GREEN AUDIT REPORT

Madhya Pradesh Bhoj (Open) University, Kolar road , Bhopal (MadhyaPradesh)

PREPARED BY

EMPIRICAL EXERGY PRIVATE LIMITED

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(2022-23)

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ACKNOWLEDGEMENT

Empirical Exergy Private Limited (EEPL), Indore (M.P) takes this opportunity to appreciate & thank the management of **Madhya Pradesh Bhoj (Open) University, Bhopal (Madhya Pradesh)** for allowing us to conduct the green audit for the university.

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 during the 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.
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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.

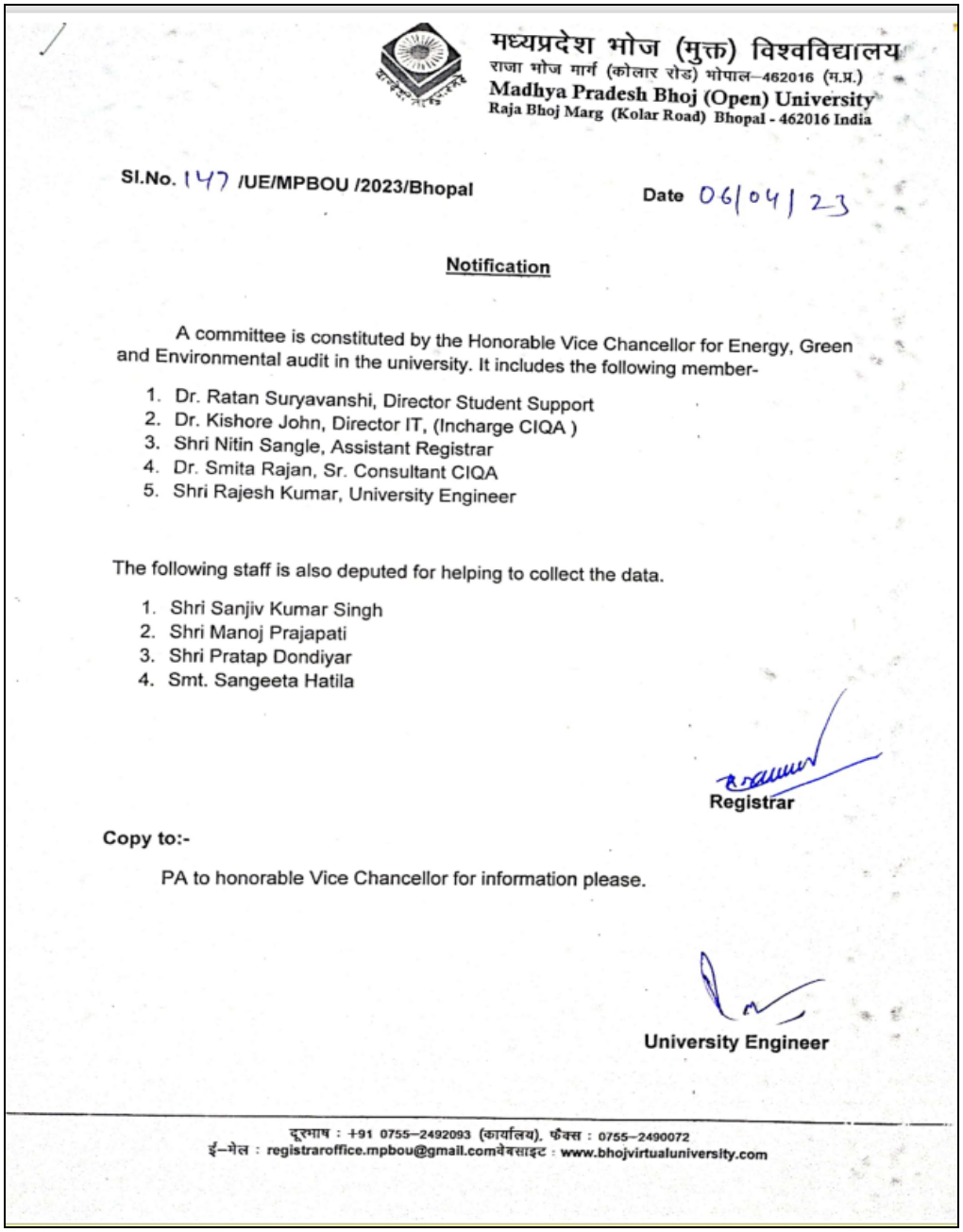
On cancellation, the certificate of accreditation shall be surrendered to the Bureau within fifteen days from the date of receipt of order of cancellation.

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.



