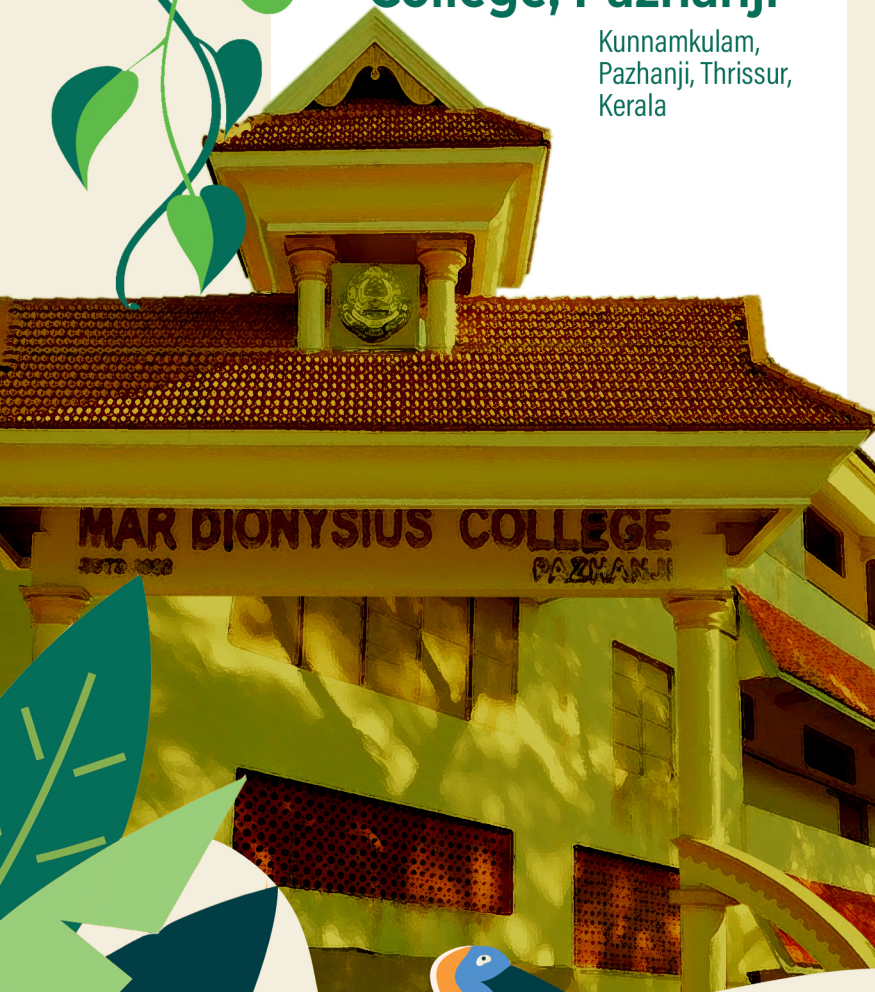


REPORT OF **GREEN AUDIT**

**Mar Dionysius
College, Pazhanji**

Kunnamkulam,
Pazhanji, Thrissur,
Kerala



Based on International Standards
ISO 14001: 2015, ISO 50001: 2018,
ISO 46001: 2019, ISO 14046: 2014,
ISO 14067: 2018, ISO 45001:2018



**MAR DIONYSIUS COLLEGE
PAZHANJI, THRISSUR.**

Affiliated to University of Calicut

REPORT OF GREEN AUDIT

Based on International Standards

ISO 14001: 2015, 50001: 2018, 46001: 2019, 14046: 2014, 14067: 2018, ISO 45001:2018



Auditee

Mar Dionysius College

Kunnamkulam, Pazhanji, Thrissur, Kerala - 680542

Affiliated to University of Calicut



Auditor

Tropical Institute of Ecological Sciences

ISO 9001:2015 Certified organization

Ecological Research Campus, K.K. Road, Velloor P.O., Kottayam, Kerala - 686501

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August, 2026

Disclaimer

This report is meticulously crafted by the Environment Management Committee of Mar Dionysius College, Pazhanji, Thrissur, Kerala with invaluable guidance and support from the ISO Green Audit Consultancy division of the Tropical Institute of Ecological Sciences (TIES: www.ties.org.in), located in Kottayam, Kerala. As an integral component of the Green Audit initiative conducted within the college premises, the data presented herein has been diligently collected by a team of certified internal auditors. College hostels and centenary block are not included in the study. Furthermore, the Report and Manual of Documented Information have undergone rigorous. Scrutiny by external auditors from TIES, ensuring alignment with ISO standards.

Published on 07th August 2026

Mar Dionysius College, Pazhanji.

TIES wish to acknowledge respective contributor's photographs and graphics are given in the pages 01,03, 16, 19, 21, 33, 105, 131, 161, 163, 215, 217, 221, 223, 227, 229 & 231

Preface

We are pleased and excited to present the Green Audit Report of Mar Dionysius College, Pazhanji, Thrissur, Kerala. This report represents the result of extensive research, careful analysis, and committed efforts to thoroughly assess the Environmental Management System (EMS) of our institution. As a college dedicated to educational excellence, Mar Dionysius College, Pazhanji, understands the vital role of environmental stewardship and sustainability. In alignment with these values, we conducted a comprehensive review of our environmental practices, identifying strengths and areas for improvement in various aspects of our operations.

The report provides a detailed overview of our environmental performance, including an Energy Audit, Water Efficiency Management Audit, Waste Management Audit, Biodiversity Audit, Occupational Health & Safety and Carbon Footprint Data. Each section offers valuable insights into our resource use, conservation initiatives, and environmental impact, demonstrating our commitment to creating a greener and more sustainable campus.

The findings in this report not only highlight our dedication to environmental responsibility but also set the foundation for strategic initiatives to further enhance our sustainability efforts. By implementing the recommendations outlined here, we aim to continuously improve our environmental performance, reduce our ecological footprint, and inspire positive change both within our campus community and beyond.

We sincerely thank all those who contributed to this report, including management, Principal, IQAC, faculty, staff, students, and external stakeholders. Your collective efforts have been crucial in advancing our environmental objectives and reinforcing our commitment to sustainability. As we continue on this journey, we remain dedicated to the principles of sustainability, innovation, and excellence, working together toward a greener and more resilient future for everyone.

Environment Management System Committee
Mar Dionysius College, Pazhanji, Thrissur, Kerala.
07.08.2026



In every walk with nature,
one receives far more than he seeks

- John Muir -

Table of contents

01	Green Audit at ISO Standards for Colleges & Universities	03
1.1	Introduction	03
1.2	Higher Education and Sustainable Development	03
1.3	UN SDG Goals and ISO Standards	04
1.4	Green Audit at ISO Standard	04
1.5	Green Audit Certification Body	05
1.6	Green Audit as per ISO standards at Mar Dionysius College Pazhanji	05
02	Profile of the College	09
2.1	Profile of the college	09
2.2	Vision	10
2.3	Mission	10
2.4	Motto	10
2.5	Goal and objectives	10
2.6	Governing council	10
2.7	College council	10
2.8	College staff council	11
2.9	College IQAC	11
2.10	Academic programs	12
2.11	College Organogram	13
2.12	Strength of the college	13
2.13	Campus location & layout	16
2.14	Facilities of the college	17
03	Environment Management System (EMS) Audit Report	21
3.1	Environment Management Policy	21
3.2	Environment Management Plan	29
04	Energy Management System (EnMS) Audit Report	35
4.1	Introduction	35
4.2	Energy Management System Policy	37
4.3	Methodology	39
4.4	Result and discussion	43
4.5	Conclusion	93
4.6	Recommendations	94
4.7	Energy Management Plan	94
4.8	Summary	97
4.9	Activities Conducted	98
05	Water Efficiency Management System (WEMS) Audit Report	107
5.1	Introduction	107
5.2	Water Efficiency Management Policy	109
5.3	Methodology	112
5.4	Results and Discussion	115
5.5	Conclusion	125

5.6	Recommendations	125
5.7	Water Efficiency Management Plan	126
5.8	Summary	128
5.8	Activities Conducted	129
06	Campus Biodiversity Register (CBR)	131
6.1	Introduction	133
6.2	Campus Biodiversity Management Policy	135
6.3	Methodology	139
6.4	Results and Discussion	143
6.5	Conclusion	152
6.6	Recommendations	153
6.7	Biodiversity Management Plan	154
6.8	Summary	157
6.9	Activities Conducted	158
07	Waste Management System (WMS) Audit	161
7.1	Introduction	163
7.2	Waste Management Policy	165
7.3	Methodology	168
7.4	Results and Discussion	171
7.5	Conclusion	180
7.6	Recommendations	180
7.7	Waste Management Plan	181
7.8	Summary	183
7.8	Activities Conducted	184
08	Occupational Health & Safety Management System	187
8.1	Introduction	189
8.2	Occupational Health & Safety Management Policy	190
8.3	Methodology	193
8.4	Results and Discussion	196
8.5	Conclusion	206
8.6	Recommendations	206
8.7	Occupational Health & Safety Management Plan	207
8.8	Summary	209
8.9	Activities Conducted	211
09	Carbon Foot Print (CF)	215
9.1	Introduction	217
9.2	Institutional background	217
9.3	Methodology and emission factors	217
9.4	Result and data analysis	218
9.5	Summary Emission Ledger & Per Capita Impact	219
9.6	Biodiversity management system	220
9.7	Recommendations	220
9.8	Conclusion	220
10	General Conclusion of Green Audit & Recommendation	221
10.1	General Conclusions	223
10.2	General Recommendation	225
11	Best Practices of Environment Management System	227
12	Executive Summary Report	231

Chapter I

**GREEN AUDIT
AT ISO STANDARDS
FOR COLLEGES &
UNIVERSITIES**

An Introduction





The Earth does not belong to us.
We belong to the Earth

- Marlee Matlin -

Green audit at ISO Standards

1.1. INTRODUCTION

Green audit in colleges, also known as an environmental audit or sustainability audit, is a systematic examination of an educational institution's operations, practices, and facilities to assess their environmental impact and identify opportunities for improvement in sustainability efforts.

During a green audit, various aspects of the college's operations are typically evaluated, including energy consumption, waste management, water usage, transportation, procurement practices, and overall environmental policies. The audit may involve gathering data, conducting interviews with key stakeholders, and assessing compliance with environmental regulations and standards.

The goal of a green audit in colleges is to promote environmental responsibility, reduce the institution's ecological footprint, and foster a culture of sustainability among students, faculty, and staff. By identifying areas for improvement and implementing targeted strategies, colleges can enhance their environmental performance and contribute to broader efforts toward sustainability and climate action.

1.2. HIGHER EDUCATION AND SUSTAINABLE DEVELOPMENT

The 2030 Agenda, powered by the UN Sustainable Development Goals (SDGs), goals encompass a broad view of development, spanning environmental, social, and economic sustainability.

The SDGs serve as a compass for nations, institutions, and civil society to navigate their journey towards lasting peace and prosperity for both people and the planet. In this monumental task, every individual and organization have a role to play. Among them, higher education institutions (HEIs) occupy a unique and pivotal position.

Firstly, HEIs have a primary mission to educate and train the future leaders, equipping them with the skills and knowledge necessary to contribute to sustainable societies.

Secondly, HEIs undertake a significant and innovative role in research, generating cutting-edge knowledge and technology that can drive societal progress.

Thirdly, HEIs directly benefit communities by sharing their knowledge and technology and forging alliances with other stakeholders in the Quadruple Helix, which includes governments, industry, and societal groups.

Moreover, the management and administration of HEIs offer an opportunity to lead by example, promoting ethical and sustainable governance, strategies, and operations.

This distinctive position empowers HEIs not only to participate in but to lead the charge toward sustainable economic, social, and environmental development. However, this potential comes hand in hand with a significant responsibility to do everything possible to advance sustainable development. While many HEIs already contribute to the SDGs in various ways and to varying degrees, these efforts are often scattered and lack a comprehensive institutional-level sustainability approach or strategy.

In this era of unprecedented global challenges, it's time for HEIs to unite their efforts, align their strategies, and take a leadership role in driving sustainable development forward. Together, they can be the change-makers, guiding us towards a brighter, more sustainable future for all.

[Adapted from "General guidelines for the implementation of sustainability in Higher Education Institutions", 2023. UNESCO & UN Academic Impact].

1.3. UN SD GOALS AND ISO STANDARDS

The UN-SD goals, an ambitious action plan to enhance peace and prosperity, eradicate poverty and protect the planet is recognized globally as essential for the future sustainability of our world. To be successful, the process requires consensus, collaboration and innovation. ISO has published more than 22000 International Standards and related documents that represent globally recognized guidelines and frameworks based on international collaboration. Built around consensus, they provide a solid base on which innovation can thrive and are essential tools to help governments, industry and consumers contribute to the achievement of every one of the SDGs.

ISO standards support the three pillars of sustainable development :

Economic - ISO standards promote economic sustainability by facilitating international trade, improving a country's national quality infrastructure and supporting sustainable business practices. They cover everything from efficient farming methods to anti-bribery management systems.

Social - ISO Standards promote social sustainability by helping countries and communities to improve the health and well-being of their citizens. They cover all aspects of social welfare, from healthcare systems and related products to social inclusion and accessibility.

Environmental - ISO International Standards promote environmental sustainability by helping businesses and countries manage their environmental impact. They cover such aspects as implementing an environmental management system, measuring and reducing greenhouse gas emissions and energy consumption, and encouraging responsible consumption.

1.4. GREEN AUDIT AT ISO STANDARDS- WHY?

Green Audits are not merely an obligation for NAAC accreditation; they are in alignment with the broader canvas of Sustainable Development Goals. This dynamic form of environmental scrutiny reveals compliance gaps and pinpoints areas for bolstering management systems, all while proposing viable corrective actions.

Green audit helps to reduce negative impacts on environment and enhancing conservation in college and university campuses. Its main objectives are:

- A systematic examination to assess an institution's environmental responsibility
 - Aims to identify environmental compliance, gaps or lapses in implementation of conservation activities
 - Checking whether they meet stated institutional objectives and complied with including environmental management laws and ISO standards
 - Suggesting corrective measures for improvement
- It is highly significant for every academic institutions in the present scenario:
- Mandatory as per the NAAC advisory
 - Essential for complying with SD Goals

- It can help to improve the quality of academic and research processes, by complying environmental quality standards which are at par with international standards.
Help to identify areas where improvement could be possible.
- It can exhibit your university/college as an institution of international standards.
- It will help to bring more accreditations and awards easily.
- ISO certification will help to save money by streamlining your processes and making them more efficient.

1.5. GREEN AUDIT CERTIFICATION BODY

The present audit report is evaluated and external audit is conducted by Tropical Institute of Ecological Sciences (TIES- www.ties.org.in), following relevant ISO standards.

TIES is a trailblazing, professionally managed environmental research organization with over 10 years of experience in conducting comprehensive green audits in academic and research institutions, in accordance with relevant ISO protocols. Accredited with the prestigious ISO 9001:2015 certification, TIES has built an illustrious track record, having audited 30 colleges across arts, science, and professional streams, as well as two leading universities in South India, bringing extensive expertise to every audit it undertakes.

TIES have developed a unique Green Audit protocol based on relevant ISO standards. The Green audit certification for academic and research institutions by TIES is based on the following international standards:
1.5. Steps of green audit as per ISO standards.

No.	Phase	Major activities
1	Pre Audit Period	Questionnaire survey Pre audit visit to assess the facilities/infrastructure available Identify the key persons/system personals- organize for the audit
2	Audit activities at the site	Collection and collation of information (review of records) Conducting audit, Monitoring and verification
3	Post audit period	Draft report, Final report

Table 1.1. Stages of Green Audit

1.6. GREEN AUDIT AS PER ISO STANDARDS AT MAR DIONYSIUS COLLEGE, PAZHANJI

1.6.1. Process of green audit as per ISO standards

The Green audit programme as per ISO standards and developed by TIES is a customized package for universities and colleges in India, considering prevailing specific academic and social environment. It is relatively simple and easy to implement and practice.
A PLAN-DO-CHECK-ACT System is implemented.

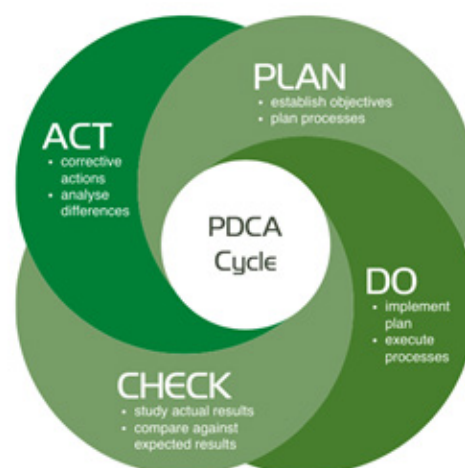


Fig.1.1. PDCA cycle of Green Audit

1.6.2. Mar Dionysius College, Pazhanji

The IQAC coordinator and the Principal of the college requested Tropical Institute of Ecological Sciences (TIES) to conduct a green audit at the college on 23.04.2025. TIES initiated the formal proceedings of the audit by requesting the prerequisite data for green audit from the college, on 25.04.2025. The college has submitted required information on 29.04.2025. Subsequently, the MoU for green audit was signed between the Principal of the college and Secretary, TIES on 27.06.2025 for a period of three months for the completion of the audit process and valid for three years. Experts from TIES ISO Green Audit Consultancy division had given a full day training for internal auditors on 27.06.2025. All participants who passed the evaluation process were given with certificate as Internal auditor.

Internal auditors aggregated to various committees like Environment Management System Committee (EMS), Energy Management System Committee (EnMS), Water Efficiency Management System (WEMS), Waste Management System (WMS), Biodiversity Management Committee (BMC) and Occupational Health and Safety Management Committee (OHSM). The internal audit process have been implemented and carbon foot print of the college was estimated by EMS of the college. They collected data on various audit components and documented, analyzed and prepared the report.

The final external audit by assessee from TIES was conducted on 05.07.2026

The first surveillance audit is scheduled for August 2027

GREEN AUDIT Based on ISO Standards



Environment Management System



TIES 2026



Chapter II

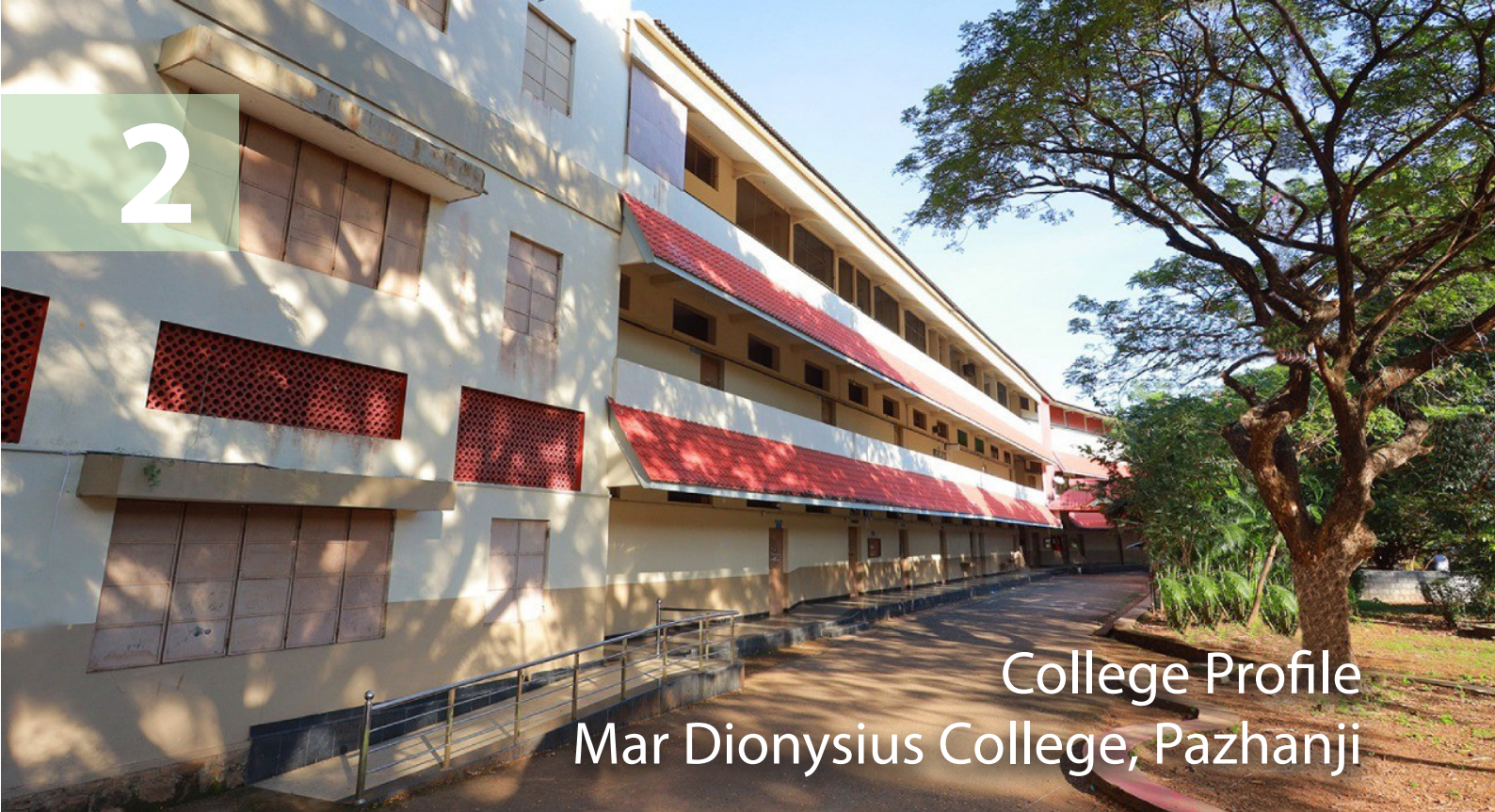
COLLEGE PROFILE MAR DIONYSIUS COLLEGE, PAZHANJI





Sustainable development begins
with Education

- UNESCO -



College Profile Mar Dionysius College, Pazhanji

2.1 PROFILE OF THE COLLEGE

Mar Dionysius College is situated at Pazhanji a small town with a beautiful and serene land scape, 6 kms away from Kunnamkulam municipal town and 14 kms from the Guruvayoor railway station. The village prides itself with its unique cultural tradition and made richer by its proximity to various churches, temples and mosques.

M. D. College, Pazhanji in Thrissur District, affiliated to the University of Calicut was formally inaugurated on 16th December 1982 under the Educational Agency of H.H.Moran Mar Baselios Marthoma Mathews I, Catholicos of the East and Malankara Metropolitan representing the Malankara Orthodox Syrian Church. The college is established in the memory of Late His Grace Pulikkottil Joseph Mar Dionysius I. Metropolitan, founder of the Orthodox Theological Seminary, Kottayam. The college started functioning as a junior college in the Sunday School building in the Orthodox Church Pazhanji, with two batches in pre-degree, one each in Arts and Commerce. In 1982, the present college site at Aruvayi was acquired and the dream of people in and around Pazhanji became a reality on 13th March 1985 on 13.5 acres of land.

The College was upgraded in the year 1991 as a degree

college with BA degree course in Economics. Many other courses were started in consecutive years. B.Sc. in Mathematics was started in the year 1993. In 1995, the college was upgraded as a Post Graduate College with an M.A. in Economics. Under the faculty of Commerce and Management Studies, the BBS degree course (presently B.B.A.) was also started in the year 1998. Later, B.A.(English Language and Literature) and B.Com (Computer Application) were also started in 2000 and 2005 respectively. Other courses were introduced in the coming years such as B.Sc. (Physics), B.C.A. and M.Com. in 2013; and B.S.W., B.Com. (Finance), B.Sc. (Psychology) and B.T.T.M. courses in 2015. In 2000, the College also received a grant 2F/12 B registration from the University Grants Commission.

The college has been making consistent progress in results and academic proficiency and is currently at the zenith of excellence. Honour in the history of college was marked by securing first and third rank for BBS in the year 2001. The glory kept continuing when the first rank in BBA was bagged in the years 2002 and 2004. B.Sc. (Mathematics) students also bagged second rank and third rank in the years 2010 and 2011 respectively.

The institution believes that quality of work is from the blessings of the almighty. Let the Lord build and guard

our second home with all heavenly blessings. H.H. Baselius Marthoma Mathews III Catholicos of the East and Malankara Metropolitan is the Educational Agency and the President of the Local Governing Board. His insight, enthusiasm, patronage, guidance and support helps the institution to move on its path of progress. H.G. Dr. Thomas MarAthanasios Metropolitan, Manager of M.O.C Colleges has a special concern towards the institution. Dr. M. E. Kuriakose, Secretary, MOC Colleges, also stands by us in all the developmental programmes of the College

2.2 VISION OF THE COLLEGE

The vision of the college is the entire transformation and upliftment of rural youth through education.

2.3 MISSION

The mission of the college is “the total dedication for education and to enable the less privileged youth to acquire knowledge and develop their personality – to

transform themselves to transform the society.”

2.4 MOTTO

The motto of the college is “The Lord Gives Wisdom.” Knowledge can be acquired even without understanding the omnipresence and omnipotence of God; however, wisdom can be attained only through God, who is the sole source of it.

2.5 GOALS AND OBJECTIVES

- To enable the youth to accept the challenges of the modern age.
- To develop the intellect.
- To promote scholastic pursuit, aesthetic appreciation and physical abilities. to strengthen the spiritual and moral fibre of the human material for the individual and social development.
- To inculcate a sense of fatherhood of god almighty and brotherhood of man.

