Report

On

Environmental Audit

At

Dr. Madhukarrao Wasnik P.W.S. Arts, Commerce, Science College, Nagpur

(Year 2018-19)

Prepared by

Nutan Urja Solutions

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

Sus Road, Sus, Pune 411 021

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Acknowledgement

We at Nutan Urja Solutions, Pune wish to express our sincere gratitude to the management of Dr. Madhukarrao Wasnik P.W.S. Arts, Commerce, Science College, Nagpur for assigning the work of Environmental Audit of college campus.

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We are also thankful to all other staff members who helped us during the Measurements at the field and for giving us the necessary inputs to carry out this vital exercise.

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.

Dr. Madhukarrao Wasnik P.W.S. Arts, Commerce, Science College, Nagpur 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	3,145	2.52
2	Minimum	1,608	1.29
3	Average	2,470	1.98
4	Total	29,645	23.72

3. The various projects already implemented for Environmental Conservation:

- Usage of Energy Efficient BEE STAR Rated ACs
- Usage of Natural Day light in corridors
- Implementation of Bio Composting pit for disposal of Bio degradable waste
- Implementation of Rain Water Harvesting
- Installation of **20 kW** Solar PV Power Plant.

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
3. Installation of sensor on water tank to reduce water wastage due to overflow.

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
kWh	:	kilo-Watt Hour
Qty	:	Quantity
W	:	Watt
kW	:	Kilo Watt
PF	:	Power Factor
M D	:	Maximum Demand
PC	:	Personal Computer
MSEDCL	:	Maharashtra State Electricity Distribution Company Ltd

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

1.1.3. Environmental Pollutant: means any solid, liquid and gaseous substance present in the concentration as may be, or tend to be, injurious to Environment.

1.1.4. Relevant Environmental Laws in India: Table No-1:

1927	The Indian Forest Act
1972	The Wildlife Protection Act
1974	The Water (Prevention and Control of Pollution) Act
1977	The Water (Prevention & Control of Pollution) Cess Act
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1986	The Environment Protection Act
1991	The Public Liability Insurance Act
2002	The Biological Diversity Act
2010	The National Green Tribunal Act

1.1.5. Some Important Environmental Rules in India: Table No-2:

1989	Hazardous Waste (Management and Handling) Rules
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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
1	Name of Institution	Dr. Madhukarrao Wasnik P.W.S. Arts, Commerce, Science College, Nagpur
2	Address	786, Kamptee Rd, Old Teka Naka, Teka Naka, Nagpur, Maharashtra 440026.
3	Affiliation	Rashtrasant Tukdoji Maharaj Nagpur University, Nagpur

2. Study of Consumption of Various Resources

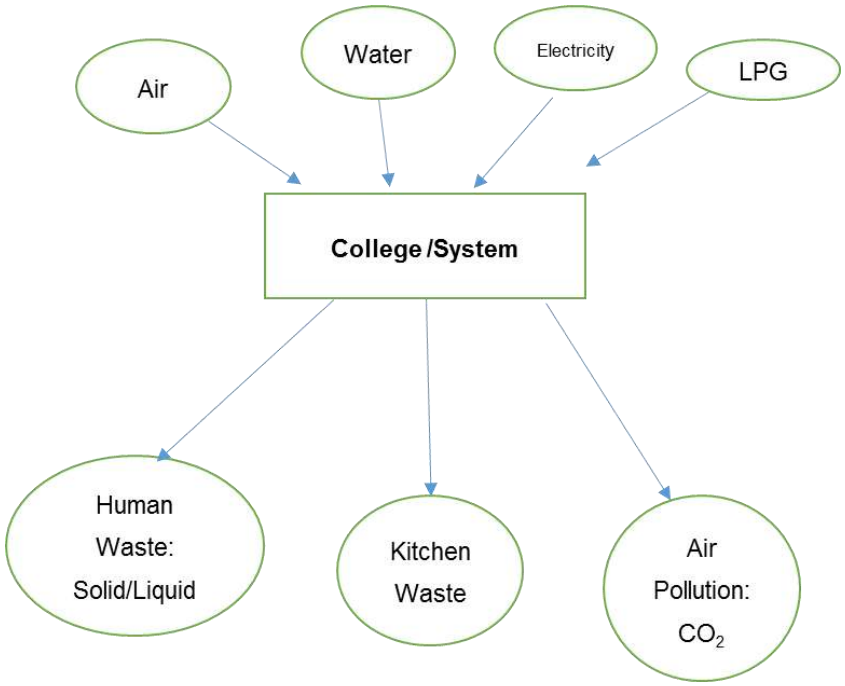
The Institute consumes following basic/derived Resources:

