Report

On

Environmental Audit

At

Arts & Commerce College warwat Bakal, Buldana.

(Year 2019-20)

Prepared by

Nutan Urja Solutions

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Executive Summary

After the Field measurements & analysis, we present herewith important observations made and various measures to reduce the dependency on Natural resources & reduce the pollution.

Arts & Commerce College Warwat Bakal, Buldana consumes various resources for day to day operations, namely: Air, Water, Electrical Energy & LPG.

1. Various Pollution due to College Activities:

- Air pollution: Mainly CO_2 on account of Electricity & LPG Consumption
- Solid Waste: Bio degradable Kitchen Waste, Garden Waste
- Liquid Waste: Human liquid waste

2. Present Level of CO_2 Emissions:

Sr no	Parameter	Energy consumed, (Units)	CO2 Emission (MT)
1	Maximum	621	0.50
2	Minimum	434	0.35
3	Average	572	0.46
4	Total	6,867	5.49

3. The various projects already implemented for Environmental Conservation:

- Usage of Natural Day light in corridors
- Implementation of Bio Composting pit for disposal of Bio degradable waste
- Implementation of Rain Water Harvesting

4. Recommendations:

1. Installation of Bio Gas Generator Plant instead of Bio composting Plant.
2. Installation of Sewage treatment Plant to make campus a Zero Discharge campus

5. Notes & Assumptions:

1. **1 kWh** of Electrical Energy releases **0.8 Kg of CO_2** into atmosphere
2. 1 kWp Solar PV plant generates 5 kWh/day Electrical Energy for 300 days in an year.

Abbreviations

AC	:	Air conditioner
PES	:	Progressive Education Society
CFL	:	Compact Fluorescent Lamp
FTL	:	Fluorescent Tube Light
LED	:	Light Emitting Diode
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PF	:	Power Factor
M D	:	Maximum Demand
PC	:	Personal Computer
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1. Introduction

1.1 Important Definitions:

1.1.1 Environment: Definition as per environment Protection Act: 1986

Environment includes water, air and land and the inter-relationship which exists among and between Water, Air, Land and Human beings, other living creatures, plants microorganism and property

1.1.2. Environmental Audit: Definition:

An audit which aims at verification and validation to ensure that various environmental laws are compiled with and adequate care has been taken towards environmental protection and preservation

According to UNEP, 1990, "Environmental audit can be defined as a management tool comprising systematic, documented and periodic evaluation of how well environmental organization management and equipment are performing with an aim of helping to regularize the environment

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1.2 Objectives

1. To study present usage of Natural resources the College is consuming
2. To Study the present pollution sources
3. To study various measures to make the campus Self sustainable in respect of Natural resources
4. To suggest the various measures to reduce the pollution: Air, Water, Noise

1.3 Audit Methodology:

1. Study of College as System
2. Study of Electrical Energy Consumption
3. Study of CO2 emissions
4. Suggestions on usage of Renewable Energy

1.4 General Details of College

No	Head	Particulars
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2	Address	Arts & Commerce College warwat Bakal, Buldana ,Maharashtra 444202
3	Affiliation	Sant Gadge Baba Amravati University, Amravati.

2. Study of Consumption of Various Resources

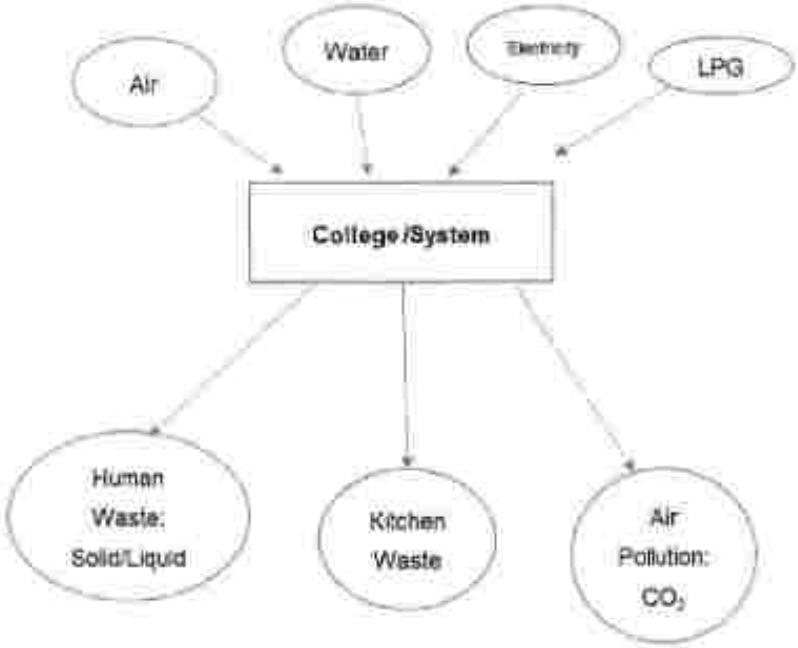
The Institute consumes following basic/derived Resources:

1. Air
2. Water
3. Electrical Energy
4. Liquefied Petroleum Gas

Also, college emits following pollutants to environment

1. Human Waste: Solid/ Liquid
2. Kitchen waste
3. Air pollution

We try to draw a schematic diagram for the College System & Environment as under.



Now we compute the Generation of CO2 on account of consumption of Electrical Energy & LPG as under.

The calculation of electrical energy consumption by college can be given as,

Table 2.1: Electrical Energy Consumption

No	Month	Energy Consumed, kWh
1	Oct-20	621
2	Sep-20	621
3	Aug-20	621
4	Jul-20	621
5	Jun-20	621
6	May-20	621
7	Apr-20	621
8	Mar-20	621
9	Feb-20	434
10	Jan-20	452
11	Dec-19	486
12	Nov-19	527
	Total	**6867**
	Maximum	621
	Minimum	433.5
	Average	572

2.1 Variation of Monthly Electrical Energy Consumption

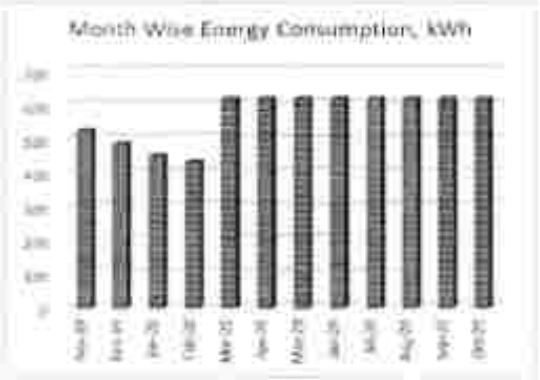


Figure 2.1 : Monthly Electrical Energy Consumption

2.2 Key Inference drawn

From the above analysis, we present following important parameters:

Table 2.2: Variation in Important Parameters

No	Parameter/ Value	Energy Consumed, kWh
1	**Maximum**	621
2	**Minimum**	433.5
3	**Average**	572
4	**Total**	6867

3. Study of Environmental Pollution

In this Chapter, we present the various types of Pollution as under:

3.1 Air Pollution

The College is using two forms of Energies, namely: Thermal in the form of LPG and Electrical Energy used for day to day operations of the College. The major pollutant on account of above Energy forms is the Carbon Di Oxide.

- 1 unit (kWh) of Electrical Energy emits 0.8 Kg of CO_2 in the atmosphere
- 1 Kg of LPG emits 3 Kg of CO_2 in the atmosphere

In the following Table, we present the CO_2 emissions.

Table 3.1: Month wise Consumption of Electrical Energy & CO_2 Emissions:

No	Month	Energy Consumed, kWh	CO2 Emissions, MT
1	Oct-20	621	0.50
2	Sep-20	621	0.50
3	Aug-20	621	0.50
4	Jul-20	621	0.50
5	Jun-20	621	0.50
6	May-20	621	0.50
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8	Mar-20	621	0.50
9	Feb-20	434	0.35
10	Jan-20	452	0.36
11	Dec-19	486	0.39
12	Nov-19	527	0.42
	Total	**6,867**	**5.49**
	Maximum	621	0.50
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In the following Chart we present the CO2 emissions due to usage of Electrical Energy.

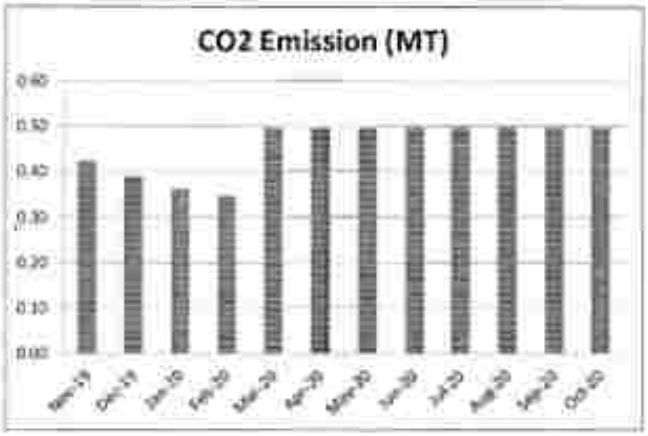
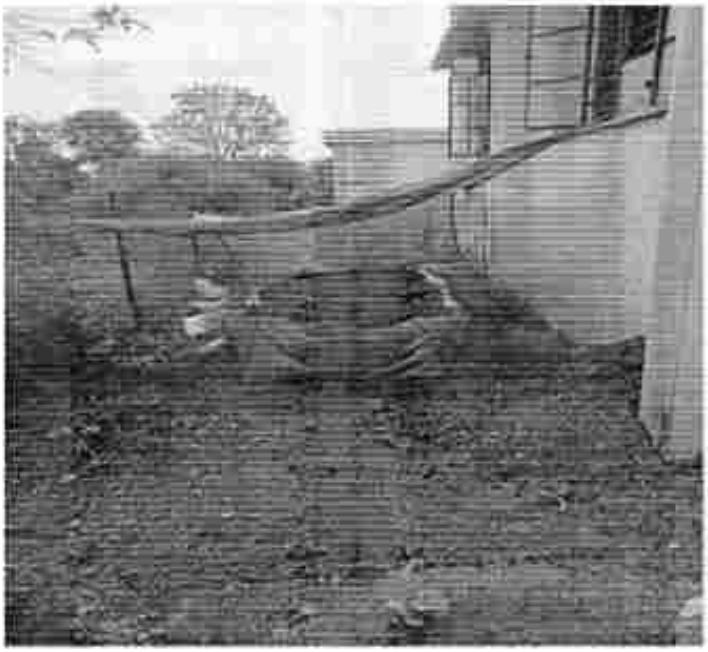


Figure 3.1: CO2 emission due to usage of electrical energy.

3.2 Study of Solid Waste Generation

The College has already installed a Bio composting Plant, wherein, the bio-degradable waste is composted & is used as fertilizer for the garden.

3.2.1 Photograph of Bio Composting Processing Tanks



3.3 Study of Liquid Waste Generation

At present the Liquid Waste generated due to day to day operations is drained off to the municipal Corporation through a pipe.

3.4 Study of e-Waste Management:

The internal communication is through emails and hence there is hardly any generation of e-Waste in the premises.