2.6 GOVERNING COUNCIL

Sl.No.	Name	Designation
1.	H.H.Baselios Marthoma Mathews III	Educational Agency
2.	H.G.Geevarghese Mar Yulious Metropolitan	Manager
3.	Rev.Fr.Joseph Cheruvathoor	Governing Board Secretary
4.	Mr. C.K.Mohan	Treasurer
5.	Dr. Thomas Mathew	Principal
6.	Prof.Dr. Rejimon P.M.	Vice Principal

Table 2.1 College Governing body

2.7 COLLEGE COUNCIL

Sl.No.	Name	Designation
1	Dr.Thomas Mathew (Principal)	College Council President
2	Prof. Dr. Rejimon P.M	College Council Secretary
3	Dr.V.Vibitha Kochamani	Elected member
4	Ms.Simi Baby Thattil	Elected member
5	Capt.Dr.Shaheetha K.S	Member of the Council
6	Dr.Manjusha K.K	Member of the Council
7	Mr.Haridas.K	Member of the Council
8	Mr.Mathew Issac	Member of the Council
9	Mr.Shabu Jacob P.M	Member of the Council
10	Ms.Anju Babu	Member of the Council

11	Ms.Lakshmi P.G	Member of the Council
12	Ms.Lijisha.P	Member of the Council
13	Ms.Minu Mathews (junior supt)	Member of the Council
14	Ms Sitha Lakshmi	Member of the Council
15	Ms Sneha Joseph (Librarian)	Member of the Council
16	Ms Sreekala.R	Member of the Council
17	Ms Unnimaya A.U	Member of the Council

Table 2.2 College Council

2.8 COLLEGE STAFF COUNCIL

Sl.No.	Name	Designation
1	Dr.Thomas Mathew (Principal)	College Council President
2	Prof. Dr. Rejimon P.M	College Council Secretary
3	Dr.V.Vibitha Kochamani	Elected member
4	Ms.Simi Baby Thattil	Elected member
5	Capt.Dr.Shaheetha K.S	Member of the Council
6	Dr.Manjusha K.K	Member of the Council
7	Mr.Haridas.K	Member of the Council
8	Mr.Mathew Issac	Member of the Council
9	Mr.Shabu Jacob P.M	Member of the Council
10	Ms.Anju Babu	Member of the Council
11	Ms.Lakshmi P.G	Member of the Council
12	Ms.Lijisha.P	Member of the Council
13	Ms.Minu Mathews (junior supt)	Member of the Council
14	Ms Sitha Lakshmi	Member of the Council
15	Ms Sneha Joseph (Librarian)	Member of the Council
16	Ms Sreekala.R	Member of the Council
17	Ms Unnimaya A.U	Member of the Council

Table 2.3 College staff council

2.9 IQAC

Sl.No.	Name	Designation
1	Dr. Thomas Mathew	Chairman and Principal
2	Dr. Raji A. M. (Asst. Professor of Management Studies)	Coordinator of IQAC
3	Lt. Dr. Benson C C (Asst. Professor of Computer Application)	Coordinator of NAAC
4	Prof. (Dr.) Rejimon P. M. (Professor of Economics)	Teacher Representative
5	Capt. Dr. Shaheetha K. S. (Asst. Professor of Management Studies)	Teacher Representative
6	Ms. Divya Krishna (Asst. Professor of English)	Teacher Representative
7	Ms. Kalajanan (Asst. Professor of Physics)	Teacher Representative
8	Ms. Sreekala R. (Asst. Professor of Physics)	Teacher Representative

9	Dr. V. Vibitha Kochamani (Asst. Professor of Mathematics)	Teacher Representative
10	Ms. Anisha Ramdas (Asst. Professor of Economics)	Teacher Representative
11	Mr. Haridas K. (Asst. Professor of Commerce)	Teacher Representative
12	Ms. Minu Mathews	Office Superintendent
13	Rev. Fr. Joseph Cheruvathoor	Management Representative
14	Mr. Shiju C K	Industry Representative
15	Mr. Ragesh	Alumni Representative
16	Mr. Muhammed Manoj E. V.	Parent Representative
17	Mr. Sachin	Student Representative

Table 2.4 IQAC representatives of the college

2.10 ACADEMIC PROGRAMS

Sl. No	Department	Programme	Courses Offered	Total Seats
1	Economics	BA Economics	Aided	70
		MA Economics	Aided	30
		Ph.D Economics	Aided	14
2	English	BA English	Aided	39
3	Computer Application	BCA	Aided	34
4	Management Studies	BBA	Aided	59
5	Mathematics	B.Sc Maths	Aided	44
6	Physics	B.Sc Physics	Aided	33
7	Commerce	B.Com Finance	Self Financing	46
		B.Com Computer Application	Self Financing	46
		M.Com Finance		30
8	Travel and Tourism	BTTM	Self Financing	29
9	Social Work	BSW	Self Financing	29
10	Psychology	B.Sc Psychology	Self Financing	29

Table 2.5 Academic programmes of the college

2.11 ORGANOGRAM

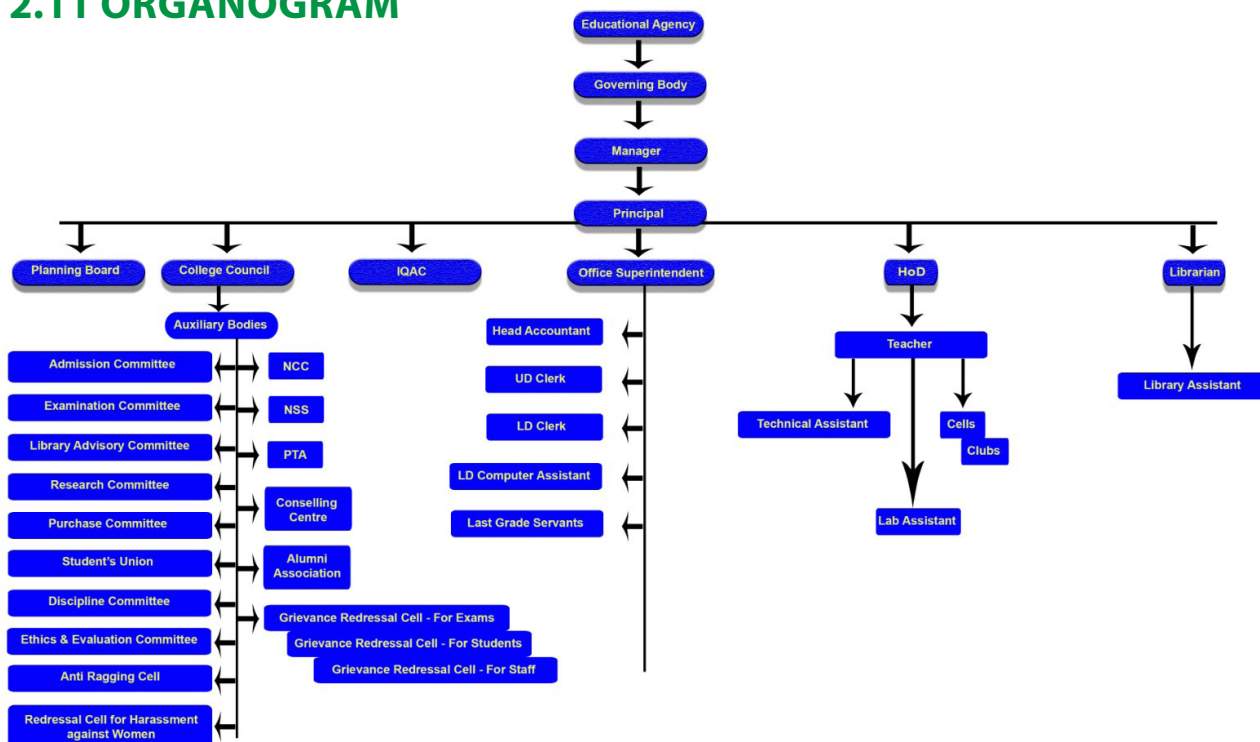


Fig 2.1 Organogram of the college

2.12 STRENGTH OF THE COLLEGE

2.12.1 Student Strength (2024-25)

Sl.No.	Department	Number of Students		Total
		Female	Male	
1	BBA	74	67	141
2	English	59	35	94
3	Physics	23	21	44
4	BCA	46	48	94
5	Economics	145	60	205
6	Mathematics	48	13	61
7	BCom CA	36	76	112
8	BCom Fin	52	69	121
9	BTTM	14	56	70
10	BSW	31	26	57
11	Psychology	41	13	54
TOTAL				1053

Table 2.6 Total students strength

2.12.2 Teaching Staff (2024-25)

Strength of the Faculty							
Sl No	Department	Program	Men	Women	Contract	Permanent	Total
1	Management Studies	BBA	0	4	0	4	4
2	English	BA English	1	4	1	4	5
3	Physics	B.Sc Physics	0	3	0	3	3
4	Computer Application	BCA	1	3	0	4	4
5	Economics	BA Economics	1	3	0	4	4
6	Mathematics	B.Sc Mathematics	0	3	1	2	3
7	Commerce- CA	B.Com CA	1	4	5	0	5
8	Commerce-Finance	B.Com Finance	1	4	5	0	5
8	Travel and Tourism	BTTM	1	2	3	0	3
9	Social Work	BSW	0	3	3	0	3
10	Psychology	B.Sc Psychology	0	3	3	0	3
Single Faculty Department							
1	Statistics		1	1	1	1	2
2	History		1	0	1	0	1
3	Political Science		1	0	1	0	1
4	Malayalam		0	2	2	0	2
5	Sanskrit		0	1	1	0	1
6	Hindi		0	1	1	0	1
7	English		0	2	2	0	2
8	Physical Education		1	0	0	1	1

Table 2.7 Total teaching staff strength

2.12.3 Non-Teaching Staff (2024-25)

Sl No	Category	Permanent	Contract
1	J.S.	1	-
2	H.A.	1	-
3	U.D.CLERK	1	-
4	Technical Assistant	1	-
5	Library Assistant	2	-
6	L.D.CLERK	1	-
7	Librarian	1	-
8	Self-Financing Director	-	1
9	Computer Assistant	1	-
10	Office Attendant	3	-
11	Accountant	-	1

12	Office Staff	-	3
13	Cleaning Staff	-	9
14	Watchman	-	2
15	Supporting Staff	-	1
16	Lab Assistant	-	1
		12	18
Total		30	

Table 2.8 Total non-teaching staff strength

2.12.4 Total strength of college community (2024-25)

Sl.No	Category	Number
1	Students	1053
2	Teaching Staff	53
3	Non- Teaching staff	30
Total		1136

Table 2.9 Total strength of the college

2.12.5 Detailed program of the college

2.12.5.1 Aided programs

SL.NO	Department	Program
1	Management Studies	BBA
2	English	B.A. English
3	Physics	BSc. Physics
4	Computer Application	BCA
5	PG & Research Dept. of Economics	B.A. Economics
6	Mathematics	BSc. Mathematics

Table 2.10 Aided programs of the college

2.12.5.2 Unaided programs

Sl No	Department	Program
1	Commerce	BCom
2	Travel and Tourism	BTTM
3	Social Work	BSW
4	Psychology	BSc. Psychology

Table 2.11 Unaided programs of the college

2.12.5.2 Doctoral program

Sl No	Department	Program
1	PG & Research Dept. of Economics	PhD
2	Name of the Guides	Prof. Dr. Rejimon P.R Professor, Department of Economics, Dr.Rajeev .G Associate Professor Department of Economics
3	No.of Ph.D students	13

Table 2.12 Doctoral program of the college

2.13 CAMPUS LOCATION & LAYOUT



Fig 2.2 Campus layout of the college

2.14 FACILITIES OF THE COLLEGE

2.15 Facilities of the college

Sl No	Facilities	Count
1	Classrooms	48
2	Labs	5
3	Staffrooms	11
4	Conference Hall/ Seminar	7
5	Ground	1
6	Cafeteria	1
7	Bathrooms	25
8	Lift	1
9	Library	1
10	Prayer Room	2
11	Sickroom	1
12	Ramps	1
13	Staircase	6
14	Guest Room	3
15	Counselling Centre	1
16	Pariksha Bhavan	1
17	Parking Space	3
18	Security Room	1
19	NCC Room	2
20	Physical Education Room	1
21	Footall/Cricket ground	1
22	Indoor table tennis	1
23	Women's centre	1
24	Girls waiting room	1

Table 2.13 Facilities of the college





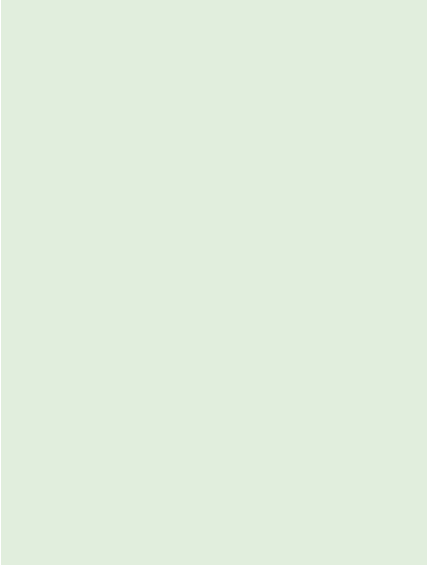
There is no such things as away.
When we throw anything away
it must go somewhere

- Annie Leonardv

Chapter III

**ENVIRONMENT
MANAGEMENT SYSTEM (EMS) : AUDIT REPORT**





ENVIRONMENT MANAGEMENT COMMITTEE (EMS 2025-26)

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Environment Management System : Audit Report

3.1 ENVIRONMENT MANAGEMENT POLICY

3.1.1 Statement of Commitment

Mar Dionysius College, Pazhanji is committed to environmental protection, sustainable development, and responsible resource management through this Environmental Management Policy (EMP). The College recognises that environmental stewardship is an integral part of academic excellence, institutional responsibility, and the well-being of present and future generations. Through this policy, the institution seeks to integrate environmental considerations into its academic, administrative, operational, and community engagement activities and promote a culture of environmental responsibility and continual improvement.

The Environmental Management Policy encompasses the following core areas:

- A. Biodiversity Conservation and Green Campus Development
- B. Waste Management and Pollution Control
- C. Water Resource Management

D. Energy Management and Climate Responsibility

E. Occupational Health, Safety, and Environmental Hygiene

3.1.2 Vision

To be an environmentally responsible institution that integrates sustainability, resource conservation, and environmental stewardship into all aspects of institutional functioning.

3.1.3 Mission

To integrate environmental considerations into institutional governance, academic activities, campus operations, and community engagement through the conservation of natural resources, protection of biodiversity, prevention of pollution, promotion of environmental awareness, maintenance of a safe and healthy environment, and continual improvement in environmental performance in compliance with applicable environmental requirements.

3.1.4 Resource Management

The College recognises that the responsible management of natural resources and environmental assets is fundamental to environmental sustainability, institutional resilience, and sound environmental

governance. The institution is committed to ensuring the sustainable use, conservation, protection, and responsible management of environmental resources through an integrated Environmental Management System. Resource management shall be guided by the principles of environmental stewardship, resource efficiency, pollution prevention, legal compliance, climate responsibility, and continual improvement in accordance with applicable environmental legislation and institutional sustainability objectives.

- Energy Management and Climate Responsibility
- The College is committed to promoting sustainable energy management through responsible energy governance, energy conservation, energy efficiency, renewable energy adoption, greenhouse gas emission reduction, climate change mitigation, and responsible utilisation of energy resources. Energy management shall contribute to institutional sustainability, environmental protection, resource efficiency, and continual improvement in environmental performance.
- Water Resource Management
- The College is committed to the sustainable, equitable, and responsible management of water resources through the principles of water conservation, water quality protection, responsible water use, groundwater conservation, rainwater management, wastewater resource management, pollution prevention, and climate resilience. Water resource management shall support environmental sustainability, regulatory compliance, and long-term water security while ensuring the responsible stewardship of available water resources.
- Waste Management and Pollution Control
- The College is committed to implementing sustainable waste management principles that prioritise waste minimisation, responsible consumption, source segregation, resource recovery, recycling, environmentally sound waste management, and pollution prevention. The institution shall promote resource efficiency, environmental protection, circular economy principles, and responsible material utilisation while ensuring compliance with applicable environmental

regulations and institutional sustainability objectives.

- Biodiversity Conservation and Green Campus Development
- The College is committed to conserving, protecting, restoring, and sustainably managing biodiversity and ecological resources as an integral component of institutional environmental governance. The institution shall uphold the conservation of native flora and fauna, protection of natural habitats, ecological restoration, sustainable landscape management, responsible land stewardship, prevention of biodiversity degradation, and environmentally responsible campus development. Biodiversity conservation shall support ecological integrity, climate resilience, and the long-term sustainability of the campus environment.
- Occupational Health, Safety, and Environmental Hygiene
- The College is committed to maintaining a safe, healthy, hygienic, and inclusive campus environment that safeguards the well-being of students, faculty, staff, visitors, and all stakeholders. The institution shall uphold the principles of occupational health, workplace safety, environmental hygiene, risk prevention, regulatory compliance, and shared institutional responsibility to ensure a safe and environmentally responsible learning and working environment.

3.1.5 Curriculum Integration

The College recognises that environmental education is fundamental to achieving sustainable development and fostering environmentally responsible citizens. The institution is committed to integrating environmental sustainability, resource conservation, climate resilience, and occupational health and safety principles into its academic framework to strengthen environmental literacy, ethical responsibility, interdisciplinary knowledge, and sustainable decision-making. Curriculum integration shall support institutional environmental objectives, comply with applicable regulatory frameworks, and promote continuous academic advancement in environmental management.

Energy Management and Climate Responsibility

The College shall integrate energy conservation, energy efficiency, renewable energy, climate change mitigation, greenhouse gas emission reduction, carbon responsibility, sustainable energy governance, and responsible energy utilisation into academic programmes to reinforce institutional commitment towards sustainable energy management and climate action.

Water Resource Management

The College shall integrate sustainable water resource management, water conservation, water quality protection, groundwater conservation, pollution prevention, wastewater management, climate resilience, and responsible water governance into academic programmes to promote sustainable utilisation and protection of water resources in accordance with institutional sustainability objectives.

Waste Management and Pollution Control

The College shall integrate sustainable waste management, waste minimisation, responsible consumption, source segregation, resource recovery, recycling, pollution prevention, circular economy principles, and environmentally responsible resource utilisation into the academic framework to strengthen environmental responsibility and promote sustainable waste governance.

Biodiversity Conservation

The College shall integrate biodiversity conservation, ecosystem protection, ecological restoration, sustainable landscape management, conservation of native species, environmental stewardship, and biodiversity governance into the academic framework to strengthen institutional commitment towards biodiversity conservation and sustainable natural resource management.

Occupational Health, Safety, and Environmental Hygiene

The College shall integrate occupational health, workplace safety, environmental hygiene, risk management, emergency preparedness, safe working practices, and institutional health and safety principles

into the academic framework to promote a culture of safety, environmental responsibility, and institutional well-being.

The College shall ensure that curriculum integration supports the institution's Environmental Management System by promoting environmental responsibility, sustainable resource management, regulatory compliance, interdisciplinary learning, and continual improvement in alignment with institutional sustainability goals.

3.1.6 Green Initiatives

The College is committed to promoting an environmentally sustainable campus through integrated green initiatives that strengthen environmental stewardship, resource conservation, climate resilience, pollution prevention, and institutional sustainability. Green initiatives shall be guided by the principles of sustainable development, responsible environmental governance, regulatory compliance, and continual improvement, ensuring that environmental considerations are incorporated into institutional planning and campus development.

- Energy Management and Climate Responsibility
- The College shall promote green initiatives that support sustainable energy management through the adoption of energy conservation principles, energy efficiency, renewable energy, low-carbon development, responsible energy utilisation, and climate change mitigation. Institutional green initiatives shall contribute to reducing environmental impacts, improving energy performance, and strengthening climate responsibility.
- Water Resource Management
- The College shall promote green initiatives that support the sustainable conservation, protection, and responsible management of water resources. The institution shall uphold the principles of water conservation, rainwater resource management, water quality protection, wastewater resource management, groundwater conservation, pollution prevention, and climate-resilient water stewardship as integral components of sustainable campus development.

- Waste Management and Pollution Control
- The College shall promote green initiatives that support sustainable waste governance through waste minimisation, responsible consumption, source segregation, resource recovery, recycling, circular economy principles, environmentally sound waste management, pollution prevention, and responsible utilisation of natural resources. Green initiatives shall contribute to maintaining a clean, healthy, and environmentally responsible campus.
- Biodiversity Conservation and Green Campus Development
- The College shall promote green initiatives that strengthen biodiversity conservation, ecological restoration, protection of natural habitats, conservation of native species, sustainable landscape management, responsible land stewardship, prevention of biodiversity degradation, and environmentally responsible campus development. Green initiatives shall support ecological balance, enhance environmental quality, and strengthen the institution's commitment to biodiversity conservation and sustainable campus management.
- Occupational Health, Safety, and Environmental Hygiene
- The College shall promote green initiatives that foster a safe, healthy, hygienic, and inclusive campus environment. The institution shall uphold the principles of occupational health, environmental hygiene, workplace safety, risk prevention, environmental quality, and institutional well-being while ensuring that environmental sustainability and human well-being remain complementary components of responsible campus management.

Green initiatives undertaken by the College shall collectively support environmental sustainability, responsible resource management, climate resilience, ecological integrity, regulatory compliance, and continual improvement in alignment with the institution's Environmental Management System and long-term sustainability objectives.

3.1.7 Purchasing and Procurement

The College is committed to adopting environmentally responsible, sustainable, and transparent purchasing and procurement practices that support institutional sustainability objectives and minimise environmental impacts throughout the procurement lifecycle. Procurement decisions shall be guided by the principles of environmental stewardship, resource efficiency, legal compliance, lifecycle sustainability, and continual improvement while ensuring that environmental considerations are incorporated into the acquisition of goods, services, equipment, and infrastructure.

- Energy Management and Climate Responsibility
- The College shall give preference to the procurement of energy-efficient products, equipment, technologies, and infrastructure that support energy conservation, renewable energy adoption, improved energy performance, and responsible energy utilisation. Procurement decisions shall consider energy efficiency, lifecycle performance, and environmental sustainability in accordance with applicable energy conservation standards.
- Water Resource Management
- The College shall promote the procurement of water-efficient fixtures, plumbing systems, equipment, and environmentally sustainable products that support responsible water use, water conservation, protection of water quality, pollution prevention, and sustainable water resource management. Procurement practices shall contribute to the efficient utilisation and long-term conservation of water resources.
- Waste Management and Pollution Control
- The College shall adopt sustainable procurement practices that minimise waste generation, encourage responsible consumption, reduce the use of environmentally harmful materials, promote recyclable and reusable products, and support circular economy principles. Procurement decisions shall prioritise environmentally preferable materials and products that contribute to pollution prevention, resource efficiency, and sustainable waste management.

- Biodiversity Conservation and Green Campus Development
- The College shall ensure that procurement practices support biodiversity conservation, ecological sustainability, and environmentally responsible campus development. Preference shall be given to products, materials, and services that minimise adverse impacts on biodiversity, promote sustainable resource utilisation, and support the conservation of natural ecosystems and ecological integrity.
- Occupational Health, Safety, and Environmental Hygiene
- The College shall ensure that all goods, equipment, materials, and services procured comply with applicable occupational health, safety, environmental, and quality standards. Procurement practices shall support a safe, healthy, hygienic, and environmentally responsible campus while minimising risks to human health and the environment.

The College shall periodically review its purchasing and procurement principles to ensure continued alignment with institutional sustainability objectives, environmental legislation, applicable regulatory requirements, and recognised best practices in sustainable procurement.

3.1.8 Research and Innovation

The College recognises research and innovation as essential components of institutional environmental sustainability and responsible environmental governance. The institution is committed to fostering a research culture that advances scientific knowledge, promotes innovation, and supports evidence-based decision-making in environmental management. Research and innovation shall be aligned with institutional sustainability objectives, applicable regulatory frameworks, and emerging environmental challenges to contribute to continual improvement in environmental performance.

- Energy Management and Climate Responsibility
- The College shall promote research and innovation in the fields of sustainable energy management, energy efficiency, renewable energy, climate change mitigation, greenhouse gas reduction, and

responsible energy governance. Research activities shall contribute to the development of knowledge and innovative approaches that strengthen institutional sustainability and climate responsibility.

- Water Resource Management
- The College shall encourage research and innovation related to sustainable water resource management, water conservation, water quality protection, groundwater conservation, wastewater management, pollution prevention, climate resilience, and integrated water governance. Research shall support the advancement of scientific knowledge and sustainable solutions for responsible water resource management.
- Waste Management and Pollution Control
- The College shall promote research and innovation in sustainable waste management, pollution prevention, resource recovery, recycling, circular economy principles, responsible resource utilisation, and environmental protection. Research initiatives shall contribute to improving institutional environmental performance and strengthening sustainable waste governance.
- Biodiversity Conservation and Green Campus Development
- The College shall promote research and innovation that support biodiversity conservation, ecological restoration, ecosystem management, conservation of biological resources, sustainable landscape management, and environmental stewardship. Research activities shall contribute to enhancing ecological knowledge and strengthening institutional biodiversity conservation objectives.
- Occupational Health, Safety, and Environmental Hygiene
- The College shall promote research and innovation that support occupational health, workplace safety, environmental hygiene, risk management, and institutional well-being. Research activities shall uphold applicable ethical principles, regulatory requirements, and institutional safety standards while contributing to the continuous enhancement of a safe and healthy campus environment.

The College shall encourage interdisciplinary collaboration, scientific excellence, responsible research practices, and knowledge generation that support institutional sustainability, environmental stewardship, regulatory compliance, and continual improvement in the Environmental Management System.

3.1.9 Community Engagement

The College recognises community engagement as a fundamental component of environmental governance and sustainable development. The institution is committed to fostering meaningful collaboration with local communities, government agencies, local self-government institutions, educational and research institutions, industry, civil society organisations, and other relevant stakeholders to promote environmental stewardship, shared responsibility, and sustainable resource management. Community engagement shall strengthen institutional accountability, environmental awareness, climate resilience, and collective action towards environmental protection while supporting the objectives of the Environmental Management System.

- **Energy Management and Climate Responsibility**

The College shall promote community engagement that advances responsible energy management through the principles of energy conservation, energy efficiency, renewable energy adoption, greenhouse gas emission reduction, climate change mitigation, sustainable energy governance, and responsible energy utilisation. The institution shall encourage collaborative partnerships that contribute to sustainable energy stewardship and support regional and national climate action objectives.

- **Water Resource Management**

The College shall promote community engagement that supports sustainable water governance through the conservation and responsible utilisation of water resources, protection of water quality, groundwater conservation, rainwater harvesting, wastewater management and reuse, pollution prevention, and climate-resilient water management. The institution shall strengthen collaboration with local self-government institutions and other stakeholders to promote responsible

water stewardship, improve water security, and contribute to the sustainable management of water resources within the surrounding community.