मध्यप्रदेश भोज (मुक्त) विश्वविद्यालय
राजा भोज मार्ग (कोलार रोड) भोपाल–462016 (म.प्र.)
Madhya Pradesh Bhoj (Open) University
Raja Bhoj Marg (Kolar Road) Bhopal - 462016 India

Sl.No. 147 /UE/MPBOU /2023/Bhopal Date 06/04/23

Notification

A committee is constituted by the Honorable Vice Chancellor for Energy, Green and Environmental audit in the university. It includes the following member-

1. Dr. Ratan Suryavanshi, Director Student Support
2. Dr. Kishore John, Director IT, (Incharge CIQA)
3. Shri Nitin Sangle, Assistant Registrar
4. Dr. Smita Rajan, Sr. Consultant CIQA
5. Shri Rajesh Kumar, University Engineer

The following staff is also deputed for helping to collect the data.

1. Shri Sanjiv Kumar Singh
2. Shri Manoj Prajapati
3. Shri Pratap Dondiyar
4. Smt. Sangeeta Hatila

Registrar

Copy to:-

PA to honorable Vice Chancellor for information please.

University Engineer

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ई–मेल : registraroffice.mpbou@gmail.comवेबसाइट : www.bhojvirtualuniversity.com

The Audit Team

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

- **Mr. Rakesh Pathak**, [Director & Electrical Expert]
- **Mr. Rajesh Kumar Singadiya** [Director & Accredited Energy Auditor AEA-0284]
- **Mrs. Laxmi Raikwar Singadiya** [Chemical Engineer]
- **Mr. Sachin Kumawat** [Sr. Project Engineer]
- **Mr. Hemendra Khadekar** [Sr. Electrical Engineer]
- **Mr. Charchit Pathak** [Asst. Project Engineer]
- **Mr. Aakash Kumawat** [Assistant Jr. Engineer]
- **Mr. Mohan Choudhary** [Sr. Electrician]

EXECUTIVE SUMMARY

Green initiative taken by university

- **CAMPAIGN OF PLANTATION AND GREEN CAMPUS**

University has around **24,968 Nos** trees on campus. It's a good initiative taken by management for a green campus under the campaign of a plantation. **It's appreciable.**

RECOMMENDATION: -

- **5 DUST BIN SYSTEM**

It is observed that university has adopted two dust bin system for all kind of waste generated in university campus. It is recommended to 5 dust bin system for segregation of all type of waste ganrated in university campus.

- **INSTALLATION ORGANIC WASTE COMPOSTING MACHINE**

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

- **QR CODE SYSTEM ON TREE**

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

OTHER SUGGESTIONS & RECOMMNEDATION

Some of the very important suggestions.

- Adopt the proposed Environmentally Responsible Purchasing Policy, and work towards creating and implementing a strategy to reduce the environmental impact of its purchasing decisions.
- Increase recycling education on campus.
- Increase Awareness of Environmentally Sustainable Development in university campus.
- Practice Institutional Ecology- Set an example of environmental responsibility by establishing institutional ecology policies and practices of resource conservation, recycling, waste reduction, and environmentally sound operations.
- Involve All Stakeholders- Encourage involvement of government, foundations, and industry in supporting interdisciplinary research, education, policy formation, and information exchange in environmentally sustainable development.
- Collaborate for interdisciplinary approaches- To develop interdisciplinary approaches to curricula, research initiatives, operations, and outreach activities that support an environmentally sustainable future.
- Increase reduce, reuse, and recycle education on campus.
- Develop a butterfly garden that arouses appreciation towards flora and fauna diversity.
- Name all the trees and plants (Plant DNA barcodes) with its common name and scientific name.
- Arrange training programmes on environmental management system and nature conservation.
- Ensure participation of students and teachers in local environmental issues.
- Avoid plastic/thermocole plates and cups in the university level or department level functions.

CHAPTER-1
INTRODUCTION

1.1 About University

The National Policy of Education (NPE) 1986, emphasized that distance education is an important medium for the development and promotion of hogher education. In this context , for the expansion and promotion of distance education the Central Advisory Board of Education (CABE), Government of India took an important decision that in the VIIIth year plan every state should establishe a state open university following the distance education pattern . On this basis Madhya Pradesh Bhoj (Open) Unversity (MPBOU) was established under an Act of State Assembly in 1991.

Figure 1.1: - Google Image of Madhyapradesh Bhoj (Open) University

VISION:-

To be an institution of excellence in open and distance education (ODL) through its academic philosophy, inspirational ways of education delivery and systematic interventions in teaching-learning processes to serve the societal needs and sustainable development goal for making future global citizens.