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 (kWh)
1	Aug-19	3,048
2	Jul-19	3,145
3	Jun-19	2,945
4	May-19	3,116
5	Apr-19	2,644
6	Mar-19	2,399
7	Feb-19	1,781
8	Jan-19	1,868
9	Dec-18	1,608
10	Nov-18	1,670
11	Oct-18	2,680
12	Sep-18	2,741
	Total	29,645
	Maximum	3,145
	Minimum	1,608
	Average	2,470

2.1 Variation of Monthly Electrical Energy Consumption

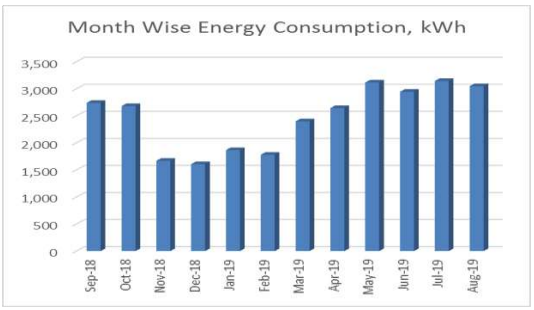


Figure 2.1 : Monthly Electrical Energy Consumption

2.2 Key Inference drawn

From the above analysis, we present following important parameters:

Table 2.2: Variation in Important Parameters

No	Parameter	Energy consumed, (Units)
1	Maximum	3,145
2	Minimum	1,608
3	Average	2,470
4	Total	29,645

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	Aug-19	3,048	2.44
2	Jul-19	3,145	2.52
3	Jun-19	2,945	2.36
4	May-19	3,116	2.49
5	Apr-19	2,644	2.12
6	Mar-19	2,399	1.92
7	Feb-19	1,781	1.42
8	Jan-19	1,868	1.49
9	Dec-18	1,608	1.29
10	Nov-18	1,670	1.34
11	Oct-18	2,680	2.14
12	Sep-18	2,741	2.19
	Total	**29,645**	**23.72**
	Maximum	3,145	2.52
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In the following Chart we present the CO2 emissions due to usage of Electrical Energy.

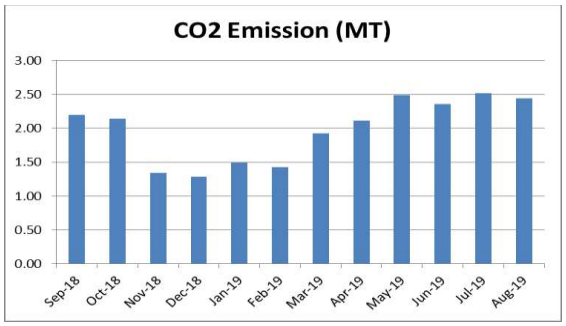

Figure 2.1: CO2 emission due to usage of electrical energy.

