M-1699118], the Institution of Engineers (India)
Member of ISHRAE [58150]

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.

Estb. Year 1990

Chandrakanti Ramawati Devi Arya Mahila P.G. College

Gorakhpur, U.P.

NAAC ACCREDITED

Website www.crdapgcollege.edu.in

Mob. : 7376618230

(Affiliated to D.D.U. Gorakhpur University, Gkp. U.P.)

Ref. 2284/C.R.D/2022 Date 07/07/2022

Energy, Water, Green & Environmental Audit Committee

Energy, Water, Green & Environmental Audit Committee will consist of the following faculty members.

S.No.	Name	Designation	Department
01	Mr. Anant Kumar Pathak	Assistant Professor	B.Ed.
02	Dr. Rekha Srivastava	Assistant Professor	M.Ed.
03	Dr. Aparna Mishra	Assistant Professor	B.Ed.
04	Dr. Virendra Kumar Gupta	Assistant Professor	M.Ed.
05	Dr. Sarika Jaiswal	Assistant Professor	Home Science
06	Miss Ankita Upadhyay	Assistant Professor	Commerce
07	Miss Priya Kumari	Assistant Professor	Sociology
08	Dr. Rekha Rani Sharma	Assistant Professor	Fine Art
09	Mr. Narendra Singh Rawat	Office Superintendent	Administration Office

Time duration of this committee is 03 years up to June 2025, after which the committee will be reconstituted.

Principal

The Audit Team

The study team constituted of the following senior technical executives from **Empirical Exergy Private Limited,**

- **Mr. Rajesh Kumar Singadiya** [Director & Accredited Energy Auditor AEA-0284]
- **Mr. Rakesh Pathak**, [Director & Electrical Expert]
- **Mr. Sachin Kumawat** [Sr. Project Engineer]
- **Mr. Charchit Pathak** [Ass. Project Engineer]
- **Mr. Mohit Malviya** [Fire safety Engineer]
- **Mr. Aakash Kumawat** [Site Engineer]
- **Mr. Ajay Nahra,** [Sr. Accountant & admin]

EXECUTIVE SUMMARY

The executive summary of the energy audit report furnished in this section briefly gives the identified energy conservation measures and other recommendation during the project that can be implemented in a phased manner to conserve energy, increase productivity inside the college campus.

ENERGY MANAGEMENT INITIATIVE TAKEN BY COLLEGE

- **10 KWp SOLAR PHOTOVOLTAIC ROOFTOP INSTALLATION:**

College has 10 KWp solar photovoltaic roof top grid connected system installed on various building. Total unit generation from May-2022 to Oct- 2022 is **2148 units**.

RECOMMENDATION:-

- **SOLAR SYSTEM ON HOSTEL CONNECTION**

  As per the unit consumption of hostel connection, there are good potential of installation 5 kWp solar system. At present this connection taking 100 % power from grid .Details are given in chapter-04

- **SASOR** BASED **LIGHTING SYSTEM**

  Installation of Timer control on building focus light with sensor based in College campus.

- **LIGHTING SYSTEM**

  It is observed that there is good potential for replacement of "conventional T-8 (40 Watt) tube light by 20-Watt energy efficient LED lighting. **Details are given in Chapter-04**

- **CEILING FAN**

  Replacement of "conventional ceiling fan (60 Watt)" by energy efficient star rated fan or BLDC based energy efficient fan (28 Watt) in "admin building, class rooms, laboratories and faculties cabin" have great potential for energy saving. **Details are given in Chapter-04**

- **IOT BASED ENERGY MONITORING SYSTEM AT MAIN FEEDER**
  - Installation of "Cloud based (IoT based) energy monitoring system" on both feeder as well as energy monitoring on individual building will be good initiate for energy monitoring as well as student demo project for student and management .

- **SOME OTHER OBSERVATIONS :-**
  - Energy audit team was finding many electrical penal are open condition. Also there is requirement cable scheduling to avoid any electrical hazards.
  - It is observe that there are requirement of annually earth testing in every earth pit ,
- **Energy Management Workshop and Training:**
  - Conduct awareness and training programs for faculty, student and non-teaching staffs. Conduct seminars, workshops and exhibitions on energy management education.
  - Involve all stakeholders- encourage involvement of government, foundations, and industry in supporting interdisciplinary research, education, policy formation, and information exchange in energy management system.

ENERGY CONSERVATION MEASURES FOR ELECTRICAL SYSTEM

Case Study	Section	Identification	Observation	Recommendation	Annual energy saving (kWh)	Annual cost saving (Rs.)	Investment (Rs.)	Simple payback Period (Year)
1	Lighting System	191 No. FTL tube light	Power consumption by T-12 LED 40 Watt (08 to 10 watt blast power)	Replacement of conventional (T-12) with (T-5 Watt)	15,280	1,68,691	39346	0.3
2	Celling Fan	281 No ceiling fan working with 60 Watt	Power consumption by existing ceiling fan (60 Watt)	Replacement of 60W conventional ceiling fan by 28W BLDC energy efficient ceiling fan	17,984	1,98,543	7,23,575	3.65
3	Solar System	A separate connection for hostel	6 kW Separate connection for hostel,	Installation of 5 Kw solar system for hostel power supply	7,300	88,111	2,00,000	2.3

CHAPTER-1
INTRODUCTION

1.1 About College

Chandrakanti Ramawati Devi Arya Mahila P.G. College, Gorakhpur in the holy land of Guru Gorakhnath, located in diwan bajar in Gorakhpur city was, established by Smt. Chandrakanti Devi Arya Mahila Sansthan on the day of Kartik Shukla Navami in 1990. The aim of this institution is to promote conserve and encourage the Arya culture, science and literature language, civilization while working for the multi faceted development of the students along with the educational, social and economical revival of women in which the organization is constantly engaged.

On graduation level B.A., B.Sc. (Home Science), and B.Com. and on Post-Graduation level Home Science, Visual Art, Education and Political Science under M.A. are being run by this college. B.Ed. and M.Ed. program are also being run for teacher-training by the faculty of Education. A study center has also been approved by the Uttar Pradesh Rajarshi Tandon University Prayagraj which is to be operated from session 2019-20. Since the beginning, this college is continuously working for the all round development of women- students. Co-curricular activities and cultural programs are run in regular form for the spiritual and intellectual development of women-students. The college students have so far received the highest marks in the university examination and have received gold medal at the university level. Various students have been selected for the National Camp and Pre RD Parade by the units of NCC and NSS, run in the college which is a milestone in fulfilling the purpose of the establishment of this college.

The college is fully active for the promotion of Arya culture and the goal of women education and multifaceted development which was set at the time of the establishment of this college.

MISSION :-

- To provide women a wider access towards education of excellence,Excellence of Education, knowledge, Skill, through our wider access of Exposure. Empowerment of Human Values and Indian Culture by Self Responsibility. Enhancing Potential through the way of Curricular Actions.

VISION :-

- To Promote the Efficiency of Society by Women Education Creation of Security and Ability on Student. Provision of Positive Energy and Self dependency for the Progress of the Nation

1.2 About Campus: - Chandrakanti Ramawati Devi Arya Mahila P.G. College, Gorakhpur total campus area is 7159.85 Sq.m.

Table 1.1 Details are total build up area given in the table:-

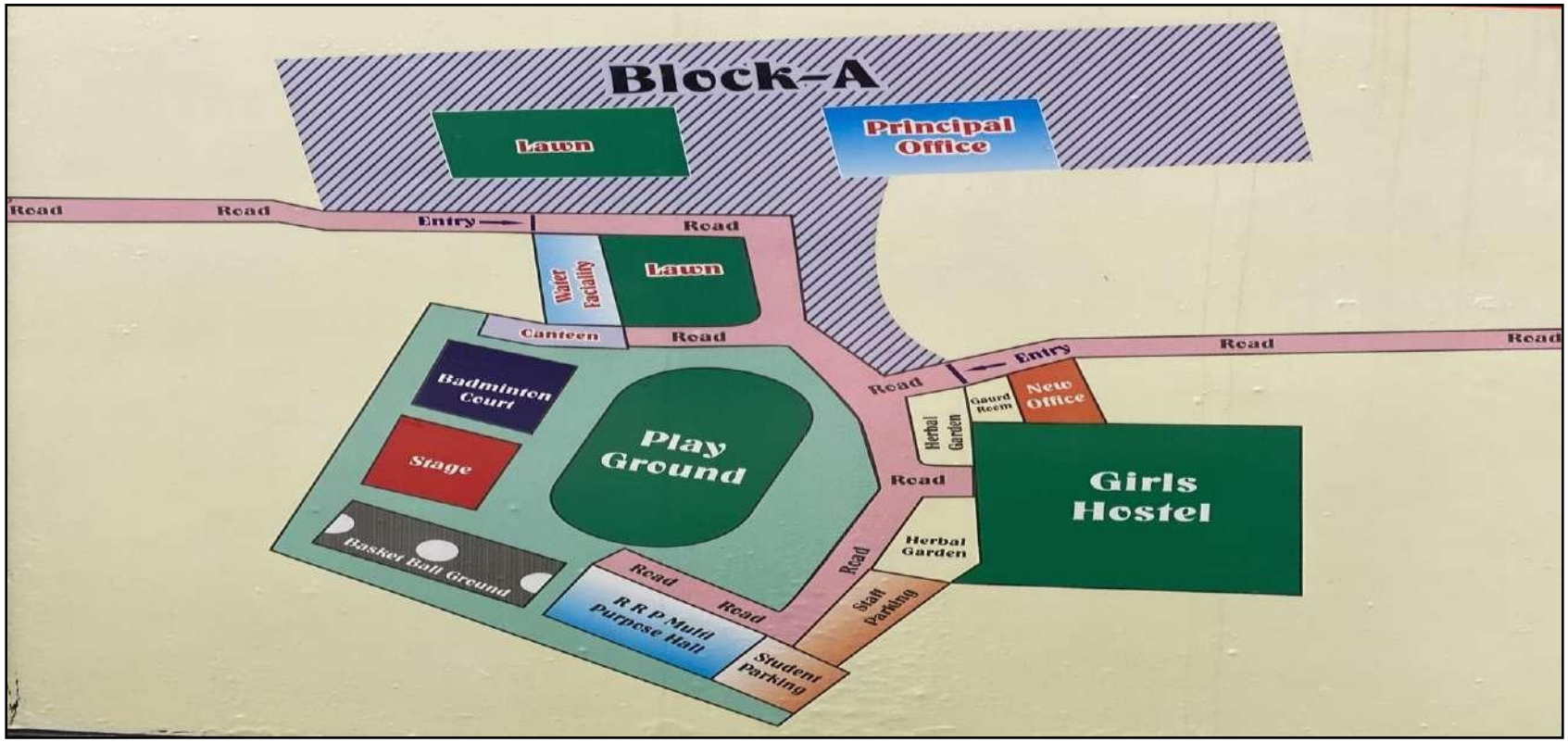
Name of Buildings in campus & Built-up area of Buildings	
Floor wise Built-up area in Sq.	
Floor	**Proposed**
Ground floor	918.9708
First floor	918.9736
Second floor	918.9717
Third floor	918.9717
Total Built-up Area	3675.8878

Satellite Image of College campus from Google map

Satellite image of college from Google map

1.3 COLLEGE LAYOUT OF VARIOUS BUILDINGS

Layout map of College



1.4 About Energy Audit

Energy audit helps to understand more about the ways energy is used in any plant and helps in identifying areas where waste may occur and scope for improvement exists. The overall energy efficiency from generation to final consumer becomes 50%. Hence one unit saved in the end user is equivalent to two units generated in the power plant.

Energy audit is the most efficient way to identify the strength and weakness of energy management practices and to find a way to solve problems. Energy audit is a professional approach in utilizing economic, financial, and social and natural resources responsibility. Energy audits "adds value" to management control and is a way of evaluating the system.

Empirical Exergy Private Limited (EEPL), Indore M.P. carried out the "Energy Audit" at the site to find gaps in the energy consumption pattern for Chandrakanti Ramawati Devi Arya Mahila P.G. College, Gorakhpur. A technical report is prepared as per the need and the requirement of the project.

1.5 Objectives of Energy Auditing

An energy audit provides vital information base for overall energy conservation program covering essentially energy utilization analysis and evaluation of energy conservation measures. It aims at:

- Identifying the quality and cost of various energy inputs.
- Assessing present pattern of energy consumption in different cost centers of operations.
- Relating energy inputs and production output.
- Identifying potential areas of thermal and electrical energy economy.
- Highlighting wastage in major areas.
- Fixing of energy saving potential targets for individual cost centers.
- Implementation of measures for energy conservation & realization of savings.

1.6 Methodology:

Methodology adopted for achieving the desired objectives viz.: Assessment of the current operational status and energy savings include the following:

- Discussions with the concerned officials for identification of major areas of focus and other related systems.
- Team of engineers visited the site and had discussions with the concerned officials / supervisors to collected data / information on the operations and load distribution within the plant and same for the overall premises. The data was analyzed to arrive at a base line energy consumption pattern.
- Measurements and monitoring with the help of appropriate instruments including continuous and / or time-lapse recording, as appropriate and visual observations were made to identify the energy usage pattern and losses in the system.
- Trend analysis of costs and consumptions.
- Capacity and efficiency test of major utility equipment's, wherever applicable.
- Estimation of various losses
- Computation and **in-depth analysis** of the collected data, including utilization of computerized analysis and other techniques as appropriate were done to draw inferences and to evolve suitable energy conservation plan/s for improvements/ reduction in specific energy consumption.

1.7 College Present Energy Scenario:

College uses energy in the form of electricity purchased from grid and 10 KWp solar grid connected system for college campus. There are two feeders one is college building and other for Hostel building.

Annual energy consumption of College campus has been found to be about **33,003 unit** period from July- 2021 to Jun- 2022.

College has 10 KWp solar photovoltaic roof top grid connected system installed on college building. Total unit generation from May-2022 to Oct- 2022 is **2148 units**.

CHAPTER- 2
POWER SUPPLY SYSTEM

2.1 Power Supply System

The power supply for the Chandrakanti Ramawati Devi Arya Mahila P.G. College, Gorakhpur is from PVVNL with the help of 11 kV feeders. College has 02 No connection one is college connection are 10 KW and second is hostel connection with 6 KW.

2.2 DG Set:-

There are 2 DG sets in college campus. Detailed of the DG Sets are given table. 2.4

Table 2.1 Technical specifications for DG sets- 01 and 02

Sr. No.	Parameter	Technical Specification DG Set-01 (College Feeder)	Technical Specification DG Set-02 (Hostel Feeder)
1	Make	Stamford	Kirloskar
2	Serial No	N11D146214	200708013
3	Capacity (KVA)	50	7.5
4	Rated Voltage	230	230
5	Full load current	217.4	30
6	Frequency	50	50
7	Power factor	0.8	0.8
8	RPM	1500	1500
9	Phase	1	1

DG set in College Campus

Observation:-

- DG set use only in case of grid power failure.
- There is no system to monitor fuel consumptions w.r.t. unit generation.