MISSION:-

1. To build an integerated open education system enabling the learning to attain their career as well as social and national goal.
2. To emerge as a knowledge centre through ICT facilities in education delivery processes and academic governanace.
3. To attain the global standards of academic practices through reaserach, institutional collaborations and need-based training program.
4. To make learner competitive and socially responsible citizens by incorporation of humanistic values and vocational skills in academic programs/curriculam.
5. To ensure inclusive and equitable quality higher education and promote lifelong learning opportunities to all sections of society.

University Build-up area

Total area of university 2,02,464.23 sq. mt.

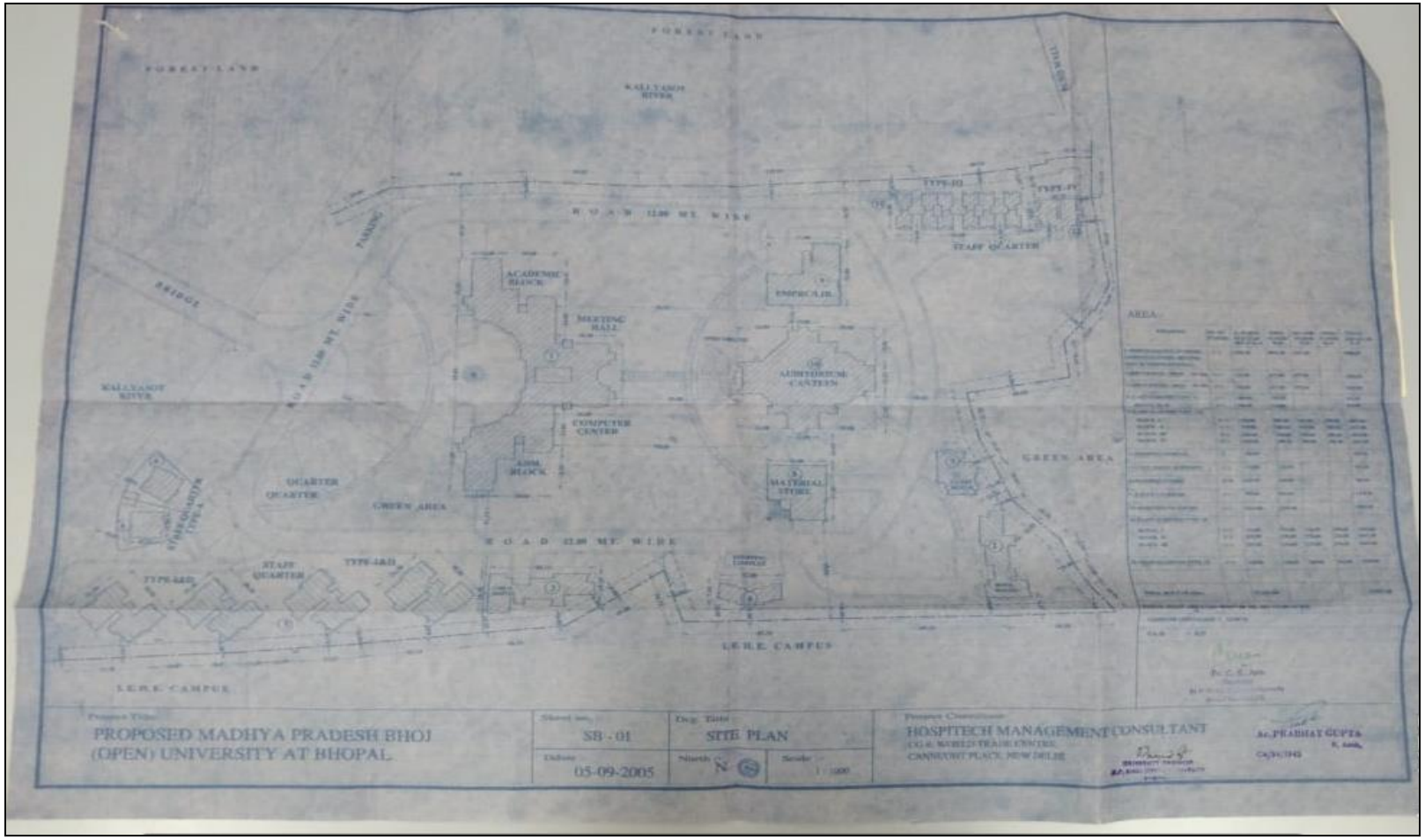
Details are the total build-up area given in the table:-

Sr.No.	Location	Area in Sq. mt.
1	Administrative building	9,480
2	Staff quarters	628
3	Staff quarters(Type-2)	8,148
4	Guest house	543
5	Material store	793
6	EMPRC/EDUSAT	1,638
7	Staff quarters(Type-3)	3,141
Total		24,371