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 Pipe:

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.
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2. Present Level of CO_2 Emissions:

Sr no	Parameter	Energy consumed, (Units)	CO2 Emission (MT)
1	Maximum	3,579	2.86
2	Minimum	1,068	0.85
3	Average	1,761	1.41
4	Total	21,135	16.91

3. The various projects already implemented for Environmental Conservation:

- Usage of Energy Efficient BEE STAR Rated ACs
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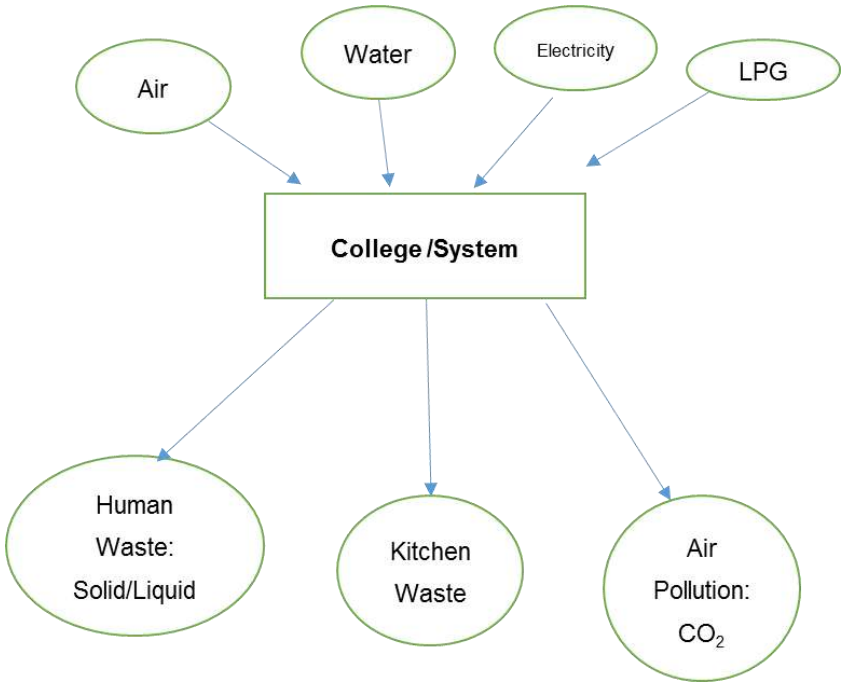

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The calculation of electrical energy consumption by college can be given as,

Table 2.1: Electrical Energy Consumption

No	Month	Energy (kWh)
1	Sep-20	1,243
2	Aug-20	1,317
3	Jul-20	1,068
4	Jun-20	3,579
5	May-20	1,626
6	Apr-20	1,626
7	Mar-20	1,822
8	Feb-20	1,645
9	Jan-20	1,410
10	Dec-19	1,753
11	Nov-19	1,320
12	Oct-19	2,726
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	Maximum	3,579
	Minimum	1,068
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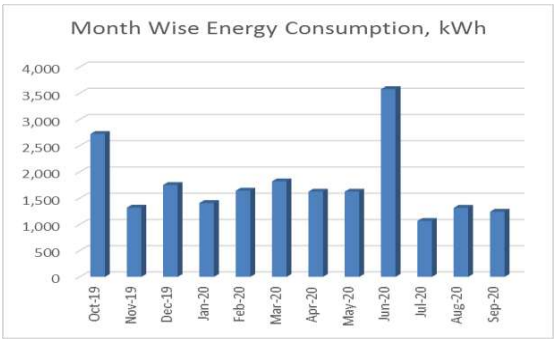

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In this Chapter, we present the various types of Pollution as under:

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8	Feb-20	1,645	1.32
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	Total	**21,135**	**16.91**
	Maximum	3,579	2.86
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In the following Chart we present the CO2 emissions due to usage of Electrical Energy.

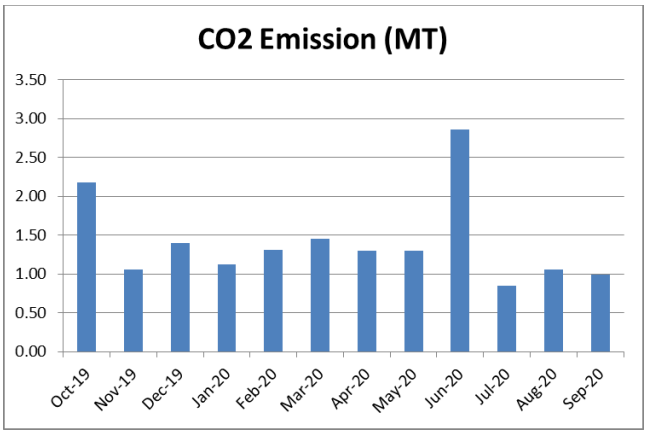

Figure 2.1: CO2 emission due to usage of electrical energy.