2.3 Grid Connected Solar Photovoltaic System (10 Kwp)

There is 10 KWp solar photovoltaic roof top grid connected systems installed on main building. System details are given below:

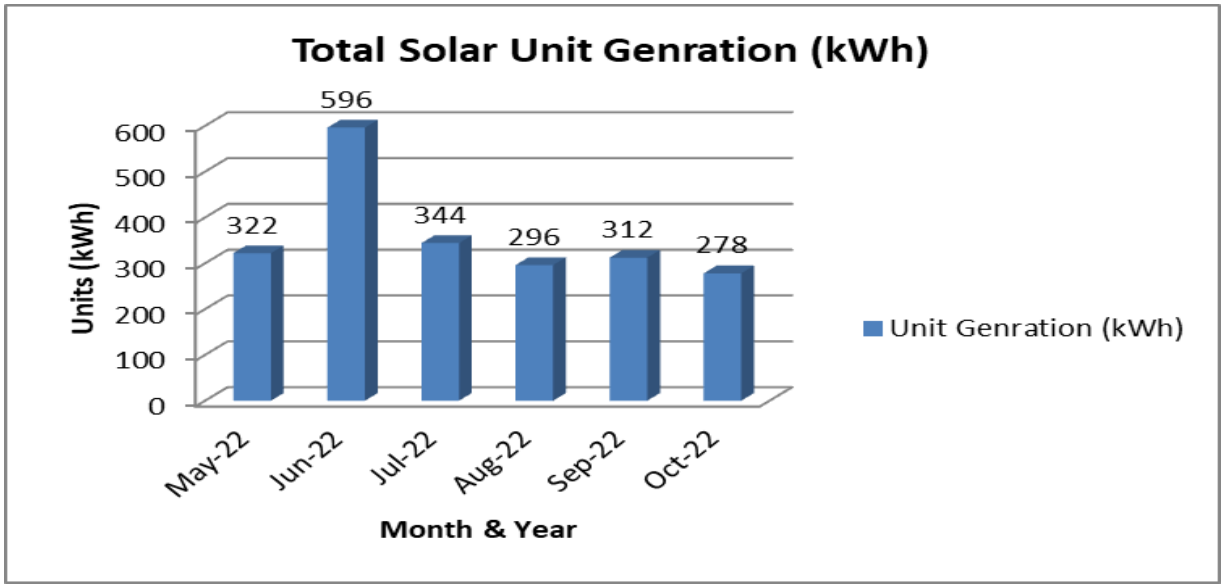
Table: - 2.6 solar plants detailed

Sr.No.	Description	Technical Specification
1	**Plant Information**	
1.1	Brand Name	NEOSOL
1.2	Plant Capacity	10KW
1.3	Location	Main Building
2	**PV Panel Details**	
2.1	Modal	NS72P6-420
2.2	Panel Wattage	420WATT
2.3	No. Of PV Panel	24
2.4	Panel Tilt Angle	23 DEGREE
3	**Inverter Information**	
3.1	Model Name	POLYCAB
3.2	Model Number	PSIT-10K
3.3	Capacity	11000 WATT
3.4	No. Of Inverter	1

Total Solar unit generation:-

Table 2.7:- Total solar unit generation May-2022 to Oct-2022

Sr. No	Month & Year	Unit Generation (kWh)
1	May-22	322
2	Jun-22	596
3	Jul-22	344
4	Aug-22	296
5	Sep-22	312
6	Oct-22	278
	Total	2148

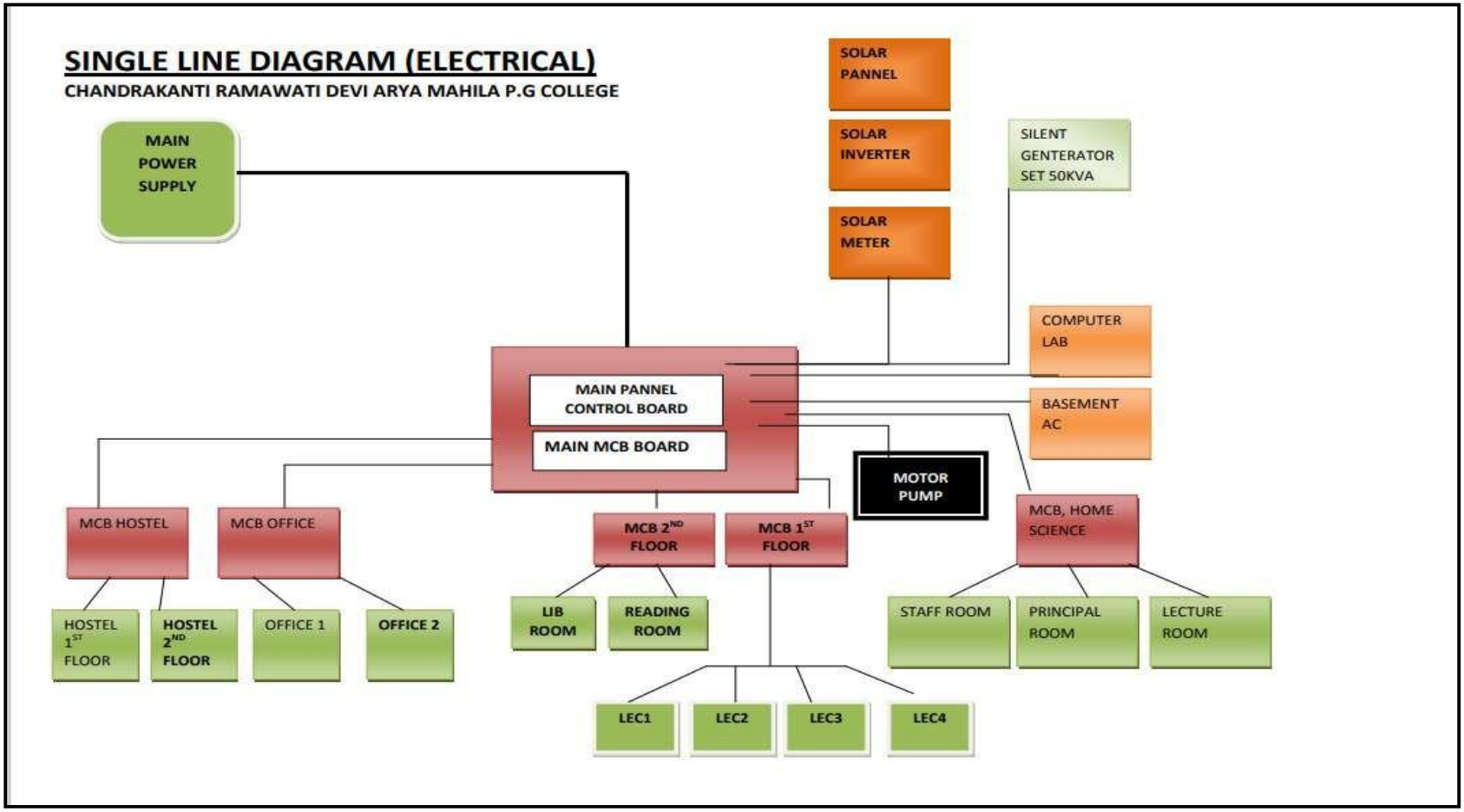


Graphical presentation of solar unit generation

Observation: -

Total unit generation from installation from solar system is 2148 unit.

2.4 Single Line Diagram

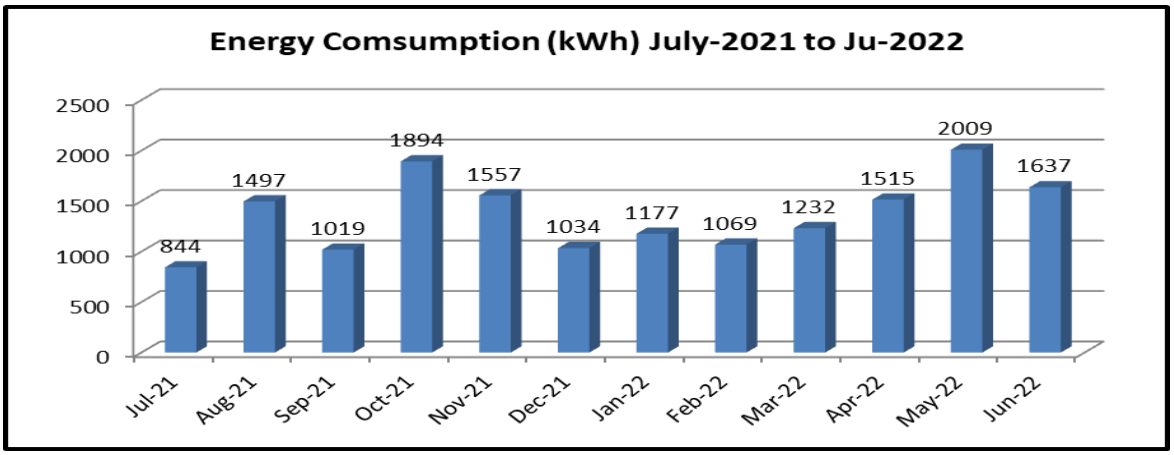


CHAPTER- 3
ELECTRICITY BILL ANALYSIS

3.1 Monthly electrical energy consumption 2021-22 (College Feeder)

The monthly electrical consumption for the College is given in the table.
Table 3.1 Energy consumption and billing amount (year 2021-22)

Sr. no.	Month & Year	Sanction Load (KW)	Energy Consumption (kWh)	Energy Charges (Rs.)	Billing Amount (Rs.)	Over all Per Unit Charges
1	Jul-21	10	844	6936	10373	12.29
2	Aug-21	10	1497	12475	16149	10.79
3	Sep-21	10	1019	8411	11982	11.76
4	Oct-21	10	1894	15849	19792	10.45
5	Nov-21	10	1557	12984	16785	10.78
6	Dec-21	10	1034	8539	12117	11.72
7	Jan-22	10	1177	9372	12991	11.04
8	Feb-22	10	1069	8836	12429	11.63
9	Mar-22	10	1232	9734	13213	10.72
10	Apr-22	10	1515	12627	16436	10.85
11	May-22	10	2009	16828	20837	10.37
12	Jun-22	10	1637	13440	16541	10.10
			16484	**136031**	**179645**	**11.04**



Graphical presentation of energy consumption year 2021-22

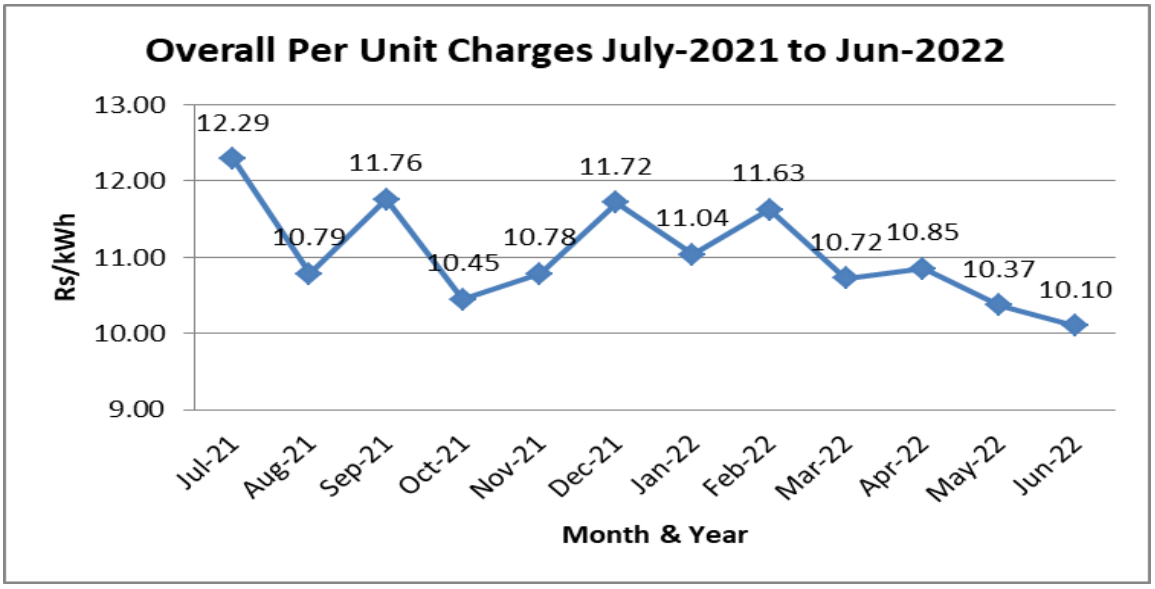
Observation:

It was found out that total energy consumption in last 12 month was 16,484/- unit.

3.2 Overall per unit charges (Rs/kwh) 2021-22

The Overall per unit charges (Rs/kwh) for the college is given in the table .3.2

Sr. no.	Month & Year	Over all Per Unit Charges
1	Jul-21	12.29
2	Aug-21	10.79
3	Sep-21	11.76
4	Oct-21	10.45
5	Nov-21	10.78
6	Dec-21	11.72
7	Jan-22	11.04
8	Feb-22	11.63
9	Mar-22	10.72
10	Apr-22	10.85
11	May-22	10.37
12	Jun-22	10.10
	Average	11.04



Graphical presentation of actual per unit charges year 2021-22

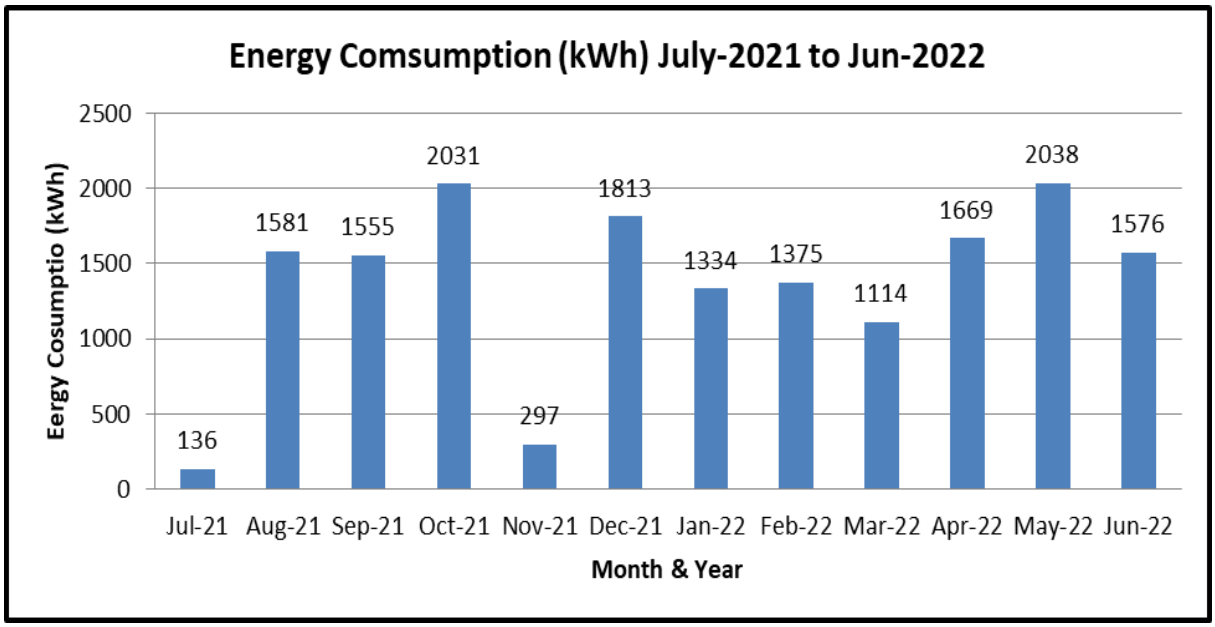
Observation:

It was found out that Average annual energy charges Rs 11.04 /kWh.