University Population

Sr. No.	University Staff/ Student	No. of university population
1	Student	8,0149
2	Teaching staff	19
3	Non- teaching staff	48
4	Admin staff	03

MP Bhoj (Opne) University layout : -



1.2 About Green Auditing

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

Green audit means to identify opportunities for sustainable development practices, enhance environmental quality, improve health, hygiene, and safety, reduce liabilities achieve values of virtue. A 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 **"Madhya Pradesh Bhoj (Open) University"** enables assessment of the lifestyle, action, and its impact on the environment. This green audit was mainly focused on greening indicators like utilization of green energy (solar energy) and optimum use of secondary energy sources (petrol and diesel) in the University campus, vegetation, carbon footprint of the campus, etc. Green auditing aims to help the institution to apply sustainable development practices and to set examples before the community and young learners.

1.3 Objectives of Green Auditing

The general objective of a 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 a green audit mechanism.
- Providing a database for corrective actions and plans.
- To identify the gap areas and suggest recommendations to improve the green campus status of the University.

CHAPTER- 2
GREEN CAMPUS & SUSTAINABLE DEVELOPMENT

2.1 Green Audit

In the survey, the focus has been given to the assessment of the present status of plants and trees on the university campus and efforts made by the university authorities for nature conservation. The campus is in the vicinity of approximately more than 24,968 trees. The detail is given below:

Green Campus

2.2 List of plants in the university campus.

Sr. no.	Tree Name	Botanical Name	Total
1	Shisham	Dalbergia sissoo	5688
2	Satparni	Alstonia scholaris	120
3	Kadam	Neolamarckia cadamba	40
4	Morchali	Helicteres isora	56
5	Neem	Azadirachta indica	396
6	Aam	Mangifera indica	110
7	Jamun	Syzygium cumini	190
8	Aawla	Phyllanthus emblica	496
9	Palash	Butea monosperma	180
10	Patrangi jiva	Putranjiva roxburghii	12
11	Bottlepalm	Hyophorbe lagenicaulis	80
12	Peepal	Ficus religiosa	75
13	Gular	Ficus racemosa	25
14	Ber	Ziziphus mauritiana Lamk	45
15	Semal	Bombax Ceiba	30
16	Kalaseran		865
17	Babul	Vachellia nilotica	95
18	Chandan	Santalum album	12
19	Mahaneem	Swietenia mahogani L	15
20	Bargad	Ficus benghalensis	8
21	Amaltas	Cassia fistula	256
22	Gulmohar	Delonix regia	58
23	Shubabul	Leucaena leucocephala	1602
24	Kanji	Holoptelea integrifolia	2260
25	Mahua	Madhuca indica	1970
26	Aachar(Chironji)	Buchanania lanzan	75
27	Giloye(Chironji)	Tinospora cordifolia	445
28	Safed siran	Chlorophytum borivilianum	1850
29	Kathal	Artocarpus heterophyllus	15
30	Ghaman	Grwia Tillifolia	120
31	Katgular	Physalis angulata	340
32	Mungfali	Arachishypogaea	15
33	Kosam	Schleichera oleosa	18
34	Kachnar	Bauhinia Variegata	920
35	Fikes	Ficus	26
36	Imli	Tamarindus indica	28
37	Raijamun	Syzygium cumini	760

Sr. no.	Tree Name	Botanical Name	Total
38	Arjun tree	Terminalia arjuna	140
39	Bans tree	Bamboo	10
40	Gujja tree	Psidium guajava	38
41	UK biptus	Psidium guajava	8
42	Sagon	Tectona grandis	436
43	Tinus	Viburnum tinus	60
44	Kher(Black)	Senegalia catechu	4670
45	Kher(White)	Senegalia catechu	250
46	Tendu tree	Diospyros melanoxylon	60
Total			24,968

University has 24,968 **trees** on the campus. This is a good initiative taken by management for a green campus under the campaign of the plantation. **It's appreciable.**

Glimpse of some appreciable initiative by the university

Chapter-03
CARBON FOOTPRINT

3.1 About Carbon footprint.

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

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

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

We all have a carbon footprint…

3.2 Methodology and Scope

The carbon footprint gives a general overview of the Madhya Pradesh Bhoj (Open) University 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 Madhya Pradesh Bhoj (Open) University 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 Madhya Pradesh Bhoj (Open) University. This includes electricity, as well as emissions 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.

3.3 Carbon Emission From Electricity

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

Unlike 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 a significant contributor to GHGs emissions 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 for generating electricity, the carbon dioxide intensity of electricity for the 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	Unit	Emission Factor kg CO_2e/kWh	Emission ton CO_2e/year
1	2022-23	2,31,163	kWh	0.9613	222.17

3.4 Solar Photovoltic System

University has install 100 kWp solar system.