- **Waste Management and Pollution Control**

The College shall promote community engagement that supports environmentally responsible waste governance through waste minimisation, responsible consumption, source segregation, resource recovery, recycling, circular economy principles, reduction of plastic pollution, environmentally sound waste management, and pollution prevention. The institution shall encourage collaborative efforts that strengthen environmental responsibility and sustainable resource utilisation within the campus and the wider community.

- **Biodiversity Conservation and Green Campus Development**

The College shall promote community engagement that supports biodiversity conservation through the protection of native flora and fauna, conservation of natural habitats, ecological restoration, sustainable landscape management, responsible land stewardship, prevention of biodiversity degradation, and conservation of ecological resources.

The institution shall encourage collaborative partnerships that strengthen biodiversity stewardship, ecological sustainability, and the conservation of natural ecosystems for present and future generations.

- **Occupational Health, Safety, and Environmental Hygiene**

The College shall promote community engagement that supports occupational health, workplace safety, environmental hygiene, public health, emergency preparedness, risk prevention, and the creation of a safe, healthy, and inclusive environment. The institution shall encourage shared responsibility among all stakeholders in promoting health, safety, environmental responsibility, and community well-being.

The College shall ensure that all community engagement initiatives undertaken under the Environmental Management System are consistent with institutional sustainability objectives, applicable environmental legislation, national and state environmental policies, and the United Nations

Sustainable Development Goals. Through collaborative environmental stewardship and responsible stakeholder engagement, the institution reaffirms its commitment to environmental protection, resource conservation, ecological resilience, climate responsibility, and sustainable development.

3.1.10 Monitoring and Reporting

The College recognises that systematic monitoring, documentation, reporting, and periodic evaluation are fundamental to effective environmental governance and continual improvement. The institution is committed to maintaining an integrated environmental monitoring and reporting framework that evaluates environmental performance, supports evidence-based decision-making, ensures institutional accountability, and facilitates compliance with applicable environmental legislation and sustainability objectives.

- **Energy Management and Climate Responsibility**

The College shall monitor and periodically evaluate energy consumption, energy efficiency, renewable energy utilisation, greenhouse gas emissions, and overall energy performance to support sustainable energy governance, climate change mitigation, regulatory compliance, and continual improvement.

- **Water Resource Management**

The College shall monitor and maintain appropriate records relating to water consumption, water quality, groundwater utilisation, rainwater harvesting, wastewater management, water conservation measures, and the overall effectiveness of institutional water resource management to ensure responsible water stewardship and long-term water security.

- **Waste Management and Pollution Control**

The College shall monitor waste generation, source segregation, resource recovery, recycling, environmentally sound waste disposal, pollution prevention measures, and compliance with applicable waste management regulations to strengthen sustainable waste governance and minimise environmental impacts.

- **Biodiversity Conservation and Green Campus Development**

The College shall periodically monitor the status

of campus biodiversity, ecological resources, native flora and fauna, green cover, landscape management, habitat conservation, and biodiversity conservation measures to ensure the protection and sustainable management of ecological resources.

- **Occupational Health, Safety, and Environmental Hygiene**

The College shall monitor occupational health, workplace safety, environmental hygiene, risk management, emergency preparedness, and compliance with applicable health and safety requirements to maintain a safe, healthy, and environmentally responsible campus environment. The College shall maintain appropriate environmental documentation and reporting mechanisms to support institutional transparency, regulatory compliance, environmental accountability, and continual improvement of the Environmental Management System.

3.1.11 Compliance and Review

The College recognises that compliance with environmental legislation, institutional policies, and recognised environmental standards is fundamental to responsible environmental governance. The institution is committed to ensuring that all environmental management practices remain consistent with applicable legal, regulatory, and institutional requirements while supporting continual improvement in environmental performance.

Energy Management and Climate Responsibility

The College shall ensure compliance with all applicable energy conservation legislation, standards, and regulatory requirements relating to energy efficiency, renewable energy, responsible energy utilisation, and climate change mitigation.

Water Resource Management

The College shall ensure compliance with applicable legislation, policies, and regulatory requirements governing water conservation, water quality, groundwater management, wastewater management, pollution prevention, and sustainable water resource management.

Waste Management and Pollution Control

The College shall ensure compliance with applicable environmental legislation and regulatory requirements relating to waste minimisation, waste segregation, storage, collection, transportation, recycling, treatment, disposal, pollution prevention, and environmentally sound waste management.

Biodiversity Conservation and Green Campus Development

The College shall ensure compliance with applicable biodiversity conservation laws, environmental regulations, and institutional commitments relating to the protection of biological resources, ecological restoration, conservation of natural habitats, and sustainable environmental management.

Occupational Health, Safety, and Environmental Hygiene

The College shall ensure compliance with applicable occupational health, workplace safety, environmental hygiene, emergency management, and institutional health and safety requirements to safeguard the well-being of all campus stakeholders.

The Environmental Management Policy shall be periodically reviewed to ensure its continued suitability, effectiveness, alignment with emerging environmental challenges, technological advancements, audit recommendations, institutional priorities, and applicable legal and regulatory requirements. The review process shall support continual improvement and strengthen the effectiveness of the Environmental Management System.

3.1.12 Leadership and Accountability

The College recognises that effective environmental management requires strong institutional leadership, clearly defined responsibilities, shared accountability, and active participation of all stakeholders. The institution is committed to integrating environmental sustainability into institutional governance, decision-making processes, academic activities, administrative functions, campus operations, and long-term strategic planning.

The Principal shall serve as the overall authority for the Environmental Management System and shall provide strategic leadership, policy oversight, and

institutional direction for environmental sustainability initiatives. The Principal shall be supported by the respective institutional committees responsible for Energy Management, Water Resource Management, Waste Management, Biodiversity Conservation, and Occupational Health and Safety, which shall collectively ensure coordinated environmental governance and policy implementation.

The respective committees shall provide guidance, oversight, coordination, and accountability within their respective areas of responsibility, ensuring that institutional policies relating to energy conservation, water resource management, sustainable waste management, biodiversity conservation, occupational health, workplace safety, and environmental hygiene remain integrated within the Environmental Management System.

All academic departments, administrative offices, support services, faculty members, staff, students, contractors, and other stakeholders shall share responsibility for supporting institutional environmental objectives, complying with applicable environmental policies and regulations, protecting natural resources, promoting environmental stewardship, and contributing to the continual improvement of environmental performance across the campus.

The College shall maintain an integrated governance framework that promotes transparency, institutional accountability, interdisciplinary collaboration, responsible environmental decision-making, regulatory compliance, and continual improvement, thereby strengthening the long-term effectiveness of the Environmental Management System.

3.1.13 Conclusion

The Environmental Management Policy of Mar Dionysius College, Pazhanji establishes an integrated framework for promoting environmental sustainability through responsible governance of energy, water, waste, biodiversity, and occupational health and safety. The College is committed to protecting natural resources, preventing pollution, ensuring regulatory compliance, and fostering a safe, healthy, resource-efficient, and environmentally responsible campus in alignment with institutional sustainability objectives and the United

Nations Sustainable Development Goals (SDGs).

The College shall periodically review this policy to ensure its continued relevance, effectiveness, and alignment with emerging environmental challenges, statutory requirements, and institutional priorities. Through collective responsibility and continual improvement, Mar Dionysius College aspires to strengthen environmental stewardship, institutional resilience, and sustainable campus development for the benefit of present and future generations.

3.2 ENVIRONMENT MANAGEMENT PLAN

3.2.1 Statement of Commitment

Mar Dionysius College, Pazhanji is committed to incorporating environmental responsibility into its institutional functions and promoting sustainable practices that contribute to environmental protection and resource conservation. The College recognises that effective environmental management requires planned action, stakeholder participation, and continuous evaluation. This Environment Management Plan establishes a framework for improving environmental performance and supporting the long-term sustainability objectives of the institution.

3.2.2 Environment Management Team

The implementation of the Environment Management Plan shall be guided by an institutional framework comprising the Principal, Internal Quality Assurance Cell (IQAC), Environmental Management Committee, and the committees responsible for biodiversity, water, waste, energy, and occupational health and safety management.

These bodies shall function in a coordinated manner to facilitate environmental planning, oversee the implementation of environmental initiatives, maintain necessary documentation, and periodically review environmental performance. Faculty members, non-teaching staff, and students shall contribute to environmental activities and support the effective implementation of the Environment Management Plan.

3.2.3 Objectives

The Environment Management Plan aims to:

- Improve environmental performance through planned and systematic environmental management practices.
- Promote the efficient use and conservation of natural resources.
- Strengthen environmental awareness and responsible environmental behaviour among stakeholders.
- Integrate environmental considerations into academic, administrative, and operational activities.
- Establish mechanisms for monitoring environmental performance and supporting continual improvement.

3.2.4 Formulation of Comprehensive Strategy

The Environment Management Plan shall be implemented through coordinated action across the areas of energy management, water management, waste management, biodiversity conservation, and occupational health and safety.

Energy Management: The College shall undertake periodic energy audits, monitor electricity consumption, implement energy conservation measures, replace conventional lighting with energy-efficient systems, promote optimum use of natural lighting and ventilation, progressively adopt renewable energy technologies, and maintain energy-efficient infrastructure.

Water Management: The College shall implement water conservation measures through regular water audits, leak detection and rectification, efficient operation and maintenance of water supply systems, rainwater harvesting, groundwater recharge, wastewater treatment and reuse through the Sewage Treatment Plant (STP), and continuous monitoring of water quality and consumption.

Waste Management: The College shall implement source segregation of waste, compost biodegradable waste, ensure authorised disposal of hazardous, biomedical, sanitary, and electronic waste, promote recycling and resource recovery, reduce single-use plastics, strengthen sustainable procurement practices, and conduct regular waste audits to improve waste management

performance.

Biodiversity Conservation: The College shall undertake periodic biodiversity audits, maintain a campus biodiversity register, expand green cover through plantation of native and indigenous species, establish and maintain herbal gardens, butterfly gardens, and pollinator-friendly landscapes, conserve existing trees and habitats, control invasive species wherever necessary, implement ecological restoration of degraded areas, utilise compost for landscape management, and strengthen biodiversity monitoring through documentation and field observations.

Occupational Health and Safety: The College shall conduct periodic risk assessments, maintain emergency preparedness systems, strengthen fire and electrical safety, ensure safe laboratory and workplace practices, maintain campus sanitation and hygiene, improve internal traffic safety, conduct safety training and awareness programmes, and monitor occupational health and safety performance through regular inspections and documentation.

The implementation of these activities shall be supported through institutional coordination, defined responsibilities, periodic monitoring, documentation, environmental audits, and annual review to ensure continual improvement in environmental performance.

3.2.5 Communication Channel and Governance Structure

Environmental information and updates are communicated through established institutional channels such as committee meetings, official circulars, notice boards, departmental communications, and periodic reports. These channels ensure timely dissemination of information related to environmental initiatives and performance across all units of the institution.

The Environmental Management Committee and IQAC conduct periodic review meetings to assess the progress of environmental activities, ensure coordination among various sub-committees, and review compliance with planned actions under different environmental management areas.

Observations arising from monitoring activities, audits,

and committee reviews are compiled and submitted to the Environmental Management Committee and IQAC. These are further evaluated and forwarded to the Principal and relevant administrative authorities for necessary action and implementation.

Decisions and directions issued by the institutional authorities are communicated to the concerned departments and implementation teams through written circulars and committee resolutions, ensuring consistent execution, accountability, and continuous improvement in environmental management practices.

3.2.6 Short-Term and Long-Term Goals Short-Term Objectives (1–2 Years)

1. Energy Management and Climate Responsibility

Baseline energy audits are conducted across campus buildings to assess electricity consumption patterns. Existing solar photovoltaic systems are utilised for energy support, and their efficiency is monitored for optimal performance. LED lighting systems are progressively installed in classrooms, laboratories, corridors, and offices. Energy-saving practices such as switching off unused equipment, optimising natural lighting, and reducing energy wastage are implemented. Annual awareness programmes on energy conservation and climate responsibility are conducted for students and staff.

2. Water Resource Management

Periodic water audits are conducted to assess water consumption in academic blocks, and common facilities. The existing rainwater harvesting system (approximately 1000 L capacity unit) is maintained and monitored for effective water collection and utilisation. Leak detection surveys are carried out and timely repairs are ensured to minimise water loss. Awareness programmes on water conservation are conducted each semester. Water-saving signage is installed in washrooms, canteens, and hostel areas to promote responsible water use.

3. Waste Management and Pollution Control

Existing colour-coded bin systems are effectively utilised across the campus to ensure proper waste segregation at source. Regular waste audits are conducted to assess waste generation patterns and improve segregation

efficiency. Awareness programmes on plastic reduction and waste minimisation are conducted periodically. Campus clean-up drives are organised with student participation to maintain hygiene and environmental cleanliness.

4. Biodiversity Conservation and Green Campus Development

Native species plantation is carried out in identified open and degraded areas of the campus to enhance ecological balance and green cover. Baseline biodiversity audits are conducted to document flora and fauna diversity and seasonal variations. Herbal gardens and butterfly gardens are developed using medicinal, nectar-rich, and pollinator-friendly plant species. Existing green spaces are maintained through compost application, mulching, watering, and periodic ecological maintenance. Environmental observance programmes such as Environment Day, Earth Day, and Biodiversity Day are conducted with plantation and awareness activities.

5. Occupational Health and Safety (OHS)

Campus-wide hazard identification and risk assessments are conducted in classrooms, laboratories, canteen areas, and infrastructure facilities. Safety registers and inspection records are maintained systematically. Fire safety preparedness and emergency response systems are assessed and strengthened. Awareness programmes on occupational health, hygiene, and safety practices are conducted for students and staff.

Long-Term Objectives (3–5 Years)

1. Energy Management and Climate Responsibility

Existing solar photovoltaic systems are further expanded where feasible to increase renewable energy contribution. Energy-efficient infrastructure upgrades and smart monitoring systems are implemented to optimise energy usage. The campus progressively reduces dependence on conventional electricity sources and improves overall energy efficiency.

2. Water Resource Management

The Sewage Treatment Plant (STP) is fully operational and integrated for wastewater treatment and reuse. Rainwater harvesting systems are strengthened and

expanded where possible to enhance groundwater recharge. Treated water is reused for gardening and non-potable purposes, ensuring long-term water sustainability.

3. Waste Management and Pollution Control

Composting systems for biodegradable waste are established and operated within the campus. Recycling systems are strengthened through authorised recyclers. The campus progressively moves towards a zero-waste approach through improved segregation, reuse, and resource recovery practices.

4. Biodiversity Conservation and Green Campus Development

The campus is developed into a biodiversity-rich ecosystem through large-scale plantation of native species and systematic ecological enhancement. Invasive or non-native species are replaced wherever required to strengthen ecological integrity. Ecological restoration of degraded areas is undertaken through soil improvement and habitat development. Green corridors are developed to connect fragmented green spaces. Herbal gardens, butterfly gardens, and pollinator zones are expanded and maintained as functional ecological systems with continuous monitoring and maintenance.

5. Occupational Health and Safety (OHS)

A structured Occupational Health and Safety management system is fully established within the institution. Continuous monitoring of safety conditions in laboratories, electrical systems, and campus facilities is implemented. Emergency preparedness systems are strengthened, including evacuation procedures and safety infrastructure upgrades. Regular audits and corrective actions ensure continuous improvement in campus safety standards.

3.2.7 Continuous Monitoring and Enhancement of the System

The implementation of the Environmental Management Plan is monitored on a periodic basis through internal environmental audits, performance reviews, and systematic maintenance of environmental records related to energy, water, waste, biodiversity, and occupational health and safety.

Monthly and annual data on resource consumption,

waste generation, biodiversity status, and safety compliance are collected and analysed by the respective committees. The Environmental Management Committee and IQAC conduct periodic review meetings to assess progress against defined objectives and identify deviations or performance gaps.

The findings from monitoring activities and audits are used to identify areas requiring corrective actions and operational improvements. Based on these observations, necessary modifications are incorporated into existing environmental practices, including refinement of procedures, strengthening of resource management measures, and improvement of operational efficiency.

The Environmental Management Plan is reviewed periodically to ensure its continued effectiveness, relevance, and alignment with institutional requirements, regulatory expectations, and emerging environmental concerns.

3.2.8 Conclusion and Follow-Up

The Environmental Management Plan (EMP) of Mar Dionysius College, Pazhanji provides a structured framework for integrating environmental sustainability into all functional areas of the institution, including academic, administrative, and campus operations. The plan translates environmental objectives into

clearly defined actions across energy management, water conservation, waste management, biodiversity conservation, and occupational health and safety.

The implementation of the EMP is supported through periodic environmental audits, routine monitoring, and committee-level reviews, which ensure systematic tracking of environmental performance indicators and compliance status. These processes enable the institution to assess the effectiveness of implemented measures and identify areas requiring improvement.

Findings from audits and monitoring activities are used to initiate corrective actions and strengthen existing environmental practices. Continuous follow-up through review meetings and documentation ensures that improvements are effectively implemented and sustained over time.

Through this structured approach, the institution strengthens resource efficiency, ensures environmental compliance, and promotes a culture of sustainability across the campus, contributing to long-term environmental stewardship and continuous improvement.



Chapter IV

ENERGY MANAGEMENT SYSTEM (En MS): AUDIT REPORT





ENERGY MANAGEMENT SYSTEM COMMITTEE (EnMS 2025-26)

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Rose Jose

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Ardra T S

Aneeta C Kuriakose

Aysa C A

Adithya M R

Adhthiya N.S

Rameesha Nasrin

Shikha C S

Naema K K

Rafeena K M

Sivani A B

Fidha C Y

Student representatives





Energy Management System: Audit Report

4.1. INTRODUCTION

Energy represents a fundamental requirement for human sustenance and is indispensable for the functioning of modern society. It supports nearly all daily activities within institutional, domestic, and technological contexts. The Earth provides a wide spectrum of energy resources, each with distinct characteristics and modes of utilization. However, the extraction and consumption of these resources are invariably associated with environmental consequences. The relationship between energy utilization and environmental sustainability is inherently interlinked. Activities involved in the generation, transmission, and consumption of energy lead to significant ecological impacts. These impacts manifest in various forms, including air pollution, climate change, water contamination, thermal pollution, and the accumulation of solid waste. In particular, the combustion of fossil fuels remains a major contributor to atmospheric pollution and is the primary driver of greenhouse gas emissions. In addition, energy-related activities can also lead to deterioration in water quality, creating further environmental concerns.

Electrical power distribution within an institution involves a network of conductors, control devices, and safety systems that supply energy to various equipment

such as cooling and ventilation units, lighting systems, computers, pumps, and other operational machinery. Over time, the efficiency of these systems may reduce due to factors like wear and tear of components, accumulation of dust, presence of moisture, and reliance on outdated equipment. Such conditions result in unnecessary energy loss, where a portion of electrical energy is converted into heat instead of being effectively utilized. This not only reduces system efficiency but also increases overall electricity consumption. A detailed energy audit helps in identifying these issues by assessing system performance and highlighting areas where improvements can be made.

The ISO 50001 framework enables organizations to improve their energy performance in a structured and systematic manner. It supports the identification and implementation of measures that promote efficient energy use, while also helping institutions demonstrate their commitment to responsible energy management to a more environmentally aware society. Energy auditing, carried out in line with recognized standards and in support of sustainable development goals, involves a detailed evaluation of energy consumption within a building or defined area. The purpose of this process is to detect areas of inefficiency and identify opportunities for

improvement. The findings obtained from the audit are then used to formulate practical energy management strategies aimed at reducing energy consumption without affecting operational efficiency, user comfort, or system performance. During the audit process, several influencing factors such as user behaviour, the age and condition of infrastructure, and prevailing climatic conditions are taken into account to ensure that the recommendations provided are realistic, reliable, and suitable for implementation.

4.1.1 What is an energy Audit?

An energy audit is a systematic process used to evaluate energy usage and identify opportunities for improving energy efficiency within an organization or facility. It plays a crucial role in detecting areas where energy can be conserved and in determining suitable measures for optimization, along with their economic feasibility at different levels of operation. The audit process typically begins with a preliminary assessment, which includes site visits and a general review of energy consumption patterns. This initial stage helps in identifying simple, low-cost measures for energy savings. As the audit progresses to more detailed levels, a deeper analysis is carried out, focusing on energy costs, usage trends, and the performance of various systems. Advanced stages often involve on-site measurements and technical evaluations to identify major efficiency improvements that may require higher investment but offer long-term benefits. The findings from such assessments support the development of site-specific strategies that balance energy savings with financial considerations. The prerequisites for conducting an energy audit include:

- A detailed evaluation of the institution's energy infrastructure is required to understand the existing system and its condition.
- A thorough analysis of energy consumption at different utility points should be carried out to identify patterns, along with areas where energy losses or inefficiencies occur.
- Identification of suitable energy conservation measures, including improvements in user practices, adoption of energy-efficient equipment and infrastructure, and the possible use of alternative or renewable energy sources.

Conducting detailed energy audits provides a strong foundation for implementing an Energy Management System (EnMS) within educational institutions. It also supports better planning and control of energy usage, thereby improving overall energy management practices.

4.1.2 Needs for Energy Audit

In the present context, sustainability has become an important consideration in the functioning of educational institutions, leading to increased attention towards systematic energy management practices. Efficient use of energy and reduction of carbon dioxide (CO₂) emissions are now recognized as essential components of responsible campus management. A noticeable shift in energy usage can be observed, with institutions gradually moving towards energy-efficient systems and equipment. This transition is not only aimed at reducing electricity expenditure but also at improving overall operational efficiency. As a result, the need for a well-planned and efficiently maintained energy infrastructure has gained greater significance.

Functions of an Energy Audit

- Identifies opportunities to optimize energy usage and reduce overall consumption within the institution.
- Helps in minimizing energy costs by improving efficiency and reducing unnecessary expenditure.
- Contributes to improved comfort levels by ensuring better performance of lighting, ventilation, and other systems.
- Supports the reduction of carbon emissions, thereby lowering the environmental impact of institutional activities.
- Assists in minimizing energy wastage and controlling associated forms of pollution.

Aligning energy audits with structured energy management systems enables institutions to effectively control and reduce energy-related expenses, thereby improving financial efficiency. It also provides a clearer understanding of operational processes and energy consumption patterns. This improved insight supports the timely implementation of appropriate measures for enhancing energy performance in a consistent and sustainable manner.

4.1.3. Benefits of adopting energy management system

An Energy Management System based on the ISO 50001 framework offers several advantages to organizations. These include:

- Facilitates a systematic approach to reducing energy consumption and associated carbon emissions.
- Provides a clear understanding of current energy usage, enabling the establishment of appropriate objectives and targets.
- Supports the evaluation and prioritization of energy-efficient technologies and improvement measures.
- Establishes a structured framework for promoting energy efficiency across operations and supply chains.
- Offers guidance for benchmarking, monitoring, documentation, and reporting of energy performance.
- Enhances the utilization of energy-consuming equipment, helping to identify opportunities for improved efficiency.
- Contributes to the reduction of maintenance costs and supports better capacity management.

4.2 ENERGY MANAGEMENT POLICY

4.2.1 Statement Of Commitment

Mar Dionysius College is committed to promoting environmental sustainability through responsible energy management and conservation practices. Recognizing the crucial role of educational institutions in shaping a sustainable future, the College strives to minimize energy consumption, reduce greenhouse gas emissions, and enhance energy efficiency across all processes and activities.

This policy is aligned with Sustainable Development Goal (SDG) 7 – Affordable and Clean Energy, which emphasizes ensuring access to reliable, sustainable, and modern energy for all. It also adheres to national energy conservation frameworks, including the Energy Conservation Act, 2001, and the Bureau of Energy Efficiency (BEE) guidelines, promoting the adoption of

energy-efficient technologies, five-star rated appliances, and sustainable energy practices across campus operations.

Through this policy, the College establishes a systematic approach to energy management, integrating energy efficiency into decision-making, infrastructure, academics, and campus governance while fostering a culture of sustainability and environmental responsibility.

4.2.2 Vision

To establish Mar Dionysius College as a benchmark for sustainable energy management by fostering a resilient, energy-efficient, and low-carbon campus. The College envisions a campus where responsible energy use, renewable technologies, and environmentally conscious practices are fully integrated into academic, administrative, and operational frameworks, serving as a model for energy stewardship in higher education.

4.2.3 Mission

To uphold a commitment to responsible energy management through principled decision-making, promoting a culture of sustainability, ensuring compliance with relevant energy standards, and inspiring the campus community to embrace environmental responsibility.

4.2.4 Resource Management

The institution is committed to managing energy resources efficiently and in an environmentally responsible manner. The institution promotes energy conservation through the efficient use of energy resources and supports the use of alternative energy resources, including solar energy, to contribute to sustainable campus development.

4.2.5 Curriculum Integration

The College recognizes the critical role of energy conservation and sustainability in shaping environmentally responsible citizens. Energy management principles shall be systematically integrated into the curriculum through lectures, assignments, projects, seminars, and research initiatives. Students and faculty will engage in experiential learning opportunities, energy audits, and campus-based sustainability projects that reinforce theoretical

knowledge and promote practical application. This approach ensures that the campus community develops a deep understanding of sustainable energy practices, fosters innovation in energy efficiency, and contributes actively to the College's overarching energy stewardship objectives.

4.2.6 Green Initiatives and Campus Practices

The College is committed to fostering a sustainable campus environment by promoting energy conservation and environmentally responsible practices across all operations. This commitment reflects the institution's dedication to cultivating a culture of sustainability within the campus community.

4.2.7 Purchasing and Procurement

Mar Dionysius College shall adopt a strategic, energy-conscious approach to procurement that aligns with its commitment to sustainable energy management and institutional environmental responsibility.