3.3 Monthly electrical energy consumption 2021-22 (Hostel Feeder)

The monthly electrical consumption for the hostel is given in the table.
Table 3.3 Energy consumption and billing amount (year 2021-22)

Sr. no.	Month & Year	Sanction Load (KW)	Energy Consumption (kWh)	Billing Amount (Rs.)	Over all Per Unit Charges (Rs/kWh)
1	Jul-21	6	136	2342	17.22
2	Aug-21	6	1581	16778	10.61
3	Sep-21	6	1555	17849	11.48
4	Oct-21	6	2031	21746	10.71
5	Nov-21	6	297	5297	17.84
6	Dec-21	6	1813	18563	10.24
7	Jan-22	6	1334	14551	10.91
8	Feb-22	6	1375	14934	10.86
9	Mar-22	6	1114	12714	11.41
10	Apr-22	6	1669	18370	11.01
11	May-22	6	2038	21406	10.50
12	Jun-22	6	1576	19092	12.11
		Total	**16519**	**183642**	**12.07**



Energy consumption (kWh) July-2021 to Jun-2022

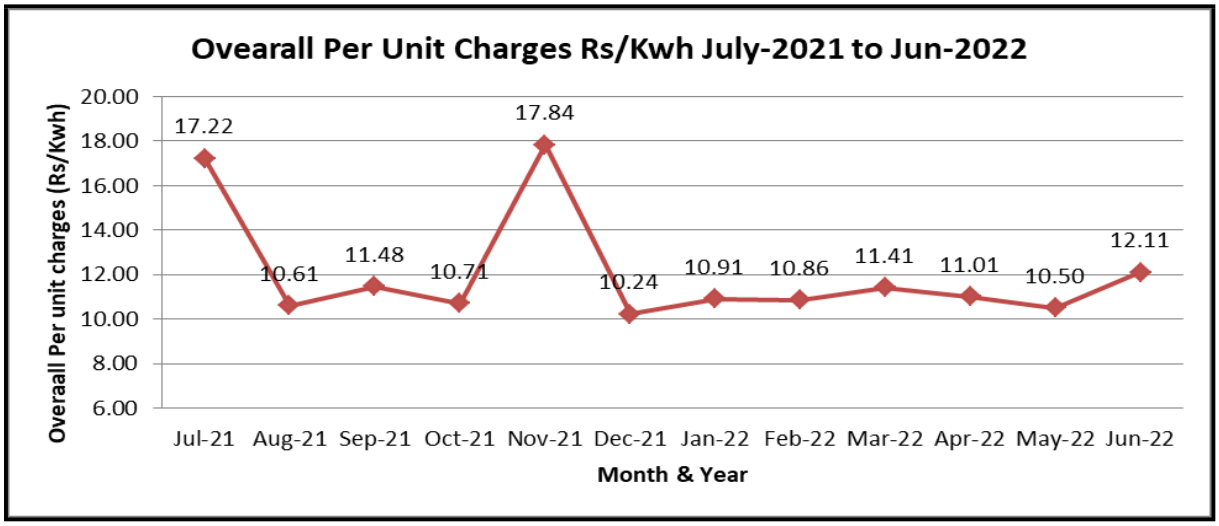
Observation:

It was found out that total energy consumption in last 12 month was 16,519/- unit.

3.4 Overall per unit charges (Rs/kwh) 2021-22 (Hostel Feeder)

The Overall per unit charges (Rs/kwh) for the college is given in the table .3.4

Sr. no.	Month & Year	Overall Per Unit Charges (Rs/kWh)
1	Jul-21	17.22
2	Aug-21	10.61
3	Sep-21	11.48
4	Oct-21	10.71
5	Nov-21	17.84
6	Dec-21	10.24
7	Jan-22	10.91
8	Feb-22	10.86
9	Mar-22	11.41
10	Apr-22	11.01
11	May-22	10.50
12	Jun-22	12.11
	Average	**12.07**



Overall per unit charges July-2021 to Jun-2022

Observation:-

Overall per unit charges is 12.07 kWh.

3.5 power measurement in College

Table 3.7 Operating load measurement on various building.

Sr. No	Building / Section	Voltage	Current	P.F	Total Kw
1	Main Building	446	9.2	0.865	6.14
2	Hostel Building	438	9.6	0.850	6.19
	Total Operating Load At 17/10/2022				12.33

3.6 Connected load of college

Table 3.6:- Connected load of building wise

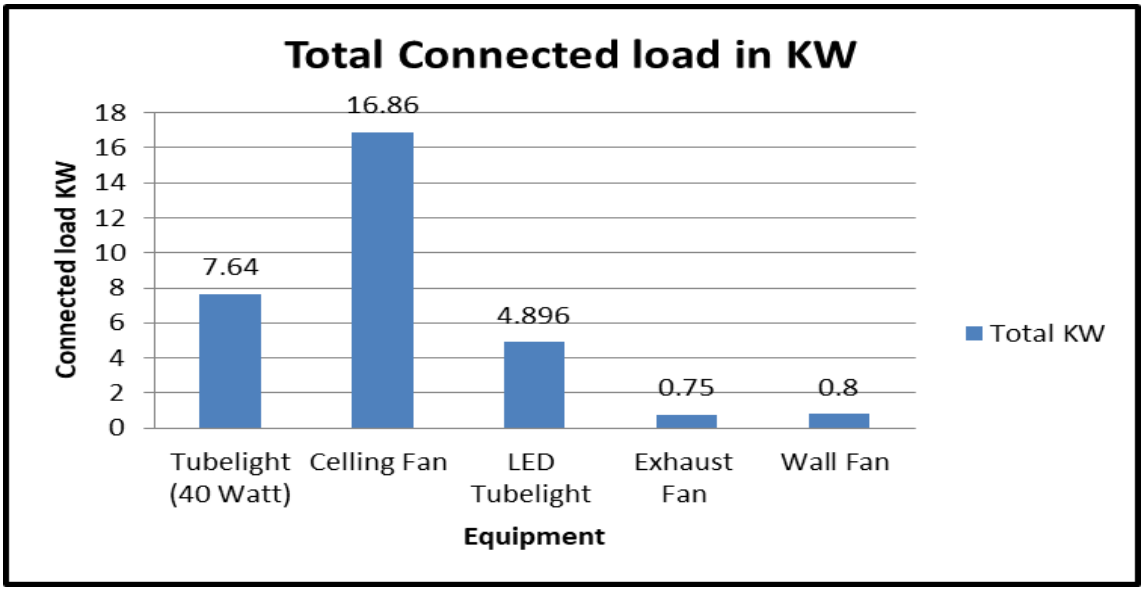
Sr. No	Location	Ceiling Fan	Tube light (40W)	LED 15W	Ex. Fan	Wall Fan
1	Room No-013 B.Ed. Staff	2	2	3	0	0
2	Room No-014 IQAC	2	2	3	0	0
3	Room No-015 Principal	2	2	2	0	0
4	Ladies Staff washroom	0	2	0	0	0
5	Room No-012 Home sc.	9	8	1	1	1
6	Room No-016 EDP	1	1	1	0	1
7	017 office	2	2	0	0	0
8	008 Server Room	1	0	2	0	0
9	009 Staff Room	12	5	1	2	1
10	007 ICT LAB	5	4	1	0	0
11	006 Smart Room	5	4	1	0	0
12	005 Lecture Room	5	4	0	0	0
13	004 Store Room	0	2	2	0	0
14	003 Lecture Room	5	5	1	0	0
15	002 Computer Room	3	5	2	0	1
16	001 Store Room	1	0	1	0	0
17	Girls washroom	0	1	2	0	0
18	101 Store room-3	0	0	1	0	0
19	102 Music Room	2	1	0	0	0
20	103 Lecture Room	5	4	2	0	0
21	104 Fine Art Lab-1	5	4	0	0	0
22	105 Fine Art Lab-2	5	4	0	0	0
23	106 Lecture Room	5	4	0	0	0
24	010 Health Care	1	0	0	0	1
25	011 Lecture Room	9	4	0	0	0
26	107 NCC Store Room	1	1	0	0	0
27	108 Lecture Room	3	3	0	0	0
28	109 Lecture Room	3	2	0	0	0
29	110 Lecture Room	4	2	0	0	0
30	111 Lecture Room	4	2	1	0	0
31	Gents washroom	0	1	0	0	0
32	112 Science Lab	2	2	0	0	0
33	113 Lecture Room	2	2	1	0	0
34	114 Lecture Room	2	1	1	0	0
35	115 Record Room	2	2	2	0	0
36	Water Point	0	0	2	0	0
37	213 Psychological Lab	1	1	0	0	0
38	214 Lecture Room	1	1	0	0	0
39	212 Lecture Room	2	2	3	0	0

40	Ladies Staff washroom	0	0	2	0	0
41	210 Lecture Room	2	2	1	0	0
42	209 Central Library	8	8	3	0	1
43	211 Lecture Room	2	2	1	0	0
44	212 Lecture Room	2	2	1	0	0
45	208 Reading Room	2	4	3	0	1
46	207 Common Hall	4	2	2	0	0
47	206 Lecture Room	9	0	7	0	0
48	205 Lecture Room	9	0	7	0	0
49	204 Lecture Room	9	0	7	0	0
50	Girls washroom	0	1	1	0	0
51	203 Lecture Room	9	0	6	0	0
52	202 Textile Room	2	2	0	0	0
53	201 Store Room-5	1	1	0	0	0
54	018 Reception	1	0	2	0	0
55	Baramda	1	1	3	0	0
56	019 Vice Principal Room	1	1	2	0	0
57	020 NCC Office	1	1	2	0	0
58	021 Founder Room	1	1	2	0	0
59	022 Specially Abled	1	1	1	0	0
60	023 Rovers Rangers	1	1	1	0	0
61	116 Sports Room	2	1	2	0	0
62	117 NSS Office	1	1	2	0	0
63	Baramda	0	0	4	0	0
64	118 Lecture Room	1	1	2	0	0
65	119 Lecture Room	1	1	2	0	0
66	Canteen	0	0	6	0	0
67	001 RRP Memorial Hall	18	12	40	0	0
68	Washroom	0	0	5	0	0
69	101 RRP Lecture Room	6	0	10	0	0
70	102 Lecture Room	8	0	10	0	0
71	103 M.ed Staffroom	8	0	16	0	0
72	104 M.Ed Office	1	0	4	0	1
73	Manager Office	1	0	2	0	0
74	Room No-1 Hostel UG	0	1	2	0	0
75	Room No-2	1	1	2	0	0
76	Room No-3	1	1	0	0	0
77	Room No-4	0	1	0	0	0
78	Room No-5	2	2	2	0	0
79	Room No-6	3	3	2	0	0
80	Room No-7	1	1	0	0	0
81	Room No-8	1	1	1	0	0
82	Room No-9	1	1	1	0	0

83	Room No-10	1	1	1	0	0
84	Room No-11	1	1	1	0	0
85	Room No-12	1	1	1	0	0
86	Room No-13	1	1	1	0	0
87	Hostel Office	1	1	3	0	0
88	Guest Room	1	1	3	0	0
89	Room No-14	1	1	2	0	0
90	Room No-15	1	1	1	0	0
91	Room No-16	2	4	2	0	0
92	Room No-17	2	1	2	0	0
93	Room No-18	1	1	2	0	0
94	Room No-19	1	1	2	0	0
95	Room No-20	1	1	2	0	0
96	Room No-21	1	1	0	0	0
97	Washroom Hostel	0	2	0	0	0
98	Bhoj Nalay Kauch	3	4	10	2	0
99	Room No-22	1	1	2	0	0
100	Room No-23	1	1	3	0	0
101	Room No-24	1	1	2	0	0
102	Room No-25	1	1	2	0	0
103	Room No-26	1	1	2	0	0
104	Washroom	0	0	2	0	0
105	Room No-27	4	3	2	0	0
106	Room No-28	1	1	2	0	0
107	Room No-29	1	1	2	0	0
108	Room No-30	1	1	2	0	0
109	Room No-31	4	1	1	0	0
110	Room No-32	2	1	2	0	0
111	Room No-33	1	1	2	0	0
112	Room No-34	1	1	2	0	0
113	Reading Room No-35	4	2	4	0	0
114	Room No-36	1	1	2	0	0
	Total	**281**	**191**	**272**	**5**	**8**

Connected load Summary :-

Sr. No	Equipment	Unit Watt	Quantity	Total Watt
1	Tube light (40 Watt)	40	191	7.64
2	Ceiling Fan	60	281	16.86
3	LED Tube light	18	272	4.896
4	Exhaust Fan	150	5	0.75
5	Wall Fan	100	8	0.8
	Total Connected load			30.946

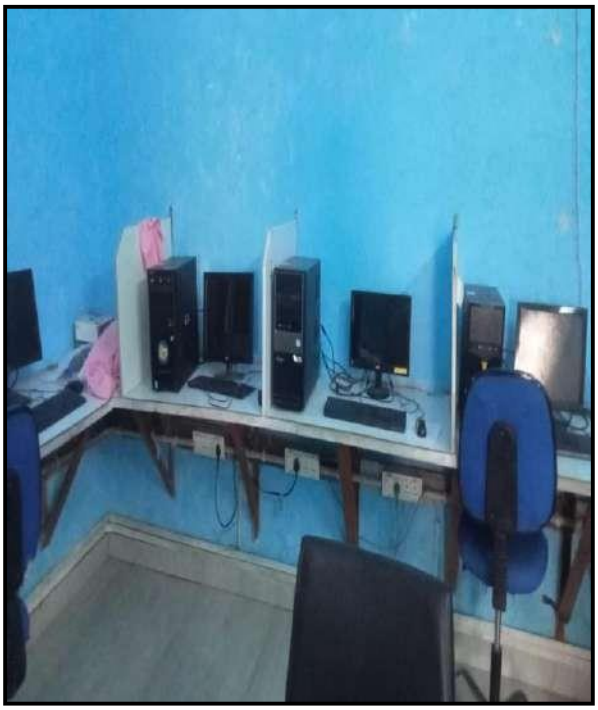


Connected load of the college campus

3.8 Some Photograph of Electrical Equipment's: -

Celling Fan

Water Cooler



Computer System

Tubelight

Electrical Equipment in College Camps

CHAPTER- 4
ENERGY CONSERVATION MEASURES

Case Study No. -01

Replacement of conventional 40 Watt to energy efficient LED tube light 20 Watt in college campus:-

Sr. No	Items	Parameters	Units
1	Power Consumption by FTL	40	W
2	No of T-8	191	Nos.
3	Working Hrs./Day	8	Hrs./Day
4	Working Days/Year	250	Days/Year
5	Energy Efficient T-5 (LED)	20	W
6	Expected Energy Saving	15,280	kWh/Year
7	Load Factor@90% Assume	0.90	NA
8	Overall Per Unit Charges	11.04	Rs./kWh
9	Expected Money Saving	1,68,691	Rs./Year
10	Cost of T-5	200	Rs./ Pices
11	Investment on New Light Purchasing	38,200	Rs.
12	Maintenance Investment @ 3%	1146	Rs.
13	Total Investment	39,346	Rs
14	Simple Pay Back Period	0.3	Year

Total Calculated Monetary Saving Potential in lighting = Rs 1, 68,691/-

Note: - Energy saves depend on the operation hour per day and load factor of the systems.

Case Study No. -02

Replacement of 60W conventional ceiling fan by 28W BLDC Energy Efficient ceiling fan in College campus:-

Sr. No	Items	Parameters	Units
1	Power Consumption by 60W	60	W
2	No of Fan	281	No's
3	Working Hrs./Day	8	Hrs./Day
4	Working Days/Year	250	Days/Year
5	Energy Efficient 28W	28	W
6	Expected Energy Saving	17,984	kWh/Year
7	Load Factor	0.9	NA
8	Per Unit Charges	11.04	Rs./kWh
9	Expected Money Saving	1,98,543	Rs./Year
10	Cost of New Celling Fan	2500	Rs./ Pices
11	Investment on New Fan Purchasing	7,02,500	Rs.
12	Maintenance Investment @ 3%	21,075	Rs.
13	Total Investment	7,23,575	Rs.
14	Simple Pay Back Period	3.65	Year

Total Calculated Monetary Saving Potential in Celling Fan = Rs 1, 98,543/-

Note: - Energy saving depend on the operation hour per day and load factor of the systems.

Case Study No. -03

Installation 5 kWp grid connected solar roof top system for hostel building.

Observation: -

It is observed that there is good potential for installation of solar roof top grid connected system on bank premises.

Recommendation:

Installation 5 kWp Solar Photovoltaic Grid Connected System.