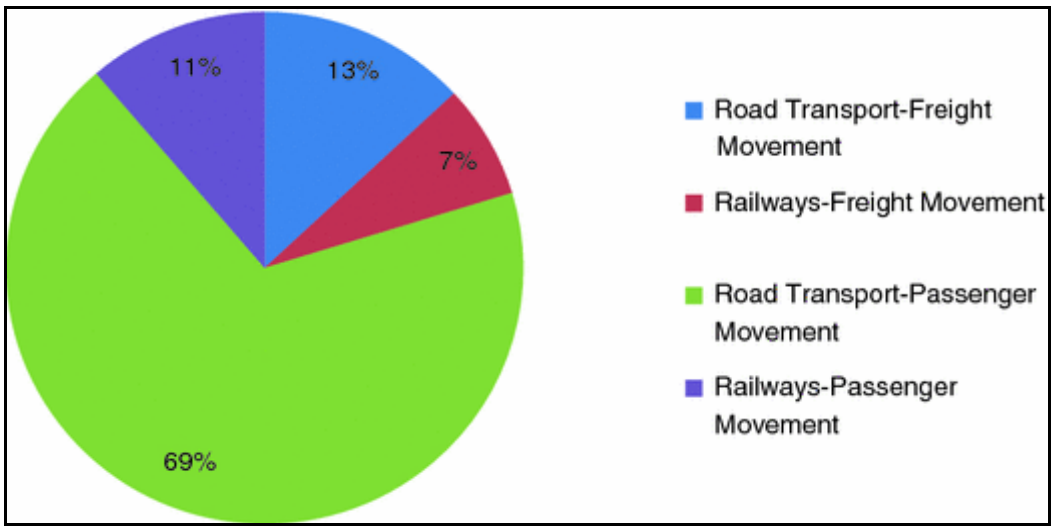
Observation:-

Total CO_2 Emission by indirectly from electricity is 222.17 Ton CO_2 e/year in 2022-23.

Sr. no	Year	Total unit Consumption	Unit	Emission Factor kg CO_2e/kWh	Emission ton CO_2e/year
1	2022-23	31998	kWh	0.9613	30.75

3.5 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 fuels for our cars, trucks, ships, trains, and planes.

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

The energy team has analyzed the following vehicle movement for university campus.

Calculation of Carbon footprint analysis: -

As per discussion by the concerned department in the university and data provided by management.university has 2 car, 2 truck.

The following details are given in the table: -

Sr. No.	Month& Year	Distance travelled Per Month (KM)	Disesel Consumption (Ltr.)
1	Apr-22	10,362	922
2	May-22	11,819	1,145
3	Jun-22	13,625	1,314
4	Jul-22	15,450	1,362
5	Aug-22	13,590	1,023
6	Sep-22	11,840	1,255
7	Oct-22	9,061	808
8	Nov-22	8,091	833.2
9	Dec-22	9,165	930
10	Jan-23	9,004	915
11	Feb-23	957	294
12	Mar-23	3,998	375
Total		1,16,962	1,11,76

- 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 liters)

- CO_2 Emissions from a Littre of gasoline: 2347.95 grams CO_2/ Liter.
- CO_2 Emissions from a Littre of diesel: 2689.56 grams CO_2/ liter.

$$\text{Total } CO_2 \text{ Emissions} = \frac{CO_2 \text{ Per liter}}{\text{Average Mileage (Km/Liter)}} \times \text{Distance (in km)}$$

$$\text{Total } CO_2 \text{ Emissions} = \frac{2689.59}{10.46} \times 116962 = \mathbf{30,074,553 \text{ gram or } 30.0. \text{ ton/year}}$$

Sr. No.	Month& Year	Distance travelled Per Month (KM)	Disesel Consumption (Ltr.)
1	Apr-22	2753	428
2	May-22	2587	446
3	Jun-22	1563	330
4	Jul-22	6963	1057
5	Aug-22	991	180
6	Sep-22	0	0
7	Oct-22	0	0
8	Nov-22	0	0
9	Dec-22	0	0
10	Jan-23	0	0
11	Feb-23	0	0
12	Mar-23	0	0
Total		14857	2441

$$\text{Total } CO_2 \text{ Emissions} = \frac{CO_2 \text{ Per liter}}{\text{Average Mileage (Km/Liter)}} \text{ X Distance (in km)}$$

$$\text{Total } CO_2 \text{ Emissions} = \frac{2689.59}{6.08} \text{ X } 14857 = \mathbf{6572243.1 \text{ gram or } 6.57 \text{ Ton/year}}$$

3.6 Carbon emission from DG sets: -

University has 02 no. DG sets installed on the university campus

Table 4.5 :- Total diesel consumption in a year Apr-2022 to Mar-2023.