4. Study of Rain Water Harvesting

The College has already installed Rain Water Harvesting project, wherein the rain water falling on the terrace is collected and through pipes it is fed to underground Water Storage tank. This stored water is then reused for domestic purpose.

Photograph of Rain Water Harvesting:

5. Recommendations

In order to reduce the dependency on Natural resources and also in order to reduce the various pollutions arising due to the day to day operations of the College we herewith recommend following recommendations.

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- Liquid Waste: Human liquid waste

2. Present Level of CO_2 Emissions:

Sr no	Parameter	Energy consumed, (Units)	CO2 Emission (MT)
1	Maximum	621	0.50
2	Minimum	390	0.31
3	Average	510	0.41
4	Total	6,118	4.89

3. The various projects already implemented for Environmental Conservation:

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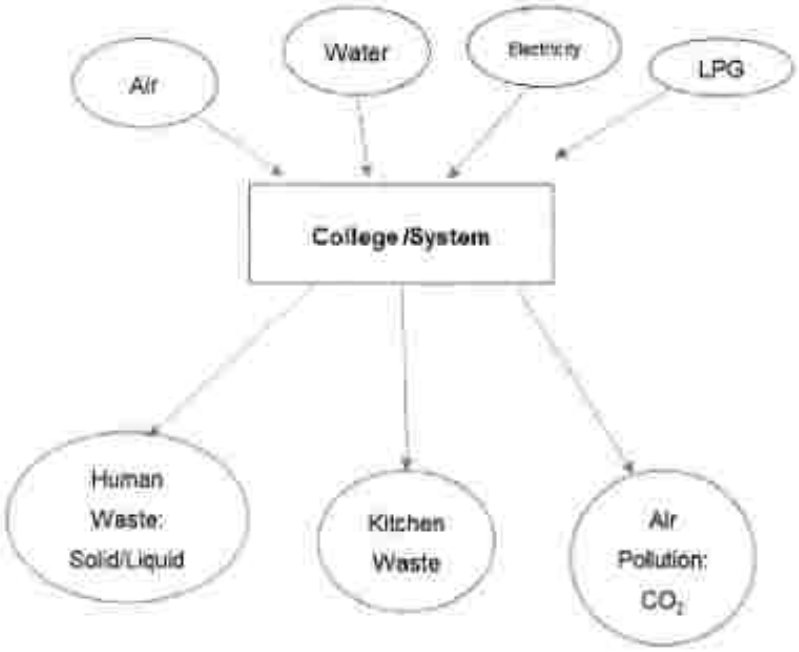

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The calculation of electrical energy consumption by college can be given as,

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No	Month	Energy Consumed, kWh
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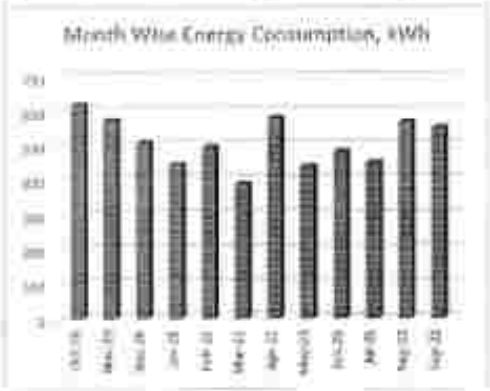
3	Jul-21	451
4	Jun-21	484
5	May-21	440
6	Apr-21	582
7	Mar-21	390
8	Feb-21	497
9	Jan-21	445
10	Dec-20	509
11	Nov-20	575
12	Oct-20	621
	Total	**6118**
	Maximum	621
	Minimum	390
	Average	510

2.1 Variation of Monthly Electrical Energy Consumption



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In the following Table, we present the CO_2 emissions.

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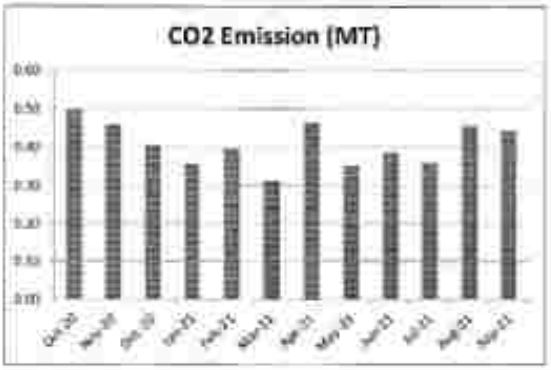
8	Feb-21	497	0.40
9	Jan-21	445	0.36
10	Dec-20	509	0.41
11	Nov-20	575	0.46
12	Oct-20	621	0.50
	Total	**6,118**	**4.89**
	Maximum	621	7990
	Minimum	390	3640
	Average	510	4996

In the following Chart we present the CO2 emissions due to usage of Electrical Energy.



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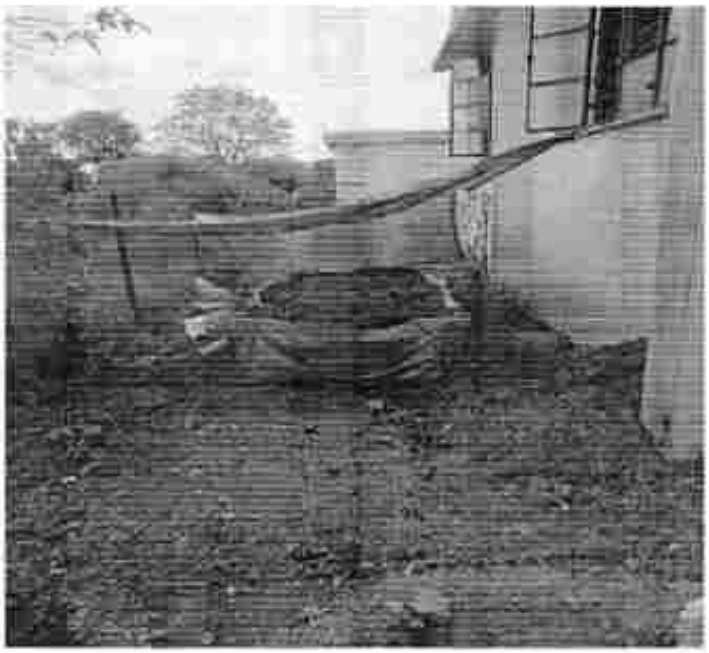

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3	Affiliation	Sant Gadge Baba Amravati University, Amravati.

2. Study of Consumption of Various Resources

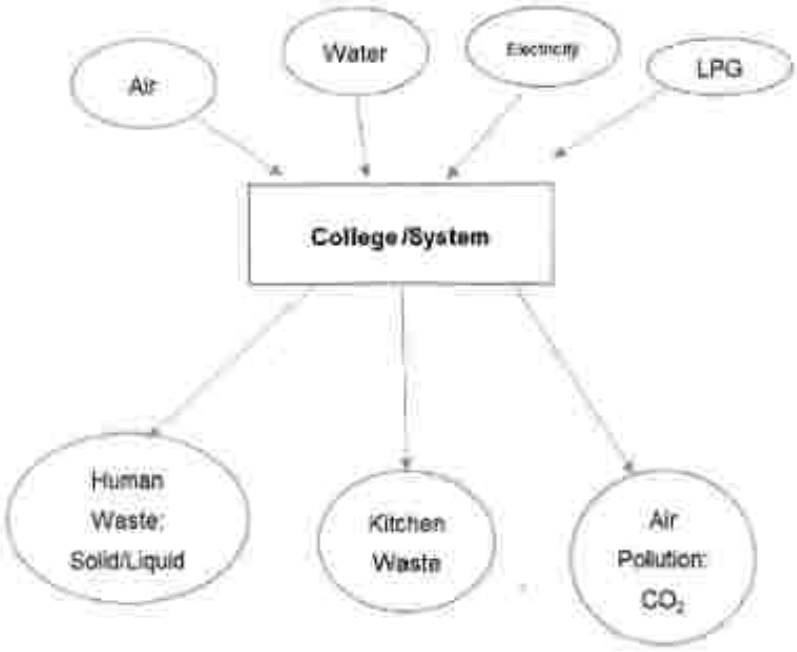
The Institute consumes following basic/derived Resources:

1. Air
2. Water
3. Electrical Energy
4. Liquefied Petroleum Gas

Also, college emits following pollutants to environment

1. Human Waste: Solid/ Liquid
2. Kitchen waste
3. Air pollution

We try to draw a schematic diagram for the College System & Environment as under.



Now we compute the Generation of CO2 on account of consumption of Electrical Energy & LPG as under.

The calculation of electrical energy consumption by college can be given as,

Table 2.1: Electrical Energy Consumption

No	Month	Energy Consumed, kWh
1	Jun-22	519
2	May-22	576
3	Apr-22	638
4	Mar-22	477
5	Feb-22	410
6	Jan-22	473
7	Dec-21	531
8	Nov-21	443
9	Oct-21	471
10	Sep-21	554
11	Aug-21	570
12	Jul-21	451
	Total	**6113**
	Maximum	638
	Minimum	410
	Average	509

2.1 Variation of Monthly Electrical Energy Consumption

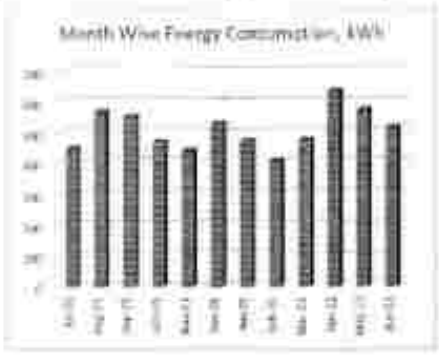


Figure 2.1 : Monthly Electrical Energy Consumption

2.2 Key Inference drawn

From the above analysis, we present following important parameters:

Table 2.2: Variation in Important Parameters

No	Parameter/ Value	Energy Consumed, kWh
1	**Maximum**	638
2	**Minimum**	410
3	**Average**	509
4	**Total**	6113

3. Study of Environmental Pollution

In this Chapter, we present the various types of Pollution as under:

3.1 Air Pollution

The College is using two forms of Energies, namely: Thermal in the form of LPG and Electrical Energy used for day to day operations of the College. The major pollutant on account of above Energy forms is the Carbon Di Oxide.

- 1 unit (kWh) of Electrical Energy emits 0.8 Kg of CO_2 in the atmosphere
- 1 Kg of LPG emits 3 Kg of CO_2 in the atmosphere

In the following Table, we present the CO_2 emissions.

Table 3.1: Month wise Consumption of Electrical Energy & CO_2 Emissions:

No	Month	Energy Consumed, kWh	CO2 Emissions, MT
1	Jun-22	519	0.42
2	May-22	576	0.46
3	Apr-22	638	0.51
4	Mar-22	477	0.38
5	Feb-22	410	0.33
6	Jan-22	473	0.38
7	Dec-21	531	0.42
8	Nov-21	443	0.35
9	Oct-21	471	0.38
10	Sep-21	554	0.44
11	Aug-21	570	0.46
12	Jul-21	451	0.36
	Total	**6,113**	**4.89**
	Maximum	638	0.51
	Minimum	410	0.33
	Average	509	0.41

In the following Chart we present the CO2 emissions due to usage of Electrical Energy.