All acquisitions of equipment, instruments, and infrastructure shall be evaluated based on:

- **Energy Performance:** Priority shall be given to devices and systems with verified high energy efficiency, including five-star rated appliances, LED lighting solutions, and energy-optimized laboratory instruments.
- **Supplier Compliance:** Procurement shall favour suppliers who demonstrate adherence to recognized environmental and energy efficiency standards, ensuring responsible sourcing and minimal ecological impact.
- **Sustainability Integration:** All purchasing decisions shall incorporate long-term considerations for energy conservation, operational sustainability, and lifecycle environmental impact, supporting the College's overarching energy management objectives.

This policy establishes a framework for sustainable procurement that reinforces the College's commitment to reducing energy consumption, promoting environmentally responsible operations, and advancing institutional sustainability goals.

4.2.8 Research and Innovation

The College emphasizes the strategic significance of research and academic development in the field of sustainability and energy management. A key component of the institution's long-term sustainability framework is knowledge development, academic excellence, and interdisciplinary inquiry in energy-related subjects.

4.2.9 Community Engagement

The College recognizes its responsibility to contribute to energy conservation and sustainability beyond the campus. The institution upholds engagement with the wider community and relevant stakeholders as part of its commitment to environmental responsibility and sustainable development.

4.2.10 Monitoring and Reporting

The College shall maintain a robust framework for oversight and evaluation of energy management performance to ensure alignment with institutional sustainability objectives, regulatory requirements, and best practices in energy governance. Monitoring mechanisms shall facilitate evidence-based decision-making, continuous performance improvement, and accountability across all academic, administrative, and operational domains.

4.2.11 Compliance and Review

The College will make sure that all relevant local and national energy conservation laws, rules, and guidelines are followed. To keep this policy current, effective, and in line with changing institutional priorities, technological advancements, and regulatory needs, it will be reviewed on a regular basis. To guarantee ongoing governance supervision, any changes to this policy must be authorized by the appropriate institutional authority.

4.2.12 Leadership and Accountability

The College Governing Council, along with the Staff Council, under the leadership of the Principal, shall serve as the overarching authority providing strategic direction for all energy management initiatives. The Energy Management Committee (EMC), comprising faculty and student representatives, shall support the implementation, monitoring, and evaluation of energy policies and practices.

All departments, offices, and campus units are collectively responsible for adopting energy-efficient measures and fostering a culture of sustainability. Regular training programs, awareness campaigns, and capacity-building initiatives will be conducted to ensure active engagement, accountability, and continuous improvement across the entire campus community.

4.2.13 Conclusion:

The Energy Management Policy of Mar Dionysius College, Pazhanji reinforces the institution's commitment to responsible, sustainable, and efficient energy use across all academic, administrative, and operational activities. Aligned with SDG 7 – Affordable and Clean Energy, and in compliance with national energy conservation standards and regulatory frameworks, the policy establishes a structured approach for energy governance, performance monitoring, and continuous improvement.

The College will ensure adherence to all applicable energy conservation laws, guidelines, and standards, while systematically promoting energy efficiency, reducing greenhouse gas emissions, and integrating sustainability into institutional operations. The Principal, as the overall policy head, supported by the Energy Management Committee (EMC) comprising faculty and student representatives, will provide strategic oversight, guidance, and accountability for policy implementation.

All departments and campus units share collective responsibility for adopting energy-efficient practices, fostering a culture of sustainability, and actively participating in awareness, training, and capacity-building initiatives. Regular monitoring, reporting, and evaluation of energy performance indicators will guide evidence-based decision-making and support the adoption of new technologies and innovative practices to enhance energy efficiency.

Through this policy, Mar Dionysius College aspires to serve as a model institution for sustainable energy management, contributing to environmental stewardship, institutional resilience, and the creation of a sustainable campus culture for current and future generations.

4.3. METHODOLOGY

The energy audit was conducted through a structured and systematic approach to evaluate the institution's energy consumption patterns. The data collection process was carried out by an internal audit team under the guidance and supervision of the faculty coordinator.

4.3.1 Internal audit training

Internal audit training plays a crucial role in strengthening institutional involvement and ensuring active participation in the energy audit process. As part of the established Energy Management System (EnMS), selected students and faculty members were trained to carry out internal auditing activities. A structured one-day training programme was conducted on 27.06.2025 to equip participants with the necessary knowledge and skills, following which they were designated as internal auditors for the institution. This enabled them to actively participate in the energy audit process under proper guidance. The internal energy audit process comprised several key stages, including initial assessment, identification of potential risks, systematic data collection, development of relevant policies, and documentation of records and action plans related to energy conservation and resource management.

4.3.2. Power quality analysis

The power quality analysis was carried out to assess the condition and reliability of the institution's electrical system. A power quality analyser was used to evaluate the characteristics of the electrical supply, with specific focus on voltage stability, load variations, and the presence of harmonic distortions. In addition, thermal imaging of both single-phase and three-phase systems was conducted to detect any abnormal temperature variations and to examine load distribution across different phases. This assessment supports the identification of potential issues and helps in planning preventive maintenance activities. The evaluation also included verification of the accessibility of electrical equipment for maintenance purposes, along with clear identification and functionality of emergency shutdown controls within the assessed areas.

4.3.3. Registers and documents

The energy audit process commenced with the systematic preparation and consolidation of essential

registers and documents. A total of seven registers and five supporting documents were maintained, including records such as training attendance, list of internal auditors, meeting minutes, and the institution's energy policy and conservation plan.

As part of the data collection process, students were assigned the task of preparing a campus layout and identifying the location of major electrical appliances. To ensure effective monitoring, dedicated registers were maintained to record energy meter readings, monthly electricity consumption, solar power generation (where applicable), motor and pump operations, and details of electrical equipment.

In addition, a maintenance register was used to evaluate the operational status of appliances and to document their performance as well as daily and weekly usage hours. Special attention was given to collecting data during weekends and recording separate meter readings for individual blocks to ensure accuracy in analysis.

4.3.4. Energy infrastructure documentation

A comprehensive documentation of the institution's energy infrastructure was carried out, covering components such as lighting systems, audio-visual equipment, laboratory instruments, computers, and other electrical appliances. This documentation provided a detailed overview of the connected load within the campus. Based on the collected data, the total annual energy consumption was estimated in kilowatt-hours (kWh) by considering the rated power of each equipment and its average duration of usage over a year. This assessment enabled a better understanding of energy demand across different categories of infrastructure.

4.3.5. Usage pattern assessment through energy meter sampling data

Energy consumption across different blocks of the institution was evaluated by compiling and analysing meter readings collected over a three-week period. Accuracy of the data was ensured through regular daily and weekly verification. The assessment involved recording energy meter readings three times a day over a nine-day period, including both weekdays and

weekends to capture variations in usage patterns. In addition, field observations were conducted to document details of electrical equipment, lighting systems, appliances, their power ratings, and operational patterns. Further inputs were obtained through interactions with the system manager and concerned faculty members to understand the functional aspects and operational schedules. This combined approach enabled a comprehensive assessment of energy usage patterns within the campus.

4.3.6 Analysis of KSEB meter reading

Energy consumption data were obtained from the electricity bills provided by the Kerala State Electricity Board (KSEB) for the specified periods of 2022–2023 and 2023–2024. These records were analysed to understand overall consumption trends and variations in energy usage over time.

4.3.7 Identification of energy saving options and scope of alternate energy resources

Potential energy conservation measures were identified and systematically documented, along with suitable recommendations for implementation. In addition, the feasibility of adopting alternative and renewable energy sources was evaluated, and an appropriate action plan was proposed.

As part of the assessment, the institution's carbon footprint was analysed by examining the available energy sources, including grid electricity supplied by the Kerala State Electricity Board (KSEB), along with possible alternatives. The study also considered energy consumption patterns across various functional areas such as laboratories, administrative offices, and kitchens to identify opportunities for optimization.

4.3.8 External Audit

An external audit was conducted by a qualified external energy auditor to assess the institution's compliance with established energy management requirements. The evaluation focused on verifying conformity with the principles and requirements of ISO 50001, identifying areas of non-conformity, and recommending measures for improving energy performance and management practices within the institution.

4.3.9. Stages of Energy audit

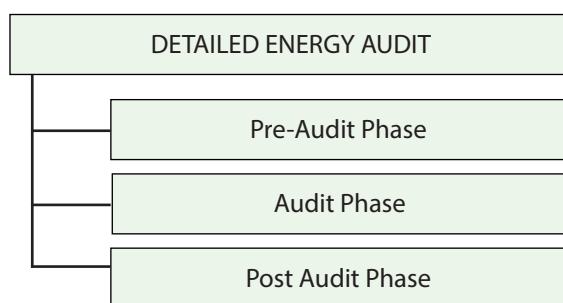


Fig. 4.1 An energy audit has three phases: pre-audit, audit, and post-audit.

1. Pre-Audit phase

- Formation of audit team; scheduling audit programmes
- Setting up of scope and objectives (in tune with energy policy of the institution)
- Discusses with the responsible persons of each location (staff, teachers, lab assistants, sweepers, watchmen, students etc.) about the usage pattern and habits related to energy consumption.
- Preparation of inventory of energy infrastructure- site diagrams, electrical diagrams, checklists etc.
- Analysis of consumption pattern; identification of energy loss or wastage

2. Audit phase

During this phase, auditors systematically collected and verified all relevant data to ensure that no critical information was missed in the assessment. The following details were gathered:

- Information regarding the sources of energy supply to the institution was collected.
- Electricity bills for the previous 24 months were obtained and analysed to understand tariff structure and energy costs.
- Data related to connected load were collected, including the power ratings of equipment, instruments, and various utilities.
- The existing energy management practices were reviewed to identify areas of energy loss and wastage, along with possible improvements for

energy conservation.

Outcomes of Data Analysis

- Preparation of process flow diagrams along with energy and material balance for the system.
- Identification of potential energy conservation (ENCON) opportunities within the institution.
- Development of suitable energy-saving measures and recommendations.
- Preparation of technical and feasibility reports for the proposed measures.
- Formulation of an implementation plan for energy conservation projects to be carried out in the post-audit phase.

3. Post audit phase

- The post-audit phase focuses on the implementation of recommended measures and subsequent follow-up activities. The objective is to support the execution of identified energy conservation (ENCON) measures and to monitor their performance over time.
- The Energy Management System (EMS) committee is responsible for ensuring the effective functioning of the system within the institution. This includes promoting awareness among the campus community through regular communication and conducting periodic evaluations to track progress and performance.

4.3.10. Steps of Energy Audit

1. Site assessment

- Collection of contour maps and campus diagrams]
- Preparing an inventory of energy infrastructure of each building
- Construction details of the building envelope (e.g. walls, roof, windows, doors and related insulation values)
- Manual, time clock or automated control and measuring methods (energy meters, main switches; MCB, ELCB etc.)- control section; capacity; location etc.
- Interior and exterior lighting systems and related controls.
- Equipment, appliances, instruments etc. – watts,

utility pattern, average consumption (monthly or yearly)

- Discussion with responsible persons of each infrastructure (on utility pattern, working condition, operation and maintenance procedures etc.)
- Date entry in prescribed forms (Energy spread sheets)

2. Data analysis

- Analysis of current and past performance (energy bill comparison, previous audit data etc.)

- Regression analysis involves the comparison of energy consumption on the Y axis versus the potential energy driver on the X axis (weather, working days/holidays etc.).

- Preparation of checklists and verification.
- Carbon credit calculation.

3. Final audit by external audit team

- Checklists verification- identifying non-conformities
- Action plan –long term and short term
- Final report & certification as per ISO standards.

4.3.11. Workplan and schedule of energy audit

Date to date	Work Plan
15/07/2025	Constitution of EnMS committee and Internal Auditors
16/07/2025	Formulation of EnMS Policy and Plan
31/07/2025	Onset of 1. Data collection: mapping, indoor, outdoor and appliance list 2. Meter reading data collection 3. Motor register updation (Pursue throughout) 4. Collection of electricity bills of previous years 5. Setup LPG and fossil fuel registers at canteen and both offices (Pursue throughout) 6. Collect details of alternate energy resources.(Pursue throughout) 7. Review progress of work in a meeting
31/08/2025	Completion of 1. Data collection, indoor outdoor and appliance list 2. Meter reading data collection 3. Review progress of work in a meeting
31/09/2025	Finalize data collection and request for approval

Table 4.1. Work plan of energy management audit



Fig 4.1 Internal audit review and progress meeting

4.4. RESULT AND DISCUSSION

4.4.1 Energy Infrastructure Assessment

4.4.1.1 Academic Block

Equipment	Count	Watt (W)	Hours	Days	kW	Yearly Consumption (kWh)
Tube Light	185	40	6	5	0.04	11100
LED Lighting	140	10	6	5	0.01	2100
Fans	165	70	6	5	0.07	17325
Computers	95	150	6	5	0.15	21375
Projectors	32	300	2	5	0.3	4800
CCTV Cameras	28	40	24	7	0.04	9408
Speakers	40	20	1	5	0.02	200
AC (1.5 ton)	12	1500	6	5	1.5	27000
TOTAL						93308

Table 4.2. Academic Block Infrastructure Assessment

4.4.1.2 Administrative Block

Equipment	Count	Watt (W)	Hours	Days	kW	Yearly Consumption (kWh)
LED Lighting	25	10	6	6	0.01	450
Tube Light	12	40	6	6	0.04	864
Fans	15	70	6	6	0.07	1890
Computers	12	150	6	6	0.15	3240
Printers	3	500	2	6	0.5	900
AC	3	1500	6	6	1.5	8100
CCTV	6	40	24	7	0.04	2016
TOTAL						17460

Table 4.3. Administrative Block Infrastructure Assessment

4.4.1.3 Library Block

Equipment	Count	Watt (W)	Hours	Days	kW	Yearly Consumption (kWh)
Tube Light	27	40	4	5	0.04	1080
Fans	20	70	3	6	0.07	1260
Computers	10	150	2	5	0.15	750
CCTV Cameras	14	40	24	7	0.04	4704
Speakers	1	20	0.25	5	0.02	1.25
TOTAL						7795

Table 4.4 Library Block Infrastructure Assessment



Fig 4.2 Library of the college

4.4.1.4 Auditorium Block

Equipment	Count	Watt (W)	Hours	Days	kW	Yearly Consumption (kWh)
Lights	6	200	2	2	0.2	240
LED	2	40	2	2	0.04	16
Tube	2	300	2	2	0.3	120
Fans	18	150	2	2	0.15	1080
TOTAL						1456

Table 4.5 Auditorium Block Infrastructure Assessment



Fig 4.3 College main auditorium

4.4.1.5 Common Utilities

Equipment	Count	Watt (W)	Hours	Days	kW	Yearly Consumption (kWh)
LED Outdoor	60	40	6	5	0.04	3600
CCTV Cameras	20	40	24	7	0.04	6720
Coolers	5	120	24	6	0.12	4320
Fans	10	70	6	5	0.07	1050
TOTAL						15690

Table 4.6 Common Utilities Assessment

Grand Total Energy Consumption

Total = 135,709 kWh/year

4.4.2 Mandatory Audit Assessment

4.4.2.1 Energy/Utility Details

Items	Details
Name of Building / Hospital / College	Mar Dionysius College, Pazhanji, Thrissur
KSEBL Consumer No, Tariff Category & Connected load	115701401364 LT-6A 50.09kW
KSEBL Section Office:	Pazhanji
Annual Electricity Consumption (kWh)	21,468 kWh (From bill of Sep-24 to Aug-25)
Average Number of Students & Staff	886
Water Source	Not provided
Average Water Consumption (KL)	Not provided
Number of vehicles – 4 Wheeler (Own)	Nil
Number of vehicle – 4 Wheeler (Contract)	Nil
Number of vehicles – 2 Wheeler	Nil
Total Diesel / Petrol consumption of the vehicle	Not provided
Number of electric vehicles (if any)	Nil
Renewable Energy (Solar PV – kWp)	40kWp
Renewable Energy (Bio gas plant – Cub.M)	Nil
Present status of the RE system (Working or not) If any	Yes, Working
Own Diesel Generator (kVA)	63KVA
Annual Diesel Consumption (Litres)	Not provided

Table 4.7 Details of Energy/Utility

4.4.2.2 Energy Analysis

SPECIFIC ENERGY CONSUMPTION DURING THE YEAR 2024-2025					
No	Description of Fuel / Production	Unit	Consumption	Conversion Factor	Total (kWh)
A	Electricity	kWh	21,468	1	21,468
B	High Speed Diesel	Ltr	Not provided	3.5	-
C	Liquified Petroleum Gas - Propane	Kg	568	13	7,384
TOTAL					28,852
D	Average No. of Occupants				886
E	Specific Energy Consumption (kWh/Person)				32.56

Table 4.8 Analysis of Energy Specific Energy Consumption During The Year 2024-2025

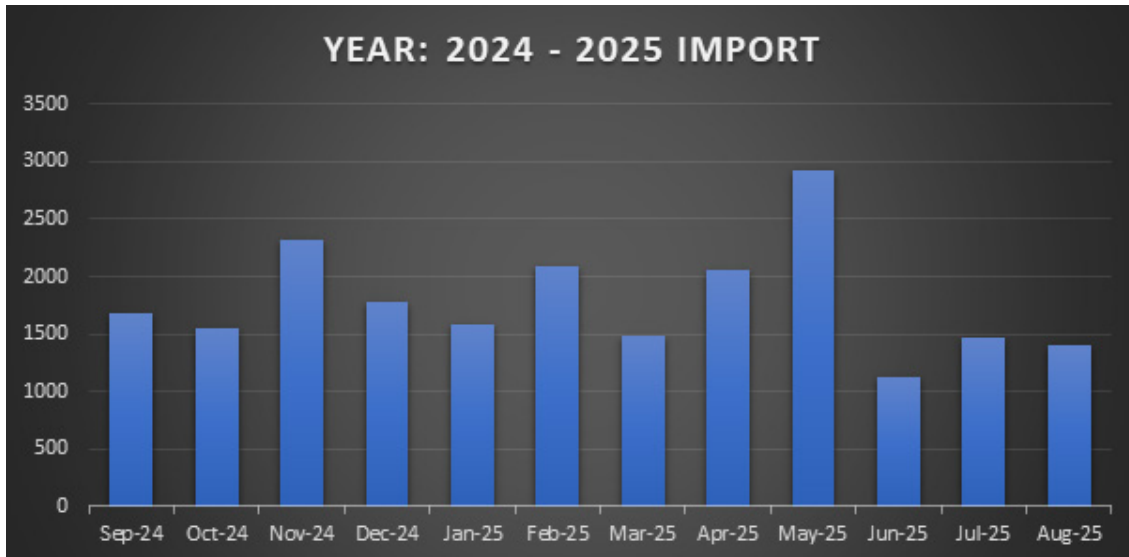
4.4.2.3 Energy Bill Details

Electricity Bill Details		
Consumer Number	1157014013064	
Month	Unit (kWh) IMPORTED	Unit (kWh) EXPORTED
Sep-24	1687	745
Oct-24	1545	1124
Nov-24	2323	502
Dec-24	1782	524
Jan-25	1584	1501
Feb-25	2089	1445
Mar-25	1484	1387
Apr-25	2052	1387
May-25	2926	1776
Jun-25	1124	1742
Jul-25	1470	1021
Aug-25	1402	1045

Table 4.9 Details Of Energy Bill

Annual Energy Import and Export

A. IMPORT



B. EXPORT



Fig 4.4 Annual energy import and export

4.4.2.4 Electric loads – Building wise

Room Name	Fan						LED Fittings			
	Ceiling	BLDC	Wall Mounted	Wall Industrial type	Pedestal	Exhaust	9W	12W	20W	24W
Wattage	80W	35W	60W	180W	60W	60W	9W	12W	20W	24W
BMT BLOCK										
Conference Hall		4					1	9		
Principal Office		1				1	2			4
Pareeksha Bhavan		2							3	
Administrative Office	6							12		
Dining Hall	1						2		1	
Auditorium	20						3		28	
Varandha							5		1	
Stair-case							1		2	
Church	4				1		2	12		
Auditorium-2	20		6				4			2
Management Room		4				1	1	12		
Guest Room		2						9		
SELF BLOCK										
Bsc. Psy LAB GF	3								3	
Psychology LAB	3								3	
III Bsc. Psy	3								3	
G23 II B.Sc Psy	5								4	
Office	4						1	8	2	
Head of Self finance	1						2		2	
G3 I BTM	3								3	
G2 II B Com CA	3								3	
G-I	3								3	
Gents Toilet							2			
G27 Staff Room-1F	3						2		4	
G28 I B.Sc Psy	5								4	
G29 I-BSW	3								3	
G30 II-BSW	3								3	
G31 III-BSW	3								3	
G7 I B.Com Finance	3								3	
G8 I B.Com CA	3								3	

G9 – III BTM	3							3	
G10 – II BTM	2							2	
G11 – Dept of Tourism	2					1		2	
G12 – Dept of Com.	2							1	
Women's toilet						3		1	
G14 – II M.Com 2F	2							1	
G15 – IM. Com	2							1	
G16 III B.Com Finance	3							3	
G17	3							3	
G18 Computer Lab	3							3	
G19 Com. Staff room	2					1		2	
Toilet Gents						1		3	
G34 – Seminar Hall-1	5							6	
G33 – Seminar Hall-2	5							7	
AIDED BLOCK									
Library GF	14				1			22	
Store Room	1							1	
NCC Girls	1							1	
Ladies Toilet						2		4	
Physical Education	1							1	
2-Language Class - II	4							2	
4-NCC	2							2	
5-ANOS	2							3	
6-DY CAMP	3							3	
7-Admission firm	3							3	
8-Admission firm	3							3	
9-Dept of English	3					4		1	
10-Language Dept.	2							2	
11- III B.A. Eng	2							2	
12- II B.A. Eng	2							2	
13- I.B.A Eng	2							2	
14- IBBA	3							2	
15- II B.B.A	3							2	
16- III B.B.A	3							1	
17- Dept of Management	2					2		1	
Varandha						4			
Gents toilet								1	
38- III BCA 1F	2							1	
39- II B. Sc. Phy	2							1	
40- I B. Sc. Phy	2							1	

Staff room	2				1		2		3	
Physics lab	8								11	
42 – Upper Hall	4								2	
III B.Sc. Phy	4								4	
37- Complimentary Computer Lab	5						9			
32- Dept of Computer Application	2								2	
31- Computer Lab-1	3						8		2	
36- II BCA	2								1	
34- Computer Lab-2	4						4		1	
30- Post Graduate & Research DE	3						1		5	
35- I BCA	2								1	
33-Pareeksha bhavan	2								2	
Varandha							2			
29- Guest Room	2		1					9		
NAAC – IQAC	3							12	2	
24 – III BA. Eco	4								2	
28- Research Centre of Economics								9		
26- I B.A. Eco	4								1	
25- II B. A. Eco	4								1	
23A IM.A Eco	2								1	
23B M. A Eco	4						2		4	
51A – IEDC 2F	3								2	
51B	2								2	
52 – Dept of Maths	1						1		1	
53	2								1	
54 – III B.Sc Maths	1								1	
55 – II B.Sc Maths	1								1	
56 – I B.Sc Maths	1								1	
57	3								2	
59 – Seminar Hall			9				9		7	
49 – Chapal Room	4						1		2	
48 - Sanskrit	1								1	
47	2								2	
46 - Sanskrit	2								2	
Language Class - Hindi	2								2	
Centre of Happiness	2								2	
44 – Hi Tech Seminar Hall	10						37			
Old – library room	8			3				23	6	
TOTAL	307	13	16	3	3	2	122	106	265	6

Room Name	Printer		Desktop	Interactive Panel	Air-Conditioner				Speaker			Amplifier	Projector	UPS	
	Xerox	IJ			1-Ton	1.5-Ton	2-Ton	3-Ton	50W	100W	150W			360W	600W
Wattage	2000W	50W	200W	400W	1000W	1200W	1500W	3500W	50W	100W	150W	200W	100W	360W	600W

BMT BLOCK

Conference Hall				1											
Principal Office					1										
Pareeksha Bhavan	2		2												1
Administrative Office	1	6	7			2						1			
Church					1		1								
Auditorium-2											4	1			
Management Room						2									
Guest Room					1										

SELF BLOCK

Bsc. Psy LAB GF															
Psychology LAB															
III Bsc. Psy				1									1		
G23 II B.Sc Psy		1	2												
Office						1									
Head of Self finance					1										
G27 Staff Room-1F		1	2												
G31 III-BSW													1		
G7 I B.Com Finance													1		
G8 I B.Com CA													1		
G9 – III BTM													1		
G10 – II BTM													1		
G11 – Dept of Tourism			1												
G12 – Dept of Com.		1	1												
G14 – II M.Com 2F													1		
G16 III B.Com Finance													1		
G17													1		
G18 Computer Lab			20												
G34 – Seminar Hall-1										2		1			
G33 – Seminar Hall-2													1		

AIDED BLOCK																
Library GF		1	10													
9-Dept of English			1												1	
10-Language Dept.		1	1												1	
11- III B.A. Eng														1		
12- II B.A. Eng														1		
13- I.B.A Eng														1		
14- IBBA														1		
15- II B.B.A														1		
16- III B.B.A														1		
17- Dept of Management		1	1													1
38- III BCA 1F														1		
39- II B. Sc. Phy														1		
Staff room		1	1													
37- Complimentary Computer Lab			20											1		
32- Dept of Computer Application		1	2													
31- Computer Lab-1			20											1		
36- II BCA														1		
34- Computer Lab-2		1	26											1		
30- Post Graduate & Research DE		1	1													1
35- I BCA														1		
29- Guest Room					1											
NAAC – IQAC		1	2													
24 – III BA. Eco														1		
28- Research Centre of Economics		1	9	1											9	
26- I B.A. Eco														1		
23A IM.A Eco														1		
23B M. A Eco														1		
52 – Dept of Maths 2F			2													1
54 – III B.Sc Maths				1												
55 – II B.Sc Maths														1		
57														1		
59 – Seminar Hall								2						1		
44 – Hi Tech Seminar Hall									4							
TOTAL	3	18	131	4	5	5	1	2	4	2	4	3	30	11	4	

Table 4.10 Assessment of Building wise Electric loads

4.4.2.5 Critical Areas

1. Earth Pits:

The earth pit appears poorly maintained, with exposed and corroded earthing conductor and no proper protective chamber or cover. Moisture, dirt accumulation, and loose connections can increase earth resistance and reduce effective grounding.