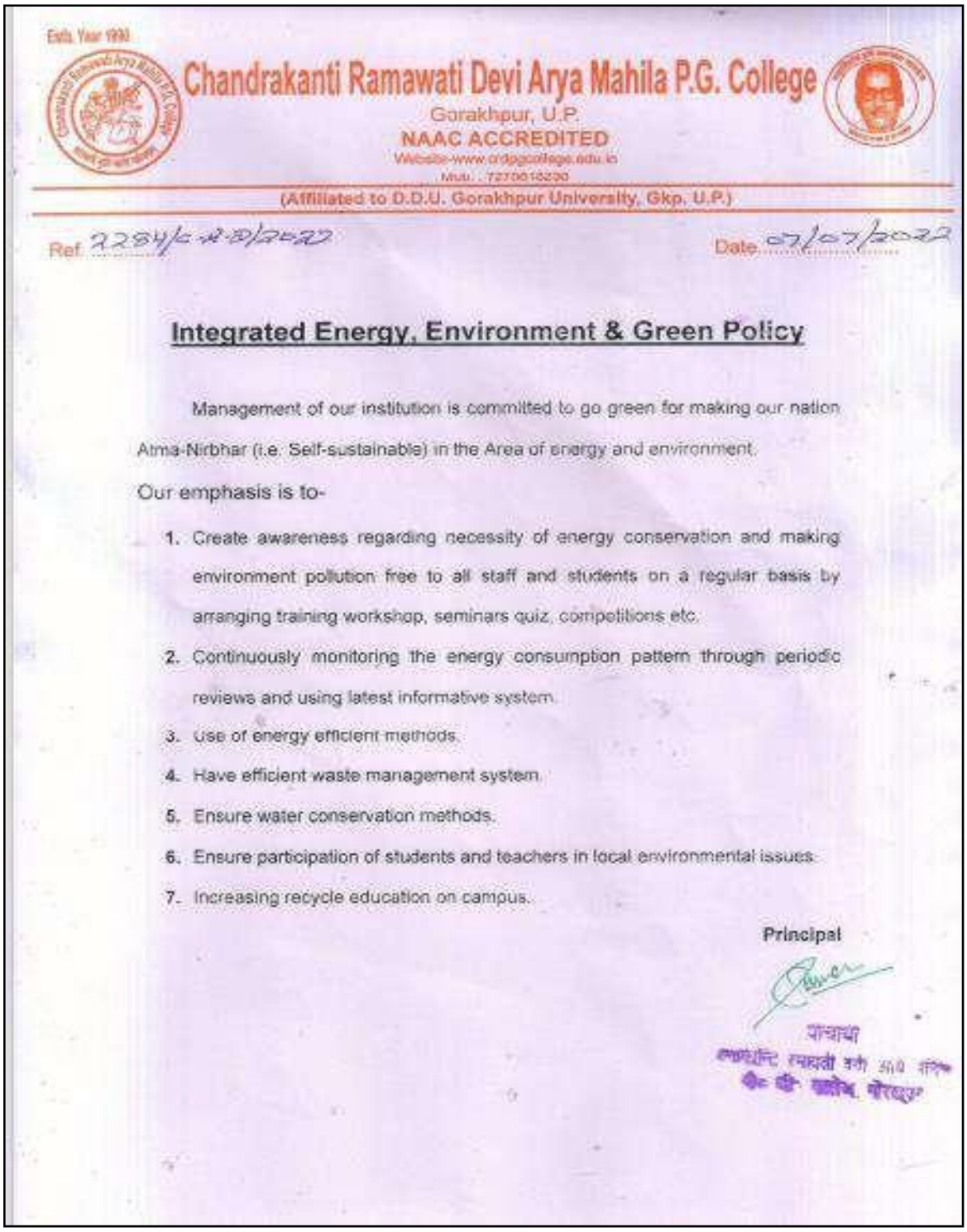
Solar unit (Energy) Generation calculation: -

Recommended capacity of solar PV system	= 5 kWp
Expected Annual energy generation @ 04 Unit /day /kWp	= 5 kWp x 4 kWh / days x 365 days = 7,300 kWh
Total Expected monetary saving potential @ Rs 12.07 per unit (Overall energy charges)	= 88,111
Total Expected investment @ Rs.40 /watt	= 2,00,000 /-
*Simple Payback period	= 2.3 year

Note: - Energy saving depends on the operation hours per day and load factor of the systems.

Annexure-01

Integrated Energy, Environment & Green Policy



Estb. Year 1990

Chandrakanti Ramawati Devi Arya Mahila P.G. College

Gorakhpur, U.P.

NAAC ACCREDITED

Website-www.crdpgcollege.edu.in

Mob. : 7270018230

(Affiliated to D.D.U. Gorakhpur University, Gkp. U.P.)

Ref. 2284/C.R.D./2021 Date 07/07/2022

Integrated Energy, Environment & Green Policy

Management of our institution is committed to go green for making our nation Atma-Nirbhar (i.e. Self-sustainable) in the Area of energy and environment.

Our emphasis is to-

1. Create awareness regarding necessity of energy conservation and making environment pollution free to all staff and students on a regular basis by arranging training workshop, seminars quiz, competitions etc.
2. Continuously monitoring the energy consumption pattern through periodic reviews and using latest informative system.
3. Use of energy efficient methods.
4. Have efficient waste management system.
5. Ensure water conservation methods.
6. Ensure participation of students and teachers in local environmental issues.
7. Increasing recycle education on campus.

Principal

प्राचार्या
चन्द्रकान्ति रमावती देवी आर्य महिला पी० जी० कॉलेज
गोरखपुर

END OF THE REPORT

THANKS

ENVIRONMENT AUDIT REPORT

CONSLTATION REPORT

Chandrakanti Ramawati Devi Arya Mahila PG College,

Diwan Bazar,

Gorakhpur, Uttar Pradesh 273001

PREPARED BY

EMPIRICAL EXERGY PRIVATE LIMITED

Flat No. 201, OM Apartment,214 Indrapuri Colony,
Bhawarkuan,Indore – 452 001 (M. P.), India
0731-4948831, 7869327256
Email ID:eempirical18@gmail.com
www.eeplgroups.com

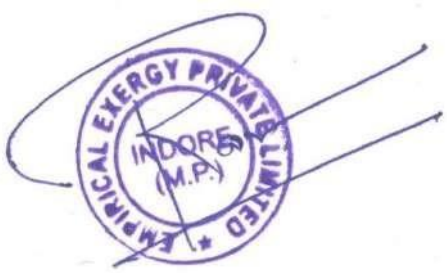
(2021-22)

CONTENT

ACKNOWLEDGEMENT

Empirical Exergy Private Limited (EEPL), Indore (M.P) takes this opportunity to appreciate & thank the management of **Chandrakanti Ramawati Devi Arya Mahila P.G. College, Gorakhpur** for giving us an opportunity to conduct environment audit for the college.

We are indeed touched by the helpful attitude and co-operation of all faculties and technical staff, who rendered their valuable assistance and co-operation the course of study.



Rajesh Kumar Singadiya

(Director)

M.Tech (Energy Management), PhD (Research Scholar)
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)
Charted Engineer [M-1699118], The Institution of Engineers (India)
Member of ISHRAE [58150]

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.

Estb. Year 1990

Chandrakanti Ramawati Devi Arya Mahila P.G. College

Gorakhpur, U.P.

NAAC ACCREDITED

Website-www.crdapgcollege.edu.in

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Ref. 2284/C.R.D/2022 Date 07/07/2022

Energy, Water, Green & Environmental Audit Committee

Energy, Water, Green & Environmental Audit Committee will consist of the following faculty members.

S.No.	Name	Designation	Department
01	Mr. Anant Kumar Pathak	Assistant Professor	B.Ed.
02	Dr. Rekha Srivastava	Assistant Professor	M.Ed.
03	Dr. Aparna Mishra	Assistant Professor	B.Ed.
04	Dr. Virendra Kumar Gupta	Assistant Professor	M.Ed.
05	Dr. Sarika Jaiswal	Assistant Professor	Home Science
06	Miss Ankita Upadhyay	Assistant Professor	Commerce
07	Miss Priya Kumari	Assistant Professor	Sociology
08	Dr. Rekha Rani Sharma	Assistant Professor	Fine Art
09	Mr. Narendra Singh Rawat	Office Superintendent	Administration Office

Time duration of this committee is 03 years up to June 2025, after which the committee will be reconstituted.

Principal

The Audit Team

The study team constituted of the following senior technical executives from **Empirical Exergy Private Limited,**

- **Mr. Rajesh Kumar Singadiya** [Director & Accredited Energy Auditor AEA-0284]
- **Mr. Rakesh Pathak**, [Director & Electrical Expert]
- **Mr. Sachin Kumawat** [Sr. Project Engineer]
- **Mr. Charchit Pathak** [Ass. Project Engineer]
- **Mr. Mohit Malviya** [Fire safety Engineer]
- **Mr. Aakash Kumawat** [Site Engineer]
- **Mr. Ajay Nahra,** [Sr. Accountant & admin]

EXECUTIVE SUMMARY

The executive summary of the environment audit report furnished in this section briefly gives the identified water conservation measures that can be implemented in a phased manner to conserve water and increase the productivity of the college.

SUSTAINABLE INITIATIVE TAKEN BY COLLEGE: -

- **WATER SPRINKLER SYSTEM**

  College has installed Water sprinkler system for Lawn area in college building. IT is reduced water consumption in the college campus. **It's Appreciable**

- **WATER TANK OVERFLOW SENSOR :-**

  College has installed water tank overflow buzzer sensor. It is indicate the tank filling **Its Appreciable**

- **RAIN WATER HARVESTING SYSTEM**

  College has installed Rain water harvesting system on college building. It will be increased ground water level. **It's Appreciable**

ENVIRONMENT AUDIT RECOMMENDATION

WATER MONITORING SYSTEM:

- Installation of **"Cloud based (IoT based) ground water extraction monitoring system"** for bore well to quantify fresh water consumption per day in the college.
- Install water flow meters (Mechanical or Electronics) in distribution network, (At outlet of supply pump of open well and underground RCC tank) it will help to determine water consumption of college main building, and hostels building,

WASTE WATER TREATMENT PLANT (STP PLANT)

- There is requirement to install Sewerage Treatment Plant (STP) waste water generated from daily activity from college department. All waste water generated from drinking, washing, etc. activity is collected in separate tank and it should be treated in proposed STP plant

.

DRIP WATER IRRIGATION SYSTEM FOR GARDENING.

- Use drip water irrigation system for gardening.

USE EFFICIENT WATER TAPS -

- Water saving taps either reduce water flow or automatically switch off to help save water. So, it is highly recommended to install efficient water taps in university campus to reduce water consumption.

USE EFFICIENT URINAL TAPS: -

- Replacing these inefficient fixtures with water sense labelled flushing urinal can save between 0.5 to 04 litters per flush without sacrificing performance. Installing water saving flushing urinal will not only reduce water use in facilities but also save money on water bills.

CHAPTER-1
INTRODUCTION

1.1 About College

Chandrakanti Ramawati Devi Arya Mahila P.G. College, Gorakhpur in the holy land of Guru Gorakhnath, located in diwan bajar in Gorakhpur city was, established by Smt. Chandrakanti Devi Arya Mahila Sansthan on the day of Kartik Shukla Navami in 1990. The aim of this institution is to promote conserve and encourage the Arya culture, science and literature language, civilization while working for the multi faceted development of the students along with the educational, social and economical revival of women in which the organization is constantly engaged.

On graduation level B.A., B.Sc. (Home Science), and B.Com. and on Post-Graduation level Home Science, Visual Art, Education and Political Science under M.A. are being run by this college. B.Ed. and M.Ed. program are also being run for teacher-training by the faculty of Education. A study center has also been approved by the Uttar Pradesh Rajarshi Tandon University Prayagraj which is to be operated from session 2019-20. Since the beginning, this college is continuously working for the all round development of women- students. Co-curricular activities and cultural programs are run in regular form for the spiritual and intellectual development of women-students. The college students have so far received the highest marks in the university examination and have received gold medal at the university level. Various students have been selected for the National Camp and Pre RD Parade by the units of NCC and NSS, run in the college which is a milestone in fulfilling the purpose of the establishment of this college.

The college is fully active for the promotion of Arya culture and the goal of women education and multifaceted development which was set at the time of the establishment of this college.

MISSION :-

- To provide women a wider access towards education of excellence, Excellence of Education, knowledge, Skill, through our wider access of Exposure. Empowerment of Human Values and Indian Culture by Self Responsibility. Enhancing Potential through the way of Curricular Actions.

VISION :-

- To Promote the Efficiency of Society by Women Education Creation of Security and Ability on Student. Provision of Positive Energy and Self dependency for the Progress of the Nation

1.2 About Campus: - Chandrakanti Ramawati Devi Arya Mahila P.G. College, Gorakhpur total campus area is 7159.85 Sq.m**.**

Table 1.1 Details are total build up area given in the table:-

College campus Built-up area of Buildings	
Floor	**Proposed**
Ground floor	918.9708
First floor	918.9736
Second floor	918.9717
Third floor	918.9717
Total Built-up Area	3675.8878

Satellite Image from Google map

Figure 1.1: - Satellite Image of College from Google map

1.3 LAYOUT OF VARIOUS BUILDINGS

Layout map of College

1.4 Environment Auditing

Environment audits can be a highly valuable tool for institute in a wide range of ways to improve their energy, environment and economic performance. While reducing wastages and operating costs. Environment audits provide a basis for calculating the economic benefits of water conservation projects by establishing the current rates of water use and their associated cost.

1.5 Objectives of Environment audit

The general objective of environment audit is to conduct water audit and preparation of baseline report on water conservation measures to mitigate consumption, improve quality and sustainable practices.

The specific objectives are:

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

1.6 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 unprecedented rates. It is therefore essential that any environmentally responsible institution should examine its water use practices.

1.7 Methodology followed for conducting Environment audit

Step 1: Walk through survey

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

Step 2: Secondary Data Collection

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

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

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

Step 4: Conduction of Detailed Environment Audit & Measurements

- Conduction of field measurements to quantify water/wastewater streams
- Power measurement of pumps/motors
- Preparation of water balance diagram
- Establishing 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 & analysed 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 options

CHAPTER- 2
WATER CONSUMPTION AND WASTE WATER SOURCES

2.1 Details of Source of Fresh Water and Use Areas:

The main source of freshwater is Borewell for the college. The freshwater is mainly used for drinking, housekeeping, gardening, domestic activity and new construction project. Details of the pumps are given in table.

Table:2.1 Details of Fresh water sources.

Sr. No.	Fresh Water Sources	Location	Motor Power (HP)	Remark
1	Borewell-01	Block-A	1.5	For Fresh water Supply
2	Borewell-02	Hostel	1.5	For Fresh water Supply

Power Measurement of Bore wells

Sr. No	Borewell No	Voltage (V)	Current (Amp)	Power Factor	KW	Remark
1	Borewell-01	423	5.9	0.854	3.7	Block-A
2	Borewell-02	430	4	0.876	2.6	Hostel

Observation:-

College has 02 no's bore well system for fresh water supply. But there are requirement a water meter in bore well to quantify per day water consumption

2.2 Water Storage Capacity in college Campus: -

There is different type of tank available in college campus for water storage like Underground RCC tank, Overhead RCC tank and PVC tanks etc.