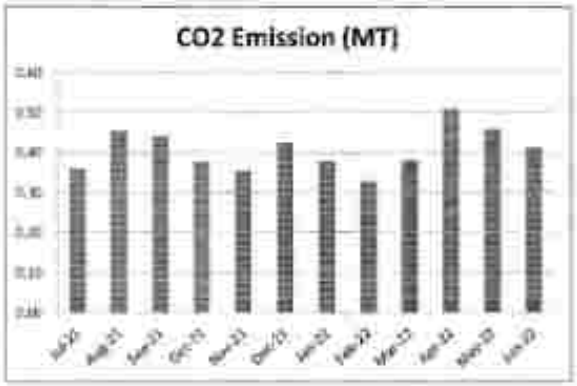


Figure 3.1: CO2 emission due to usage of electrical energy.

3.2 Study of Solid Waste Generation

The College has already installed a Bio composting Plant, wherein, the bio-degradable waste is composted & is used as fertilizer for the garden.

3.2.1 Photograph of Bio Composting Processing Tanks

3.3 Study of Liquid Waste Generation

At present the Liquid Waste generated due to day to day operations is drained off to the municipal Corporation through a pipe.

3.4 Study of e-Waste Management:

The internal communication is through emails and hence there is hardly any generation of e-Waste in the premises.

4. Study of Rain Water Harvesting

The College has already installed Rain Water Harvesting project, wherein the rain water falling on the terrace is collected and through pipes it is fed to underground Water Storage tank. This stored water is then reused for domestic purpose.

Photograph of Rain Water Harvesting:

5. Recommendations

In order to reduce the dependency on Natural resources and also in order to reduce the various pollutions arising due to the day to day operations of the College we herewith recommend following recommendations.

- Installation of Bio Gas Generator Plant instead of Bio composting Plant.
- Installation of Sewage treatment Plant to make campus a Zero Discharge campus

Report

On

Energy Audit

At

Arts & Commerce College warwat Bakal, Buldana.

(Year 2019-20)

Prepared by

Nutan Urja Solutions

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Acknowledgement

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We are also thankful to various Head of Departments & other Staff members for helping us during the field measurements.

We hope that the recommendations stated in this report will be useful and worthy of discussions to take things forward to help implementation of energy conservation measures through energy savings. While we have made every attempt to adhere to high quality standards, in both data collection and analysis through the report, we would welcome your suggestions so as to improve upon this report further.

Executive Summary

After the Field measurements & analysis, we present herewith important observations made and various measures to reduce the Energy Consumption & mitigate the CO_2 emissions. College consumes Energy in the form of Electrical Energy used for various gadgets, Office & other facilities.

1. Present Energy Consumption

In the following Table, we present the details of Energy Consumption.

Table no 2.1: Details of energy consumption

Sr no	Parameter	Energy consumed, (Units)	CO2 Emission (MT)
1	Maximum	621	0.50
2	Minimum	434	0.35
3	Average	572	0.46
4	Total	6,867	5.49

2. Energy Conservation Projects already installed

1. Usage of LED lights at some indoor locations
2. Usage of LED Lights for outdoor lighting.
3. Usage of STAR rated fans at new installations

3. Key Observations

1. Usage of LED lights.
2. Usage of star rated equipment.
3. Maintained a good power factor.

5. Percentage of Usage of LED Lighting

The College has various Types of Light fittings, namely: LED & CFL. The percentage of Annual LED Lighting Usage to Annual Lighting requirement works out to be 94 %.

6. Recommendations

Table no 1: Recommendations for energy savings

No	Recommendation	Annual Saving potential, kWh/Annum	Annual Monetary Gain, Rs.	Investment Required, Rs.	Payback period, Months
1	Replacement of 29 Nos Old Ceiling Fans with STAR rating fans	377	4,147	63,046	182
2	Installation of 3kW grid connected PV panel	4,500	49,500	150,000	36
	Total	**4,877**	**53,647**	**213,046**	**48**

7 Notes & Assumptions

1. Daily working hours-10 Nos
2. Annual working Days-300 Nos
3. Average Rate of Electrical Energy : Rs 11/- per kWh

Abbreviations

CFL	:	Compact Fluorescent Lamp
FTL	:	Fluorescent Tube Light
LED	:	Light Emitting Diode
V	:	Voltage
I	:	Current
kW	:	Kilo- Watt
kWh	:	kilo-Watt Hour
kVA	:	Active Power

1. Introduction

The mission undertaken by Arts & Commerce College warwat Bakal, Buldana is to strive and provide Education to those poor, downtrodden and exploited communities of the area. It will accelerate the development of this region and establish confidence among the youth.

1.1 Objectives

1. To study present level of Energy Consumption
2. To Study Electrical Consumption
3. To assess the various equipment/facilities from Energy efficiency aspect
4. To study various measures to reduce the Energy Consumption

1.2 Audit Methodology:

1. Study of connected load
2. Study of various Electrical parameters
3. To prepare the Report with various Encon measures with payback analysis

1.3 General Details of College

Table No-1.1: Details of college

No	Head	Particulars
1	Name of Institution	Arts & Commerce College warwat Bakal, Buldana
2	Address	Arts & Commerce College warwat Bakal, Buldana ,Maharashtra 444202
3	Affiliation	Sant Gadge Baba Amravati University, Amravati.

2. Study of connected load

In this chapter, we present details of various connected electrical equipment and electrical load.

Table No-2.1: Location wise study of Electrical fittings in various buildings

No	Location	LED tube (20W)	CFL	Fans	Computers (65W)
1	IQAC	3		3	2
2	Exam room		1	1	
3	Seminar Hall	4		7	
4	Staff Room	2		3	
5	G1	1		1	
6	G2	1		1	
7	G3	1		1	
8	G4 (Principal room)	1	1	1	
9	G5 (Office)	3		3	4
10	G6	2		1	1
11	F1	1			1
12	F2	1			1
13	F3	1			1
14	F4	1			1
15	F5	2			1
16	S1	1			1
17	S4	1			1
18	S5	3			1
19	Reading room	1			1
20	Library	10		7	1
21	Chemistry lab	2			1
22	Chemistry Dept	1			1
23	Zoology lab	2			1
24	Zoology Dept.	2			1
25	Physics lab	2			1
26	Botany Dept.	2			1
27	Computer lab	2			1
28	Meeting hall	3			2
29	Rest House	1			2

30	NCC	1			1
31	Sports	1			1
32	NSS	1			1
33	Hall	5			5
	Total	**65**	**2**	**29**	**36**

Apart from above load, the school has pump. Individual fitting wise load is as under.

Table No 2.2: Equipment wise Connected Load

No	Equipment	Qty	Load, W/Unit	Load, kW
1	Ceiling Fan	29	65	1.9
2	LED-20W	65	20	1.3
3	CFL	2	24	0.0
4	Computers	36	65	2.3
5	Pump (2HP)			1.5
	Total			**7.1**

Data can be represented in terms of PIE chart as under,

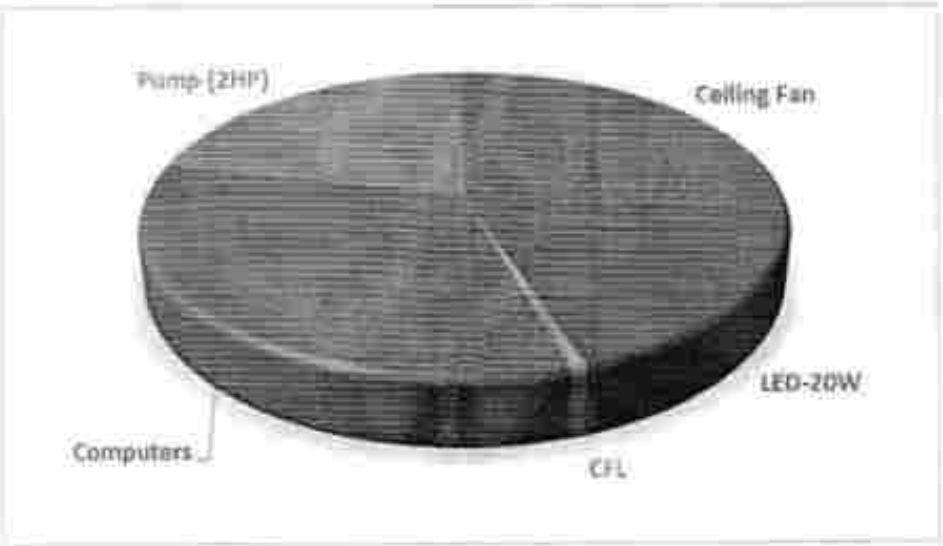

Figure 2.1: Distribution of connected load.

3. Study of Electrical Energy Consumption

In this chapter, electricity bills are studied for the analysis of electrical energy consumption.

Table no 3.1: Summary of electricity bills

No	Month	Energy (kWh)	Bill Amount (Rs)
1	Oct-20	621	6043
2	Sep-20	621	6043
3	Aug-20	621	6043
4	Jul-20	621	6043
5	Jun-20	621	6043
6	May-20	621	6043
7	Apr-20	621	6043
8	Mar-20	621	6043
9	Feb-20	434	4215
10	Jan-20	452	4389
11	Dec-19	486	4724
12	Nov-19	527	5119
	Total	**6867**	**66790**

Variation in energy consumption is as follows,

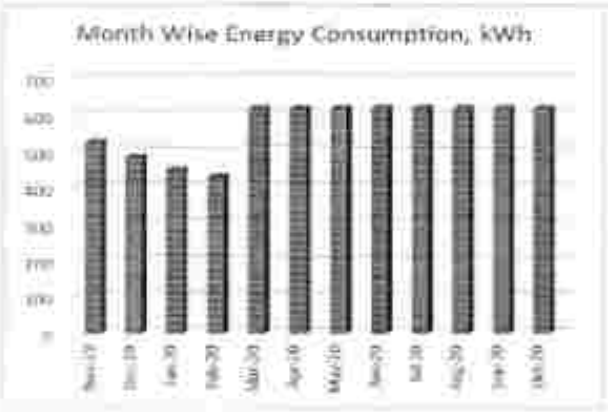

Figure 3.1: Month wise energy consumption

Monthly variation in electricity bill is as follows,

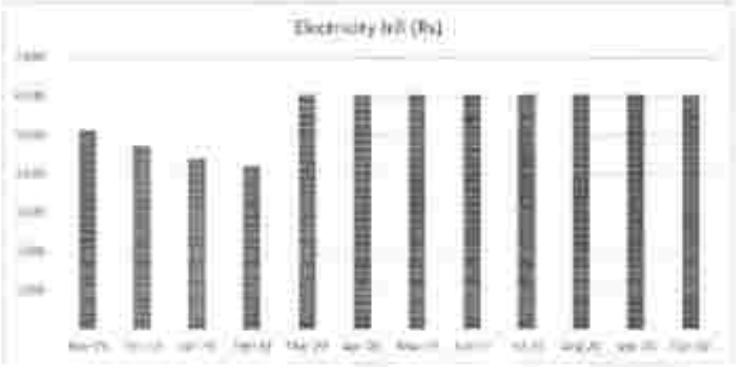

Figure 3.2: Month wise electricity bill

Key observations of electricity bill are as follows,

Table no 3.2: Key observations

Sr no	Parameter	Energy consumed, (Units)	CO2 Emission (MT)
1	Maximum	621	0.50
2	Minimum	434	0.35
3	Average	572	0.46
4	Total	6,867	5.49

4. Carbon Foot printing

1. A Carbon Foot print is defined as the Total Greenhouse Gas emissions (CO_2 emissions), emitted due to various activities. In this we compute the emissions of Carbon-Di-Oxide, by usage of the various form of Electrical Energy used by the College for performing its day to day activities

2. Basis for computation of CO_2 Emissions:

The basis of Calculation for CO_2 emissions due to Electrical Energy is as under

- 1 Unit (kWh) of Electrical Energy releases **0.8 Kg of CO_2** into atmosphere.