Sr. No.	Month&Year	Diesel consumption(in ltr.)
1	Apr-22	100
2	May-22	50
3	Jun-22	200
4	Jul-22	0
5	Aug-22	500
6	Sep-22	100
7	Oct-22	100
8	Nov-22	100
9	Dec-22	50
10	Jan-23	0
11	Feb-23	0
12	Mar-23	100
Total		1300

Every liter of diesel fuel contains 720 grams of pure carbon. In an average liquid hydrocarbon burning engine. It can be assumed that about 99 % of the fuel is Oxidized (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 CO_2.

Calculation of Total CO_2 =

- CO_2 Emissions from a Littre of diesel: 2689.56 grams CO_2/ liter.
- Diesel consumption Apr-2022 to Mar-2023 = 1300 Liter
- 1300 x 2689 = 30493260 gram. or **3.49Ton/year**

3.7 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)

$$BGB = AGB \times 0.15$$

2 Total Biomass (TB)

$$TB = AGB + BGB$$

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

$$C = W \times 0.50$$

4 Calculate the weight of CO_2 sequestered in the tree per year in Kg.

$$CO_2 = C \times 3.666$$

Where: -

AGB = Above ground biomass.

D = Diameter of tree breast height.

BGB = Below Ground Biomass.

C = Carbon

TB = Total Biomass.

Biomass calculation of the tree

Sr. no.	Tree Name	Botanical and Family Name	Average Daimeter CM (10 to 100)	AGB	BGB	Total	Carbon Storage	Amount of Co2 Sequestered	Total	Total Amount of Co2 Sequestered	Annually Co2 Sequestered amount (Ton/year)
1	Shisham	Dalbergia sissoo	32	471.5	70.7	542.2	271.1	993.9	5688	5653529	77.11
2	Satparni	Alstonia scholaris	36	623.9	93.6	717.5	358.7	1315.2	120	157821	2.15
3	Kadam	Neolamarckia cadamba	34	545.0	81.8	626.8	313.4	1148.8	40	45953	0.63
4	Morchali	Helicteres isora	16	79.2	11.9	91.1	45.5	166.9	56	9349	0.13
5	Neem	Azadirachta indica	32	471.5	70.7	542.2	271.1	993.9	396	393600	5.37
6	Aam	Mangifera indica	30	403.5	60.5	464.0	232.0	850.5	110	93554	1.28
7	Jamun	Syzygium cumini	34	545.0	81.8	626.8	313.4	1148.8	190	218278	2.98
8	Aawla	Phyllanthus emblica	20	144.7	21.7	166.4	83.2	305.0	496	151280	2.06
9	Palash	Butea monosperma	18	109.2	16.4	125.6	62.8	230.2	180	41444	0.57
10	Patrangi jiva	Putranjiva roxburghii	30	403.5	60.5	464.0	232.0	850.5	12	10206	0.14
11	Bottlepalm	Hyophorbe lagenicaulis	22	185.6	27.8	213.4	106.7	391.2	80	31296	0.43
12	Peepal	Ficus religiosa	34	545.0	81.8	626.8	313.4	1148.8	75	86163	1.18
13	Gular	Ficus racemosa	42	893.2	134.0	1027.2	513.6	1882.9	25	47072	0.64
14	Ber	Ziziphus mauritiana Lamk	20	144.7	21.7	166.4	83.2	305.0	45	13725	0.19
15	Semal	Bombax Ceiba	16	79.2	11.9	91.1	45.5	166.9	30	5008	0.07
16	Kalaseran	NA	28	340.9	51.1	392.0	196.0	718.5	865	621501	8.48