Table 2.3: - Water Storage tank in university campus

Sr. No	Location	Type of Tank	Unit Capacity (Litter)	Quantity	Total Capacity (Litter)	Total Capacity (Kilo Litter)
1	Main building,	Under ground (RCC tank)	10,000	1	10000	10
2	Main building,	Overhead tank (Sintex)	1000	2	2000	2
3	Hostel Building	Overhead tank (RCC)	3000	1	3000	3

2.3 Photographs of water storage tanks.

Fig: - 2.2 Water storage tank and capacity of college campus

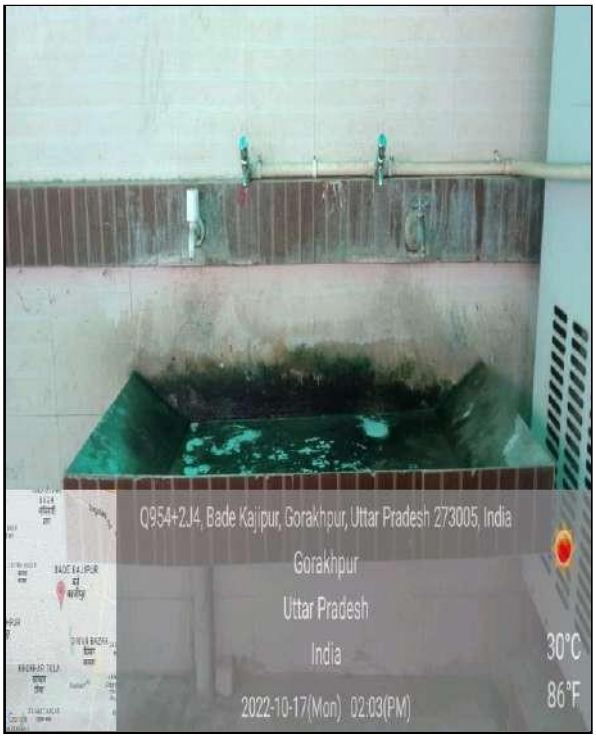
2.4 Water use areas in College Campus: -

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

Table: 2.4 Details of washroom and Uses Taps in various areas

Sr. No.	Location of Taps	Fresh water Taps	R.O. + Water Cooler Tape
1.	Garden Area	13	2
2.	Home Science Staff washroom	2	0
3.	Home Science Lab	5	1
4.	Ladies staff washroom (Ground floor)	5	0
5.	B.Ed. Staff washroom (013)	2	1
6.	I.Q.A.C. Office (014)	3	0
7.	Principal office Washroom	2	0
8.	Health Care Centre	2	0
9.	Gents Washroom (1st Floor)	3	0
10.	Science Lab (Room No.-112)	2	0
11.	Girls Washroom (1st Floor)	13	1
12.	Second Floor (Stair Case)	1	2
13.	Girls Washroom (2nd Floor)	13	0
14.	Ladies Staffroom (Library Department 2nd Floor)	3	0
15.	Washroom (office Area)	4	0
16.	R.R. Memorial Hall (001) (Ground Floor)	1	3
17.	R.R. Memorial Hall (001) 2 Washroom	4	0
18.	R.R. Memorial Hall (001) Washroom (Backside)	4	0
19.	M.Ed. Staffroom Washroom	7	0
20.	**Hostel** Gust Room	2	0
21	Teaching staffroom (Ground floor)	2	0
22	Hostel Washroom (Ground floor)	13	2
23	Hostel Mess	3	0
24	Teaching Staff (Room No.-23)	2	0
25	Teaching Staff (Room No.-24)	2	0
26	Washroom (1st Floor)	11	1
	Total No. of Water Taps-	**124**	**13**

Photographs of Water Cooler and taps



Observation: -

College has installed 03 no's RO system. And all RO rejected water in drain into drain line .Estimated rejected waste water from 3 no's RO plants is $1m^3$/Day. It is highly recommended to collect all rejected water in separate tank and utilize for other activity. It is reduce fresh water consumption of the college

2.5 Fresh Water uses for Gardening:

College has installed water sprinkler system for lawn area in front of main college building. **It's appreciable.**

Figure:-Water Sprinkler system in college campus

Observation: - There is good potential for water saving by adopt "Automatic Watering 360 adjustable misting nozzle irrigation Dripper's system" for other area of the college.

2.6 Waste Water Generation sources: -

At present waste water generated from various departments canteen, Mess, hostels like washrooms, hand wash and washing and RO rejected water treated in Proposed STP plants. After that treated Water College to be reused in gardening.

Table: - 2.6 Waste water generation area in university campus

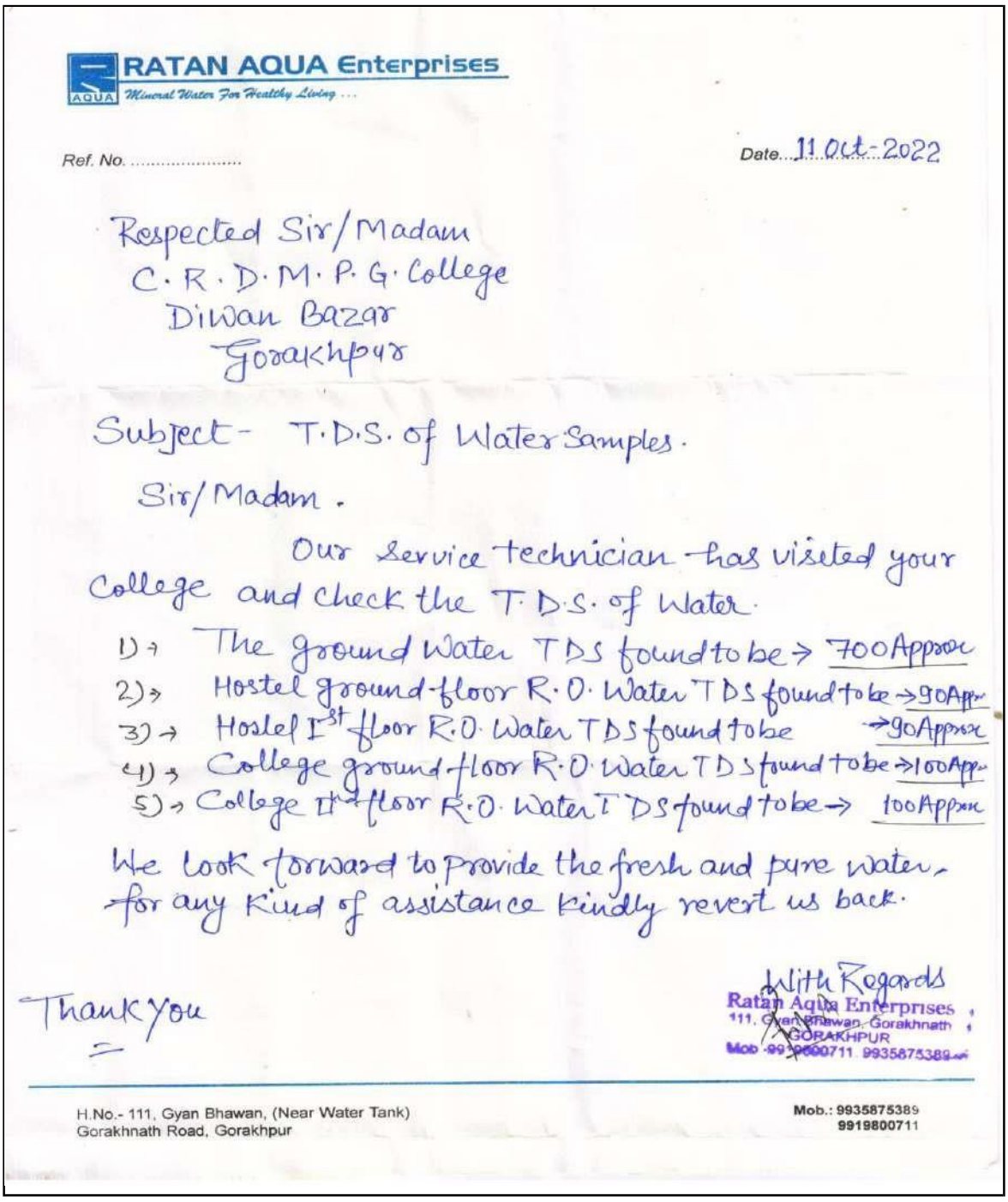
Sr. No	Key Water Usage Section	Type of water used (raw, treated etc.)	Water Consuming activities
1	Main Building	Fresh Water	Drinking and other uses
2	Hostels	Fresh Water	Drinking, Food cooking, other Uses
3	Institution Buildings	Fresh Water	Drinking and other uses
4	Canteens /Mess	Fresh Water	Food cooking, drinking
6	Guest House	Fresh Water	Drinking and other uses

- Some photographs of waste water generation sources are given

Figure: -2.5 Waste Water Generation sources

2.7 Water Quality Report:-

College has frequently done water quality test. **It's Appreciable**



RATAN AQUA Enterprises
Mineral Water For Healthy Living ...

Ref. No. .....

Date... 11 Oct-2022

Respected Sir/Madam
C.R.D.M.P.G. College
Diwan Bazar
Gorakhpur

Subject- T.D.S. of Water Samples.

Sir/Madam.

Our service technician has visited your College and check the T.D.S. of Water.

1) → The ground Water TDS found to be → 700 Approx
2) → Hostel ground-floor R.O. Water TDS found to be → 90 Appr
3) → Hostel I st floor R.O. Water TDS found to be → 90 Approx
4) → College ground-floor R.O. Water TDS found to be → 100 App
5) → College II nd floor R.O. Water TDS found to be → 100 Approx

We look forward to provide the fresh and pure water. for any kind of assistance kindly revert us back.

Thank you

With Regards
Ratan Aqua Enterprises
111, Gyan Bhawan, Gorakhnath
GORAKHPUR
Mob 9919800711 9935875389

H.No.- 111, Gyan Bhawan, (Near Water Tank)
Gorakhnath Road, Gorakhpur

Mob.: 9935875389
9919800711

CHAPTER- 3
RAIN WATER HARVESTING SYSTEM

3.1. Rain water harvesting systems

The 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 flow 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.

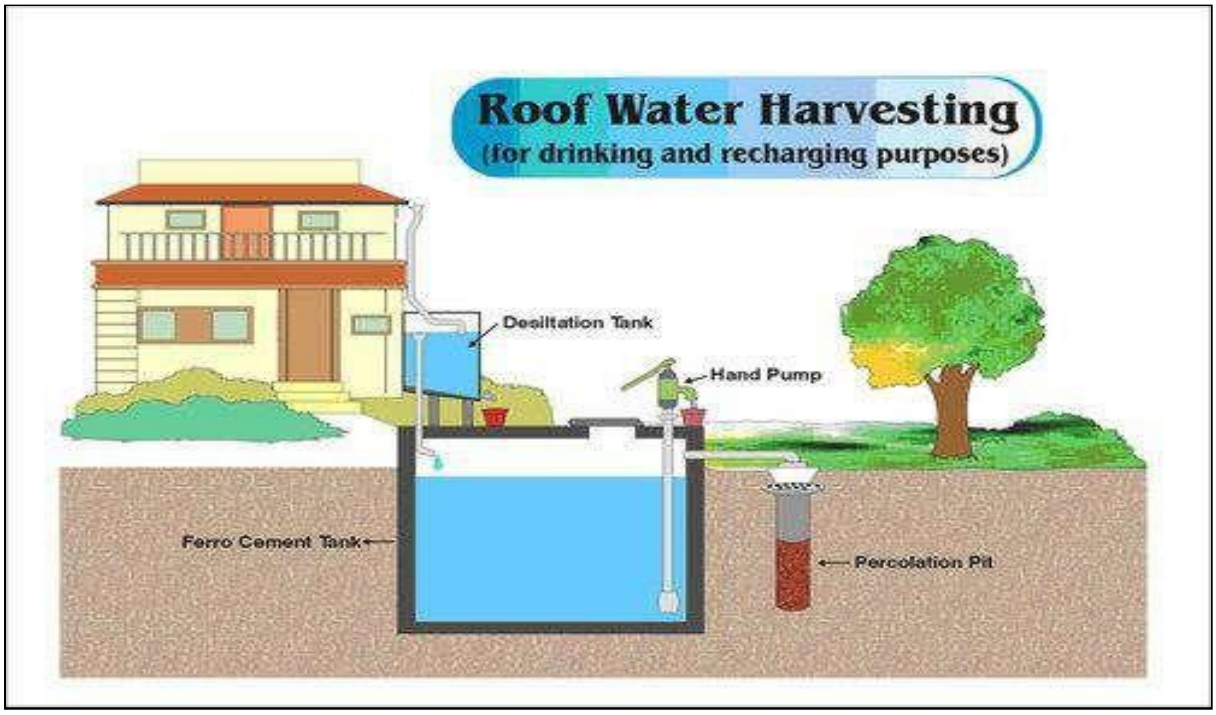
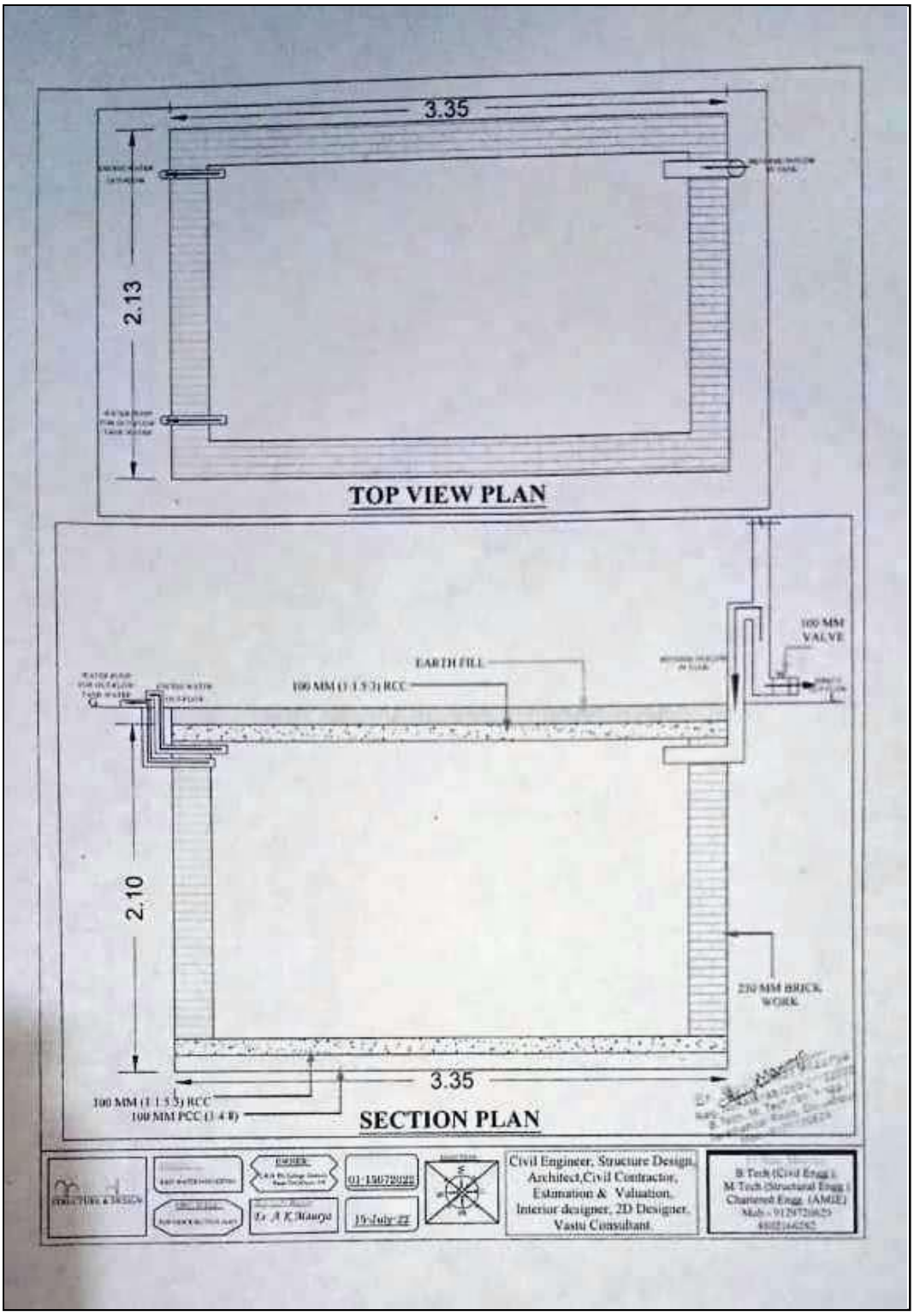


Figure: - 3.1 Components of a rooftop rainwater harvesting system

3.2 Rainwater harvesting system in college campus:-

College has a rain water harvesting system for main building. **It's Appreciable**, RWH design layout is given below.