Based on the above Data we compute the CO_2 emissions which are being released in to the atmosphere by the College due to its Day to Day operations

We herewith furnish the details of various forms of Energy consumption as under

Table 4.1: Month wise Consumption of Electrical Energy & CO2 Emissions

No	Month	Energy Consumed, kWh	CO2 Emissions, MT
1	Oct-20	621	0.50
2	Sep-20	621	0.50
3	Aug-20	621	0.50
4	Jul-20	621	0.50
5	Jun-20	621	0.50
6	May-20	621	0.50
7	Apr-20	621	0.50
8	Mar-20	621	0.50
9	Feb-20	434	0.35
10	Jan-20	452	0.36
11	Dec-19	486	0.39
12	Nov-19	527	0.42
	Total	**6,867**	**5.49**

In the following Chart we present the CO2 emissions due to usage of Electrical Energy.

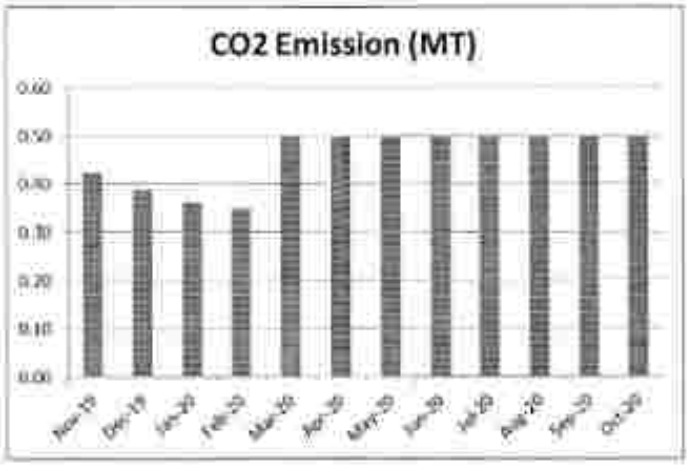

Figure 4.1: Month wise CO2 Emission

5. Study of utilities

5.1 Study of Lighting

There are 2 CFLs and 65 LEDs in indoor lightings.

5.2 Ceiling Fans

At building facility, there are about 29 Nos Old Ceiling Fans, which consumed about 65 W of Electrical Energy. It is recommended to replace these old Fans with BEE STAR Rated Ceiling Fans.

5.3 Water Pumps

There is 1 Water pump with 2HP capacity.

6. Study of usage of LED lighting

In this chapter we study the lighting system of college and compute the percentage of total load catered by LED lighting.

Table 7.1: Total lighting load

No	Particulars	Qty	Load, W/Unit	Load, kW
1	CFL	2	24	0.048
	LED lighting load			
1	LED tube	65	20	1.3
	Total LED lighting load			**1.3**
	Total Lighting load			**1.348**

It can be seen that out of total lighting load 96% load is LED lighting load.

7. Energy conservation proposals

7.1 Replacement of old fans with STAR Rated fans

During the Audit, it was observed that there are 29 no of fans. It is recommended to replace these old fans with STAR Rated fans.

In the following Table, we present the savings, investment required & payback analysis.

No	Particulars	Value	Unit
1	Present Qty of Old Ceiling Fan fittings	29	Nos
2	Energy Demand of Old Ceiling Fan fitting	65	W/Unit
3	Energy Demand of STAR Rated Fan	52	W/Unit
4	Reduction in demad	13	W/Unit
5	Average Daily Usage period	4	Hrs/Day
6	Daily saving in Energy	1.508	kWh/Day
7	Annual Working Days	250	Nos
8	Annual Energy Saving possible	377	kWh/Annum
9	Rate of Electrical Energy	11	Rs/kWh
10	Annual Monetary saving	4147	Rs/Annum
11	Cost of STAR Rated Ceiling Fan	2174	Rs/unit
12	Investment required	63046	Rs lump sum
13	Simple Payback period	182	Months

7.2 Installation of 3 kW Solar PV panel

It is recommended to install 3 kW solar PV panel. In the following Table, we present the savings, investment required & payback analysis.

No	Particulars	Value	Unit
1	Installation of 3kW PV unit	3	kW
2	Energy saving	4500	kWh/Annum
3	Rate of electrical energy	11	Rs
4	Annual monetory savings	49500	Rs/ Annum
5	Investment required	150000	Rs lump sum
6	Simple payback period	36	Months

7.3 Summary of Savings

No	Recommendation	Annual Saving potential, kWh/Annum	Annual Monetary Gain, Rs.	Investment Required, Rs.	Payback period, Months
1	Replacement of 29 Nos Old Ceiling Fans with STAR rating fans	377	4,147	63,046	182
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	Total	**4,877**	**53,647**	**213,046**	**48**

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Prepared by

Nutan Urja Solutions

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3	Average	510	0.41
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7 Notes & Assumptions

1. Daily working hours-10 Nos
2. Annual working Days-300 Nos
3. Average Rate of Electrical Energy : **Rs 11/- per kWh**

Abbreviations

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FTL	:	Fluorescent Tube Light
LED	:	Light Emitting Diode
V	:	Voltage
I	:	Current
kW	:	Kilo- Watt
kWh	:	kilo-Watt Hour
kVA	:	Active Power

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The mission undertaken by Arts & Commerce College warwat Bakal, Buldana is to strive and provide Education to those poor, downtrodden and exploited communities of the area. It will accelerate the development of this region and establish confidence among the youth.

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6	G2	1		1	
7	G3	1		1	
8	G4 (Principal room)	1	1	1	
9	G5 (Office)	3		3	4
10	G6	2		1	1
11	F1	1			1
12	F2	1			1
13	F3	1			1
14	F4	1			1
15	F5	2			1
16	S1	1			1
17	S4	1			1
18	S5	3			1
19	Reading room	1			1
20	Library	10		7	1
21	Chemistry lab	2			1
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24	Zoology Dept.	2			1
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27	Computer lab	2			1
28	Meeting hall	3			2
29	Rest House	1			2

30	NCC	1			1
31	Sports	1			1
32	NSS	1			1
33	Hall	5			5
	Total	**65**	**2**	**29**	**36**

Apart from above load, the school has pump. Individual fitting wise load is as under.

Table No 2.2: Equipment wise Connected Load

No	Equipment	Qty	Load, W/Unit	Load, kW
1	Ceiling Fan	29	65	1.9
2	LED-20W	65	20	1.3
3	CFL	2	24	0.0
4	Computers	36	65	2.3
5	Pump (2HP)			1.5
	Total			**7.1**

Data can be represented in terms of PIE chart as under,

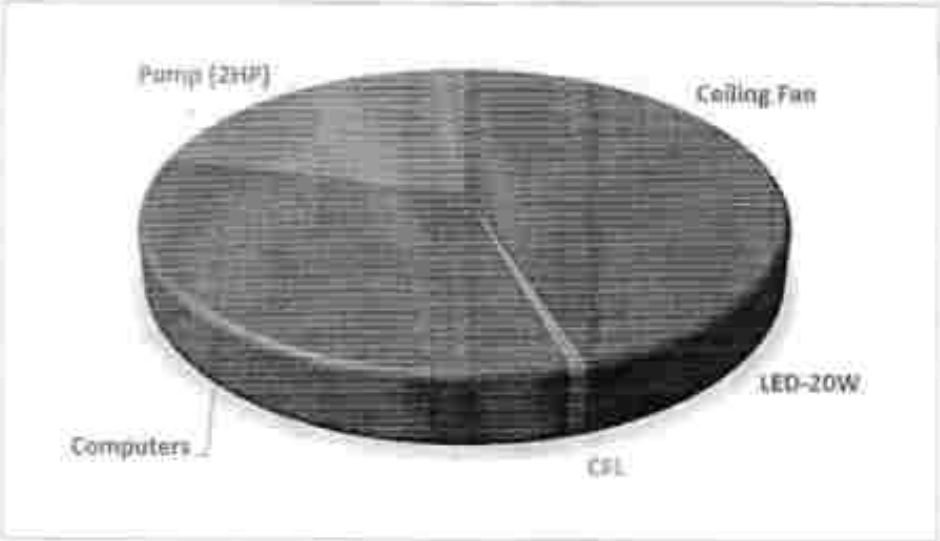

Figure 2.1: Distribution of connected load.

3. Study of Electrical Energy Consumption

In this chapter, electricity bills are studied for the analysis of electrical energy consumption.

Table no 3.1: Summary of electricity bills

No	Month	Energy (kWh)	Bill Amount (Rs)
1	Sep-21	554	4200
2	Aug-21	570	7,990
3	Jul-21	451	3,640
4	Jun-21	484	4,695
5	May-21	440	4,267
6	Apr-21	582	5,649
7	Mar-21	390	3,801
8	Feb-21	497	4,833
9	Jan-21	445	4,324
10	Dec-20	509	4,929
11	Nov-20	575	5,585
12	Oct-20	621	6,043
	Total	**6118**	**59955**

Variation in energy consumption is as follows,

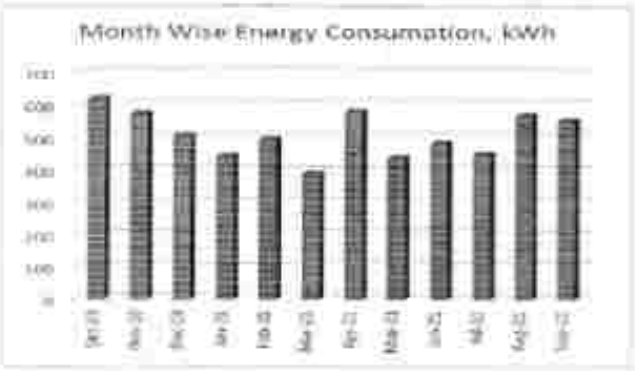

Figure 3.1: Month wise energy consumption

Monthly variation in electricity bill is as follows,

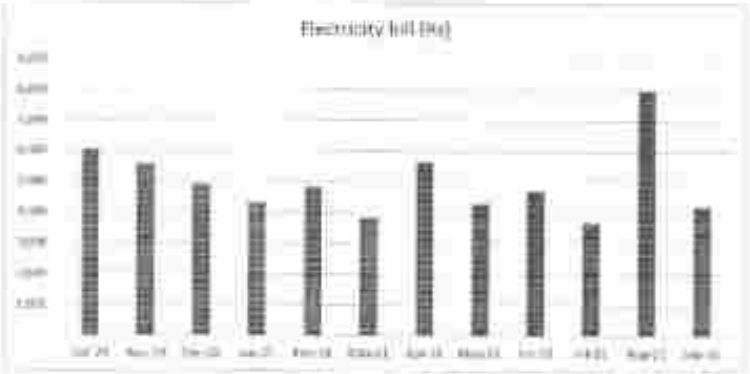

Figure 3.2: Month wise electricity bill

Key observations of electricity bill are as follows,

Table no 3.2: Key observations

Sr no	Parameter	Energy consumed, (Units)	CO2 Emission (MT)
1	Maximum	621	0.50
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3	Average	510	0.41
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1. A Carbon Foot print is defined as the Total Greenhouse Gas emissions (CO_2 emissions), emitted due to various activities. In this we compute the emissions of Carbon-Di-Oxide, by usage of the various form of Electrical Energy used by the College for performing its day to day activities

2. Basis for computation of CO_2 Emissions:

The basis of Calculation for CO_2 emissions due to Electrical Energy is as under

- 1 Unit (kWh) of Electrical Energy releases **0.8 Kg of CO_2** into atmosphere.