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Phone: 83568 18381. Email: nutanurja.solutions@gmail.com

Date: 10/07/2022

CERTIFICATE

This is to certify that we have conducted Environmental Audit at Dr. Madhukarrao Wasnik P.W.S. Arts, Commerce, Science College, Nagpur in the year 2021-22.

The College has already adopted following projects for making the campus **Energy Efficient.**

- Installation of Bio Composting Pit
- Installation of Rain Water Harvesting System
- Installation of **20 kW** Solar PV Power Plant.

We appreciate the support of Management, involvement of faculty members and students in the process of Energy Conservation & making the campus Green.

Nutan Urja Solutions,

K G Bhatwadekar,
Certified Energy Auditor,
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2	Minimum	328	0.26
3	Average	1,261	1.01
4	**Total**	**15,128**	**12.10**

3. The various projects already implemented for Environmental Conservation:

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Nutan Urja Solutions

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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
1	Name of Institution	Dr. Madhukarrao Wasnik P.W.S. Arts, Commerce, Science College, Nagpur
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2. Study of Consumption of Various Resources

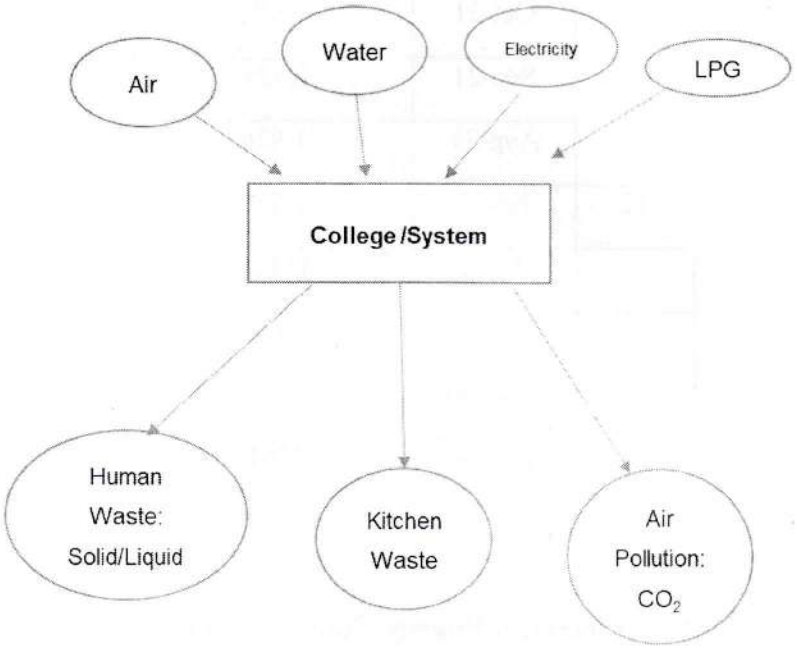
The Institute consumes following basic/derived Resources:

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 (kWh)
1	Jun-22	676
2	May-22	792
3	Apr-22	848
4	Mar-22	865
5	Feb-22	328
6	Jan-22	402
7	Dec-21	1,743
8	Nov-21	1,916
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10	Sep-21	2,151
11	Aug-21	1,926
12	Jul-21	1,809
	Total	**15128**
	Maximum	2151
	Minimum	328
	Average	1261