3.3 Rainwater Harvesting Photos

END OF THE REPORT

THANKS

GREEN AUDIT REPORT

Chandrakanti Ramawati Devi Arya Mahila PG College,

Diwan Bazar,

Gorakhpur, Uttar Pradesh 273001

PREPARED BY

EMPIRICAL EXERGY PRIVATE LIMITED

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(2021-22)

CONTENTS

ACKNOWLEDGEMENT

Empirical Exergy Private Limited (EEPL), Indore (M.P) takes this opportunity to appreciate & thank the management of **Chandrakanti Ramawati Devi Arya Mahila P.G. College, Gorakhpur** for giving us an opportunity to conduct green audit for the college.

We are indeed touched by the helpful attitude and co-operation of all faculties and technical staff, who rendered their valuable assistance and co-operation the course of study.

Rajesh Kumar Singadiya

(Director)

M.Tech (Energy Management), PhD (Research Scholar)
Accredited Energy Auditor [AEA-0284]
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(BEE, Ministry of Power, Govt. of India)
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Member of ISHRAE [58150]

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.

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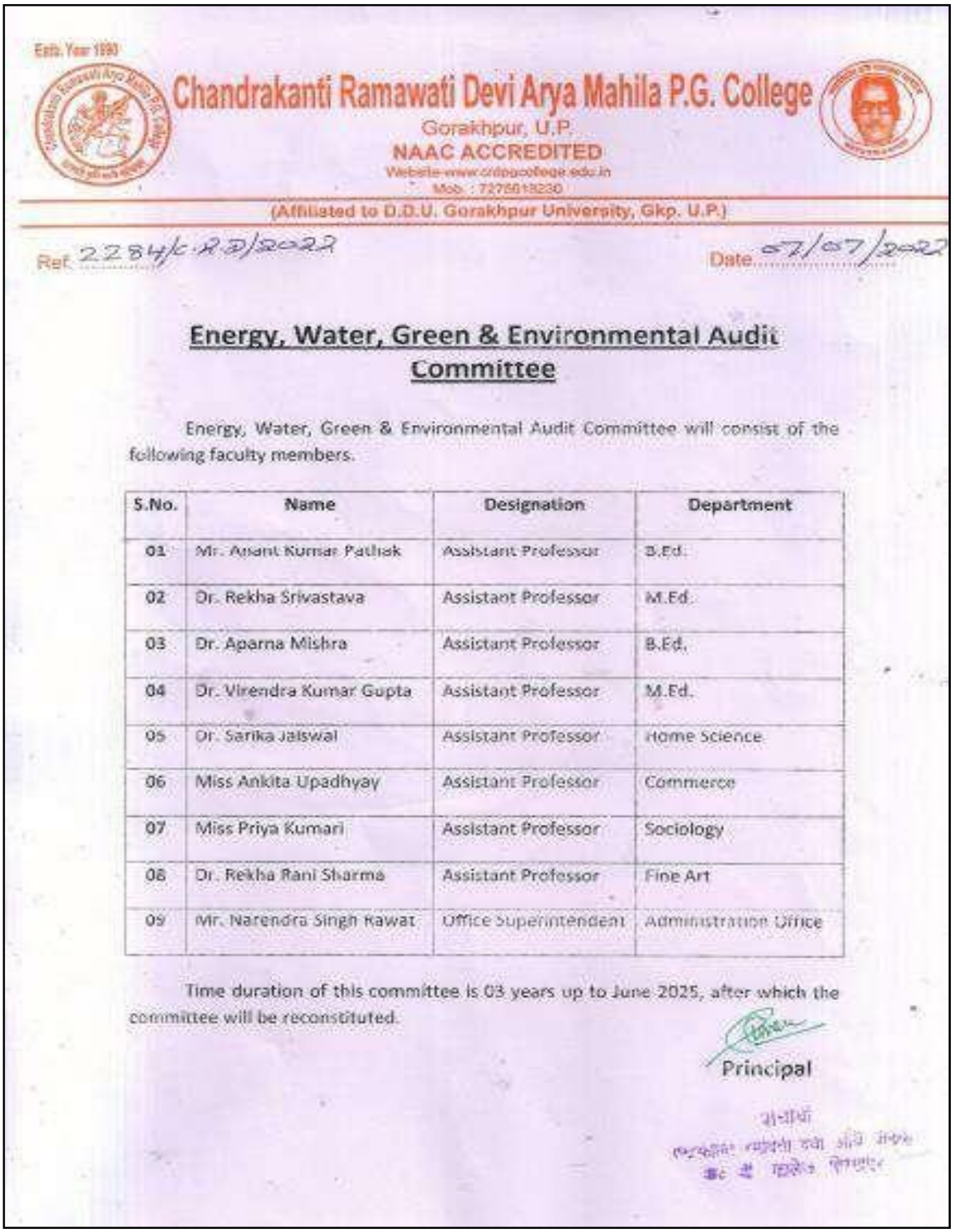

Estb. Year 1990

Chandrakanti Ramawati Devi Arya Mahila P.G. College

Gorakhpur, U.P.

NAAC ACCREDITED

Website-www.crdapgcollege.edu.in

Mob. : 7275013230

(Affiliated to D.D.U. Gorakhpur University, Gkp. U.P.)

Ref. 2284/C.R.D/2022 Date 07/07/2022

Energy, Water, Green & Environmental Audit Committee

Energy, Water, Green & Environmental Audit Committee will consist of the following faculty members.

S.No.	Name	Designation	Department
01	Mr. Anant Kumar Pathak	Assistant Professor	B.Ed.
02	Dr. Rekha Srivastava	Assistant Professor	M.Ed.
03	Dr. Aparna Mishra	Assistant Professor	B.Ed.
04	Dr. Virendra Kumar Gupta	Assistant Professor	M.Ed.
05	Dr. Sarika Jaiswal	Assistant Professor	Home Science
06	Miss Ankita Upadhyay	Assistant Professor	Commerce
07	Miss Priya Kumari	Assistant Professor	Sociology
08	Dr. Rekha Rani Sharma	Assistant Professor	Fine Art
09	Mr. Narendra Singh Rawat	Office Superintendent	Administration Office

Time duration of this committee is 03 years up to June 2025, after which the committee will be reconstituted.

Principal

The Audit Team

The study team constituted of the following senior technical executives from **Empirical Exergy Private Limited,**

- **Mr. Rajesh Kumar Singadiya** [Director & Accredited Energy Auditor AEA-0284]
- **Mr. Rakesh Pathak**, [Director & Electrical Expert]
- **Mr. Sachin Kumawat** [Sr. Project Engineer]
- **Mr. Charchit Pathak** [Ass. Project Engineer]
- **Mr. Mohit Malviya** [Fire safety Engineer]
- **Mr. Aakash Kumawat** [Site Engineer]
- **Mr. Ajay Nahra,** [Sr. Accountant & admin]

EXECUTIVE SUMMARY

Green Initiative Taken by College

- **CAMPAIGN OF PLANTATION AND GREEN CAMPUS:**

  College has around **667** trees in the campus. with 97 Medical plants Its good initiative taken by management for green campus under the campaign of plantation. **It's APPRECIABLE.**

- **10 KWp SOLAR PHOTOVOLTAIC ROOFTOP INSTALLATION:**

  College has installed 10 KWp solar photovoltaic roof top grid connected system on College building. Total unit generation from May-2022 to Oct- 2022 is **2148 units**. Solar unit generated for year May-2022 to Oct- 2022 is 2148 units. The total CO_2 reduction is 3.91 -ton CO2e as up year May-2022 to Oct- 2022 **it's APPRECIABLE.** (CO2e data are consider in solar system)

- **VERMICOMPOST UNIT:**

  College has installed 01 no of varmi compost pit. All type of agriculture waste decomposes in the pit and prepares good quality environmentally friendly manure is formed from the compost and it is to be used for agricultural purposes in the college campus. **It's APPRECIABLE.**

- **QR CODE SYSTEM ON TREE: -**

  College has adopted QR code system on trees for identification and nature of the tree. **It's APPRECIABLE.**

- **5 DUST BIN SYSTEM**

  College has adopted 5 Dust bin System for various type of waste generated in college campus **It's APPRECIABLE.**

RECOMMENDATION: -

SOLID WASTE MANAGEMENT:

- The basic principle of good waste management practice is based on the concept of 3Rs, namely, reduce, recycle, and reuse. All the degradable and non-degradable waste material are collected and processed in environmentally friendly way in the College campus.
- **Organic converter:** - There are good potential of installation of organic converter in the college for all type of kitchen and vegetable waste generated from Hostels mess.

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CHAPTER-1
INTRODUCTION

1.1 About College

Chandrakanti Ramawati Devi Arya Mahila P.G. College, Gorakhpur in the holy land of Guru Gorakhnath, located in diwan bajar in Gorakhpur city was, established by Smt. Chandrakanti Devi Arya Mahila Sansthan on the day of Kartik Shukla Navami in 1990. The aim of this institution is to promote conserve and encourage the Arya culture, science and literature language, civilization while working for the multi faceted development of the students along with the educational, social and economical revival of women in which the organization is constantly engaged.

On graduation level B.A., B.Sc. (Home Science), and B.Com. and on Post-Graduation level Home Science, Visual Art, Education and Political Science under M.A. are being run by this college. B.Ed. and M.Ed. program are also being run for teacher-training by the faculty of Education. A study center has also been approved by the Uttar Pradesh Rajarshi Tandon University Prayagraj which is to be operated from session 2019-20. Since the beginning, this college is continuously working for the all round development of women- students. Co-curricular activities and cultural programs are run in regular form for the spiritual and intellectual development of women-students. The college students have so far received the highest marks in the university examination and have received gold medal at the university level. Various students have been selected for the National Camp and Pre RD Parade by the units of NCC and NSS, run in the college which is a milestone in fulfilling the purpose of the establishment of this college.

The college is fully active for the promotion of Arya culture and the goal of women education and multifaceted development which was set at the time of the establishment of this college.

- **MISSION :-**
  - To provide women a wider access towards education of excellence, Excellence of Education, knowledge, Skill, through our wider access of Exposure. Empowerment of Human Values and Indian Culture by Self Responsibility. Enhancing Potential through the way of Curricular Actions.
- **VISION :-**
  - To Promote the Efficiency of Society by Women Education Creation of Security and Ability on Student. Provision of Positive Energy and Self dependency for the Progress of the Nation

1.2 About Campus: - Chandrakanti Ramawati Devi Arya Mahila P.G. College, Gorakhpur total campus area is 7159.85 Sq.

Table 1.1 Details are total build up area given in the table:-

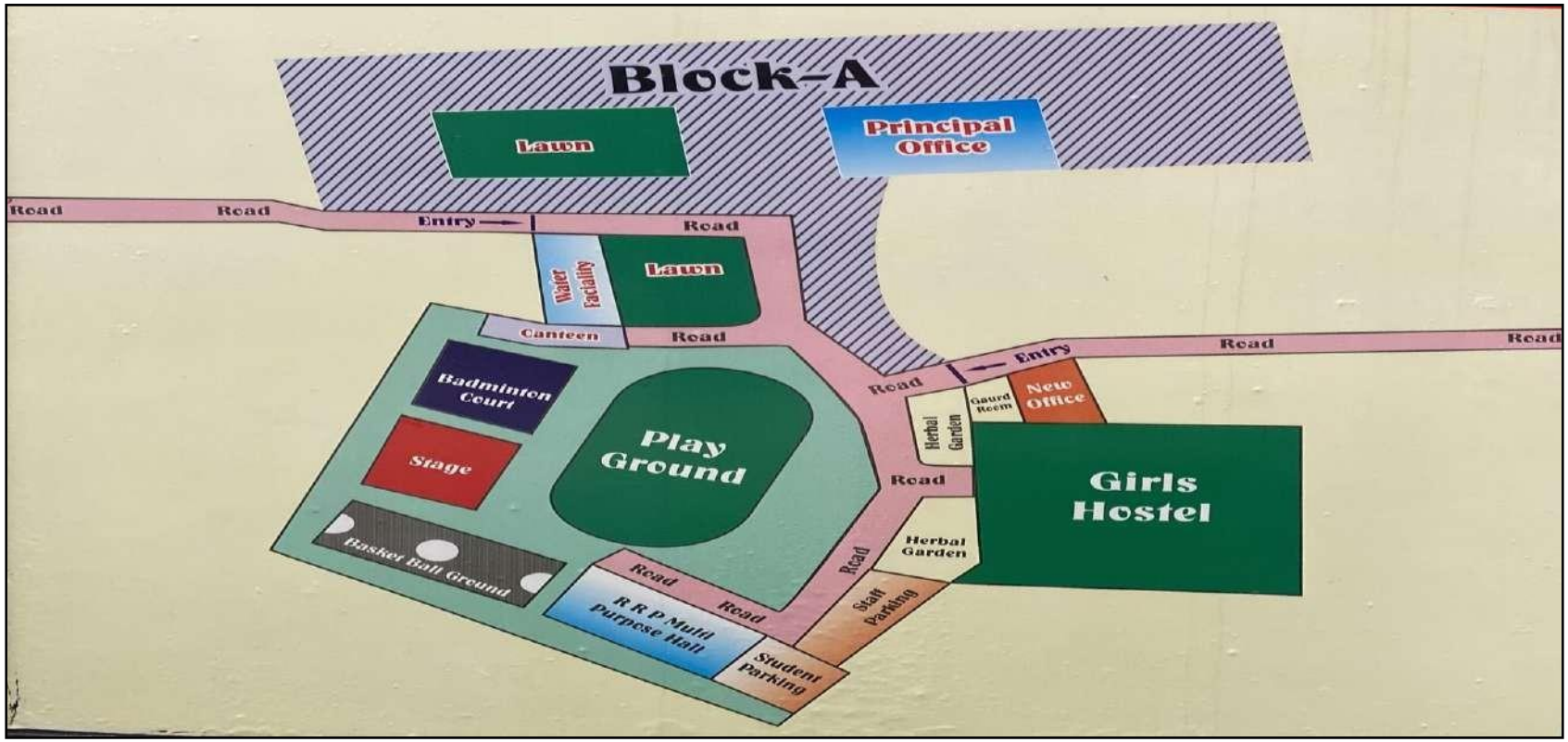
Name of Buildings in campus & Built-up area of Buildings	
Floor wise Built-up area in Sq.	
Floor	**Proposed**
Ground floor	918.9708
First floor	918.9736
Second floor	918.9717
Third floor	918.9717
Total Built-up Area	3675.8878

Satellite Image of College campus from Google map

Figure 1.1: - Satellite Image of College from Google map

1.3 COLLEGE LAYOUT OF VARIOUS BUILDINGS

Layout map of College



1.4 About Green Auditing

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 College 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.

1.5 Objectives of Green Auditing

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 College.