Based on the above Data we compute the CO_2 emissions which are being released in to the atmosphere by the College due to its Day to Day operations

We herewith furnish the details of various forms of Energy consumption as under

Table 4.1: Month wise Consumption of Electrical Energy & CO2 Emissions

No	Month	Energy Consumed, kWh	CO2 Emissions, MT
1	Sep-21	554	0.44
2	Aug-21	570	0.46
3	Jul-21	451	0.36
4	Jun-21	484	0.39
5	May-21	440	0.35
6	Apr-21	582	0.47
7	Mar-21	390	0.31
8	Feb-21	497	0.40
9	Jan-21	445	0.36
10	Dec-20	509	0.41
11	Nov-20	575	0.46
12	Oct-20	621	0.50
	Total	**6,118**	**4.89**

In the following Chart we present the CO2 emissions due to usage of Electrical Energy.

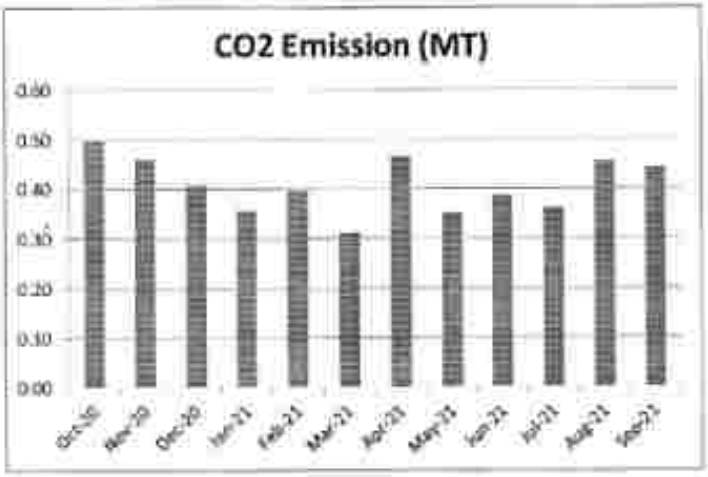

Figure 4.1: Month wise CO2 Emission

5. Study of utilities

5.1 Study of Lighting

There are 2 CFLs and 65 LEDs in indoor lightings.

5.2 Ceiling Fans

At building facility, there are about 29 Nos Old Ceiling Fans, which consumed about 65 W of Electrical Energy. It is recommended to replace these old Fans with BEE STAR Rated Ceiling Fans.

5.3 Water Pumps

There is 1 Water pump with 2HP capacity.

6. Study of usage of LED lighting

In this chapter we study the lighting system of college and compute the percentage of total load catered by LED lighting.

Table 7.1: Total lighting load

No	Particulars	Qty	Load, W/Unit	Load, kW
1	CFL	2	24	0.048
	LED lighting load			
1	LED tube	65	20	1.3
	Total LED lighting load			**1.3**
	Total Lighting load			**1.348**

It can be seen that out of total lighting load 96% load is LED lighting load.

7. Energy conservation proposals

7.1 Replacement of old fans with STAR Rated fans

During the Audit, it was observed that there are 29 no of fans. It is recommended to replace these old fans with STAR Rated fans.

In the following Table, we present the savings, investment required & payback analysis.

No	Particulars	Value	Unit
1	Present Qty of Old Ceiling Fan fittings	29	Nos
2	Energy Demand of Old Ceiling Fan fitting	65	W/Unit
3	Energy Demand of STAR Rated Fan	52	W/Unit
4	Reduction in demad	13	W/Unit
5	Average Daily Usage period	4	Hrs/Day
6	Daily saving in Energy	1.508	kWh/Day
7	Annual Working Days	250	Nos
8	Annual Energy Saving possible	377	kWh/Annum
9	Rate of Electrical Energy	11	Rs/kWh
10	Annual Monetary saving	4147	Rs/Annum
11	Cost of STAR Rated Ceiling Fan	2174	Rs/unit
12	Investment required	63046	Rs lump sum
13	Simple Payback period	182	Months

7.2 Installation of 3 kW Solar PV panel

It is recommended to install 3 kW solar PV panel. In the following Table, we present the savings, investment required & payback analysis.

No	Particulars	Value	Unit
1	Installation of 3kW PV unit	3	kW
2	Energy saving	4500	kWh/Annum
3	Rate of electrical energy	11	Rs
4	Annual monetory savings	49500	Rs/ Annum
5	Investment required	150000	Rs lump sum
6	Simple payback period	36	Months

7.3 Summary of Savings

No	Recommendation	Annual Saving potential, kWh/Annum	Annual Monetary Gain, Rs.	Investment Required, Rs.	Payback period, Months
1	Replacement of 29 Nos Old Ceiling Fans with STAR rating fans	377	4,147	63,046	182
2	Installation of 3kW grid connected PV panel	4,500	49,500	150,000	36
	Total	**4,877**	**53,647**	**213,046**	**48**

Report

On

Energy Audit

At

Arts & Commerce College warwat Bakal, Buldana.

(Year 2021-22)

Prepared by

Nutan Urja Solutions

A 703, Balaji Witefield, Near Sunni's World,

Sus Road, Sus, Pune 411 021

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We are also thankful to various Head of Departments & other Staff members for helping us during the field measurements.

We hope that the recommendations stated in this report will be useful and worthy of discussions to take things forward to help implementation of energy conservation measures through energy savings. While we have made every attempt to adhere to high quality standards, in both data collection and analysis through the report, we would welcome your suggestions so as to improve upon this report further.

Executive Summary

After the Field measurements & analysis, we present herewith important observations made and various measures to reduce the Energy Consumption & mitigate the CO_2 emissions. College consumes Energy in the form of Electrical Energy used for various gadgets, Office & other facilities.

1. Present Energy Consumption

In the following Table, we present the details of Energy Consumption.

Table no 2.1: Details of energy consumption

Sr no	Parameter	Energy consumed, (Units)	CO2 Emission (MT)
1	Maximum	638	0.51
2	Minimum	410	0.33
3	Average	509	0.41
4	Total	6,113	4.89

2. Energy Conservation Projects already installed

1. Usage of LED lights at some indoor locations
2. Usage of LED Lights for outdoor lighting.
3. Usage of STAR rated fans at new installations

3. Key Observations

1. Usage of LED lights.
2. Usage of star rated equipment.
3. Maintained a good power factor.

5. Percentage of Usage of LED Lighting

The College has various Types of Light fittings, namely: LED & CFL. The percentage of Annual LED Lighting Usage to Annual Lighting requirement works out to be 94 %.

6. Recommendations

Table no 1: Recommendations for energy savings

No	Recommendation	Annual Saving potential, kWh/Annum	Annual Monetary Gain, Rs.	Investment Required, Rs.	Payback period, Months
1	Replacement of 29 Nos Old Ceiling Fans with STAR rating fans	377	4,147	63,046	182
2	Installation of 3kW grid connected PV panel	4,500	49,500	150,000	36
	Total	**4,877**	**53,647**	**213,046**	**48**

7 Notes & Assumptions

1. Daily working hours-10 Nos
2. Annual working Days-300 Nos
3. Average Rate of Electrical Energy : **Rs 11/- per kWh**

Abbreviations

CFL	:	Compact Fluorescent Lamp
FTL	:	Fluorescent Tube Light
LED	:	Light Emitting Diode
V	:	Voltage
I	:	Current
kW	:	Kilo- Watt
kWh	:	kilo-Watt Hour
kVA	:	Active Power

1. Introduction

The mission undertaken by Arts & Commerce College warwat Bakal, Buldana is to strive and provide Education to those poor, downtrodden and exploited communities of the area. It will accelerate the development of this region and establish confidence among the youth.

1.1 Objectives

1. To study present level of Energy Consumption
2. To Study Electrical Consumption
3. To assess the various equipment/facilities from Energy efficiency aspect
4. To study various measures to reduce the Energy Consumption

1.2 Audit Methodology:

1. Study of connected load
2. Study of various Electrical parameters
3. To prepare the Report with various Encon measures with payback analysis

1.3 General Details of College

Table No-1.1: Details of college

No	Head	Particulars
1	Name of Institution	Arts & Commerce College warwat Bakal, Buldana
2	Address	Arts & Commerce College warwat Bakal, Buldana ,Maharashtra 444202
3	Affiliation	Sant Gadge Baba Amravati University, Amravati.

2. Study of connected load

In this chapter, we present details of various connected electrical equipment and electrical load.

Table No-2.1: Location wise study of Electrical fittings in various buildings

No	Location	LED tube (20W)	CFL	Fans	Computers (65W)
1	IQAC	3		3	2
2	Exam room		1	1	
3	Seminar Hall	4		7	
4	Staff Room	2		3	
5	G1	1		1	
6	G2	1		1	
7	G3	1		1	
8	G4 (Principal room)	1	1	1	
9	G5 (Office)	3		3	4
10	G6	2		1	1
11	F1	1			1
12	F2	1			1
13	F3	1			1
14	F4	1			1
15	F5	2			1
16	S1	1			1
17	S4	1			1
18	S5	3			1
19	Reading room	1			1
20	Library	10		7	1
21	Chemistry lab	2			1
22	Chemistry Dept	1			1
23	Zoology lab	2			1
24	Zoology Dept.	2			1
25	Physics lab	2			1
26	Botany Dept.	2			1
27	Computer lab	2			1
28	Meeting hall	3			2
29	Rest House	1			2

30	NCC	1			1
31	Sports	1			1
32	NSS	1			1
33	Hall	5			5
	Total	**65**	**2**	**29**	**36**

Apart from above load, the school has pump. Individual fitting wise load is as under.