Sr. no.	Tree Name	Botanical and Family Name	Average Daimeter CM (10 to 100)	AGB	BGB	Total	Carbon Storage	Amount of Co2 Sequestered	Total	Total Amount of Co2 Sequestered	Annually Co2 Sequestered amount (Ton/year)
17	Babul	Vachellia nilotica	32	471.5	70.7	542.2	271.1	993.9	95	94424	1.29
18	Chandan	Santalum album	30	403.5	60.5	464.0	232.0	850.5	12	10206	0.14
19	Mahaneem	Swietenia mahogani L	28	340.9	51.1	392.0	196.0	718.5	15	10777	0.15
20	Bargad	Ficus benghalensis	48	1211.4	181.7	1393.2	696.6	2553.7	8	20429	0.28
21	Amaltas	Cassia fistula	26	283.7	42.5	326.2	163.1	598.0	256	153075	2.09
22	Gulmohar	Delonix regia	34	545.0	81.8	626.8	313.4	1148.8	58	66632	0.91
23	Shubabul	Leucaena leucocephala	24	231.9	34.8	266.7	133.3	488.9	1602	783140	10.68
24	Kanji	Holoptelea integrifolia	28	340.9	51.1	392.0	196.0	718.5	2260	1623806	22.15
25	Mahua	Madhuca indica	30	403.5	60.5	464.0	232.0	850.5	1970	1675474	22.85
26	Aachar(Chironji)	Buchanania lanzan	24	231.9	34.8	266.7	133.3	488.9	75	36664	0.50
27	Giloye(Chironji)	Tinospora cordifolia	22	185.6	27.8	213.4	106.7	391.2	445	174084	2.37
28	Safed siran	Chlorophytum borivilianum	16	79.2	11.9	91.1	45.5	166.9	1850	308843	4.21
29	Kathal	Artocarpus heterophyllus	36	623.9	93.6	717.5	358.7	1315.2	15	19728	0.27
30	Ghaman	Grwia Tillifolia	22	185.6	27.8	213.4	106.7	391.2	120	46944	0.64
31	Katgular	Physalis angulata	20	144.7	21.7	166.4	83.2	305.0	340	103700	1.41
32	Mungfali	Arachishypogaea	16	79.2	11.9	91.1	45.5	166.9	15	2504	0.03
33	Kosam	Schleichera oleosa	20	144.7	21.7	166.4	83.2	305.0	18	5490	0.07
34	Kachnar	Bauhinia Variegata	16	79.2	11.9	91.1	45.5	166.9	920	153587	2.09

Sr. no.	Tree Name	Botanical and Family Name	Average Daimeter CM (10 to 100)	AGB	BGB	Total	Carbon Storage	Amount of Co2 Sequestered	Total	Total Amount of Co2 Sequestered	Annually Co2 Sequestered amount (Ton/year)
35	Fikes	Ficus	18	109.2	16.4	125.6	62.8	230.2	26	5986	0.08
36	Imli	Tamarindus indica	32	471.5	70.7	542.2	271.1	993.9	28	27830	0.38
37	Raijamun	Syzygium cumini	14	54.6	8.2	62.8	31.4	115.1	760	87466	1.19
38	Arjun tree	Terminalia arjuna	30	403.5	60.5	464.0	232.0	850.5	140	119069	1.62
39	Bans tree	Bamboo	20	144.7	21.7	166.4	83.2	305.0	10	3050	0.04
40	Gujja tree	Psidium guajava	30	403.5	60.5	464.0	232.0	850.5	38	32319	0.44
41	UK biptus	Psidium guajava	32	471.5	70.7	542.2	271.1	993.9	8	7952	0.11
42	Sagon	Tectona grandis	32	471.5	70.7	542.2	271.1	993.9	436	433358	5.91
43	Tinus	Viburnum tinus	18	109.2	16.4	125.6	62.8	230.2	60	13815	0.19
44	Kher(Black)	Senegalia catechu	30	403.5	60.5	464.0	232.0	850.5	4670	3971810	54.17
45	Kher(White)	Senegalia catechu	38	708.3	106.2	814.5	407.2	1493.0	250	373242	5.09
46	Tendu tree	Diospyros melanoxylon	32	471.5	70.7	542.2	271.1	993.9	60	59636	0.81
Total Co_2 Emission nuterlize By the trees											245.56

University has **24,968 trees** on campus. This is a good initiative taken by management for a green campus under the campaign of the plantation. **It's appreciable.** There are total CO_2 sequestered of **245.56 Tons /Year.** Its Appriciable.

Calculation of CO_2 Emission of Madhya Pradesh Bhoj (Open) University: -

Total Carbon Footprint generated by the campus	=	Carbon footprint by electricity + Carbon footprint by vehicle + Carbon footprint by DG Sets. - Carbon Neutralize by the Solar system - Carbon Neutralize by the tree,

Total Carbon Footprint by campus:

222.17+36.57+3.49 – 245.56 + 30.75 = -14.08 tons/year

3.8 Other Emissions Excluded

This study did not evaluate the carbon sequestration potential of existing plantation activities and emissions 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 emissions in the future years. Accordingly, a set of tools and record-keeping procedures will be developed for improving the quality of data collection for the next year's carbon footprint studies.