2. Relays and RCCB's:

We noticed that most of RCCBs provided are not working properly, all relays must be tested and fitted.

3. Distribution Board Earthing:

We noticed that most of the distribution board is not earthed. Not earthing a vertical distribution board can cause electric shock risk, equipment damage, malfunction of protection devices, and increased chances of electrical fire due to fault currents not having a safe path to ground. We recommend to properly earth the distribution board since it is an educational Institution.

4. Rubber mat's near Panel Board

Rubber mats under panel boards are critical for safety, providing electrical insulation to protect workers from electric shocks and arc flash hazards by breaking the path to ground. They offer high dielectric strength, preventing fatal electrocution, reducing fatigue, and keeping workplaces compliant

with safety standards like IS 15652 and IEC 61111.

5. Exposed Wiring

We noticed in utility area that most of the wire near inverter and Battery is exposed. Exposed electrical wires can cause electric shock, leading to serious injury or even death if touched. They also increase the risk of short circuit, which can result in fires and equipment damage.

6. High Neutral Current

We noticed using clamp meter that the neutral line contains high current (31.4 Amps). high neutral current is a serious problem—it indicates load imbalance or harmonics, which can cause overheating of the neutral conductor, energy losses, and potential equipment damage or fire risk.

4.4.2.6 Key Strengths & Good Safety Practices

1. Insulated rubber mats conforming to IS 15652 standards are provided in the electrical room to ensure operator safety against electrical shock hazards during maintenance and operation.
2. Two-point earthing has been provided for the motors, ensuring effective fault current dissipation and enhancing operational safety in compliance with standard electrical safety practices.

4.4.2.7 Safety Audit Check List

4.4.2.7.1 AIDED BLOCK

Sr. No.	Activity description	Requirement	Observation and Recommendation (if any)
1	Earthing pits with identification.	Pit number, test date, due date, and earthing resistance test value should be displayed	The earth pipe is identified but is poorly maintained. Earth pit could not be identified.
2	Check Nut-Bolts	- Should be free from rust. - Should be applied a layer of Grease or Petroleum Jelly.	Rusted nuts and holder and not properly maintained.
3	Earth Pit location at dealership	Should match with earth pit layout diagram.	The earth pit layout diagram was not available during inspection
4	Check Earth Pit Inspection Chamber	Inspection Chamber of earth pit should be provided with lid	Couldn't identified earth pit

5	Check for any signs of rust, corrosion or damage on the panel enclosure.	Visual check	Couldn't identified earth pit
6	Check all covers and doors are intact, properly secured and lockable.	Visual check	Couldn't identified earth pit
7	Check meter sealing	Should be intact	Couldn't identified earth pit
8	Check earthing provision	Two-point earthing with two separate earth pits or grid.	Couldn't identified earth pit
DG Set-1			
9	SOP for DG Set Start & Stop	Should be displayed / made available near to DG Set in English / Local language	NOT AVAILABLE
10	Check Neutral and Body earthing of the DG Set.	• DG Set Neutral and Body should be connected to two separate earth pits. • There should be 02 nos. of earth pit required for Body earthing, and 02 nos. of earth pit required for neutral earthing.	Body earthing was found but couldn't identified earth pit.
11	Segregation of earth pits	Mutual Segregation between the DG Set Neutral & Body Earth Pit shall not less than 6M.	Couldn't identified earth pit.
12	Check DG Set breaker	4-Pole breaker should be available for DG Set	AVAILABLE
13	Check cleanliness inside the DG Set	Should be free from dust / cobwebs / oil leakage etc.	Dust & cobwebs are observed inside the DG during inspection.
14	Check DG battery terminal caps	Should be intact	Battery terminal caps are not available.
15	Check whether Dielectric Grease or Petroleum Jelly is applied on the Battery Terminals	To prevent corrosion and enhance conductivity	Neither petroleum jelly nor dielectric grease has been applied to the terminals.
16	Check working of emergency stop push button provided on the enclosure	DG should stop by pressing the emergency push button provided on the enclosure	The emergency push button on the DG set could not be tested.
17	Check the illumination light inside the DG set	Should be working condition	No illumination

18	- Check whether all the wall openings and cable duct entries in the electrical room are sealed. - Also check for the water seepage, if any.	- All the openings in walls (such as cable trench entry/bus duct entry) should be sealed. - No signs of rainwater seepage should be available in walls / cable trench.	DG is placed outside the panel room so it is more prone to rain.
19	Check earthing provision in electrical room equipment if any.	Two-point earthing with two separate earth pits or grid.	No earthing in panel board
20	List of authorized person's need to be displayed	Name & designation of Electrical Engineer / Electrician / Contractor need to be displayed	NOT DISPLAYED
21	Emergency Telephone numbers need to be displayed in the electrical room	Emergency Telephone numbers of Police, Fire Office and Ambulance should be displayed in electrical room.	NOT DISPLAYED
22	Check proper ventilation in the electrical room	Cooling mechanisms such as exhaust fans / AC should be available	Natural cooling is provided in the electrical room through passive ventilation
23	Check for availability of Insulated Electrical Hand Gloves	Insulated Electrical hand gloves suitable for 11Kv and 415V should be available	NOT AVAILABLE
23	Check that electrical room is NOT used as storage area	Storage of scraps, oil drums, clothes, spares & carton / wooden boxes etc. not allowed	CLEAN
24	Check whether 'AUTHORIZED PERSONNEL ONLY' board is displayed in a conspicuous manner in the Electrical Room.	Visual check only	NOT DISPLAYED
25	Check the Identifications (Incomer & Outgoing Feeders)	Should be labeled with Feeder Name, Breaker Type and Rating	All panels were found without proper identification labels indicating their names and ratings.
26	In case of two incomers check correct interlock is provided for safe operation.	Suitable electrical or mechanical interlock	Electrical lock
27	Check ELR (Earth Leakage Relay) for its healthiness	Incomer Breaker should trip, when the TEST push button is pressed	Earth Leakage Relay (ELR) is not available.

28	Check meters like MFM (Multifunction meter), Voltmeter and Ammeter	- Inspect the meters exterior for damage (such as cracks or broken parts) not acceptable. - Check the integrity of display screens & buttons / knobs.	Energy meters that were found to be in proper working condition. Multifunction meter & volt meter not available.
29	Indication Lamps should be healthy (Phase / ON / OFF / Trip indication)	Indication Lamps provide visual feedback on the status of various components or circuits	Indication lamps of panel is non-functional.
30	Check PDB enclosure for rusting	PDB enclosure should be free from severe rusting	Rusting was observed during inspection.
31	Check the implementation of Lock Out Tag Out (LOTO)	- Visual check for LOTO provision for Incomer and Feeders - Observe the Lockout/ Tagout in action LOTO usage during service work (if applicable).	Lockout-Tagout (LOTO) systems have not been implemented, posing a potential safety risk during maintenance or servicing activities. The absence of proper isolation and tagging procedures increases the likelihood of accidental energization and exposure to electrical hazards.
32	Check isolation provision for control circuit.	MCB or Fuse cutout should be available	AVAILABLE
33	Check Panel door Locking	Door Locking mechanism should be available	AVAILABLE
34	Check for any unwanted holes / any cutout open	Unused cable entry open holes / any other openings should be closed to ensure ingress protection	NONE
35	Check for the cable gland condition	SS gland for armored cable, PVC gland for flexible cable and Duct seal for incoming wire should be available	Duct sealing for incoming cables was found to be off-position at cable entry points, which may lead to safety, dust ingress, and rodent intrusion concerns.
36	Check Earthing of panel as per earth pit layout diagram	Double earthing with two separate earth pits or grid	NO PROPER EARTHING
37	Check Grouting/ mounting of the panel	Firm Mounting should be firm	The panel mounting does not appear to be firm.
38	Check the Panel Board location	Should be away from corrosive fumes/ fluids, easy to access, max 2m from ground level.	YES

39	Check for the phase barriers	Phase barrier between each phase of MCCB, ACB & Changeover Switch for <25mm phase-to-phase air clearance.	NOT AVAILABLE
40	Check effective shrouding to all live parts	Shrouding should be provided to all live parts on all cable termination.	AVAILABLE
41	Check cleanliness inside the panel	Should be free from dusts / cobwebs etc.	Multiple panels were found to have heavy accumulation of dust and cobwebs, indicating a lack of regular maintenance and housekeeping.
42	Check Busbar & Terminal connection	Should be no signs of overheating, such as discoloration, melting insulation, or burning odors.	Discoloration due to overheating and the presence of burn marks were observed in multiple panels, indicating possible thermal stress or previous electrical faults.
43	Check insulating rubber mats conforming IS 15652 are provided in front of the electrical panels to save the operating personnel of electrical shock.	The insulating rubber mats should conform IS 15652	NOT AVAILABLE
44	Check that 30mA ELCB / RCCB / RCBO is connected in Lighting and Socket circuit	- The rating should be not more than 30mA - ELCB / RCCB / RCBO should trip, when the TEST push button is pressed	In multiple panels, the RCCB was found to be either non-functional or bypassed, thereby compromising the system's electrical safety and protection against leakage currents.
45	Check for spare MCB cutouts.	Should be closed with MCB Dummy Blank Plate	MCB Dummy blank plates are available
46	Check for circuit identification.	The nameplates / labeling identification should match with SLD	LDB panels lack proper identification labels, making it difficult to trace circuits and potentially hindering maintenance and troubleshooting efforts.
47	Check for any unwanted holes / any cutout open	Unused cable entry open holes / any other openings should be closed to ensure ingress protection	Unwanted cut-outs were observed on multiple panels, which may pose safety and ingress concerns.
48	Check cleanliness inside the panel	Should be free from dusts / cobwebs etc.	Dust and Cobwebs are present inside panel.
49	Check earthing provision at LDB	Two-point earthing with two separate earth pits or grid.	NOT AVAILABLE

50	Check insulating rubber mats conforming IS 15652 are provided in front of the electrical panels to save the operating personnel of electrical shock.	The insulating rubber mats should conform IS 15652	NOT AVAILABLE
51	Check for the type of wires / cables used on random basis	Prefer FRLS / LSZH as and when the existing wires / cable are replaced	YES
52	Check electrical wiring / cables	The wiring / cable should be in good condition with no exposed wiring / cables	Exposed cables were observed in multiple areas.
53	Check cable dressing	• Cables should be neatly organized, bundled and adequately secured • Cable sharp bends should be avoided. • Cable ties, clips or clamps should be used. • Cable should not cross over metal sharp edges. • No cables hanging • No insulation damage or cuts in cables	NOT PROPER
54	Visual check for improper / unsafe cable / wire jointing	• Cable / Wire joints should be done with good engineering practice • Jointing should be free from any hint of overheating / burning marks	Evidence of overheating was observed at multiple cable joints, indicating potential issues with connection integrity or load handling.
55	Check cable trays	Cable trays and conduits should not be overloaded.	NO CABLE TRAY
56	Check cable identification	Cables identification should be done using Tags / Labels	NOT AVAILABLE
57	Check cable route marking	Underground cables should have route markers with voltage level.	NO MARKING
58	Check cable conduit opening sealing (if visible)	Cable conduit opening should be sealed by suitable to prevent moisture, dust, pests, oil leakages.	Open cable conduits were observed in several areas, which may lead to physical damage to the cables and pose potential safety and maintenance concerns.

59	Check cable entry sealing in panel / junction box	Sealing of all cable entry should be available. • Suitable Cable Gland for individual cables. • Rubber Grommets for smaller conduits.	Cable entry seals were found to be misplaced in certain areas, potentially allowing dust, moisture, and pests to enter the enclosures.
60	Check cable terminals for proper use of Lugs	Cable Lugs should be available at all cable termination	NOT AVAILABLE
61	Check any unused/ unwanted cables	Unused/ unwanted cables should be removed	NOT FOUND
62	Check cable entry glands in Terminal Box	• One gland one cable • Proper size gland	NOT AVAILABLE
63	Check external electrical connections	Weatherproof enclosures should be available for external electrical connections	YES
64	Check fuses or circuit breakers (CBs)	• The rating of the fuses or CBs should match with SLD. • Fuses or CBs should NOT be bypassed.	SFUs were found to be bypassed, and several RCCBs were either non-functional or bypassed, significantly compromising electrical protection and safety compliance.
65	Check ventilation provision for area.	Natural / mechanical ventilation required	Natural ventilation is available.
66	Check earthing provision in pump room equipment.	Two-point earthing with two separate earth pits or grid.	Couldn't identified earth pit
67	Check motor terminal box for empty holes	Motor terminal box should not have any empty holes	Motor was covered
68	Check whether electrical panel / Direct Online (DOL) Starter / Electrical Light Fittings are used .	Electrical Panel / DOL Starters / Electrical Light Fittings should be suitable for IP56 protection.	NOT AVAILABLE
69	Check battery condition.	No Bulge, No Damage	YES
70	Check for isolation at Battery end.	Isolation at the battery end should be available or Integrated Protection (CB or Fuse) should be available in UPS.	NOT AVAILABLE

71	Check battery terminal caps	Should be intact	Majority of battery in the institution was found without battery cap, increasing the risk of electrical hazard and accidental contacts.
72	Check terminal for rusting or corrosive deposits.	Battery terminals should be clean (free from rusting or corrosive deposits)	Corrosive deposits and rusting were observed on the battery terminals of the batteries located near panel room.
73	Check dielectric Grease or Petroleum Jelly should apply on Battery Terminals	Battery terminals to prevent corrosion and enhance conductivity	Neither dielectric grease nor petroleum jelly is applied.
74	Check provision for battery rack earthing.	It should be properly earthed	The metal racks were found to lack proper two-point earthing, which is essential for ensuring electrical safety and fault current dissipation.
75	Check Eye Washer wherever lead acid Batteries are Installed.	- Should be available for Lead Acid Batteries. - NOT required for Ni-Cd Batteries / Maintenance free Batteries.	NOT AVAILABLE
76	Check the provision of separate earth pit.	2 nos. of dedicated earth pits should be available for LA.	NOT AVAILABLE
77	Check down conductor separation from the structure.	Down Conductor should be fixed on insulators, and NOT directly on the structure.	NOT AVAILABLE
78	Check Fire Detection and Alarm system.	Fire Detection and Alarm system should be available in the following areas: Electrical Room.	NOT AVAILABLE
79	Check whether the Uninterrupted power supply is provided to the Fire Detection and Alarm system	The power supply for the Fire Detection and Alarm system should be through UPS.	NOT AVAILABLE
80	Check Fire Sand Buckets are available near electrical equipment (Transformer, DG Set, Electrical Room, LDB)	- The sand should be free flowing. - Canopy should be provided when Fire Sand Buckets are placed in open area (for avoiding rainwater ingress).	NOT AVAILABLE

81	Check whether portable fire extinguishers are available.	• Fire extinguishers should be mounted about 1 Meter above the ground / floor. • CO₂ Type for electrical installations. • DCP Type (ABC) for all other areas.	NOT AVAILABLE
82	Check escape route marking and exit signs	Escape routes and exit signs should be marked in a conspicuous manner	NOT AVAILABLE
83	Check the availability of LOTO Equipment	Lockout Devices, Tagout Devices, Unique Keys should be available.	NOT AVAILABLE
84	Check that, electrical panels are not exposed to rainwater	• Opening / rainwater exposure not allowed. • Canopy needs to be provided for outdoor electrical panel.	Panels near DG
85	Check for display of Resuscitation (Artificial Respiration) Chart near PDB and LDB	Resuscitation (Artificial Respiration) Chart should be displayed in English or Local language.	NOT AVAILABLE
86	Check provision of emergency lights	UPS / Inverter supply based critical emergency lighting should be available in critical areas like Electrical Room, D G Area, Security cabin, Entrance etc.	AVAILABLE IN PANEL ROOM BUT NO SUFFICIENT LUX
87	Check electrical sockets for overloading	The electrical sockets should not be overloaded with multiple loads.	NOT OVERLOADED
88	Check that every connection is provided with one exclusive terminal connector	Visual inspection	NO
89	Check Terminal box for easy access	Terminal box should be provided at a height not more than 3M from the floor level.	YES
90	Check whether the Terminal box is mounted firmly	Min. 4 fasteners should be used	NA

91	Check for presence of Rodents and Termites in the premises	- The premises should be kept clean and free from the traces of the leftover foods. - Repellents may be used to keep the biological agents away from electrical installation.	Evidence of rodent presence was observed inside the DG set as well as panel near DG, indicating a need for pest control measures and improved housekeeping.
92	Check whether the material used for false ceiling, flooring and wall furnishing (if any) is highly flammable	Use of highly flammable materials in the construction of false ceiling, flooring and wall furnishing should be avoided.	NONE
93	Check Single Line Diagram	Updated	NOT UPDATED
94	Check that as built drawing are available	Approved	NOT AVAILABLE
95	Check earth pit layout diagram	Updated	NOT AVAILABLE
96	Check earth pit test records	Earthing Electrode & Grid resistance should be measured at least once in a year in a dry period as per IS 3043	NOT AVAILABLE
97	LOTO Policy Documentation	- Written LOTO Procedure including Electrical Isolation Procedure should be available. - LOTO register should be maintained.	NOT AVAILABLE
98	Check Electrical Competency Licenses	Electrical competency certificates (electrical supervisor / Contractor / Wiremen License) regulated by the respective state regulatory state authority	-
99	Check preventive maintenance schedule	The schedule should at least include the following equipment / installations. - DG Set - PDB - LDB - UPS and Batteries	-

100	Check preventive maintenance check lists and records for last 3 years	With respect to schedule	-
101	Check for measuring instrument calibration test certificates	Calibration certificates from NABL approved laboratory should be available for the following instruments • Digital Multimeter. • Digital Clamp meter. • Insulation Tester. • Earth Pit Tester. The calibration should be carried out at least once in a year.	-
102	Check for electrical accident / incident records and investigation reports	With corrective action	Not provided but noted during inspection near meter room. (near men's toilet)
103	Check for cable and equipment Insulation Resistance (IR) test reports for last 3 years	The IR test should be carried out at least once in a year.	NOT TESTED
104	Check for valid AMC for major electrical equipment	The valid AMC should be in place for the following equipment / installations. • DG Set • UPS and Batteries	AVAILABLE
105	Check for Electrical Safety Awareness Training records for last 3 years.	The Electrical Safety Awareness Training should be imparted to all the employees at least once a year.	NA
106	Check for the compliance status of the reports of annual inspection of electrical installations by local authorities	Check for last 3 years	NA
107	Test certificates for insulating rubber gloves (for electrical purpose) check for last 3 years	The insulating rubber gloves should be tested at least once in 6 months as per IS 4770	NOT AVAILABLE

108	Check for Fire Extinguisher inspection records for last 3 years	Fire Extinguisher should be checked at least once in 3 months	NOT AVAILABLE
109	Check for Fire Detection and Alarm System for last 3 years	Inspection maintenance and testing should be carried out at least once in 3 months	NOT AVAILABLE
110	Fire NOC	Check availability, validity and compliance with conditions mentioned therein	NOT AVAILABLE

Table 4.11 Checklist OF Safety Audit – Aided Block

4.4.2.8 Additional Opportunities if any for further Improvement

1. Earth pits were not traceable during inspection. During inspection, earth pipe was found but proper earth pit was not identified. It is recommended to clearly mark, document, and ensure accessible identification of all earthing points as part of compliance and maintenance protocol.
2. It was noted that all the fans in a room have single switch for operation. Provide separate switch for each fan instead of using a single common switch, so that every fan can be controlled individually.
3. All panel exhibit severe dust accumulation. Monthly cleaning is recommended.
4. Electrical panel outside the building (near DG) were found with visible rusting, indicating prolonged exposure to moisture or lack of maintenance. This can compromise panel integrity and electrical safety, and hence should be addressed promptly through cleaning, repainting, or replacement.
5. Several panels were found without proper labelling of names and ratings. Clear and durable labelling should be provided to ensure easy identification, enhance operational safety, and assist in maintenance activities.
6. Multiple SFUs were found bypassed in Aided block. It is recommended to restore proper fuse protection to ensure circuit safety and fault isolation.
7. Burn marks are observed near the meter room (near mens toilet) due to overheating and overcurrent. This indicates potential loose connections or overload conditions, and corrective action should be taken to prevent equipment damage or fire hazard.
8. Fire extinguisher was not available near the panel room and meter room. We suggest to place atleast near the panel room and meter for increasing the protection against electric fire. (Safety Note: Do not pour water is you spot fire near the panel room or meter room which can cause severe electric shock and potentially spread the fire, causing further damage.)
9. Neither sand bucket nor fire extinguisher were available near the DG area. Provision of basic fire-fighting equipment is essential and should be ensured to enhance emergency preparedness.
10. Insulated hand gloves were not available near the panel room of aided block. These are essential for electrical safety and should be provided in all electrical rooms.
11. Lockout-Tagout (LOTO) systems are not implemented in the college. Introducing LOTO procedures will significantly improve electrical safety during maintenance and servicing activities by preventing accidental energization.
12. Multiple panels were found with severe dust accumulation and cobwebs. Regular cleaning and maintenance schedules should be implemented to ensure panel hygiene and reduce fire hazards.
13. Multiple RCCBs were found either non-functional or bypassed. It is recommended to replace faulty RCCBs and ensure all protective devices are operational to maintain electrical safety standards.
14. Several hanging wires were observed in multiple areas, particularly near panel rooms VDB, posing a potential safety hazard and requiring proper cable management.
15. Multiple conduits were found left open with exposed cables, indicating the need for proper

sealing to ensure safety and protection from environmental factors.

16. Two-point earthing has not been provided for the battery rack in panel room, which is a deviation from standard electrical safety practices.
17. Foreign objects such as KSEB bills was found placed in meter room near men's toilet, posing a serious safety and fire hazard. Immediate removal and strict housekeeping protocols are recommended.
18. Indication lamps were found non-functional in panel near DG and some indication lamp appears to be broken, which can hinder quick visual identification of panel status. Replacing faulty lamps is recommended to ensure proper monitoring and safety.
19. Porcelain fuses that are bypassed as during IR scanning several SFU in panel room emitted high temperature. This compromises circuit protection and poses significant safety risks. Immediate corrective action is recommended to restore proper fuse protection.
20. Eyewash station is not available near the battery in panel room. It is recommended to install an eyewash facility to enhance safety in case of accidental exposure to harmful substances or battery acid.
21. Neither fire detection systems nor fire alarm systems are available in the electrical rooms. It is recommended to install appropriate fire detection and alarm systems to ensure early warning and improved safety during fire-related emergencies.

4.4.2.9 Load Balance Check

Sl No	Equipment	Current (in A)		
		L1	L2	L3
1	Incomer	51.2	15.93	27.31
2	DB No:2 (Aided 2 nd & 3 rd Floor)	0.17	0.10	0.17
3	DB No:1 (Aided GF)	Clamp not fit		0.21
4	No Name (BMP Block & Auditorium)	Clamp not fit – Congested wiring		
5	DB No:3 (Lift & Self Block)	Clamp not fit – Congested wiring		
6	5 th Panel	0.30	Clamp not fit	
7	6 th Panel	Clamp not fit – Congested wiring		

Table 4.12 Load Balance Check

Load Balance - % Unbalance

SI No.	Equipment	L1	L2	L3
1	Incomer	62.25	49.39	13.25
2	DB No:2	15.96	31.78	15.96

Table 4.13 Load Balance - % Unbalance

Finding:

The current in all three-phases is not balanced as you can see in the above table which can contribute to high neutral current. Ideally, current in three-phase are equal in magnitude and 120° apart. Because of this phase difference, neutral current becomes zero because it is the vector sum of all three phase current. Here, the neutral current is high because of the load imbalance caused by the non-linear loads (such as Computers, LED lights, TV's etc..) which causes harmonics in the system as it is observed that the current harmonics is significantly higher in the L3 line (B – Phase). This suggests that most of the non – linear load is concentrated on the B – phase.

Observed Neutral Current in Incomer

31.43 A

Recommendation:

- Distribute non – linear loads evenly across all three phases (R, Y, B).
- Use detuned capacitor for power-factor correction and minimizing harmonics loads.