Table No 2.2: Equipment wise Connected Load

No	Equipment	Qty	Load, W/Unit	Load, kW
1	Ceiling Fan	29	65	1.9
2	LED-20W	65	20	1.3
3	CFL	2	24	0.0
4	Computers	36	65	2.3
5	Pump (2HP)			1.5
	Total			**7.1**

Data can be represented in terms of PIE chart as under,

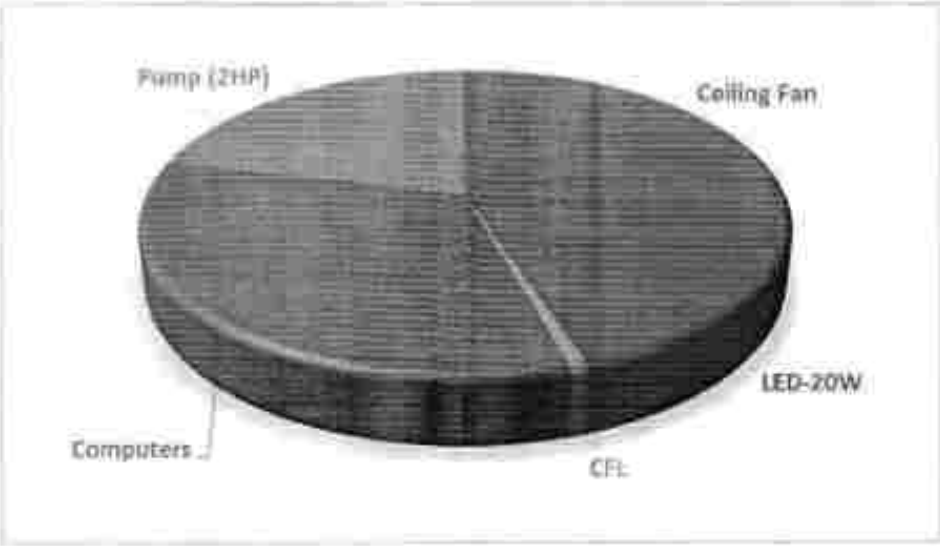

Figure 2.1: Distribution of connected load.

3. Study of Electrical Energy Consumption

In this chapter, electricity bills are studied for the analysis of electrical energy consumption.

Table no 3.1: Summary of electricity bills

No	Month	Energy (kWh)	Bill Amount (Rs)
1	Jun-22	519	13290
2	May-22	576	9,220
3	Apr-22	638	4,800
4	Mar-22	477	3,720
5	Feb-22	410	7,080
6	Jan-22	473	3,730
7	Dec-21	531	15,630
8	Nov-21	443	11,500
9	Oct-21	471	7,940
10	Sep-21	554	4,200
11	Aug-21	570	7,990
12	Jul-21	451	3,640
	Total	**6113**	**92740**

Variation in energy consumption is as follows,

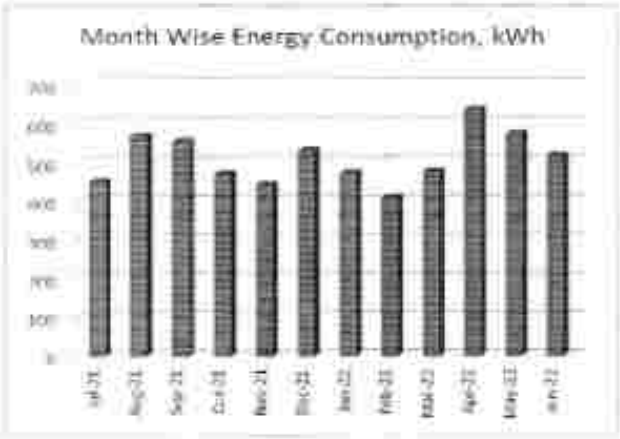

Figure 3.1: Month wise energy consumption

Monthly variation in electricity bill is as follows,

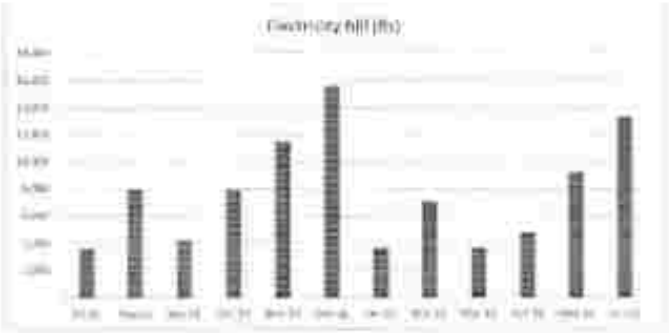

Figure 3.2: Month wise electricity bill

Key observations of electricity bill are as follows,

Table no 3.2: Key observations

Sr no	Parameter	Energy consumed, (Units)	CO2 Emission (MT)
1	Maximum	638	0.51
2	Minimum	410	0.33
3	Average	509	0.41
4	Total	6,113	4.89

4. Carbon Foot printing

1. A Carbon Foot print is defined as the Total Greenhouse Gas emissions (CO_2 emissions), emitted due to various activities. In this we compute the emissions of Carbon-Di-Oxide, by usage of the various form of Electrical Energy used by the College for performing its day to day activities

2. Basis for computation of CO_2 Emissions:

The basis of Calculation for CO_2 emissions due to Electrical Energy is as under

- 1 Unit (kWh) of Electrical Energy releases **0.8 Kg of CO_2** into atmosphere.

Based on the above Data we compute the CO_2 emissions which are being released in to the atmosphere by the College due to its Day to Day operations

We herewith furnish the details of various forms of Energy consumption as under

Table 4.1: Month wise Consumption of Electrical Energy & CO2 Emissions

No	Month	Energy Consumed, kWh	CO2 Emissions, MT
1	Jun-22	519	0.42
2	May-22	576	0.46
3	Apr-22	638	0.51
4	Mar-22	477	0.38
5	Feb-22	410	0.33
6	Jan-22	473	0.38
7	Dec-21	531	0.42
8	Nov-21	443	0.35
9	Oct-21	471	0.38
10	Sep-21	554	0.44
11	Aug-21	570	0.46
12	Jul-21	451	0.36
	Total	**6,113**	**4.89**

In the following Chart we present the CO2 emissions due to usage of Electrical Energy.

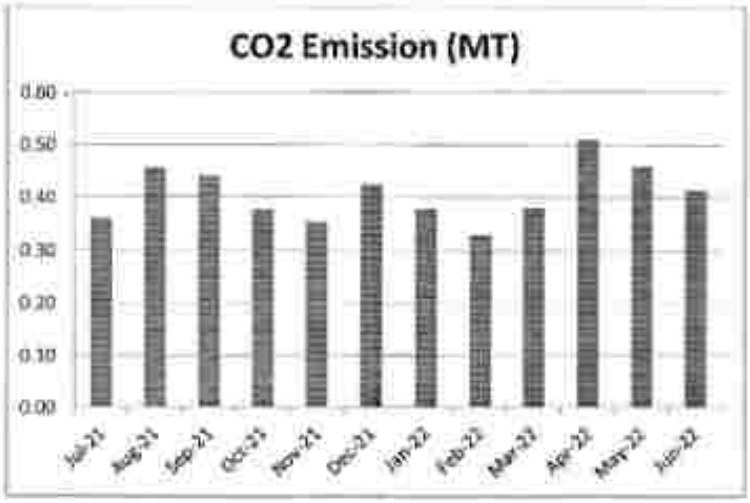

Figure 4.1: Month wise CO2 Emission

5. Study of utilities

5.1 Study of Lighting

There are 2 CFLs and 65 LEDs in indoor lightings.

5.2 Ceiling Fans

At building facility, there are about 29 Nos Old Ceiling Fans, which consumed about 65 W of Electrical Energy. It is recommended to replace these old Fans with BEE STAR Rated Ceiling Fans.

5.3 Water Pumps

There is 1 Water pump with 2HP capacity.

6. Study of usage of LED lighting

In this chapter we study the lighting system of college and compute the percentage of total load catered by LED lighting.

Table 7.1: Total lighting load

No	Particulars	Qty	Load, W/Unit	Load, kW
1	CFL	2	24	0.048
	LED lighting load			
1	LED tube	65	20	1.3
	Total LED lighting load			**1.3**
	Total Lighting load			**1.348**

It can be seen that out of total lighting load 96% load is LED lighting load.

7. Energy conservation proposals

7.1 Replacement of old fans with STAR Rated fans

During the Audit, it was observed that there are 29 no of fans. It is recommended to replace these old fans with STAR Rated fans.

In the following Table, we present the savings, investment required & payback analysis.

No	Particulars	Value	Unit
1	Present Qty of Old Ceiling Fan fittings	29	Nos
2	Energy Demand of Old Ceiling Fan fitting	65	W/Unit
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4	Reduction in demad	13	W/Unit
5	Average Daily Usage period	4	Hrs/Day
6	Daily saving in Energy	1.508	kWh/Day
7	Annual Working Days	250	Nos
8	Annual Energy Saving possible	377	kWh/Annum
9	Rate of Electrical Energy	11	Rs/kWh
10	Annual Monetary saving	4147	Rs/Annum
11	Cost of STAR Rated Ceiling Fan	2174	Rs/unit
12	Investment required	63046	Rs lump sum
13	Simple Payback period	182	Months

7.2 Installation of 3 kW Solar PV panel

It is recommended to install 3 kW solar PV panel. In the following Table, we present the savings, investment required & payback analysis.

No	Particulars	Value	Unit
1	Installation of 3kW PV unit	3	kW
2	Energy saving	4500	kWh/Annum
3	Rate of electrical energy	11	Rs
4	Annual monetory savings	49500	Rs/ Annum
5	Investment required	150000	Rs lump sum
6	Simple payback period	36	Months

7.3 Summary of Savings

No	Recommendation	Annual Saving potential, kWh/Annum	Annual Monetary Gain, Rs.	Investment Required, Rs.	Payback period, Months
1	Replacement of 29 Nos Old Ceiling Fans with STAR rating fans	377	4,147	63,046	182
2	Installation of 3kW grid connected PV panel	4,500	49,500	150,000	36
	Total	**4,877**	**53,647**	**213,046**	**48**

Report

On

Green Audit

At

Arts & Commerce College warwat Bakal, Buldana.

(Year 2019-20)

Prepared by

Nutan Urja Solutions

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Executive Summary

Green Audit of Arts & Commerce College warwat Bakal, Buldana is conducted by Nutan Urja Solutions, Pune. Based On the audit field study, following important points can be presented.

1. Present Energy Consumption

Arts & Commerce College warwat Bakal, Buldana uses Electrical Energy as the source of Energy for various equipment in the college campus. In the following Table, we present the details of Energy Consumption.

Table no 1: Details of energy consumption

Sr no	Parameter	Energy consumed, (Units)	CO2 Emission (MT)
1	Maximum	621	0.50
2	Minimum	434	0.35
3	Average	572	0.46
4	Total	6,867	5.49

2. Various Measures Adopted for Energy Conservation

1. Usage of STAR Rated ACs at new installations
2. Usage of LED lights at some indoor locations
3. Usage of LED Lights for outdoor lighting.

3. Rain Water Harvesting

The College has installed the Rainwater harvesting project, to reduce dependency on municipal corporation water supply.

4. Waste Management

The College has already installed a Bio composting Plant, wherein, the bio-degradable waste is composted & is used as fertilizer for the garden.

The internal communication is through emails and hence there is hardly any generation of e-Waste in the premises.