CHAPTER- 4
WASTE MANAGEMENT

4.1 About Waste:

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

Solid waste can be divided into three categories: biodegradable, non-biodegradable and hazardous waste. A bio-degradable waste includes food waste, 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 at the University. 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 University. The auditor diagnoses the prevailing waste disposal policies and suggests the best way to combat the problems.

Table 4.1 Different types of waste generated on the University Campus.

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

4.2 Waste Management Practices adopted by the University

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

Figure: - 4.1 Dustbin Collection system on the university campus

Recommendation

It is recommended adopted 5 bin waste collection system for collect different type of wastegenerated in university premises.

Recommended 5 dust bin waste collection System

4.3 Waste Collection Point

Audit team visited various departments, classroom, store to find out waste generation area and waste collection points for further improvement. At present university adopted 2 dustbin system. Details are given in the table.

Table: 4.2 List of waste collection dustbin system

Sr.no.	Location	Quantity
1	Admin	6
2	Garden	2
3	Material store	2
	Total	**10**

Observation:- Audit team already reccomended 5 dustbin system, At present university has 10 dustbin.

4.4 Organic Waste Composting Machine

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

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

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

University has a good potential to install an organic waste composting machine.

CHAPTER- 5

RECOMMENDATIONS AND SUGGESTIONS

5.1 QR Code system

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

Fig: 5.1 QR code system for plants

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

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

5.2 Other Suggestions

Some of the very important suggestions are: -

- Adopt the proposed Environmentally Responsible Purchasing Policy, and work towards creating and implementing a strategy to reduce the environmental impact of its purchasing decisions.
- Increase recycling education on campus.
- Increase Awareness of Environmentally Sustainable Development in university campus.
- Practice Institutional Ecology- Set an example of environmental responsibility by establishing institutional ecology policies and practices of resource conservation, recycling, waste reduction, and environmentally sound operations.
- Involve All Stakeholders- Encourage involvement of government, foundations, and industry in supporting interdisciplinary research, education, policy formation, and information exchange in environmentally sustainable development.
- Collaborate for Interdisciplinary Approaches- To develop interdisciplinary approaches to curricula, research initiatives, operations, and outreach activities that support an environmentally sustainable future.
- Increase reduces, reuse, and recycle education on campus.
- Develop a butterfly garden that arouses appreciation towards flora and fauna diversity.
- Name all the trees and plants (Plant DNA barcodes) with its common name and scientific name.
- Arrange training programmes on environmental management system and nature conservation.
- Establish a procurement policy that is energy saving and eco-friendly.

Annexure - 1

Green Policy

5. University's Green Practices

It is imperative to and responsibility of higher education to create value for humans, society, and the environment. Higher education institutions cannot restrict them to only pre-specified scholastic activities. Being sensitive and responsible to the environment is a trait that should be nurtured at different stages of students' educational journey. Significantly, the university makes its academic and non-academic employees, students, visitors, and other stakeholders aware of their environmental duties and future generations. Therefore, Madhya Pradesh Bhoj (Open) University, Bhopal, has identified the green practices as ascertained below–

5.1 Utilizing sustainable construction practices while renovation of existing infrastructure and/or any new development project or expansion initiative.
5.2 Making the university an attractive institution for education and research.
5.3 Giving preference to products/services base on their environmental friendliness or prefer least harmful products/services to the environment, if necessary.
5.4 Collaborating with suitable external organizations to explore environmental issues caused or faced by the university and their solutions.
5.5 Encouraging the conservation of native ecosystem in campus, and to strive to practice environmental responsibility of preservation of its natural woodlands.
5.6 Engaging staff and students in execution and monitoring of environmental policy.
5.7 Preventing pollution that may cause from University's operations and maintaining zero waste to its premises.
5.8 Collaborating with local community and/or task groups or NGOs to protect local environment.
5.9 Promote a purchase policy which supports those products/services which cause the least harm or no harm to the environment.
5.10 Promote and facilitate sustainable modes of transport to, from and within the University.
5.11 Developing the university's ability to practice sustainability principles and promoting understanding of environmental ethics between faculty, students, and the public in general.
5.12 Reviewing university's operations to reflect sustainable best practices.
5.13 Adopting a pro-active approach that places environmental aspects as one of the prime consideration in university's decision-making process.
5.14 Ensuring efficient and optimal utilization of resources such as land, water, and fuel, particularly, the non-renewable.
5.15 Adopting principles of green procurement by incorporating appropriate provisions in contracts and procurements.
5.16 Addressing Environmental complaints (pollution, degradation and rehabilitation/ restoration) with various stakeholders and Government Departments and conservation associations/societies.
5.17 For setting an example, MPBOU is encouraging all its stakeholders to adopt environment friendly alternatives in their life practices

END OF THE REPORT

THANKS