4.4.2.10 Electrical Measured Parameters

Parameter	Minimum	Average	Maximum
Voltage Line to Neutral	Volts, V		
V1	200.52 – 235.18	208.27 – 236.86	210.18 – 238.54
V2	236.07 – 255.71	236.8 – 255.99	237.15 – 256.31
V3	215.35 – 244.18	221.22 – 244.72	222.03 – 248.44
VN-E	5.22 – 11.64	6.24 – 12.42	6.63 – 18.93
Voltage Line to Line	Volts, V		
U12	390.16 – 422.45	392.16 – 423.98	393.05 – 424.57
U23	390.92 – 420.88	396.1 – 422.31	398.94 – 423.00
U31	374.67 – 410.79	381.15 – 411.51	382.46 – 412.26
Current	Amps, A		
A1	33 – 53	34 – 55	35 – 70
A2	15 – 26	16 – 27	16 – 27
A3	26 – 50	27 – 50	27 – 59
AN	13 – 27	14 – 29	13 – 45
Power Factor			
PF1	0.91 – 0.98	0.96 – 0.98	0.97 – 0.98
PF2	0.85 – 0.96	0.94 – 0.96	0.94 – 0.96
PF3	0.91 – 0.98	0.95 – 0.98	0.95 – 0.98
PFT	0.78 – 0.93	0.87 – 0.94	0.87 – 0.95
Active Power	Kilowatts, kW		
P1	7.5 – 11.1	7.8 – 11.3	7.8 – 11.3
P2	3.6 – 6.1	3.6 – 6.1	3.7 – 6.1

P3	6.1 – 10.8	6.1 – 10.8	6.2 – 10.8
PT	18.6 – 26.1	18.6 – 26.1	19.2 – 26.4
Apparent Power	Kilovolt-Ampere, kVA		
S1	7.8 – 11.3	8.0 – 11.6	8.2 – 14.4
S2	3.9 – 6.4	3.9 – 6.5	3.9 – 6.6
S3	6.4 – 11.0	6.5 – 11.1	6.6 – 13.0
ST	20.7 – 28.5	21.0 – 29.1	21.6 – 33.6
Reactive Power	Kilovolt-Ampere Reactive, kVAR		
Q1	-1.2 – 0.6	-1.1 – 0.7	-1.0 – 1.1
Q2	-0.3 – 1.5	-0.2 – 1.5	-0.2 – 1.6
Q3	-0.3 – 1.4	-0.2 – 1.4	-0.1 – 3.3
QT	-1.2 – 3.6	-0.9 – 3.6	-0.9 – 4.8
Harmonics	Percentage %		
THD V1	2.61 – 3.66	3.01 – 3.91	3.06 – 5.87
THD V2	2.57 – 3.3	2.68 – 3.46	2.75 – 4.11
THD V3	3.29 – 4.47	3.34 – 4.54	3.4 – 4.92
THD A1	3.66 – 7.24	4.61 – 10.45	4.8 – 16.39
THD A2	3.22 – 7.72	4.54 – 8.08	4.85 – 8.51
THD A3	4.91 – 17.4	7.3 – 17.84	7.59 – 19.13
Frequency, Hz	49.92 – 50.21	49.92 – 50.22	49.92 – 50.23

Table 4.14 Electrical measured parameters

System Voltage

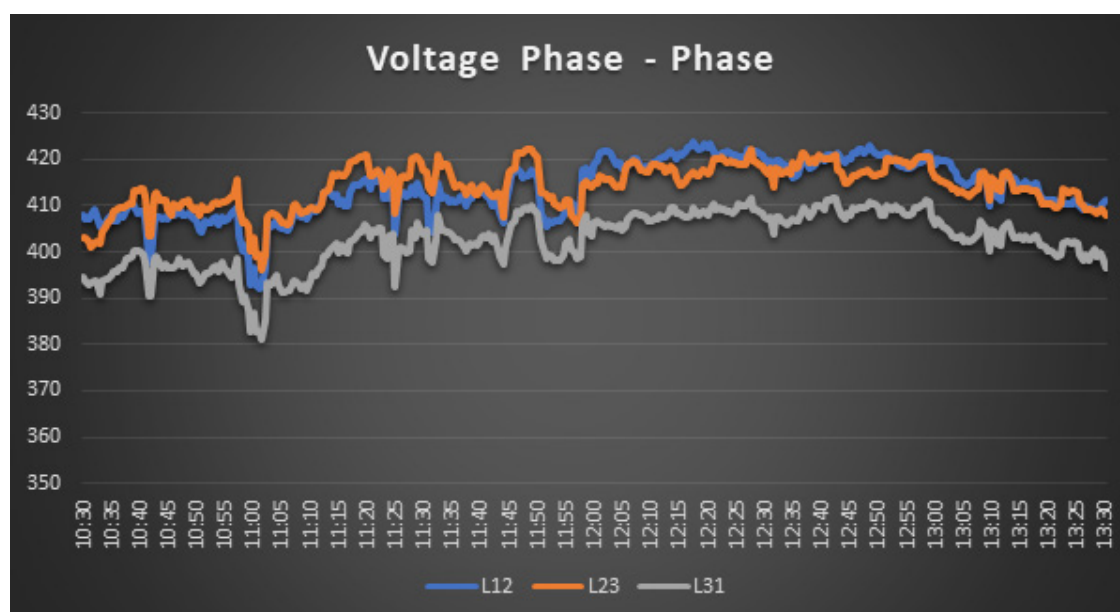


Fig 4.5 Voltage phase

From the graph, the three phase voltages (L12, L23, L31) are not balanced – one phase (L31) is consistently lower than the others, and there are noticeable fluctuations and dips.

Analysis:

- LT – 6A System : 230/400V, 3-Phase, 4-Wire.
- Line-neutral (V1, V2, V3):
 - V1: Min 200.52 – 235.18V, Avg 208.27 – 236.86V, Max 210.18 – 238.54V
 - V2: Min 236.07 – 255.71V, Avg 236.8 – 255.99V, Max 237.15 – 256.31V
 - V3: Min 215.35 – 244.18V, Avg 221.22 – 244.72V, Max 222.03 – 248.44V
- Neutral – earth:

- V N – G: typically 6.24 – 12.42V, Max 18.93V
- Line – Line (U12, U23, U31)
 - U12: Min 390.16 – 422.45V, Avg 392.16 – 423.98V, Max 393.05 – 424.57V
 - U23: Min 390.92 – 420.88V, Avg 396.1 – 422.31V, Max 398.94 – 423.00V
 - U31: Min 374.67 – 410.79V, Avg 381.15 – 411.51V, Max 382.46 – 412.26V

Solution:

- Balance the load across all three phases by redistributing single-phase loads evenly to reduce voltage imbalance.
- Check and tighten all electrical connections to eliminate voltage drops due to loose contacts.

Load Current

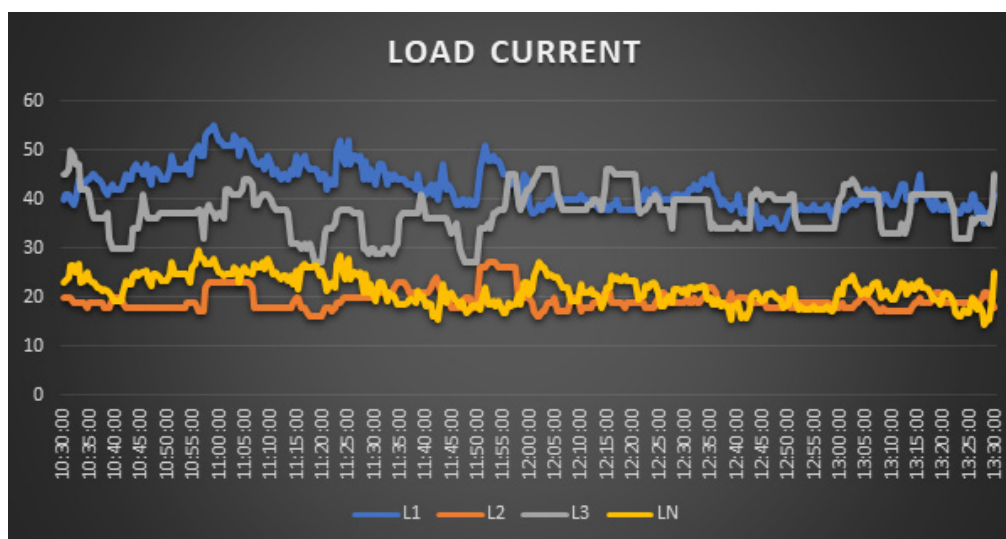


Fig 4.6 Load current

From the load current graph, the three phases (L1, L2, L3) are clearly unbalanced—L1 is significantly higher, L2 is much lower, and L3 is moderate. This indicates load imbalance across phases, resulting in high neutral current (LN), increased losses, overheating, and reduced efficiency of the electrical system.

Analysis:

- Phase currents:
 - A1: Min 33 – 53A, Avg 34 – 55A, Max 35 – 70A
 - A2: Min 15 – 26A, Avg 16 – 27A, Max 16 – 27A
 - A3: Min 26 – 50A, Avg 27 – 50A, Max 27 – 59A
- Neutral current:

- AN: Min 13 – 27A, Avg 14 – 29A, Max 13 – 45A
- Current Unbalance:
 - A1%: Min 26.50%, Avg 27.89%, Max 32.90%
 - A2%: Min 40.21%, Avg 41.03%, Max 43.44%
 - A3%: Min 13.77%, Avg 13.14%, Max 10.57%

Solution:

- Redistribute loads evenly across L1, L2, and L3 to minimize current imbalance.
- Shift single-phase loads from the heavily loaded phase (L1) to the lightly loaded phase (L2).
- Check neutral connections and ensure proper tightening.

Total Harmonic Distortion – THD%

THD% - Voltage

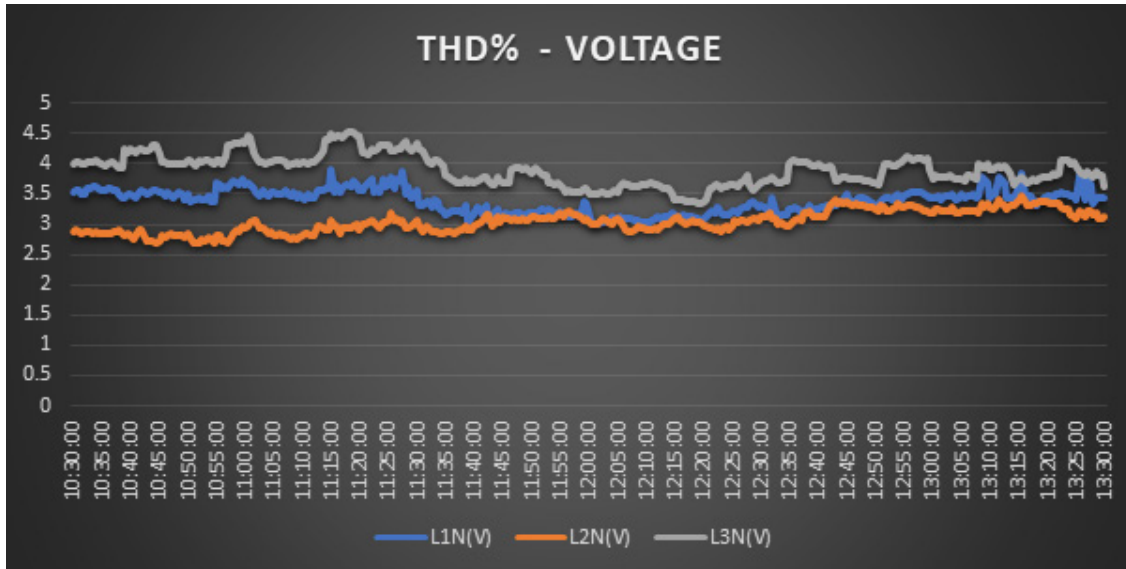


Fig 4.7 Total Harmonic Distortion

- Voltage THD is within acceptable limits (typically <5% as per IEEE standards)
- However, phase imbalance in distortion is visible (L3 higher than others)

THD% - Current

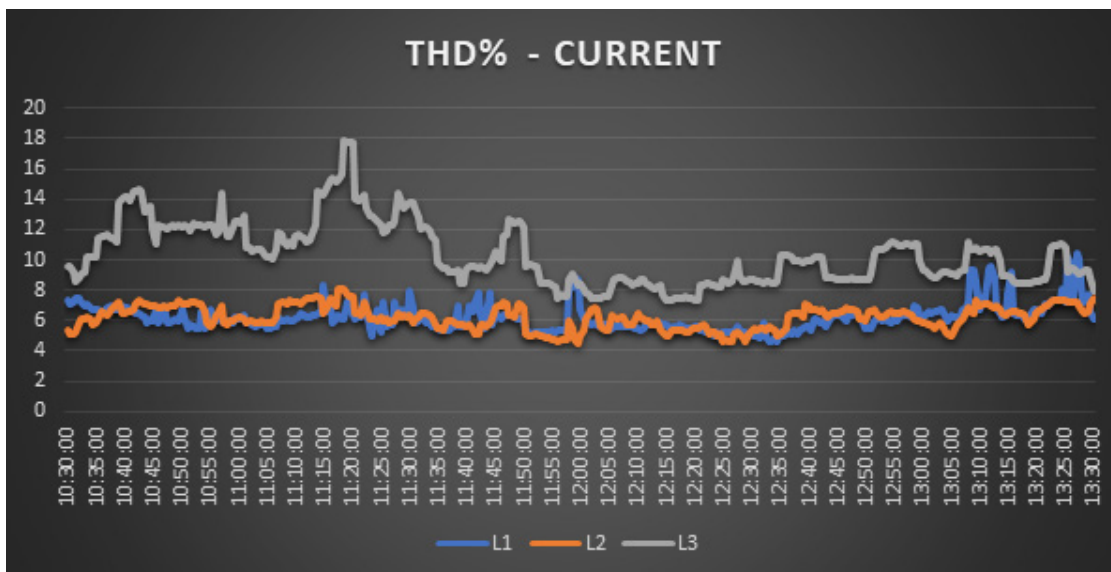


Fig 4.8 Current

- L1 & L2: ~5% to 8% (typically <8% as per IEEE standards)
- L3: ~8% to 18% (significantly higher)
- High current THD in L3 indicates nonlinear load concentration.
- Shift nonlinear loads (such as PC's, LED Lights) evenly across all three phases.

4.4.2.11 Photographs

4.4.2.11.1 Good Safety Practices:



CURRENT SITUATION:

The panel board is provided with normal rubber mats which is not safe according to safety standard and can cause electric hazards like electric shock

RECOMMENDATION:

All panel board should be provided with rubber mats conforming to IS 15652, ensuring protection against electric shock during operation and maintenance.

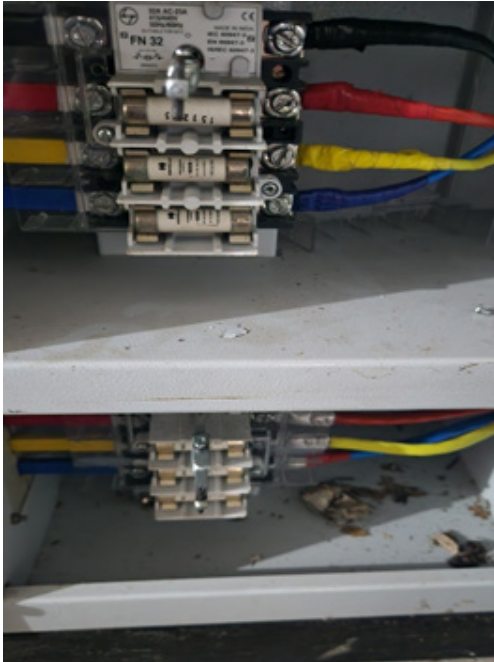


CURRENT SITUATION:

The electrical room entrance lacks a visible 'Authorized Personnel Only' signage

RECOMMENDATION:

All electrical room including meter room near the men's toilet should be labelled 'Authorized Personnel Only' which is essential for restricting unauthorized access and ensuring compliance with safety norms.



CURRENT SITUATION:

Some electrical panel were found with heavy dust accumulation, indicating poor maintenance and potential risk to equipment reliability and safety.

RECOMMENDATION:

Keep the area around the panel clean, dry, and accessible. If you notice dust, grime, or signs of rust, it is crucial to have a qualified electrician inspect and clean the panel to ensure safety and prevent costly repairs.



CURRENT SITUATION:

Cable entry sealing to the panel is not properly placed allowing dust and moisture to get inside the panel

RECOMMENDATION:

We suggest to properly seal the cable entry of the panel using proper sealant for clean and dirt free panel.

**CURRENT SITUATION:**

The earth pit could not identified during inspection.

RECOMMENDATION:

We suggest to properly build an earth pit and earth the panel boards.

**CURRENT SITUATION:**

The panel board as well as LDB are not properly earthed which is clear violation of safety regulations and national electrical standards.

RECOMMENDATION:

We suggest to properly build an earth pit and earth all the panel boards including LDB for improving safety.

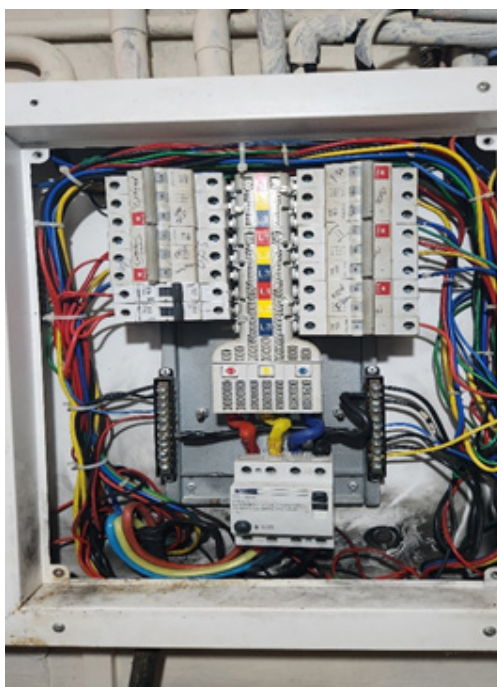


CURRENT SITUATION:

The DB area is poorly maintained and unsafe, with visible loose and exposed wiring, improper cable routing, and lack of proper cable management. The presence of open sockets, temporary connections, and cluttered wiring increases the risk of electric shock, short circuits, and fire hazards.

RECOMMENDATION:

We recommend to route all wires inside conduit and eliminate exposed/loose wiring by securing connections inside proper junction boxes.



CURRENT SITUATION:

The distribution board shows poor cable management and overcrowding, with wires loosely routed and bundled, increasing the risk of overheating and faults. This type of DB is found Panel room as well as Meter room.

RECOMMENDATION:

Reorganize & route cables properly, arrange all wires neatly using cable ducts/trunking and proper ferruling to avoid overcrowding and ensure easy maintenance also check all connections, tighten loose terminals, and replace improper joints with proper lugs and connectors to prevent overheating.

**CURRENT SITUATION:**

There are burn marks and soot deposits on the wall above the panel, indicating past overheating or arcing. Additionally, exposed and loosely routed cables without proper protection increase the risk of electrical faults, fire hazards, and further overheating.

RECOMMENDATION:

Identify and rectify the root cause: Inspect the circuit for loose connections, overloading, or faulty components that may have caused overheating/arcing, and replace any damaged parts. Install appropriate protection devices, Ensure proper rating of MCB/MCCB.

**CURRENT SITUATION:**

The battery terminal shows corrosion due to absence of dielectric or petroleum gel, with visible rust and deposits on the terminal lug. This can lead to high contact resistance, causing voltage drop, overheating, and unreliable power supply.

RECOMMENDATION:

Apply dielectric gel to the battery terminals to prevent corrosion and ensure proper conductivity, and install a terminal cover to protect against moisture, dust, and accidental short circuits.

**CURRENT SITUATION:**

Chewing of cable insulator by mice/rat is observed during inspection which can cause short-circuit and other electrical hazards.

RECOMMENDATION:

We recommend to replace the damaged wire and place the wire in the proper manner and slot.

Table 4.15 Photographs Of Good Safety Practices

4.4.2.12 Thermographic Assessment

Thermal images are an easy way to identify apparent temperature differences in industrial three phase electrical circuits, compared to their normal operating conditions.

By inspecting the thermal gradients of all three phases side-by-side, can quickly spot performance anomalies on individual legs due to unbalance or overloading. Equal load should equate to equal temperatures. In an unbalanced load situation, the more heavily loaded

phase(s) will appear warmer than others due to the heat generated by resistance. However, an unbalanced load, an overload, a bad connection, and a harmonic imbalance can all create a similar pattern. Measuring the electrical load is required to diagnose the problem. The measured temperature with respect to the ambient temperature is compared to detect the abnormal heating of components. The measured temperature with respect to the ambient temperature is compared to detect the abnormal heating of components.

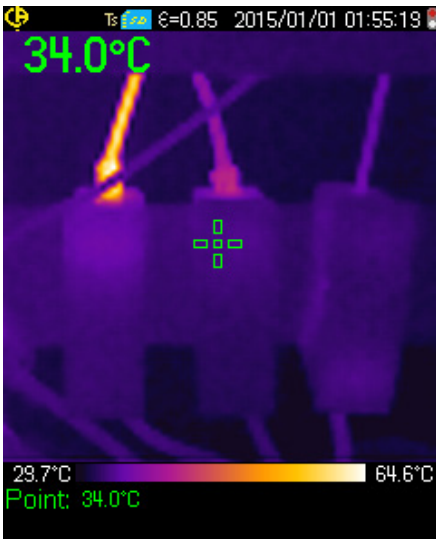
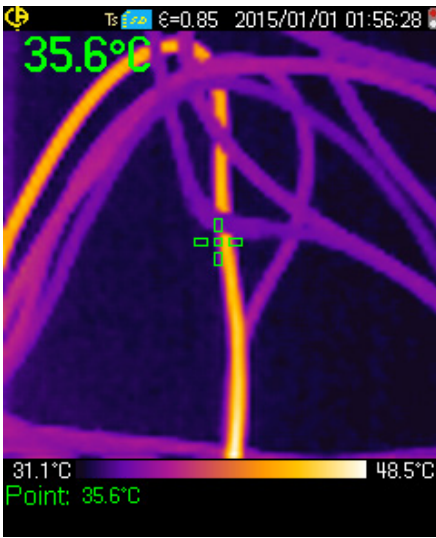
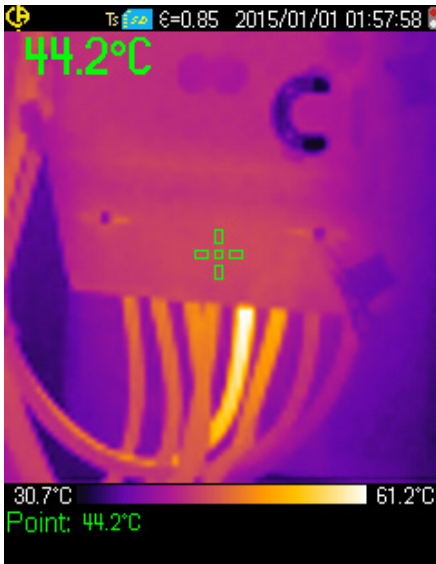


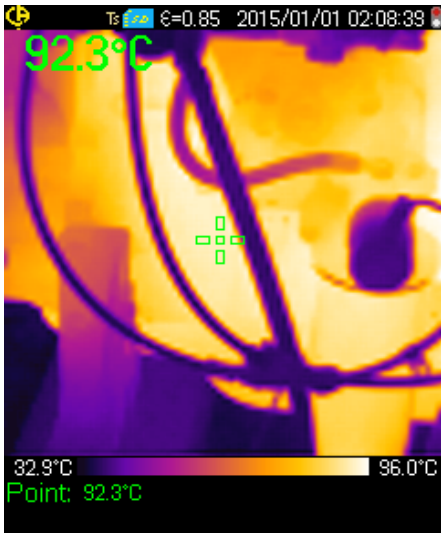
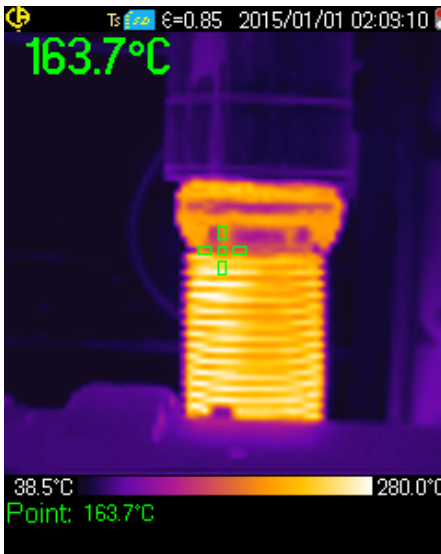
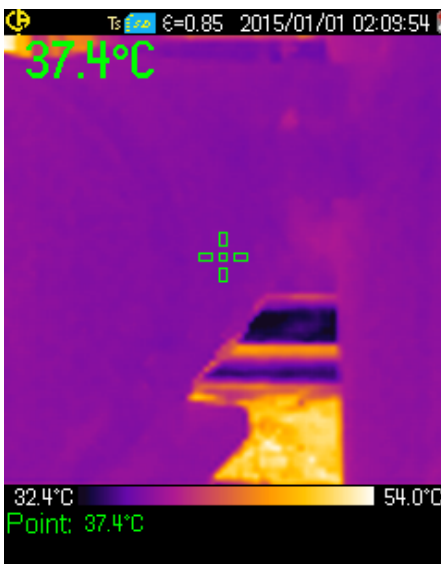
Fig 4.9 Thermographic Assessment

Temperature Rise above Ambient	Severity	Recommended Action
1°C to 10°C	Normal	No Action Required
11°C to 20°C	Minor	Monitor, analyse load condition, schedule for repairs.
21°C to 40°C	High	Repair in one or two days, reduce load until repairs are complete.
Over 40°C	Critical	Repair immediately, reduce or control load till repairs are complete.

The thermal assessment conducted panel wise is detailed in the following section.

Table 4.16 Thermographic assessment

DESCRIPTION	THERMAL IMAGE	TEMPERATURE °C
FUSE NEAR METER BOARD		64.6°C
WIRE NEAR SOLAR METER		48.5°C
SOLAR METER		61°C

DG ENGINE		96.0°C
DG EXHAUST		280°C
DG FILTER		37.4°C

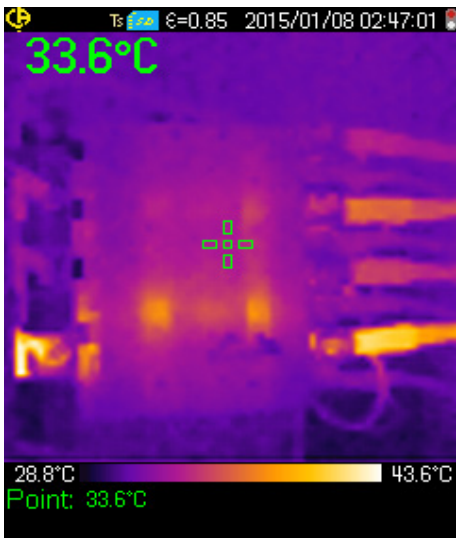
DG COOLANT INLET	 47.7°C 34.1°C 87.3°C Point: 47.7°C	47.7°C
DG COOLANT OUTLET	 69.5°C 40.0°C 74.9°C Point: 69.5°C	69.5°C
MAIN INCOMER	 33.6°C 28.8°C 43.6°C Point: 33.6°C	43.6

Table 4.17 Panel wise thermal assessment

4.4.2.13 Summary of Findings

Sl No.	Equipment	Severity
1	Fuse near Meter (Notably in R-Phase)	
2	Wire From Solar meter (Include 2 nd & 3 rd IR Image)	
3	DG Engine (Fuel burning emits heat)	
4	DG Exhaust (Burned gas emit heat)	
5	DG Filter	
6	DG Coolant inlet	
7	DG Coolant outlet	
8	Main Incomer	

Table 4.18 Summary of finding

4.4.2.14 Executive Summary

Total Yearly Saving including cost benefit analysis from Energy Efficiency Improvement Projects						
SL No	Project	Total Investment	Yearly Cost Saving	Payback	Energy Saved / Yr	Reduction in CO2 Emission
		₹	₹	Months	kWh	Tons
1	Energy Saving by replacing regular Fans to BLDC Energy Efficient Fans in future	7,50,000	1,45,500	62	22,380	18.35
2	Energy Saving by replacing 3-star AC to 5-star Efficient AC in future	35,000	3,042	138	468	0.38
3	By Behavioural Change of Occupants through education & motivation	-	83,500	-	12,880	10.56

Table 4.18 Executive summary

4.4.2.15 Summary of Electrical load

Equipment		Power Consumption (Watts - W)	Quantity (Nos.)	Total (Watts - W)
Fan	Ceiling	80	307	24560
	BLDC	35	13	455
	Wall-mounted	60	16	960
	Wall-mounted Industrial type	180	3	540
	Pedestal	60	3	180
	Exhaust	60	2	120
LED	Ceiling-mount small	12	106	1272
	Ceiling-mount large	24	6	144
	Bulb	9	122	1098
	Tube-light	20	265	5300

Air-conditioner	1-Ton	1000	1	1000
	1.5-Ton	1200	4	4800
	2-Ton	1500	2	3000
	3-Ton	3500	1	3500
Printer	Xerox	2000	3	6000
	IJ	50	18	900
Desktop	Full-set	200	131	26200
Interactive Panel		220	4	880
UPS	360W	360	11	3960
	600W	600	4	2400
Projector		100	30	3000
Amplifier		50	3	150
Speaker	50W	50	4	200
	100W	100	2	200
	150W	150	4	600
Mixer Grinder	750W	750	1	750
TV	60W	60	2	120
TOTAL				92289

Table 4.19 Summary of electrical load

4.4.2.16 Energy Saving Proposal

4.4.2.16.1 BLDC FANS

The regular Ceiling Fans consume 70-80 Watts of Power where the BLDC Fans only takes 27 -35Watts of Power. Replace the existing fans with Energy Efficient fans. Energy efficient fans have energy efficient BLDC motors.