6. Notes and Assumptions

1. Daily working hours-10 Nos
2. Annual working Days-250 Nos
3. Average Rate of Electrical Energy : Rs 11/- per kWh

Abbreviations

CFL	:	Compact Fluorescent Lamp
FTL	:	Fluorescent Tube Light
LED	:	Light Emitting Diode
V	:	Voltage .
I	:	Current
kW	:	Kilo- Watt
kWh	:	kilo-Watt Hour
kVA	:	Active Power

1. Introduction

The mission undertaken by Arts & Commerce College warwat Bakal, Buldana is to strive and provide Education to those poor, downtrodden and exploited communities of the area. It will accelerate the development of this region and establish confidence among the youth.

1.1 Objectives

1. To study present level of Energy Consumption
2. To Study the present CO_2 emissions
3. To assess the various equipment/facilities from Energy efficiency aspect
4. To measure various Electrical parameters
5. To study Scope for usage of Renewable Energy
6. To study various measures to reduce the Energy Consumption

1.2 Audit methodology

1. Study of connected load
2. Study of various Electrical parameters
3. To prepare the Report with various Encon measures with payback analysis

2. Study of Electrical Energy Consumption

In this chapter, electricity bills are studied for the analysis of electrical energy consumption.

Table no 2.1: Summary of electricity bills

No	Month	Energy (kWh)	Bill Amount (Rs)
1	Oct-20	621	6043
2	Sep-20	621	6043
3	Aug-20	621	6043
4	Jul-20	621	6043
5	Jun-20	621	6043
6	May-20	621	6043
7	Apr-20	621	6043
8	Mar-20	621	6043
9	Feb-20	434	4215
10	Jan-20	452	4389
11	Dec-19	486	4724
12	Nov-19	527	5119
	Total	**6867**	**66790**

Variation in energy consumption is as follows,

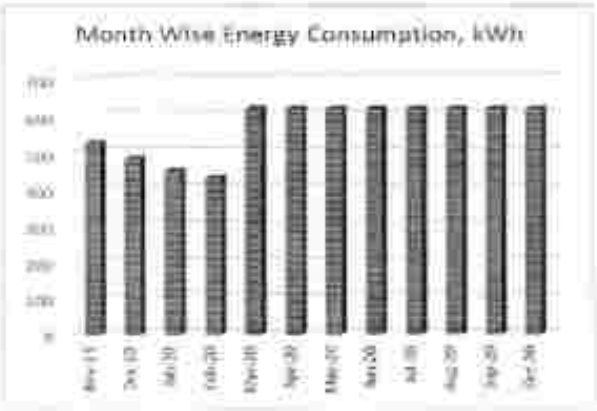

Figure 2.1: Month wise energy consumption

Monthly variation in electricity bill is as follows,

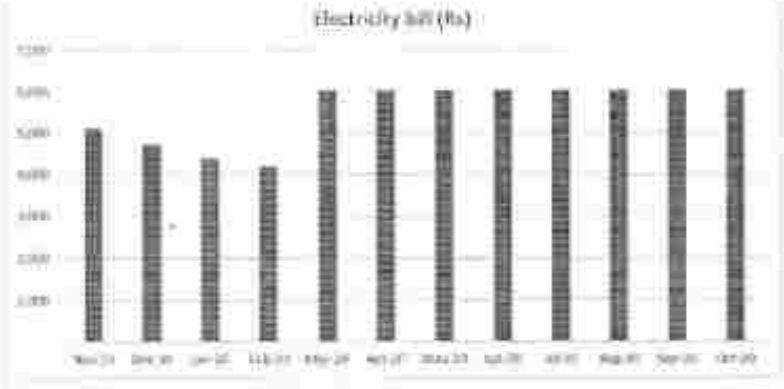

Figure 2.2: Month wise electricity bill

Key observations of electricity bill are as follows,

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1. A Carbon Foot print is defined as the Total Greenhouse Gas emissions (CO_2 emissions), emitted due to various activities. In this we compute the emissions of Carbon-Di-Oxide, by usage of the various form of Electrical Energy used by the College for performing its day to day activities

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No	Month	Energy Consumed, kWh	CO2 Emissions, MT
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3	Aug-20	621	0.50
4	Jul-20	621	0.50
5	Jun-20	621	0.50
6	May-20	621	0.50
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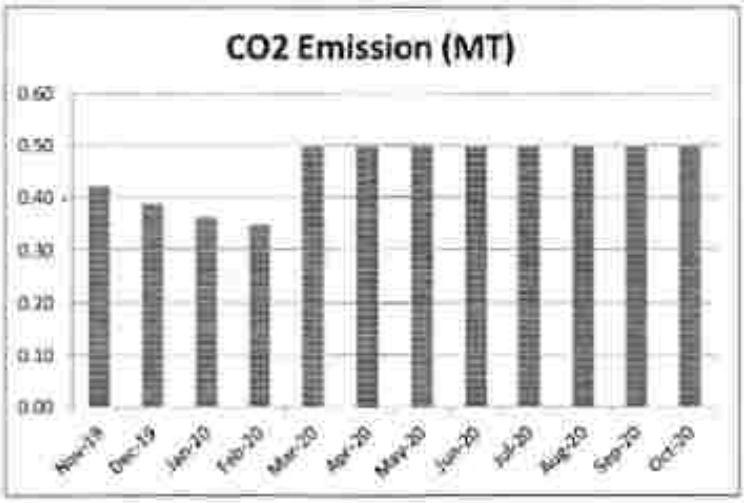

Figure 3.1: Month wise CO2 Emission

4. Study of Rain Water Harvesting

The College has already installed Rain Water Harvesting project, wherein the rain water falling on the terrace is collected and through pipes it is fed to underground Water Storage tank. This stored water is then reused for domestic purpose.

Photograph of Rain Water Harvesting

5. Study of Waste Management

5.1 Solid Waste Management

The College has already installed a Bio composting Plant, wherein, the bio-degradable waste is composted & is used as fertilizer for the garden.

Photographs of Bio Composting Storage Tanks:

5.2 e-Waste Management

The internal communication is through emails and hence there is hardly any generation of e-Waste in the premises.

6. Study of Green Practices

6.1 No of students who don't use own Vehicle for coming to Institute

Out of total students coming to Institute, about 60% students use own Automobile.

6.2 Usage of Public Transport

During the Students transport study, it was revealed that the local students who are residing near areas make use of Public Transport like Municipal Transport local buses, local sharing type auto rickshaws. Some students use bicycles.

6.3 Pedestrian Friendly Roads

The Institute has well defined pedestrian foot paths as to facilitate the easy movement of the students within the campus.

Photograph of Road within campus

6.4 Plastic Free Campus

The Institute is an active participant in the Government of India's most prestigious project of SWATCHH BHART ABHIYAN. The Institute has displayed boards in the Campus, to make the campus plastic free. Various measures adopted for this purpose are as follows

- Installation of Separate waste bins for Dry waste & wet waste
- Usage of paper tea cups in the Institute canteen
- Display of boards in the campus for Plastic Free campus

6.5 Paperless Office

The internal communication of the Institute is through the Internet. There are hardly any day to day operations, where printing is required.

6.6 Green Landscaping with Trees and Plants

The Institute has beautiful maintained Garden.

Figure 6.1: Beautiful maintained Garden of college

Report

On

Green Audit

At

Arts & Commerce College warwat Bakal, Buldana.

(Year 2020-21)

Prepared by

Nutan Urja Solutions

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6. Notes and Assumptions

1. Daily working hours-10 Nos
2. Annual working Days-250 Nos
3. Average Rate of Electrical Energy : Rs 11/- per kWh

Abbreviations

CFL	:	Compact Fluorescent Lamp
FTL	:	Fluorescent Tube Light
LED	:	Light Emitting Diode
V	:	Voltage
I	:	Current
kW	:	Kilo- Watt
kWh	:	kilo-Watt Hour
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1. Introduction

The mission undertaken by Arts & Commerce College warwat Bakal, Buldana is to strive and provide Education to those poor, downtrodden and exploited communities of the area. It will accelerate the development of this region and establish confidence among the youth.

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2. To Study the present CO_2 emissions
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4. To measure various Electrical parameters
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1. Study of connected load
2. Study of various Electrical parameters
3. To prepare the Report with various Encon measures with payback analysis

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In this chapter, electricity bills are studied for the analysis of electrical energy consumption.

Table no 2.1: Summary of electricity bills

No	Month	Energy (kWh)	Bill Amount (Rs)
1	Sep-21	554	4200
2	Aug-21	570	7,990
3	Jul-21	451	3,640
4	Jun-21	484	4,695
5	May-21	440	4,267
6	Apr-21	582	5,649
7	Mar-21	390	3,801
8	Feb-21	497	4,833
9	Jan-21	445	4,324
10	Dec-20	509	4,929
11	Nov-20	575	5,585
12	Oct-20	621	6,043
	Total	**6118**	**59955**

Variation in energy consumption is as follows,

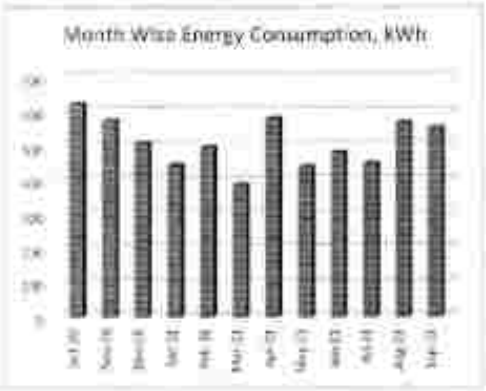


Figure 2.1: Month wise energy consumption

Monthly variation in electricity bill is as follows,

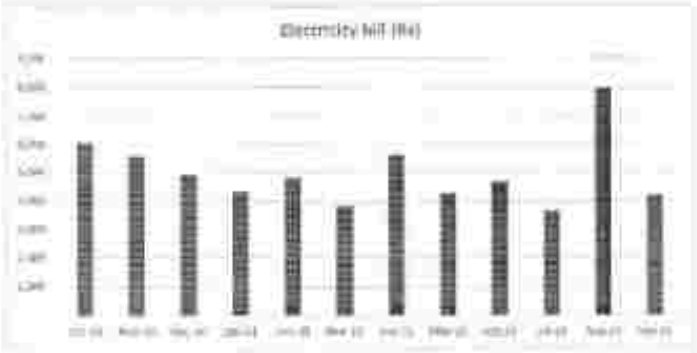


Figure 2.2: Month wise electricity bill

Key observations of electricity bill are as follows,

Table no 2.2: Key observations

Sr no	Parameter	Energy consumed, (Units)	CO2 Emission (MT)
1	Maximum	621	0.50
2	Minimum	390	0.31
3	Average	510	0.41
4	Total	6,118	4.89

3. Carbon Foot printing

1. A Carbon Foot print is defined as the Total Greenhouse Gas emissions (CO_2 emissions), emitted due to various activities. In this we compute the emissions of Carbon-Di-Oxide, by usage of the various form of Electrical Energy used by the College for performing its day to day activities

2. Basis for computation of CO_2 Emissions:

The basis of Calculation for CO_2 emissions due to Electrical Energy is as under

- 1 Unit (kWh) of Electrical Energy releases **0.8 Kg of CO_2** into atmosphere.