2.1 Variation of Monthly Electrical Energy Consumption

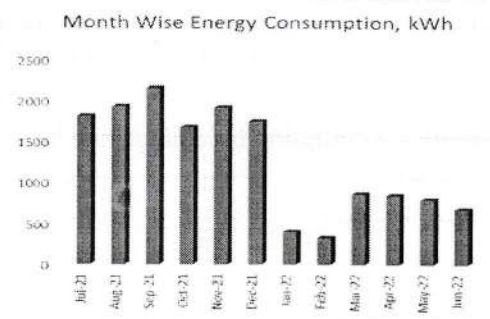

Figure 2.1 : Monthly Electrical Energy Consumption

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	2151
2	Minimum	328
3	Average	1261
4	**Total**	**15128**

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	676	0.54
2	May-22	792	0.63
3	Apr-22	848	0.68
4	Mar-22	865	0.69
5	Feb-22	328	0.26
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9	Oct-21	1,672	1.34
10	Sep-21	2,151	1.72
11	Aug-21	1,926	1.54
12	Jul-21	1,809	1.45
	Total	**15,128**	**12.10**
	Maximum	2,151	1.72
	Minimum	328	0.26
	Average	1,261	1.01

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

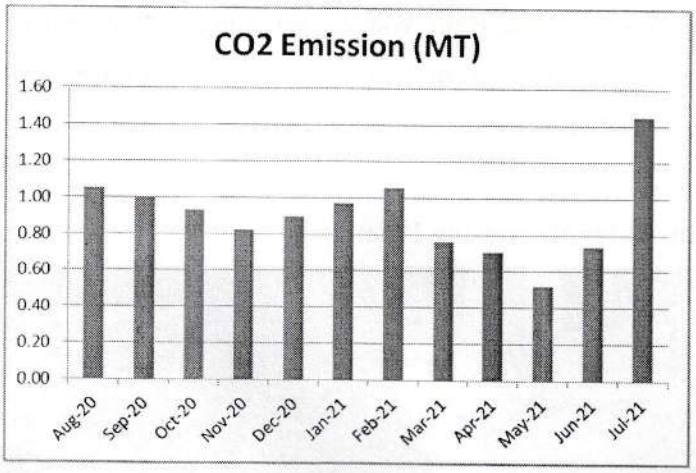
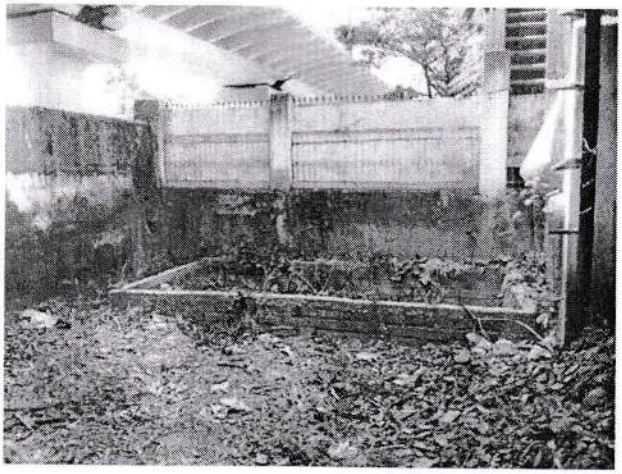


Figure 3.1: CO2 emission due to usage of electrical energy.

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.

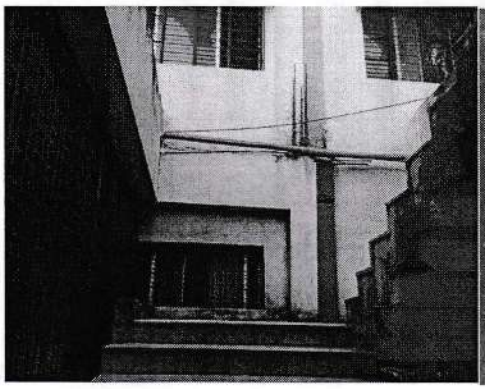
3.4 Study of e-Waste Management:

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 Pipe:



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.
- Installation of sensor on water tank to reduce water wastage due to overflow.

Nutan Urja Solutions

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

Sus Road, Sus, Pune 411 021

Phone: 83568 18381. Email: nutanurja.solutions@gmail.com

Date: 10/07/2022

CERTIFICATE

This is to certify that we have conducted Environmental Audit at Dr. Madhukarrao Wasnik P.W.S. Arts, Commerce, Science College, Nagpur in the year 2021-22.