Their operation is more reliable, efficient, less noisy, and lighter compared to conventional fans with the same power output. They produce much less heat and result in significant efficiency improvement. They work on unity power factor and will help reduce your reactive energy requirement.

ENERGY SAVING OF BY REPLACING ONE BLDC FAN

PARAMETERS	REGULAR FAN	BLDC FAN
Power drawn (Watts)	80 W	35 W
Average Annual Consumption (say 6 Hrs / Day for 260 days) (kWh)	125 kWh	55 kWh
Annual Energy Saving (125kWh – 55kWh)	70kWh	
Average Electricity Cost (₹)	₹6.5	
Annual Savings (₹)	₹455	
Investment (₹)	₹2,400	
Simple Pay back (Months)	63	
Life time Savings (10 – 15 Years)	₹4,550	

Table 4.20 Energy saving proposal

ENERGY SAVING PROPOSAL – BLDC FANS

Prudent Energy - Energy Audit	
Energy Saving Proposal Code - 01	
Replacement of 307 ceiling fan with energy efficient BLDC fans	
EXISTING SCENARIO:	
The institution consist of 307 regular ceiling fan which contributes to higher electricity consumption.	
PROPOSED SYSTEM:	
We recommend for replacing all the regular ceiling fan with energy efficient BLDC fan for saving power.	
Power drawn by Existing Fans (307 Nos) (kWh)	24.56kW
Annual working (Hrs) (6 Hrs / Day)	1,620 Hrs
Annual Energy Consumed (kWh)	39,787kWh
Annual Energy Consumed After implementation (kWh)	17,407kWh
Estimated Energy saving by implementation (kWh)	22,380kWh
Average Cost of Electricity per unit (Rs.)	₹6.5
Annual saving in (Rs.)	₹1,45,500
Investment required (Rs.) (Approx.)	₹7,50,000
Simple Pay Back (In Months)	62
Life cycle in (Yrs.)	10 – 15 Yrs
Total Saving in Life Cycle (Rs.) (Taking 10 Yrs)	₹14,55,000

Table 4.21 Energy saving proposal - BLDC fans

4.4.2.16.2 ENERGY EFFICIENT AIR CONDITIONER – 5 STAR

The primary difference between a 3-star and 5-star AC is energy efficiency and upfront cost. A 5-star AC is more expensive initially but uses 10–15% less power than a 3-star AC, saving money over time. 3-star ACs suit moderate usage, while 5-star units are better for heavy, year-round usage, saving around 25% energy.



Fig 4.10 Energy efficient between 3 star and 5 star

ENERGY SAVING BY REPLACING ONE 3-STAR AC TO 5-STAR AC (Taking 1.5 Ton AC)

PARAMETERS	3-STAR AC	5-STAR AC
Power drawn (Watts)	1,200W	900W
Average Annual Consumption (say 6 Hrs / Day for 260 days) (kWh)	1,872kWh	1,404kWh
Annual Energy Saving (2,160kWh – 1,620kWh)	468kWh	
Average Electricity Cost (₹)	₹6.5	
Annual Savings (₹)	₹3,042	
Investment (₹)	₹35,000	
Simple Pay back (Months)	138	
Life time Savings (12 Yrs)	₹36,500	

Table 4.22 Energy saving by replacing one 3-star AC to 5-star AC

4.4.2.16.3 Energy Saving By Behavioural Change

A low-cost measure to reduce energy wastage is changing occupants behaviour by education. Appoint an Energy champion and educate staff, teachers and students about basic principles of energy management and empower them to establish their own departmental

green teams.

Encourage actions that apply to most of your students, staff workspaces, or that can be practiced at work and at home, like turning off fans when not in use and activating computer power management features.

Energy Saving Proposal – Behavioural Change – No Investment Mode	
By Implementing Energy Management in Desktop Personal Computers: A normal Computer average wattage is 200 Watts but in sleep mode it will consume only 5-10 watts of electricity. By adjusting the energy saving setting, after 5 minutes of inactivity system goes to sleep mode and if an hour in a day can be saved result in:	
Power drawn by computer (kW) 131 PC's x 200 Watts	26.2
Power drawn by computer in sleep mode (kW) 131 PC's x 10 Watts	1.31
Annual Energy Saving if 1 hr / Day for 260 Days approx. (in kWh)	6,472
Average Cost of Electricity per unit (₹)	6.5
Annual saving in (₹)	42,000
The above calculation included all computer in the facility and this calculation is to give a general idea about the savings that can be made if you enable this settings in all 131 PC's	
By switching on the printer only when it's required. An average ink-jet will typically consumes 30 to 50 watts when it is printing, in standby mode most printers will draw around 3 to 5 watts of power. Commercial printer which are used in an office will draw 30 to 50 watts on stand by and 300 to 500 watts when printing.	
Power drawn by Printer (kW) 18 x 5 Watts	0.09
Annual Energy Saving if 1 Hr / Day for 260 Days (in kWh)	23.4

Average cost of Electricity per unit (₹)	6.5
Annual Savings in (₹)	150
By Switching off a regular fan for an Hour / Day – 307 Nos	
Power drawn by Fan (kW) (307 Nos x 80 W)	24.56
Annual Energy Saving if 1 Hr / Day for 260 Days (in kWh)	6,385
Average Cost of Electricity per unit (₹)	6.5
Annual saving in (₹)	41,500
Like mentioned before, the above calculation included all ceiling fan's in the facility. This calculation is to give general idea about how much saving can be made just by sparing 1 hour without fan.	

Table 4.23 Energy Saving Proposal – Behavioural Change – No Investment Mode

4.4.2.16.4 Additional Energy Saving

Opportunities

Lamps & Fixture

- Maximise day light harvesting. Remember Sun light is free. Make the best use of natural daylight and avoid using lamps during day time.
- Remove un-necessary lamps in over lit areas. People have a behavioural tendency to switch on all the lights even if not required.
- Choose LED bulbs and fixtures in place of Incandescent, Fluorescent and CFL.
- A 20 Watt LED tube will give around 2000 Lumens which is equivalent for a T-12 lamp which consumes 55 Watts of electricity.
- An LED lamp life time is around 30,000 to 50,000 hours.
- Install occupancy sensor to turn off lights automatically when no one is present in the room. This will help you save 15 – 30% of electricity consumption.
- Switch from Metal Halide or high-pressure sodium lamps to LED Lighting.

Air Conditioners

- Set the temperature to 24 – 26°C. Our body temperature is 34 – 38°C. Any temperature less than this will naturally cool us. Remember 6% of

electricity can be saved for every degree you raise and the lower you keep your AC, the longer the compressor work, shooting your energy bill.

- Shut the door always and seal the room. Pull the blinders or curtains to avoid direct sunlight to your room.
- Heavy electronic devices like computers and TV generate a lot of heat. Switch ON the devices only after you start your AC and let the room cool a bit. Then you switch on the devices.
- If you are spending long hours in air-conditioned room, try to switch it off for some period of time. You maybe felt shivering or extreme cold while sitting long hours in such situations. Keep it on for a couple of hours and then switch off another one or two hours. The room remains adequately cool and also help to save a lot of electricity.
- Keep the ceiling fan switched on while the AC is running. This helps to circulate the air all the corners. Otherwise, you have to keep decreasing the temperature to make it comfortable for all.
- Regularly clean and service. Dirt will be accumulated in the ducts and vents of the AC and make it to work hard to keep you cool. Replacing a dirty air filter will help to save 5 – 15% of electricity.
- Consider energy star label along with product quality when you purchase a new equipment.

4.4.2.17 DG MEASURED PARAMETER

DIESEL GENERATOR MEASURED PARAMETER				
MAR DIONYSIUS COLLEGE, PAZHANJI				
Location & Code		Mar Dionysius College, Pazhanji – DG		
Date & Time		04/03/2026 – 14:30 to 06/02/2026 15:00		
Reference		Technical Supplement		
Sr No	Category	Summary Analysis		Remarks
1	Voltage Continuity	Small dips present possibly due to non-linear load		NORMAL
2	RMS Voltage level	R	241.20V	NORMAL
		Y	238.91V	
		B	238.90V	
3	Voltage Wave form	Sine Wave		NORMAL
4	Power Factor	0.92		NORMAL
5	Load Current Waveform	Distorted sine wave		Due to non-linear load
6	Frequency	51.03		NOT - NORMAL
7	Reliability of Supply	Good		NORMAL
8	Earthing	Good		NORMAL
9	Neutral Current	20.91		High

table 4.24 Diesel generator measured parameter

- The Specific Energy Generation Ratio (SEGR) could not be identified as the DG details was not available.
- Tank capacity could not be calculated because sloppy structure.
- $SEGR = \text{Total Electricity Generated (kWh)} / \text{Total Diesel Consumed (Litres)}$.
- Benchmark: A well – maintained DG of 67 kVA at 75% to 100% loading should typically yield between 4.2 to 6.3 kWh/Ltr.

4.4.3 Analysis of KSEB meter reading sampling study

Week	Days	Mean consumption	Total holiday	Average Per day consumption
1.	Holiday	1798.71	70	170877.24
2.	Semi holiday	1785.5	95	357100
3.	Working day	1780.75	200	124652.42
				652629.66

Table 4.25. Energy meter reading

The analysis of KSEB meter readings indicated a total annual electricity consumption of 652,629.66 kWh during the assessment period. The institution has a total student strength of 1,136, resulting in a per capita electricity consumption of approximately 574.5 kWh per student per year. Electricity consumption was assessed across working days, semi-holidays, and holidays to understand variations in energy demand under different operational conditions. The observed consumption reflects the energy requirements associated with academic activities, laboratory operations, administrative functions, and campus support services. The analysis indicates the need for continuous energy monitoring and the adoption of energy-efficient practices to optimize electricity usage and support sustainable campus management.

4.4.4 Electricity Import and Export Analysis Based on KSEB Bills

4.4.4.1 Electricity Import (2023):

The monthly KSEB electricity import during 2023 showed noticeable variations throughout the year. Grid electricity import was highest in January (2,698 kWh), followed by December (1,500 kWh) and November (1,470 kWh). The lowest import was recorded in June (695 kWh), while relatively lower imports were also observed during February (704 kWh) and May (893 kWh). These variations indicate changes in the institution's electricity demand and the contribution of the on-campus solar photovoltaic (PV) system in meeting part of the energy requirement during different months.

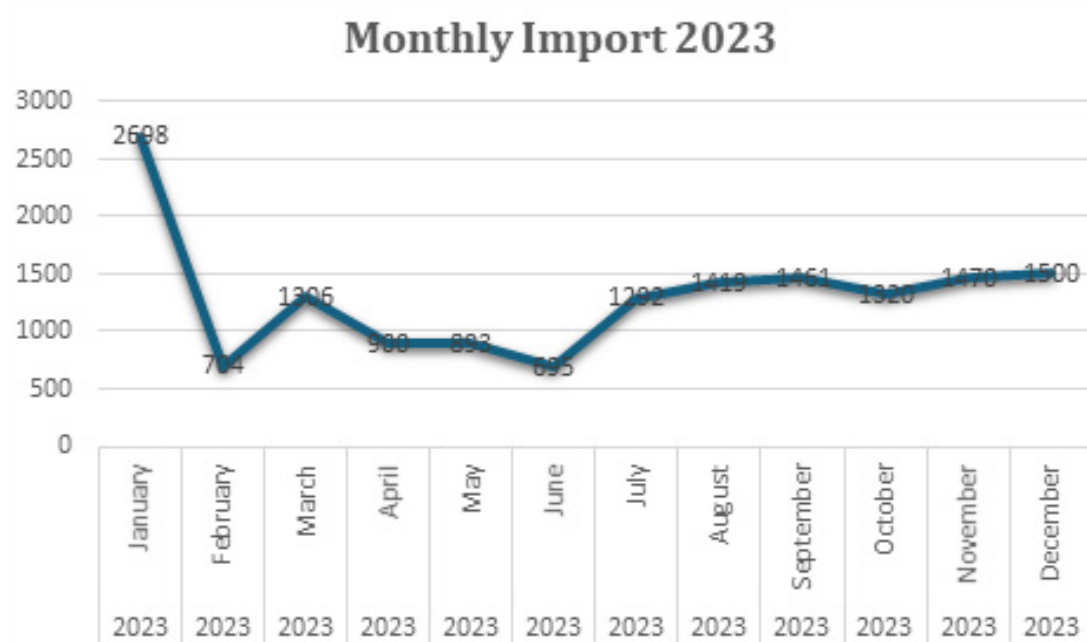


Fig 4.11 Monthly import analysis of 2023

4.4.4.2 Electricity Export (2023):

Electricity exported to the KSEB grid from the solar PV system also varied across the year. No electricity was exported in January (0 kWh), whereas the highest export was recorded in June (1,491 kWh), followed by

September (1,380 kWh) and April (1,230 kWh).

Moderate export values were observed during the remaining months, reflecting seasonal variations in solar energy generation and the availability of surplus electricity for grid export.

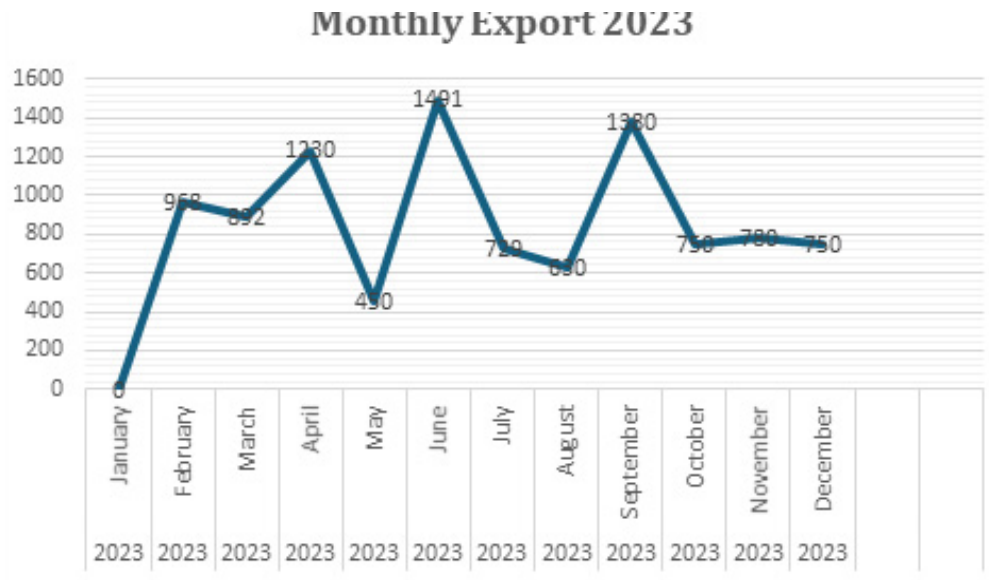


Fig 4.12 Monthly export analysis of 2023

4.4.4.3 Comparison of Monthly Grid Import and Export Energy during 2023:

A comparison of monthly import and export values shows an inverse trend during several months of 2023. Months with higher solar energy generation, particularly April, June, and September, recorded higher electricity exports and comparatively lower grid imports. In contrast, January exhibited the highest

electricity import and no electricity export, indicating greater dependence on grid power during that period. Overall, the analysis demonstrates that increased solar power generation helped reduce grid electricity consumption while enabling surplus renewable energy to be exported to the KSEB grid, thereby improving the institution's overall energy efficiency and sustainability.

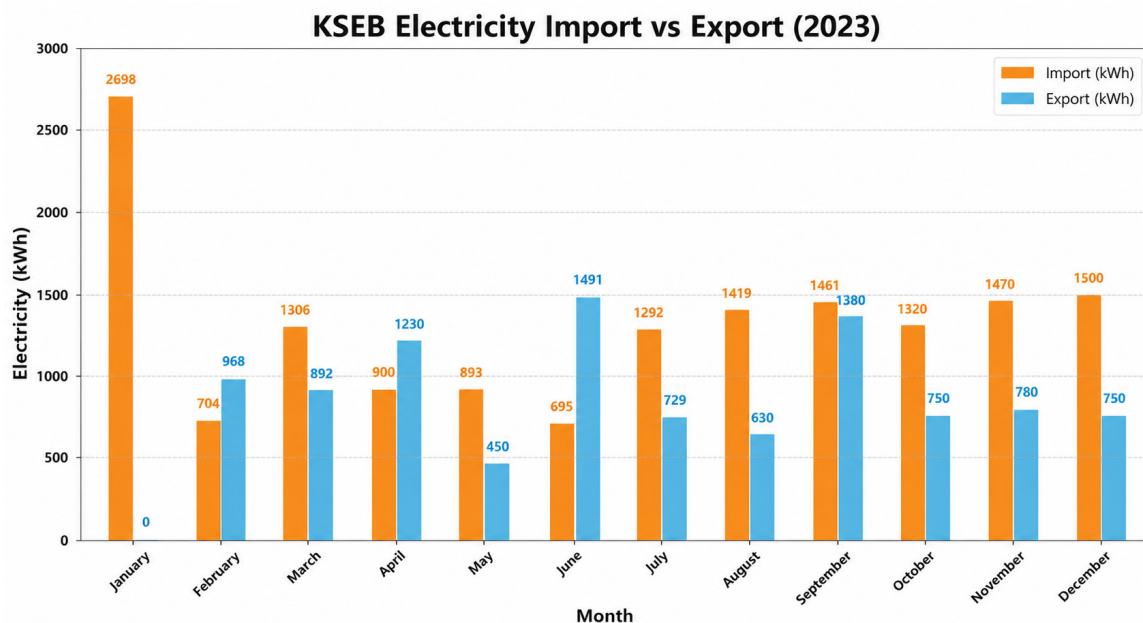


Fig 4.13 KSEB Electricity import vs export 2023

4.4.4.4 Electricity Import (2024):

The monthly KSEB electricity import during 2024 showed considerable variation throughout the year, reflecting changes in the institution's electricity demand. The highest electricity import was recorded in November (2,323 kWh), followed by July (1,760 kWh) and September (1,687 kWh). The lowest import

was observed in May (619 kWh), while relatively lower imports were also recorded in June (900 kWh) and January (1,110 kWh). The remaining months exhibited moderate import values, indicating fluctuations in grid electricity consumption corresponding to the institution's operational and seasonal energy requirements.

Monthly Import 2024

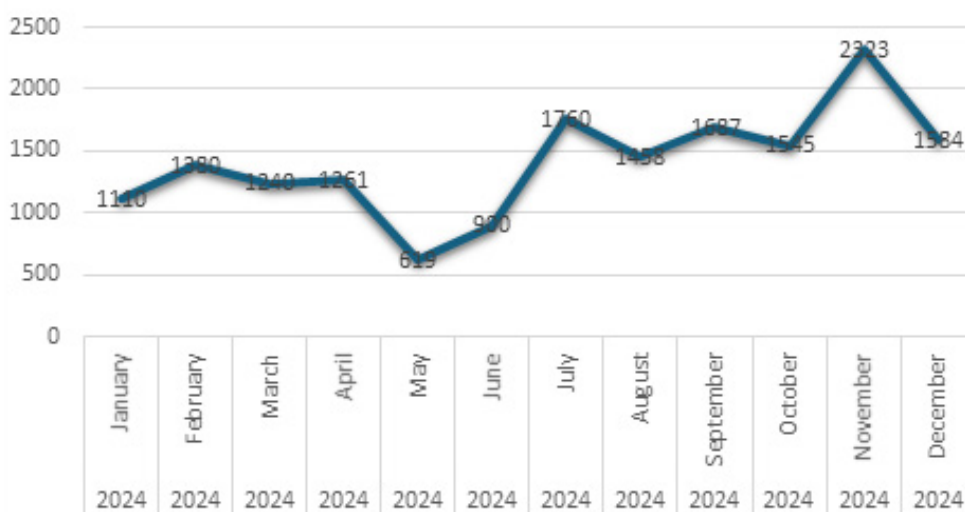


Fig 4.14 Monthly import analysis of 2024

4.4.4.5 Electricity Export (2024):

Electricity exported to the KSEB grid from the institution's solar photovoltaic (PV) system also varied across the year. The highest export was recorded in May (1,560 kWh), followed by December (1,501 kWh) and October (1,124 kWh). The lowest export occurred

in July (491 kWh), while comparatively lower exports were also observed in November (524 kWh) and August (740 kWh). These monthly variations reflect changes in solar energy generation and the availability of surplus electricity for export to the grid.

Monthly Export 2024

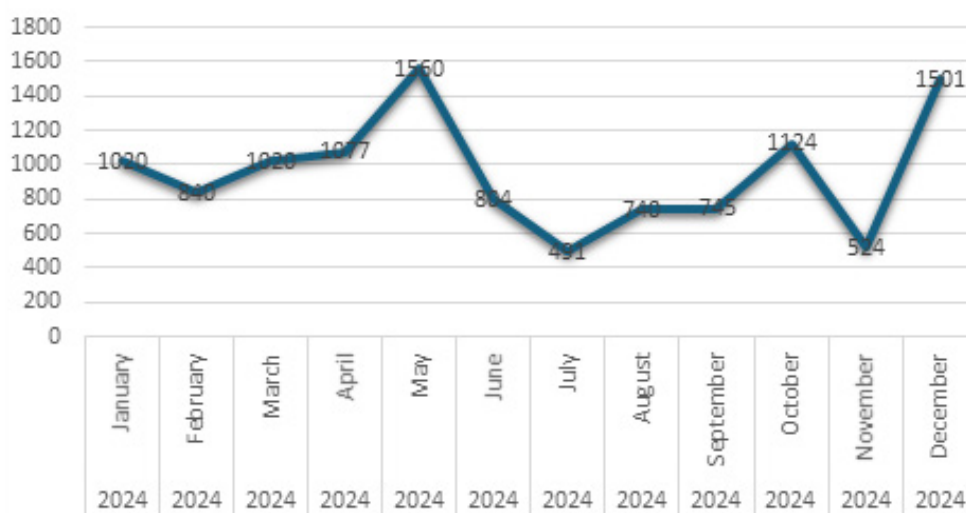


Fig 4.15 Monthly export analysis of 2024

4.4.4.6 Comparison of Monthly Grid Import and Export Energy during 2024:

A comparison of the monthly import and export values indicates that the relationship between grid electricity consumption and solar power export varied throughout 2024. During May, electricity import was at its lowest (619 kWh), while export reached its highest value (1,560 kWh), demonstrating significant solar energy generation and reduced dependence on grid electricity.

In contrast, November recorded the highest electricity import (2,323 kWh) and one of the lowest export values (524 kWh), indicating greater reliance on grid power during that period. Overall, the analysis highlights the important contribution of the solar PV system in offsetting grid electricity demand and exporting surplus renewable energy, thereby enhancing the institution's energy efficiency and sustainability.

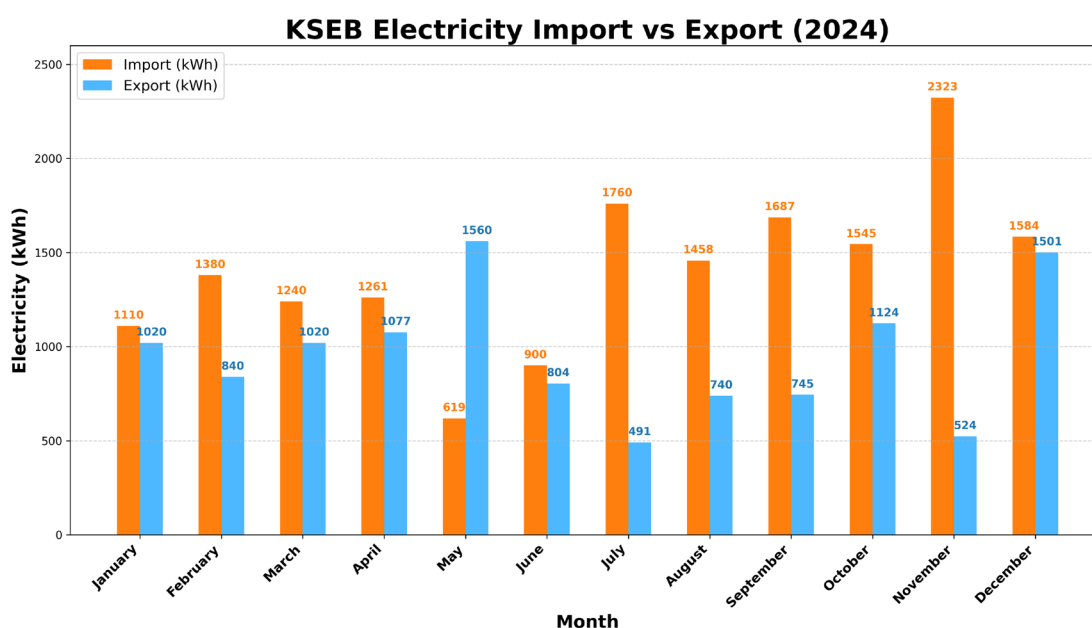


Fig 4.16 KSEB Electricity import vs export 2024

4.4.4.7 Electricity Import (2025):

The monthly analysis of KSEB electricity import for 2025 indicates considerable variation in grid electricity consumption across the year. Electricity import peaked in October (3,574 kWh), followed by April (2,941 kWh) and January (2,111 kWh), suggesting periods of increased energy demand. In contrast, the lowest

import was recorded in May (1,144 kWh), with relatively lower values also observed during August (1,402 kWh) and July (1,422 kWh). The observed fluctuations reflect changes in campus operational activities, electricity requirements, and the contribution of renewable energy generated by the on-site solar PV system.