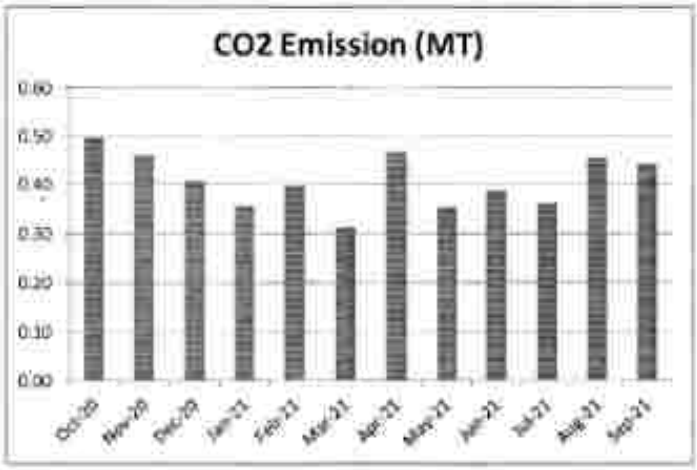
Based on the above Data we compute the CO_2 emissions which are being released in to the atmosphere by the College due to its Day to Day operations

We herewith furnish the details of various forms of Energy consumption as under

Table 3.1: Month wise Consumption of Electrical Energy & CO2 Emissions

No	Month	Energy Consumed, kWh	CO2 Emissions, MT
1	Sep-21	554	0.44
2	Aug-21	570	0.46
3	Jul-21	451	0.36
4	Jun-21	484	0.39
5	May-21	440	0.35
6	Apr-21	582	0.47
7	Mar-21	390	0.31
8	Feb-21	497	0.40
9	Jan-21	445	0.36
10	Dec-20	509	0.41
11	Nov-20	575	0.46
12	Oct-20	621	0.50
	Total	**6,118**	**4.89**

In the following Chart we present the CO2 emissions due to usage of Electrical Energy.



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4. Study of Rain Water Harvesting

The College has already installed Rain Water Harvesting project, wherein the rain water falling on the terrace is collected and through pipes it is fed to underground Water Storage tank. This stored water is then reused for domestic purpose.

Photograph of Rain Water Harvesting

5. Study of Waste Management

5.1 Solid Waste Management

The College has already installed a Bio composting Plant, wherein, the bio-degradable waste is composted & is used as fertilizer for the garden.

Photographs of Bio Composting Storage Tanks:

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The internal communication is through emails and hence there is hardly any generation of e-Waste in the premises.

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6.1 No of students who don't use own Vehicle for coming to Institute

Out of total students coming to Institute, about 60% students use own Automobile.

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During the Students transport study, it was revealed that the local students who are residing near areas make use of Public Transport like Municipal Transport local buses, local sharing type auto rickshaws. Some students use bicycles.

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The Institute has well defined pedestrian foot paths as to facilitate the easy movement of the students within the campus.

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The Institute is an active participant in the Government of India's most prestigious project of SWATCHH BHART ABHIYAN. The Institute has displayed boards in the Campus, to make the campus plastic free. Various measures adopted for this purpose are as follows

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The internal communication of the Institute is through the Internet. There are hardly any day to day operations, where printing is required.

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The Institute has beautiful maintained Garden.

Figure 6.1: Beautiful maintained Garden of college

Report

On

Green Audit

At

Arts & Commerce College warwat Bakal, Buldana.

(Year 2021-22)

Prepared by

Nutan Urja Solutions

A 703, Balaji Witefield, Near Sunni's World,

Sus Road, Sus, Pune 411 021

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Contents

Acknowledgement

We at Nutan Urja Solutions, Pune, express our sincere gratitude to the management of Arts & Commerce College warwat Bakal, Buldana for awarding us the assignment of Green Audit of their college premises.

We are also thankful to various Head of Departments & other Staff members for helping us during the field measurements.

We hope that the recommendations stated in this report will be useful and worthy of discussions to take things forward to help implementation of energy conservation measures and green practices. While we have made every attempt to adhere to high quality standards, in both data collection and analysis through the report, we would welcome your suggestions so as to improve upon this report further.

Executive Summary

Green Audit of Arts & Commerce College warwat Bakal, Buldana is conducted by Nutan Urja Solutions, Pune. Based On the audit field study, following important points can be presented.

1. Present Energy Consumption

Arts & Commerce College warwat Bakal, Buldana uses Electrical Energy as the source of Energy for various equipment in the college campus. In the following Table, we present the details of Energy Consumption.

Table no 1: Details of energy consumption

Sr no	Parameter	Energy consumed, (Units)	CO2 Emission (MT)
1	Maximum	638	0.51
2	Minimum	410	0.33
3	Average	509	0.41
4	Total	6,113	4.89

2. Various Measures Adopted for Energy Conservation

1. Usage of STAR Rated ACs at new installations
2. Usage of LED lights at some indoor locations
3. Usage of LED Lights for outdoor lighting.

3. Rain Water Harvesting

The College has installed the Rainwater harvesting project, to reduce dependency on municipal corporation water supply.

4. Waste Management

The College has already installed a Bio composting Plant, wherein, the bio-degradable waste is composted & is used as fertilizer for the garden.

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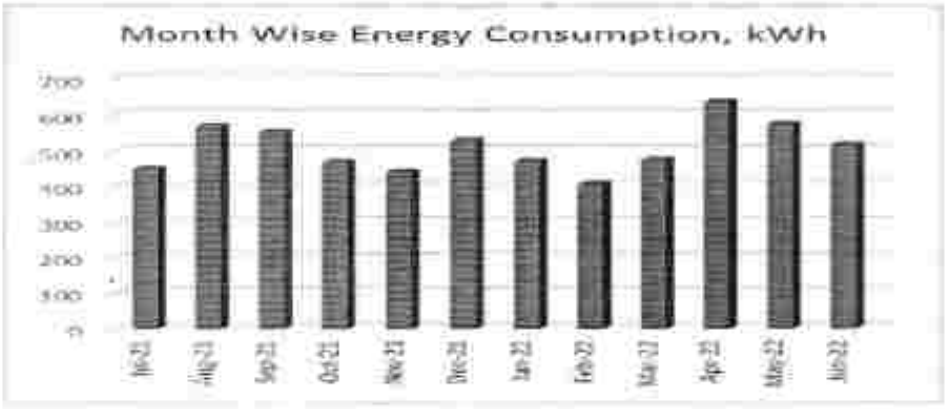
2	May-22	576	9,220
3	Apr-22	638	4,800
4	Mar-22	477	3,720
5	Feb-22	410	7,080
6	Jan-22	473	3,730
7	Dec-21	531	15,630
8	Nov-21	443	11,500
9	Oct-21	471	7,940
10	Sep-21	554	4,200
11	Aug-21	570	7,990
12	Jul-21	451	3,640
	Total	**6113**	**92740**

Variation in energy consumption is as follows,



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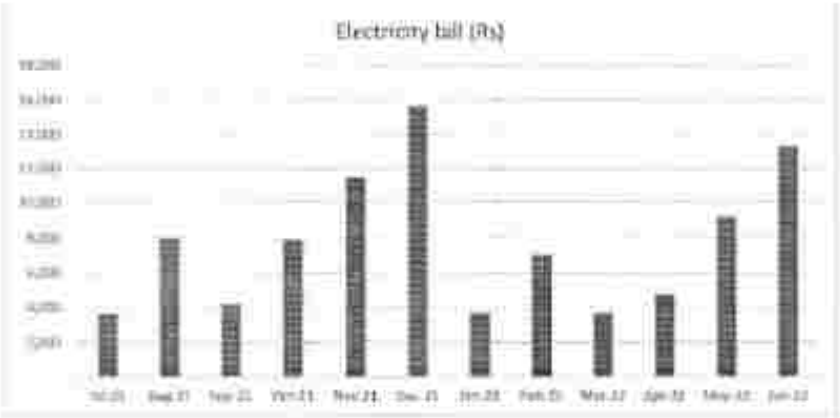

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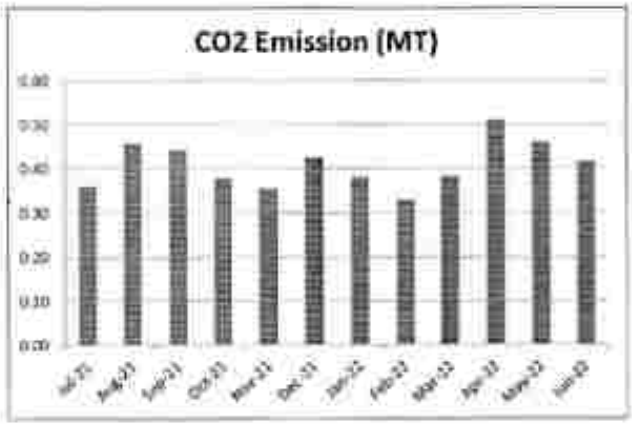

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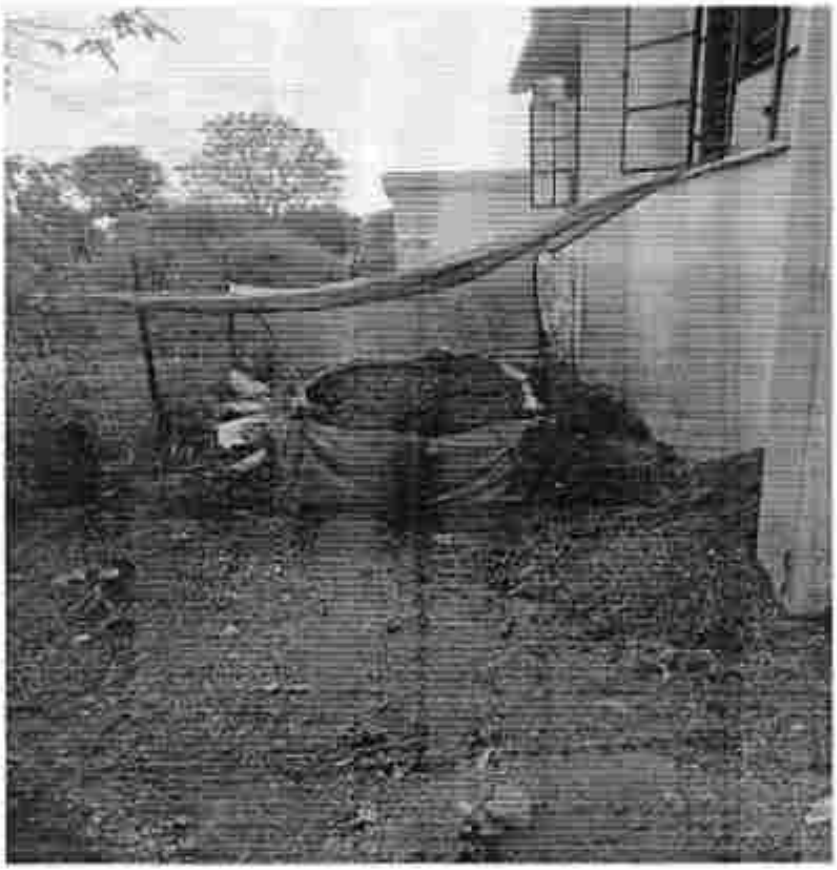

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