The College has already adopted following projects for making the campus **Energy Efficient.**

- Installation of Bio Composting Pit
- Installation of Rain Water Harvesting System
- Installation of **20 kW** Solar PV Power Plant.

We appreciate the support of Management, involvement of faculty members and students in the process of Energy Conservation & making the campus Green.

Nutan Urja Solutions,

K G Bhatwadekar,
Certified Energy Auditor,
EA – 22428

Report

On

Environmental Audit

At

Dr. Madhukarrao Wasnik P.W.S. Arts, Commerce, Science College, Nagpur

(Year 2021-22)

Prepared by

Nutan Urja Solutions

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

Dr. Madhukarrao Wasnik P.W.S. Arts, Commerce, Science College, Nagpur 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	2,151	1.72
2	Minimum	328	0.26
3	Average	1,261	1.01
4	**Total**	**15,128**	**12.10**

3. The various projects already implemented for Environmental Conservation:

- Usage of Energy Efficient BEE STAR Rated ACs
- Usage of Natural Day light in corridors
- Implementation of Bio Composting pit for disposal of Bio degradable waste
- Implementation of Rain Water Harvesting
- Installation of **20 kW** Solar PV Power Plant.

4. Recommendations:

1. Installation of Bio Gas Generator Plant instead of Bio composting Plant.
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3. Installation of sensor on water tank to reduce water wastage due to overflow.

Nutan Urja Solutions

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
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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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The Institute consumes following basic/derived Resources:

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Also, college emits following pollutants to environment

1. Human Waste: Solid/ Liquid
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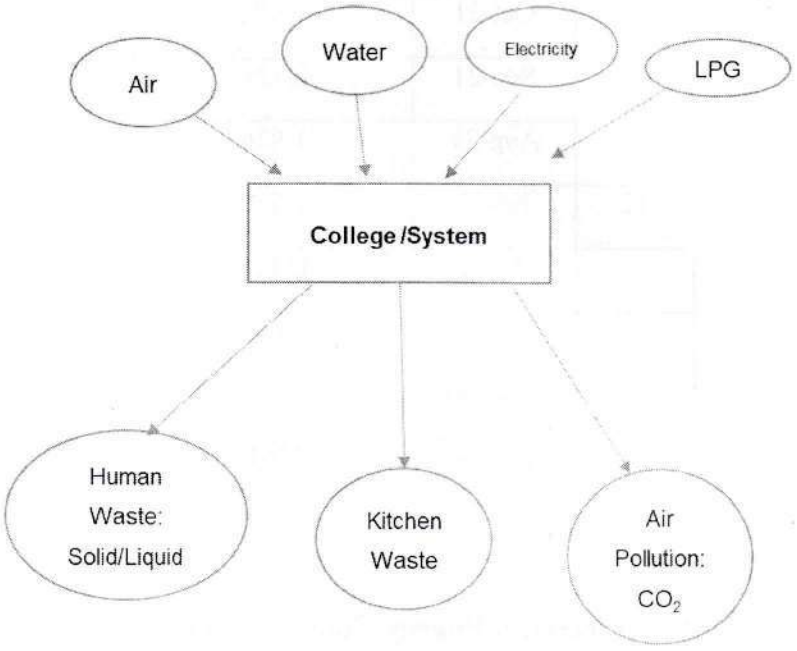
We try to draw a schematic diagram for the College System & Environment as under.