CHAPTER- 2

GREEN CAMPUS & SUSTAINABLE DEVELOPMENT

2.0 Green Audit

In the survey, focus has been given on assessment of present status of plants and tree in the college campus and efforts made by the college authorities for nature conservation. Campus is in the vicinity of approximately more than 667 trees/ medicinal herbs/ ornamental plants. The detail is given below:

Figure .2.1 Green Campus

2.1 List of plants in college camps

Sr.No.	Name of Tree	Quantity
1	Ashoka Tree	30
2	Moses in the cradle	3
3	Arabian Jasmine	1
4	Mimosa	1
5	Persian Liliac	1
6	Leechee	2
7	Shami	3
8	Chinese fan palm	1
9	Jonauba	1
10	Yellow bells	1
11	Red frangipani	1
12	Lemon Grass	2
13	Veriegated Croton	6
14	Indian laurel	3
15	West Indian Jasmine	1
16	Dumb Cane	11
17	Bich Spierlili	1
18	Sadabahar	5
19	Arrow head vine	13
20	China Rose	7
21	Karoo cycad	13
22	Paper flower	6
23	Yellow Kaner	8
24	Rose	3
25	Siberian Dog wood	1
26	sliper flower	1
27	Areca palm	16
28	Neem	4
29	Meetha Neem	1
30	Spider Plant	2
31	Mimosa	2
32	Guava	4
33	Mango	7
34	Mogra	4
35	Teak wood	29
36	Amla	3
37	cycas	2
38	Red Casiya	2
39	Peepal	1
40	Aloe Vera	14

41	Tora siekle Pod	1
42	Gulmohar	3
43	Iron Wood Cassia	1
44	Pin wheel Flower	7
45	Cuban oregano	7
46	Coleus	5
47	Balsam	64
48	Snake plant	3
49	White Orchid tree	1
50	Dwarf Umbrella tree	1
51	Norfolk island Pine	1
52	Zephyr lili	13
53	Song of india	1
54	Ladder fern	1
55	Butterfly pea	3
56	White Water Lili	1
57	Canna lili	4
58	American Wishteria	1
59	Harsingar	4
60	Gurmar	2
61	Insulin	1
62	Kalmegh	2
63	Sharifa	1
64	Sarpgandha	2
65	Brahmi	4
66	Ashvgandha	3
67	Black Pepper	2
68	Gladiolus	25
69	Straberry	4
70	Lilium	5
71	Lucky bamboo	1
72	Supari	2
73	Guldaudi	80
74	Arjun	4
75	Cactus	2
76	Jamun	2
77	Araucaria	5
78	Brodleaf Palm Lili	3
79	Cordyline Fruticosa	17
80	Peace lili	6
81	Borassus	9
82	Dhatura	1
83	Marigold	102

84	Yucca	2
85	Bauhini	2
86	Banana	2
87	Colocasia	6
88	Garam Masala	2
89	Cinnaman	2
90	Pomegranate	2
91	Lemon	2
92	Cardamom	2
93	Kapoor	2
94	Harjod	2
95	Karonda	1
96	Shreefal	1
97	Rudraksh	2
98	Tejpatta	2
99	Satavar	2
100	Aprajita	2
101	Ajwain	3
102	Paan	2
103	Giloyi	2
	Total	**667**

Green Campus Photograph:-

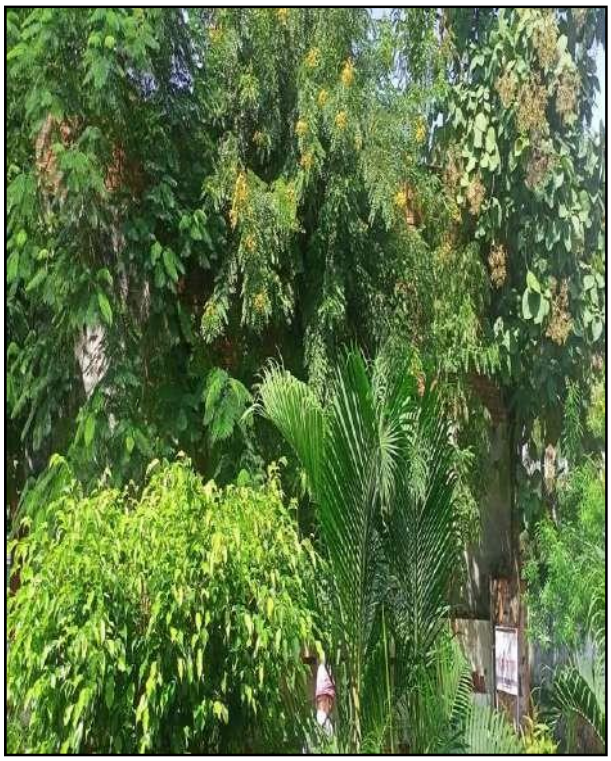


Fig.2.2 – Tree plantation and Biodiversity in the campus

College has **667 trees** in the campus. This is good initiative taken by management for green campus under the campaign of plantation. **It's APPRECIABLE.**

2.2 Medical Garden in College Campus :-

Sr. No	Plant Name	Quntity
1	Garam masala	2
2	Cinnaman	2
3	Pomegranate	2
4	lemon	2
5	Cardamom	2
6	Kapoor	2
7	Harjod	2
8	Karonda	1
9	Shreefal	1
10	Rudraksh	2
11	Tejpatta	2
12	Satavar	2
13	Aprajita	2
14	Ajwain	3
15	Paan	2
16	ALOEVERA	7
17	Lichi	1
18	Harsingar	4
19	Gurmar	2
20	Insulin	1
21	Kalmegh	2
22	Sharifa	1
23	Sarpgandha	2
24	Brahmi	4
25	Ashvgandha	3
26	Black pepper	2
27	Gladiolus	25
28	Strawberry	4
29	Lilium	5
30	Supari	2
	Total	94

Observation :-

- College has plantation a medical garden in campus. Total 94 plants are available in the garden. **Its Appreciable.**

Plantation In college campus

CHAPTER- 3
RENEWABLE ENERGY AND SUSTAINABLE DEVELOPMENT

3.0 Grid Connected Solar Photovoltaic System (10 Kwp)

There is 10 KWp solar photovoltaic roof top grid connected systems installed on main building. System details are given below:

Table: -3.1 solar plants detailed

Sr.No.	Description	Technical Specification
1	**Plant Information**	
1.1	Brand Name	NEOSOL
1.2	Plant Capacity	10KW
1.3	Location	Main Building
2	**PV Panel Details**	
2.1	Modal	NS72P6-420
2.2	Panel Wattage	420WATT
2.3	No. Of PV Panel	24
2.4	Panel Tilt Angle	23 DEGREE
3	**Inverter Information**	
3.1	Model Name	POLYCAB
3.2	Model Number	PSIT-10K
3.3	Capacity	11000 WATT
3.4	No. Of Inverter	1

Total Solar unit generation:-

Table 3.2:- Total Solar Unit generation May-2022 to Oct-2022

Sr. No	Month & Year	Unit Generation (kWh)
1	May-22	322
2	Jun-22	596
3	Jul-22	344
4	Aug-22	296
5	Sep-22	312
6	Oct-22	278
	Total	2148

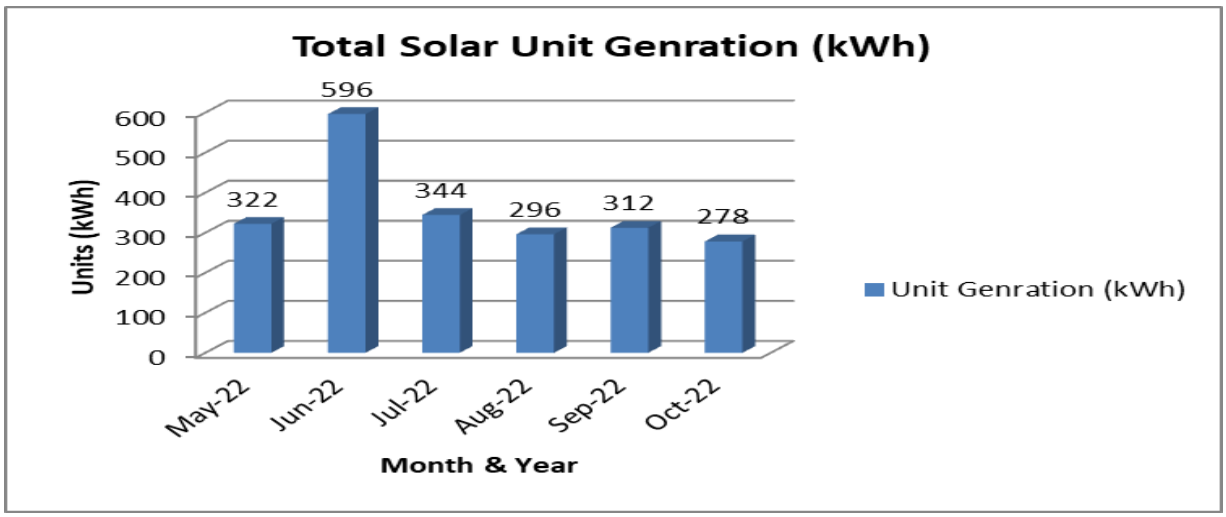


Figure: - 3.1 Graphical presentation of solar unit generation

Observation: -

Total unit generation from installation from solar system is 2148 unit.

Chapter-04
Carbon Foot print

4.1 About carbon foot print.

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

Carbon footprint is a measure of the impact of 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 tonnes.

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 you 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…

4.2 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 institute 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.

4.3 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 KgCO2/Kwh

(Reference: Central Electricity Authority (CEA) Baseline Carbon Dioxide Emission database http://cea.nic.in/reports/others/thermal/tpece/cdm_co2/database_11.zip). Electricity is purchased from the grid

Table: - 4.1 Electricity Purchased from the grid and Emissions from the electricity Import

Sr. no	Year	Total unit Consumption by AVVNL	Unit	Emission Factor kg CO^2e/kWh	Emission ton CO^2e/year
1	2020-21	33003	kWh	0.9613	31.72
	Total			**Total**	**31.72**

Observation:-

Total Co2 Emission by indirectly from electricity is 31.72 Ton CO2e/year in 2021-22

4.4 Carbon emission from DG sets: -

College has 02 no DG sets installed in the campus one is College feeder and second is for hostel feeder. Total diesel consumption is 240 Litter.in year-2021-22.

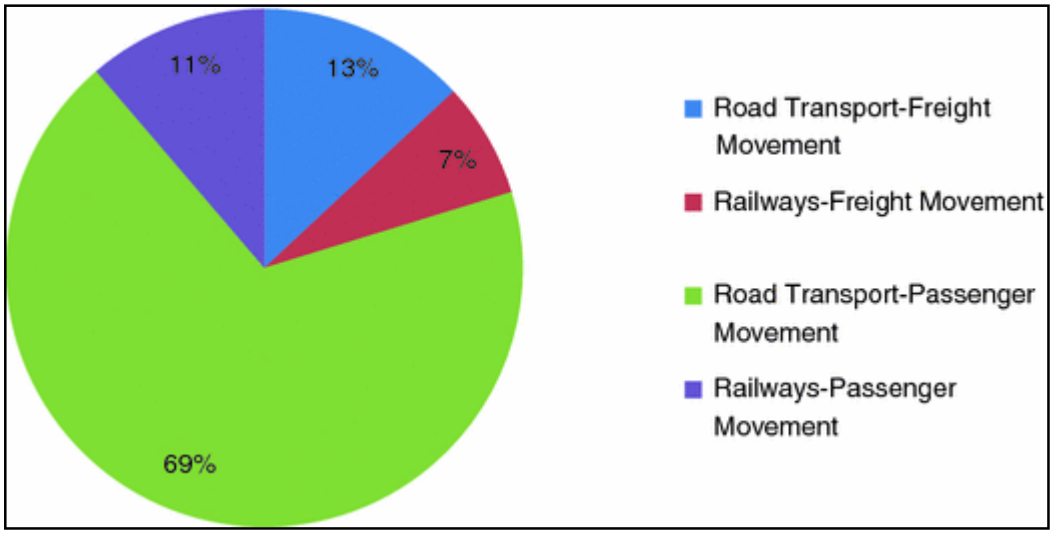
Every litter of diesel fuel contain 10180 grams of pure carbon. In an average liquid hydrocarbon burning engine. It can be assumed that about 99 % of the fuel be Oxidize (It is assumed that somewhat less than 01 % will fail to fully oxidize and will be emitted as a particulate of unburned hydrocarbons instead of Co2.

Calculation of Total Co2 =

- CO^2 Emissions from a Littre of diesel: 2689.56 grams CO^2/ litter.
- Diesel consumption Jun -2021 to july-2022 = 240 Litter
- 240 x 2689 = 6, 45,360 gram. or **0.645 Ton/year**

4.5 Carbon emission from vehicles.

In India, it is the third most CO^2 emitting sector, and within the transport sector, road transport contributed more than 90% of total CO^2 emissions (IEA, 2020; Ministry of Environment Forest and Climate Change, 2018)



Transportation (29 percent of 2019 greenhouse gas emissions) – The transportation sector generates the largest share of greenhouse gas emissions. Greenhouse gas emissions from transportation primarily come from burning fossil fuel for our cars, trucks, ships, trains, and planes.

we have also considered the total GHGs emission done by transportation facilities available in campus like Cars, Ambulance, Buses etc. We consider the different type of vehicles which are operated on petrol and diesel fuels

Energy team was analysed following vehicles are movement for Campus.

Table 4.2 :- Total Two wheeler Vehicle in College campus .

Calculation of Carbon foot print analysis: -

As per above calculation total two-wheeler vehicles traveling is 340 Km /day and Four-wheeler vehicle traveling is 15 Km/day

Following details are given in table: -

Sr. No	Vehicle Type	Fuel type	Average Mileage (Per Litter)	Total (Km /day)
1	Two-Wheeler	Petrol	40	340
2	Four-Wheeler	Diesel	15	15

- CO^2 Emissions from a gallon of gasoline: 8,887 grams CO^2/ gallon
- CO^2 Emissions from a gallon of diesel: 10,180 grams CO^2/ gallon

(1 US Gallon = 3.7854 litters)

- CO^2 Emissions from a Littre of gasoline: 2347.95 grams CO^2/ Litter.
- CO^2 Emissions from a Littre of diesel: 2689.56 grams CO^2/ litter.

Calculation CO^2 Emissions from Two-Wheeler.

$$\text{Total } CO^2 \text{ Emissions} = \frac{\text{Co2 Per litter}}{\text{Average Mileage (Km/Littre)}} \text{ X Distance (in km)}$$

$$\text{Total } CO^2 \text{ Emissions} \quad \frac{2347.95}{40} \text{ X } 340 = \textbf{19957.5 gram or 19.95 Kg/day}$$

When Vehicle traveling in 275 Days in Year =

82.35 x 275 = 22,646 Kg/year or **5.488 ton/year**

Total CO^2 Emissions from Four -Wheeler.

$$\text{Total } CO^2 \text{ Emissions} = \frac{\text{Co2 Per litter}}{\text{Average Mileage (Km/Littre)}} \text{ X Distance (in km)}$$

$$\text{Total } CO^2 \text{ Emissions} \quad \frac{2689.56}{20} \text{ X } 15 = \textbf{2017 gram or 2.01 Kg/day}$$

When Four Vehicle traveling in 275 Days in Year =

2.01 x 275 = 554.7 Kg/year or **0.55** ton/**year**

4.6 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)

1 Estimation of below ground biomass (BGD)

BGB = AGB x 0.15

2 Total Biomass (TB)

TB = AGB + BGB

3 Calculation of carbon dioxide Weight sequestered in the tree in kg.

C = W x 0.50

4 Calculate the weight of Co2 Sequestered in the tree per year in kg.

Co2 = C x 3.666

Where: -

AGB = above ground biomass.

D = Diameter of tree breast height.

BGB = Below Ground Biomass.

C = Carbon

TB = Total Biomass.