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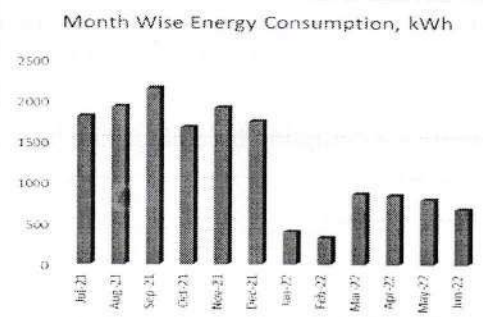

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2.2 Key Inference drawn

From the above analysis, we present following important parameters:

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

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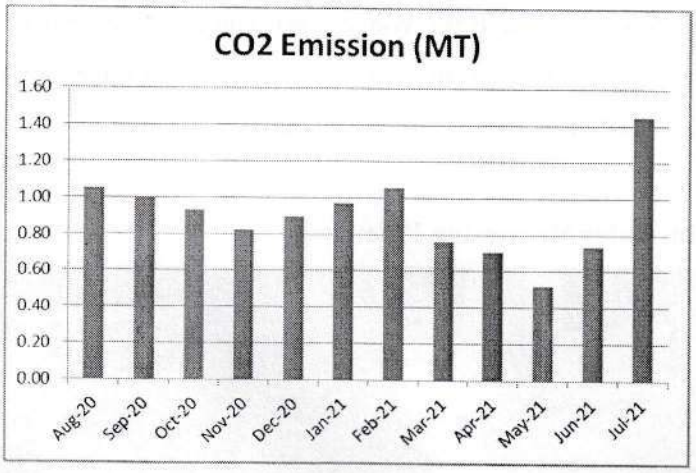
In the following Chart we present the CO2 emissions due to usage of Electrical Energy.



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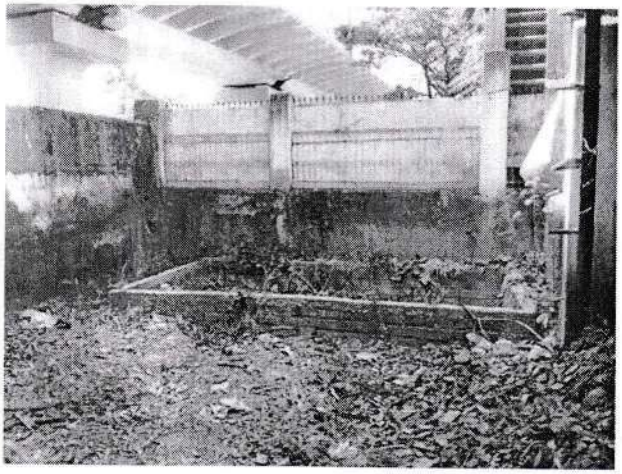

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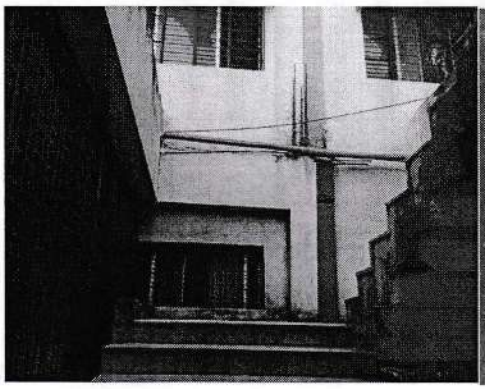

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On

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(Year 2022-23)

Prepared by

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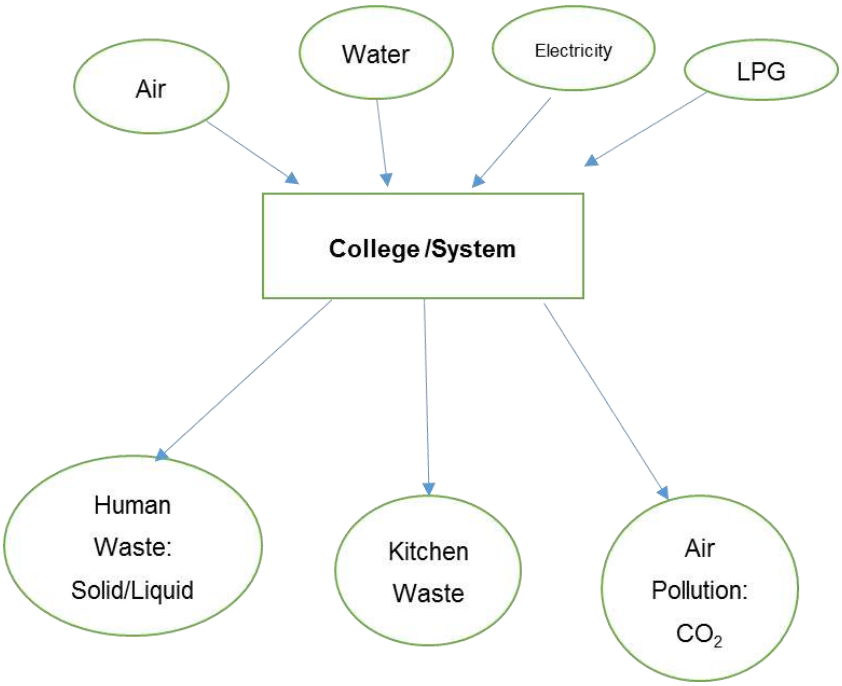
3. Air pollution

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 (kWh)
1	Jul-23	0
2	Jun-23	0
3	May-23	0
4	Apr-23	0
5	Mar-23	0
6	Feb-23	0
7	Jan-23	0
8	Dec-22	645
9	Nov-22	545
10	Oct-22	1454
11	Sep-22	1197
12	Aug-22	1263
	Total	**5104**
	Maximum	1454
	Minimum	0
	Average	425

2.1 Variation of Monthly Electrical Energy Consumption

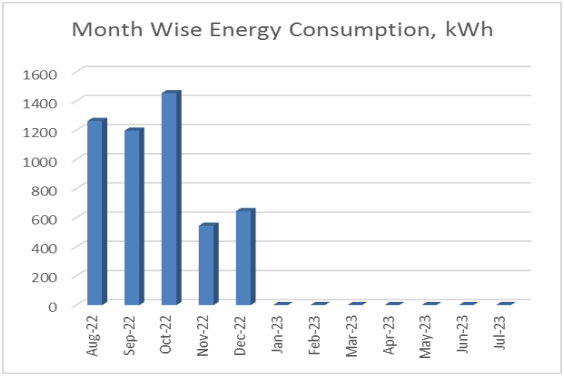


Figure 2.1 : Monthly Electrical Energy Consumption

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	1454
2	Minimum	0
3	Average	425
4	**Total**	**5104**

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	Jul-23	-	0.00
2	Jun-23	-	0.00
3	May-23	-	0.00
4	Apr-23	-	0.00
5	Mar-23	-	0.00
6	Feb-23	-	0.00
7	Jan-23	-	0.00
8	Dec-22	645	0.52
9	Nov-22	545	0.44
10	Oct-22	1,454	1.16
11	Sep-22	1,197	0.96
12	Aug-22	1,263	1.01
	Total	**5,104**	**4.08**
	Maximum	1,454	1.16
	Minimum	-	-
	Average	425	0.34

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

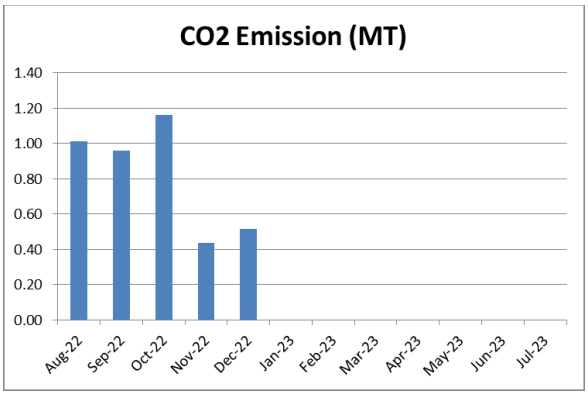


Figure 3.1: CO2 emission due to usage of electrical energy.

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. Waste water discharged from RO water plant is collected and used for garden and other domestic purposes.

Photograph of RO discharge collection tank

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. This stored water is then reused for domestic purpose.

Photographs 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.
- Installation of sensor on water tank to reduce water wastage due to overflow.