Biomass calculation of the tree

Sr. no	Common Name	Average Diameter CM (25 to 100)	AGB	BGB	Total	Carbon Storage	Amount of Co2 Sequestered	No of Tree	Total Amount of Co2 Sequestered	Annually Co2 Sequestered amount
1	Ashoka Tree	75	3248	487	3735	1868	6847	30	205415	2.80
2	Moses in the cradle	60	1994	299	2294	1147	4204	3	12613	0.17
3	Arabian Jasmine	50	1328	199	1528	764	2800	1	2800	0.04
4	Mimosa	50	1328	199	1528	764	2800	1	2800	0.04
5	Persian Liliac	40	798	120	918	459	1682	1	1682	0.02
6	Leechee	55	1644	247	1891	946	3466	2	6933	0.09
7	Shami	40	798	120	918	459	1682	3	5047	0.07
8	Chinese fan palm	65	2378	357	2735	1368	5014	1	5014	0.07
9	Jonauba	30	403	61	464	232	850	1	850	0.01
10	Yellow bells	30	403	61	464	232	850	1	850	0.01
11	Red frangipani	30	403	61	464	232	850	1	850	0.01
12	Lemon Grass	35	584	88	671	336	1231	2	2461	0.03
13	Veriegated Croton	45	1046	157	1203	602	2205	6	13232	0.18
14	Indian laurel	50	1328	199	1528	764	2800	3	8400	0.11
15	West Indian Jasmine	36	624	94	717	359	1315	1	1315	0.02
16	Dumb Cane	35	584	88	671	336	1231	11	13536	0.18
17	Bich Spierlili	45	1046	157	1203	602	2205	1	2205	0.03
18	Sadabahar	60	1994	299	2294	1147	4204	5	21021	0.29
19	Arrow head vine	45	1046	157	1203	602	2205	13	28670	0.39
20	China Rose	40	798	120	918	459	1682	7	11775	0.16

21	Karoo cycad	30	403	61	464	232	850	13	11056	0.15
22	Paper flower	65	2378	357	2735	1368	5014	6	30082	0.41
23	Yellow Kaner	65	2378	357	2735	1368	5014	8	40110	0.55
24	Rose	25	257	39	296	148	542	3	1626	0.02
25	Siberian Dog wood	35	584	88	671	336	1231	1	1231	0.02
26	sliper flower	36	624	94	717	359	1315	1	1315	0.02
27	Areca palm	30	403	61	464	232	850	16	13608	0.19
28	Neem	27	312	47	358	179	657	4	2627	0.04
29	Meetha Neem	28	341	51	392	196	718	1	718	0.01
30	Spider Plant	30	403	61	464	232	850	2	1701	0.02
31	Mimosa	54	1579	237	1815	908	3327	2	6655	0.09
32	Guava	35	584	88	671	336	1231	4	4922	0.07
33	Mango	37	665	100	765	383	1403	7	9818	0.13
34	Mogra	45	1046	157	1203	602	2205	4	8822	0.12
35	Teak wood	85	4254	638	4892	2446	8967	29	260039	3.55
36	Amla	26	284	43	326	163	598	3	1794	0.02
37	cycas	75	3248	487	3735	1868	6847	2	13694	0.19
38	Red Casiya	45	1046	157	1203	602	2205	2	4411	0.06
39	Peepal	30	403	61	464	232	850	1	850	0.01
40	Aloe Vera	30	403	61	464	232	850	14	11907	0.16
41	Tora siekle Pod	25	257	39	296	148	542	1	542	0.01
42	Gulmohar	46	1100	165	1265	632	2319	3	6956	0.09
43	Iron Wood Cassia	54	1579	237	1815	908	3327	1	3327	0.05
44	Pin wheel Flower	28	341	51	392	196	718	7	5029	0.07
45	Cuban oregano	50	1328	199	1528	764	2800	7	19601	0.27

46	Coleus	36	624	94	717	359	1315	5	6576	0.09
47	Balsam	39	752	113	865	433	1586	64	101514	1.38
48	Snake plant	36	624	94	717	359	1315	3	3946	0.05
49	White Orchid tree	45	1046	157	1203	602	2205	1	2205	0.03
50	Dwarf Umbrella tree	46	1100	165	1265	632	2319	1	2319	0.03
51	Norfolk island Pine	35	584	88	671	336	1231	1	1231	0.02
52	Zephyr lili	26	284	43	326	163	598	13	7773	0.11
53	Song of india	80	3734	560	4294	2147	7871	1	7871	0.11
54	Ladder fern	75	3248	487	3735	1868	6847	1	6847	0.09
55	Butterfly pea	36	624	94	717	359	1315	3	3946	0.05
56	White Water Lili	37	665	100	765	383	1403	1	1403	0.02
57	Canna lili	57	1780	267	2047	1024	3753	4	15012	0.20
58	American Wishteria	50	1328	199	1528	764	2800	1	2800	0.04
59	Harsingar	46	1100	165	1265	632	2319	4	9274	0.13
60	Gurmar	37	665	100	765	383	1403	2	2805	0.04
61	Insulin	30	403	61	464	232	850	1	850	0.01
62	Kalmegh	28	341	51	392	196	718	2	1437	0.02
63	Sharifa	32	472	71	542	271	994	1	994	0.01
64	Sarpgandha	35	584	88	671	336	1231	2	2461	0.03
65	Brahmi	30	403	61	464	232	850	4	3402	0.05
66	Ashvgandha	28	341	51	392	196	718	3	2155	0.03
67	Black Pepper	30	403	61	464	232	850	2	1701	0.02
68	Gladiolus	23	208	31	239	120	439	25	10965	0.15
69	Straberry	46	1100	165	1265	632	2319	4	9274	0.13
70	Lilium	25	257	39	296	148	542	5	2710	0.04

71	Lucky bamboo	35	584	88	671	336	1231	1	1231	0.02
72	Supari	30	403	61	464	232	850	2	1701	0.02
73	Guldaudi	35	584	88	671	336	1231	80	98446	1.34
74	Arjun	45	1046	157	1203	602	2205	4	8822	0.12
75	Cactus	67	2542	381	2923	1461	5357	2	10715	0.15
76	Jamun	45	1046	157	1203	602	2205	2	4411	0.06
77	Araucaria	40	798	120	918	459	1682	5	8411	0.11
78	Brodleaf Palm Lili	32	472	71	542	271	994	3	2982	0.04
79	Cordyline Fruticosa	64	2299	345	2644	1322	4846	17	82383	1.12
80	Peace lili	25	257	39	296	148	542	6	3252	0.04
81	Borassus	29	371	56	427	214	783	9	7048	0.10
82	Dhatura	25	257	39	296	148	542	1	542	0.01
83	Marigold	60	1994	299	2294	1147	4204	102	428837	5.85
84	Yucca	26	284	43	326	163	598	2	1196	0.02
85	Bauhini	24	232	35	267	133	489	2	978	0.01
86	Banana	30	403	61	464	232	850	2	1701	0.02
87	Colocasia	30	403	61	464	232	850	6	5103	0.07
88	Garam Masala	32	472	71	542	271	994	2	1988	0.03
89	Cinnaman	26	284	43	326	163	598	2	1196	0.02
90	Pomegranate	43	943	141	1084	542	1988	2	3975	0.05
91	Lemon	45	1046	157	1203	602	2205	2	4411	0.06
92	Cardamom	35	584	88	671	336	1231	2	2461	0.03
93	Kapoor	32	472	71	542	271	994	2	1988	0.03
94	Harjod	45	1046	157	1203	602	2205	2	4411	0.06
95	Karonda	54	1579	237	1815	908	3327	1	3327	0.05

96	Shreefal	33	508	76	584	292	1070	1	1070	0.01
97	Rudraksh	36	624	94	717	359	1315	2	2630	0.04
98	Tejpatta	46	1100	165	1265	632	2319	2	4637	0.06
99	Satavar	34	545	82	627	313	1149	2	2298	0.03
100	Aprajita	54	1579	237	1815	908	3327	2	6655	0.09
101	Ajwain	45	1046	157	1203	602	2205	3	6616	0.09
102	Paan	33	508	76	584	292	1070	2	2140	0.03
103	Giloyi	54	1579	237	1815	908	3327	2	6655	0.09
	Total							**667**	**1745602**	**23.808**

College has **667 trees** in the campus. This is good initiative taken by management for green campus under the campaign of plantation. **It's APPRECIABLE.**

There are total CO^2 sequestered **23808 Kg /year or 23.80 Tons /Year.**

Calculation of CO^2 Emission of College Campus.

Sr.no	CO2 Emission by	Annually Co2 Sequestered amount (Ton /Year)
1	Electricity	31.3
2	DG sets	0.64
3	Two Wheelers	5.44
4	Four Wheelers	0.55
	Total	37.93
Sr.no	**CO2 Neutralized by**	**Annually Co2 Sequestered amount (Ton /Year)**
1	Solar	3.91
2	Trees	23.08
	Total	26. 99
Total CO2 Emission by college		**10.04**

Observation:- **Total yearly College Co2 Emission is 10.04 (Ton/year). It is acceptable**

Recommendation: -
There are required for more plantation and installation of solar energy to reduce carbon emission share by college.

4.7 Other Emissions Excluded

This study did not evaluate the carbon sequestration potential of existing plantation activities and emission 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 footprint studies.

CHAPTER- 5
AIR MONITORING SURVEY

Energy audit team was conducted air monitoring survey in college campus. Following details are given in table.

Sr.No.	Location/ Room No.	PM2.5	PM10	CO2	Temp.	RH %
1	Guest House	83.5	134.8	860	26	79
2	2	71.5	112.3	651	27	78
3	3	76.3	120	678	7	77
4	5	81.6	132.1	757	27	76
5	6	80.2	126.3	848	27	76
6	7	76	120.6	832	27	76
7	8	78.2	128.4	767	27	75
8	9	80.2	125.7	684	27	78
9	10	79.1	128.5	910	27	76
10	11	84.8	133.1	927	27	75
11	12	96.5	151.2	649	27	75
12	13	55.8	89	605	27	75
13	14	92	143	610	27	74
14	15 Principal Room	50.3	78.4	639	27	72
15	16	70.3	111	645	28	77
16	17	76.6	123.1	665	28	75
17	19	90.4	144	706	27	73
18	20	89	144.5	674	27	74
19	21	174	282	616	27	77
20	22	83.7	129.2	652	27	75
21	104	90	138	683	29	68
22	103	88.6	138.2	684	29	69
23	102	82.7	134.4	667	29	69
24	105	83.4	134	636	29	68
25	106	87.1	139	627	29	68
26	108	84	132.4	639	29	70
27	109	88.3	140	667	29	69
28	110	93.8	148.8	672	29	69
29	111	93.8	140	639	28	31
30	112	76	122	666	28	21

31	113	82.5	130	619	28	72
32	114	80.6	126.9	622	28	71
33	115	86.6	137.5	674	28	71
34	202	72.1	116.1	658	28	72
35	203	90	142.1	709	29	71
36	204	74.6	121	719	29	69
37	205	84	133	610	29	70

Observation:-

- It is observed that PM2.5 and PM10 and CO2 Value are in the range.

CHAPTER-06
WASTE MANAGEMENT

6.1 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 6.1 Different types of waste generated in the college Campus.

Sr. No.	Types of Waste	Particulars
1	Solid wastes	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	Bio-medical Waste	Sanitary Napkin etc.

6.2 Waste management Practices adopted by the College

College is implemented **"Five dust bin"** waste collection system. **It's appreciable.** Vegetable waste and other leaf litters were used to feed in the **"Vermi-compost pit"** and the resulting vermin-cast is used as manure in the garden. All kind of waste generated from various activity is collected.

Figure: - 6.1 Dust bin in college campus

6.3 Waste Collection Points:

Audit team also visited various departments, college building, Hostel building to find out waste generation area and waste collection points for further improvement. Details are given in the table.

Table: 5.2 Detailed of Waste collection Dust bin system

Sr. no.	Rooms / Area	No. of Dustbin / Size	Types of Garbage
1	Store Room-01 **(Ground Floor)**	1 Small	Dry
2	Computer Lab-02	1 Small	Dry
3	Lecture Room-03	1 Small	Dry
4	Lecture Room-04	1 Small	Dry
5	Lecture Room-05	1 Small	Dry
6	Smart Room-06	1 Small	Dry
7	ICT Lab-07	1 Small	Dry
8	Health Care Room	1 Small	Dry
9	Staff Room Basement-8	2 Small	Dry, wet
10	Server Room-9	1 Small	Dry
11	Home Science Room	2 Small	Dry, wet
12	Home Science Lab	1 Medium	General, Dry, wet
13	B.Ed. Staff Room	2 Small	Dry, wet
14	I.Q.A.C.	3 Small	General, Dry, wet
15	Principal Office	1 Medium	General, Dry
16	Principal washroom	1 Small	Dry, wet
17	EDP Office-016	1 Small	General, Dry
18	Office-017	1 Small	General
19	Reception	1 Small	General
20	Vice-Principal	1 Small	Dry
21	NCC Office	1 Small	Dry
22	Founder Room-21	1 Small	Dry
23	Specially Abled Room-22	1 Small	General
24	Rovers & Rangers-23	1 Small	General

25	Ladies washroom (Ground Floor)	1 Medium	General
26	Gents washroom	1 Medium	Dry, wet
1st Floor			
27	Store Room-101	1 Small	Dry
28	Music Room-102	1 Small	Dry
29	Lecture Room-103	1 Small	Dry
30	Fine Art Lab-104	1 Medium	Dry, wet
31	Fine Art Lab-105	1 Medium	Dry, wet
32	Lecture Room-6	1 Small	Dry
33	Lecture Room-7	1 Small	Dry
34	Lecture Room-8	1 Small	Dry
35	Lecture Room-9	1 Small	Dry
36	Lecture Room-10	1 Small	Dry
37	Lecture Room-11	1 Small	Dry
38	Science Lab (Home Science)-112	1 Medium	Dry
39	Lecture Room-113	1 Small	Dry
40	Lecture Room-114	1 Small	Dry
41	Lecture Room-115	1 Small	Dry
2nd Floor			
42	Store Room-201	1 Small	Dry
43	Textile Lab (Fashion Designing)-202	1 Medium	Dry
44	Lecture Room-203	1 Small	Dry
45	Lecture Room-204	1 Small	Dry
46	Lecture Room-205	1 Small	Dry
47	Lecture Room-206	1 Small	Dry
48	Common Hall-207	1 Medium	Dry
49	Library-208	1 Medium	Dry
50	Library Central-209	1 Small	Dry
51	Lecture Room-210	1 Medium	Dry
52	Lecture Room-211	1 Small	Dry
53	Lecture Room-212	1 Small	Dry

54	Psychological Room-213	1 Small	Dry
55	Dr. R.R.P. Memorial Hall	2 Medium	Dry
56	Manager Room	1 Medium	Dry
57	M.Ed. Staff Room	6 Small	Dry
58	M.Ed. Office	1 Small	Dry
59	M.Ed. Corridor	1 Small	Dry
60	M.Ed. Lecture Room-101, 102	2 small	Dry
61	M.Ed. washroom	2 Small	Dry, wet
62	Ground floor Corridor	1 Big	Dry
63	First floor Corridor	1 Big	Dry
64	Second Floor Corridor	1 Big	Dry
65	Main Ground	2 Big	Dry, wet
66	Garden	2 Medium	Dry, wet
67	Canteen	2 Big	Dry, wet
68	Parking Area	2 Medium	Dry, wet

6.4 Varmi Compost pit:-

College has installed varmi compost pit for all type of agriculture waste and generated manure are utilized in College garden. **It's Appreciable**

6.5 Organic Waste Generation in College: -

- Audit Team also visited in hostel mess and discussion with concern officer about the waste collection process. College has approx. 10 Kg per day waste generated.

Recommended: - Install Organic waste composting Machine in college

An organic waste composting machine is an independent unit that facilitates the composting process and provides better composts. 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.

About Composting Process: -

Highly compact composting machine, which uses special microorganisms to break down and decompose all kinds of organic waste into compost within 24 hrs with a volume reduction of 85-90%. When organic waste is added to it, moisture is sensed by the humidity sensor, heater, mixing blades and an exhaust system.

Recommendation: -

College has a good potential to install organic converter.

END OF THE REPORT

THANKS