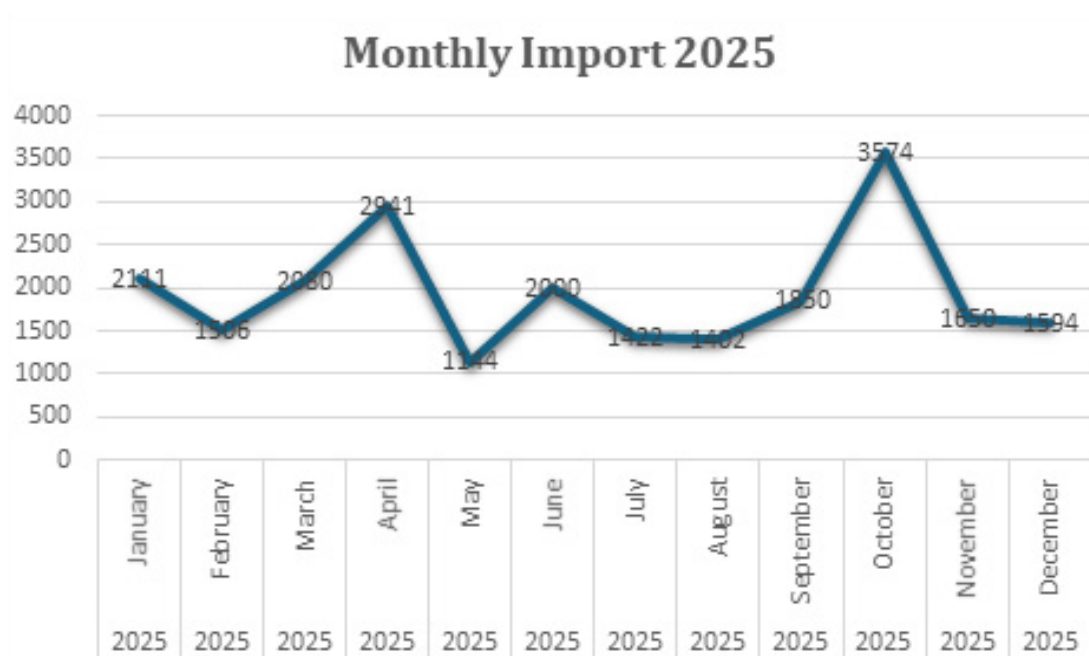


Fig 4.17 Monthly import analysis of 2025

4.4.4.8 Electricity Export (2025):

The institution maintained consistent electricity export to the KSEB grid throughout 2025, demonstrating continuous operation of the solar photovoltaic system. The maximum export was achieved in October (3,232 kWh), followed by December (2,160 kWh) and July

(1,797 kWh). The minimum export occurred in June (1,021 kWh), while August (1,045 kWh) and November (1,140 kWh) also recorded comparatively lower export values. Overall, the export pattern indicates sustained renewable energy generation with monthly variations influenced by solar radiation and weather conditions.



Fig 4.18 Monthly export analysis of 2025

4.4.4.9 Comparison Comparison of Monthly Grid Import and Export Energy during 2025:

The comparison of import and export data highlights the complementary role of the institution's solar PV system in meeting electricity demand. During May, electricity export (1,742 kWh) exceeded import (1,144 kWh), indicating that solar generation significantly reduced dependence on grid electricity. A similar trend was observed in December, where export (2,160 kWh) was higher than import (1,594 kWh).

Although October recorded the highest grid import, it also registered the highest electricity export, demonstrating that periods of increased energy demand coincided with substantial renewable energy generation. Overall, the year reflects effective integration of solar power with grid electricity, contributing to improved energy management, enhanced renewable energy utilization, and reduced reliance on conventional electricity sources.

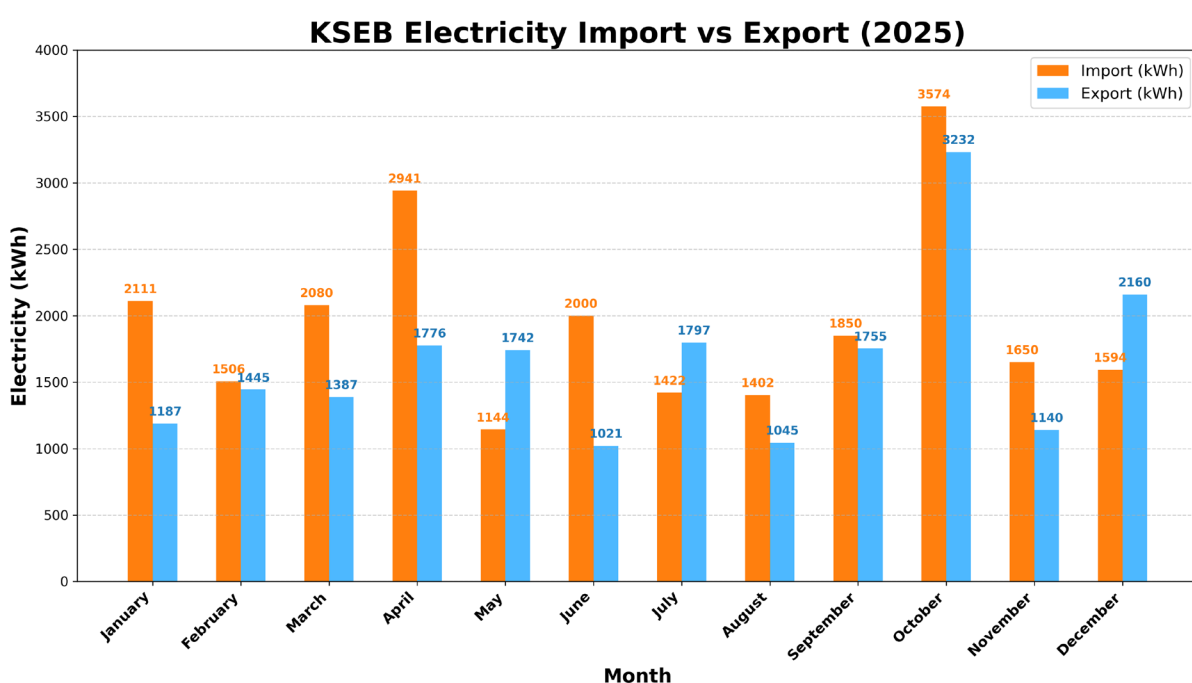


Fig 4.19 KSEB Electricity import vs export 2025

4.4.5 Total Energy consumption of MD College

No.	Assessment Mode	Total energy Consumption/year (kWh)
		College
1	Infrastructure assessment	135,709 kWh/year
2	Mandatory Audit	92289
3	KSEB Bill analysis	23,472 kWh/year
4	Energy Meter Reading Sample Study	652629.66
5	Annual Solar Production	19,071.80 kWh/year

Table 4.26 Summary of Electrical Energy consumption

4.4.6 Vehicle sharing status

Type of Vehicle	Distance Travelled (km/day)	Sharing Count	Distance Saved (km/day)	Fuel Saved (L/day)
Two Wheeler	6	0	0	0
Two Wheeler	8	2	8	0.53
Two Wheeler	29	2	29	1.93
Two Wheeler	30	2	30	2.00
Two Wheeler	25	2	25	1.67
Two Wheeler	10	2	10	0.67
Two Wheeler	29	2	29	1.93
Two Wheeler	24	2	24	1.60
Two Wheeler	30	2	30	2.00
Two Wheeler	50	2	50	3.33
Two Wheeler	40	2	40	2.67
Two Wheeler	11	2	11	0.73
Two Wheeler	40	2	40	2.67
Two Wheeler	3	2	3	0.20
Two Wheeler	7	2	7	0.47
Two Wheeler	5	2	5	0.33
Two Wheeler	20	2	20	1.33
Two Wheeler	38	2	38	2.53
Two Wheeler	15	2	15	1.00
Two Wheeler	30	2	30	2.00
Two Wheeler	10	2	10	0.67
Two Wheeler	25	2	25	1.67
Two Wheeler	32	2	32	2.13
Two Wheeler	42	2	42	2.80
Two Wheeler	15	2	15	1.00
Two Wheeler	5	2	5	0.33
Two Wheeler	3.9	2	3.9	0.26
Two Wheeler	3.9	2	3.9	0.26
Two Wheeler	35	2	35	2.33
Two Wheeler	40	2	40	2.67
Two Wheeler	40	2	40	2.67
Two Wheeler	10	2	10	0.67
Two Wheeler	35	2	35	2.33
Two Wheeler	35	2	35	2.33
Two Wheeler	48	2	48	3.20
Two Wheeler	15	2	15	1.00
Two Wheeler	15	2	15	1.00

Two Wheeler	15	2	15	1.00
Two Wheeler	36	2	36	2.40
Two Wheeler	1	2	1	0.07
			905.8 km/day	
			181,160 km/year	

Table 4.27 Vehicle sharing status of the college (2 wheeler)

Type of Vehicle	Distance Travelled (km/day)	Sharing Count	Distance Saved (km/day)	Fuel Saved (L/day)
Four wheeler	12	2	12	0.40
Four wheeler	20	0	0	0
Four wheeler	6	0	0	0
Four wheeler	30	3	60	2
Four wheeler	22	0	0	0
Four wheeler	30	0	0	0
Four wheeler	25	1	25	0.83
			97 km/day	
			19,400 km/year	

Table 4.28 Vehicle sharing status of the college (4 wheeler)

Electric

Type of Vehicle	Distance Travelled (km/day)	Sharing Count	Distance Saved (km/day)
Four wheeler	80	3	160
Two wheeler	6	3	12
Two wheeler	62	2	62
Two wheeler	8	0	0
Two wheeler	10	0	0
Two wheeler	6	2	6
		240 km/day	
		48,000 km/year	

Table 4.29 Vehicle sharing status of the college (Electric vehicle)



Fig 4.20 Vehicle parking Area

The assessment shows that vehicle-sharing practices are already being adopted by a section of the campus community. Shared travel by two-wheelers resulted in a cumulative distance saving of approximately 905.8 km/day (181,160 km/year), while four-wheeler sharing contributed an additional 97 km/day (19,400 km/year). Electric vehicles accounted for 240 km/day (48,000 km/year) of shared travel. The observed reduction in travel distance and fuel consumption indicates that vehicle sharing and electric mobility can significantly lower the environmental impacts associated with campus transportation and contribute towards reducing the institution's carbon footprint.

4.4.7 Fossil Fuel

Diesel is the primary fossil fuel used on the college campus for operating the Diesel Generator during

power interruptions and emergency situations. The Diesel Generator serves as a backup power source to ensure the uninterrupted functioning of essential campus facilities.

During the audit period, diesel was purchased for generator operation on 06/01/2025, 21/01/2025, 07/04/2025, and 13/08/2025, with each purchase amounting to approximately ₹2500. However, precise records regarding the actual quantity of diesel consumed and Diesel Generator operating hours were not available during the audit.

Maintaining a proper fuel consumption register and Diesel Generator operation logbook is recommended for effective monitoring of fossil fuel usage and for improving future energy audit assessments.

4.4.8 LPG

Sl. No.	Location	Number of LPG Cylinders Allotted	LPG Cylinder Capacity	Usage Period	Total LPG Cylinders Consumed	Total LPG Consumption (kg)
1	Canteen	1	19 kg (Commercial LPG cylinder)	June 2024 – March 2025	20	380 kg
2	Canteen	1	19 kg (Commercial LPG cylinder)	June 2025 – March 2026	19	361 kg

Table 4.30 Annual LPG Consumption

4.5 CONCLUSION

The Energy Management Audit of Mar Dionysius College, Pazhanji indicates that the institution has established a structured framework for energy management through the adoption of an Energy Management System (EnMS), formulation of an institutional energy policy, and integration of renewable energy resources. The assessment demonstrates that the institution has initiated several measures to promote energy conservation and sustainable energy practices.

However, the audit also identified deficiencies in electrical infrastructure management, protective systems, earthing arrangements, power quality parameters, and maintenance practices that require

systematic corrective interventions. The identified non-conformities highlight the need for strengthening monitoring mechanisms, improving electrical safety standards, and enhancing operational controls to achieve optimum energy performance.

Overall, the institution possesses the necessary policy framework and infrastructure base to advance towards effective and sustainable energy management, provided that the recommended corrective and preventive measures are implemented through a process of continual improvement and periodic performance evaluation.

4.6 RECOMMENDATIONS

- Establish a comprehensive preventive maintenance programme for all electrical installations, including distribution boards, panels, generators, batteries, and earthing systems, with periodic inspection and proper documentation.
- Identify, reconstruct, and properly maintain all earth pits and ensure two-point earthing for all distribution boards, panel boards, and battery racks in accordance with applicable electrical safety standards.
- Replace or restore all non-functional and bypassed RCCBs, ELCBs, and SFUs to ensure effective protection against electrical faults, leakage currents, and short circuits.
- Redistribute single-phase and non-linear electrical loads uniformly across all three phases to minimize phase imbalance, reduce neutral current, and improve overall system efficiency.
- Implement appropriate harmonic mitigation measures, including the installation of suitable filtering and power factor correction systems, to reduce current harmonic distortion and improve power quality.
- Improve cable management practices by eliminating exposed wiring, sealing cable entry points, providing cable trays and conduits, and ensuring proper cable identification and labelling.
- Replace deteriorated electrical components, corroded fittings, damaged indication lamps, and defective accessories, and ensure all electrical panels are adequately protected against moisture, dust ingress, and environmental exposure.
- Install adequate fire safety provisions in all critical electrical areas, including CO₂ fire extinguishers, fire detection and alarm systems, sand buckets, emergency lighting, and clearly marked emergency contact information.
- Implement a formal Lockout-Tagout (LOTO) procedure and provide appropriate personal protective equipment, including insulated hand gloves, insulated mats conforming to IS 15652 standards, and eyewash facilities near battery installations.
- Ensure all electrical rooms, panel boards, and critical

installations are provided with appropriate safety signage, identification labels, updated single-line diagrams, and restricted access notices.

- Establish a systematic programme for periodic power quality monitoring, thermal scanning, insulation resistance testing, and annual earthing resistance measurements to identify potential faults at an early stage and improve system reliability.
- Continue strengthening the institution's Energy Management System by promoting energy conservation awareness, conducting periodic internal and external audits, maintaining accurate energy records, and exploring additional opportunities for renewable energy integration and energy-efficient technologies.

4.7 ENERGY MANAGEMENT PLAN

4.7.1 Energy Audit and Baseline Assessment

The institution undertakes periodic energy audits to obtain a clear understanding of electricity consumption across various campus facilities. These audits cover classrooms, laboratories, administrative blocks, and common utility areas, where energy usage is systematically observed and recorded. Meter readings and electricity consumption data are collected on a monthly basis and compiled to establish baseline consumption patterns.

During the audit process, areas with comparatively higher energy demand are identified, along with equipment that contributes significantly to overall consumption. Observations from these assessments are used to detect inefficiencies such as excessive use of lighting, continuous operation of electrical devices, and outdated equipment with higher energy requirements. The audit findings form the basis for planning targeted interventions aimed at reducing energy consumption and improving overall efficiency.

4.7.2 Energy Conservation Measures

A range of practical energy conservation measures are implemented across the campus to reduce unnecessary energy usage. Conventional incandescent and fluorescent lighting systems are gradually replaced with LED fixtures, ensuring lower power consumption

without compromising illumination quality. This transition is carried out in phases, prioritizing high-usage areas such as classrooms, corridors, and laboratories.

Operational practices are also improved by encouraging responsible use of electrical equipment. Lights, fans, computers, and laboratory instruments are switched off when not in use, and usage patterns are monitored to avoid wastage. In addition, classrooms and office spaces are managed in a way that maximizes the use of natural daylight and ventilation, thereby reducing reliance on artificial lighting and mechanical cooling systems.

Regular maintenance of electrical infrastructure is carried out to ensure efficient functioning. Faulty wiring, energy leakage, and inefficient appliances are identified and rectified promptly, contributing to sustained reduction in energy consumption.

4.7.3 Renewable Energy Initiatives

The institution progressively incorporates renewable energy solutions to reduce dependence on conventional power sources. Initial efforts focus on creating awareness among students and staff regarding the benefits and applications of renewable energy systems.

In the long-term implementation phase, solar photovoltaic panels are installed in suitable locations such as rooftops to generate electricity within the campus. This locally generated energy supplements grid supply and reduces overall electricity consumption. Solar water heating systems are also introduced in facilities where hot water demand is significant, thereby reducing electrical load.

These initiatives contribute not only to lowering energy costs but also to reducing carbon emissions associated with campus operations, thereby improving environmental sustainability.

4.7.4 Awareness and Capacity Building

Continuous awareness programmes are conducted to encourage energy-conscious behaviour among students, faculty, and staff. Activities such as seminars, workshops, exhibitions, and observance of Energy Conservation Week are organized to highlight the importance of energy efficiency and responsible usage.

Students are actively involved through energy clubs and campus initiatives where they participate in monitoring energy usage and promoting conservation practices. These engagements help in developing a sense of responsibility and encourage behavioural changes that support long-term energy conservation.

Training programmes are also conducted to familiarize stakeholders with energy-saving techniques and efficient usage of electrical systems, ensuring that conservation practices are consistently followed across the campus.

4.7.5 Monitoring and Reporting

Energy consumption is continuously monitored through systematic recording and analysis of electricity usage data. Monthly records are maintained and reviewed to track variations in consumption and to evaluate the effectiveness of implemented conservation measures.

An Energy Management Committee oversees the monitoring process and periodically reviews performance indicators such as reduction in energy consumption and efficiency improvements. Comparative analysis is carried out to identify trends and assess progress over time.

The information obtained from monitoring activities is used to refine strategies, introduce corrective measures, and ensure that energy management practices remain effective and responsive to changing requirements.

4.7.6 Sustainable Procurement and Equipment Management

Procurement of electrical appliances and equipment is carried out with a focus on energy efficiency. Preference is given to devices with lower power consumption and higher performance efficiency, such as energy-rated appliances and LED-based systems.

Existing outdated equipment is gradually replaced with newer energy-efficient alternatives to reduce overall energy demand. Procurement decisions take into account long-term energy usage and operational efficiency, ensuring that the introduction of new equipment contributes positively to campus energy management.

This approach helps in minimizing energy consumption at the source and supports sustained improvement in energy efficiency.

4.7.7 Infrastructure and Energy Efficiency Improvements

Infrastructure-related improvements are undertaken to enhance energy performance across campus facilities. Building design and modifications focus on optimizing natural lighting and ventilation, thereby reducing dependence on artificial systems.

Electrical infrastructure is periodically upgraded to improve efficiency and reduce transmission losses. In the long term, advanced energy-saving technologies such as automated lighting controls and centralized energy management systems are introduced to regulate and optimize energy usage.

These improvements ensure that energy efficiency is integrated into the physical infrastructure of the campus, contributing to long-term sustainability.

4.7.8 Academic Integration and Student Participation

Energy management practices are integrated into academic activities to strengthen student involvement and practical learning. Students participate in energy-related projects, audits, and data collection exercises as part of their coursework and co-curricular activities.

Energy clubs serve as platforms for students to engage in awareness campaigns, monitoring activities, and conservation initiatives. In addition, sustainability and energy management concepts are gradually incorporated into academic curricula and research activities.

This integration ensures that students gain practical exposure to energy management while contributing to campus sustainability efforts.

4.7.9 Research and Innovation

The institution encourages research activities focused on energy conservation, efficiency improvement, and renewable energy technologies. Students and faculty undertake projects related to energy auditing, consumption analysis, and development of sustainable energy solutions.

In the long term, research efforts expand to include innovative approaches such as integration of renewable energy systems, development of energy-efficient technologies, and application of sustainable engineering practices. These activities contribute to continuous improvement in campus energy management and support knowledge development in the field.

4.7.10 Community Engagement

Energy conservation initiatives are extended beyond the campus through outreach programmes and awareness campaigns. Students participate in activities such as competitions, exhibitions, and public awareness drives that promote responsible energy use.

In the long term, training programmes and workshops are conducted for the local community to encourage adoption of energy-efficient practices and renewable energy solutions. These initiatives help in amplifying the impact of campus energy management efforts at a broader level.

4.7.11 Short-Term Action Plan (1–2 Years)

During the initial phase, emphasis is placed on establishing a clear understanding of energy consumption and implementing immediate conservation measures. Energy audits are conducted to identify consumption patterns and inefficiencies. LED lighting is installed across major campus areas to reduce electricity usage. Awareness programmes and campaigns are organized to promote responsible energy use among campus stakeholders.

Monthly monitoring systems are established to track energy consumption, and records are maintained for analysis. Energy-efficient appliances are introduced during procurement, and improvements such as better utilization of natural lighting and ventilation are implemented. Student participation is strengthened through energy clubs and awareness activities.

4.7.12 Long-Term Action Plan (3–5 Years)

In the long-term phase, the institution focuses on integrating renewable energy systems and advanced energy management technologies. Solar photovoltaic panels and solar water heating systems are installed to reduce dependence on conventional electricity sources.

Infrastructure upgrades are carried out to enhance overall energy efficiency, including the introduction of automated systems for monitoring and controlling energy usage. Benchmarking systems and measurable energy reduction targets are established to track long-term progress.

Sustainability concepts are integrated into academic programmes and research activities, and community outreach initiatives are expanded to promote energy conservation practices beyond the campus.

4.7.13 Conclusion

Energy management activities are continuously strengthened through systematic monitoring, infrastructure improvement, and adoption of efficient technologies. The combined implementation of conservation measures and renewable energy initiatives contributes to reduction in electricity consumption and improved energy performance.

Active participation of students, faculty, and staff supports the effective implementation of energy-saving practices, leading to the gradual development of an energy-efficient and environmentally sustainable campus.

4.8 SUMMARY

- The Energy Management System (EnMS) assessment provides a comprehensive evaluation of the electrical infrastructure, energy consumption characteristics, and safety practices at Mar Dionysius College, Pazhanji. The audit documented an extensive inventory of electrical assets, including 307 ceiling fans, 163 tube lights, 332 LED lights, 122 computers, 106 UPS units, and 265 CCTV cameras, along with air conditioners, projectors, interactive panels, amplifiers, printers, and other electrical equipment distributed across academic and administrative facilities. The institution also has a 40 kWp rooftop solar photovoltaic system, contributing to renewable energy generation and reducing dependence on grid electricity.
- The assessment identified several areas requiring immediate corrective action to improve electrical safety and system reliability. Earthing arrangements were found to be inadequate in multiple locations, with earth pits either poorly maintained or not traceable and several distribution boards lacking proper earthing connections. Multiple RCCBs and SFUs were observed to be non-functional or bypassed, reducing protection against electrical faults and leakage currents. Exposed wiring, open conduits, improperly sealed cable entries, rusted panel enclosures, hanging cables, and poor cable dressing were observed in several areas, increasing operational and safety risks.
- Power quality analysis indicated a significant phase imbalance at the incomer, with measured phase currents of 51.2 A, 15.93 A, and 27.31 A, resulting in a neutral current of 31.43 A. The findings suggest uneven distribution of non-linear loads and the presence of harmonic effects, necessitating load redistribution and improved electrical system management to minimise losses and prevent overheating.
- The safety audit further revealed deficiencies in emergency preparedness and maintenance practices. Fire extinguishers and fire detection systems were absent in several critical electrical locations, while insulated hand gloves, eyewash facilities near battery installations, Lockout-Tagout (LOTO) procedures, emergency contact displays, updated single-line diagrams, earth pit records, insulation resistance test reports, and preventive maintenance documentation were either unavailable or incomplete. Evidence of dust accumulation, overheating, corrosion, rodent activity, and burn marks near electrical installations highlights the need for improved housekeeping and routine inspection programmes.
- The overall findings indicate that although the institution has initiated renewable energy utilisation through its rooftop solar installation and maintains a substantial electrical infrastructure to support its operations, considerable improvements are necessary to strengthen electrical safety, preventive maintenance, documentation, and energy management practices. Implementation of the recommended corrective measures including restoration of protective devices, proper earthing, panel maintenance, systematic load balancing, enhanced fire protection, and regular monitoring

will improve operational reliability, minimise electrical hazards, reduce energy losses, and support the long-term effectiveness of the Energy Management System.

4.9 ACTIVITIES CONDUCTED

As part of promoting energy conservation, sustainability awareness, and environmental responsibility, Mar Dionysius College, Pazhanji, has organized several programmes during the academic year 2024–25 under the Department of Physics and Energy Club. These initiatives were designed to promote awareness, enhance technical competencies, and encourage community participation in energy conservation practices.

1. Fuel the Future': Hackathon on Sustainable Energy

A hackathon titled 'Fuel the Future: A Hackathon for Sustainable Energy and Beyond' was conducted on 06 March 2025. The programme served as an interdisciplinary platform for students to conceptualize, design, and present innovative solutions related to renewable energy and sustainable technologies.

The event included an expert session on energy conservation, student-led presentations (Sustaina

Talks), and competitive events such as Renewable Rush (still models) and Ray Racers (solar-powered working models). These activities enabled participants to translate theoretical knowledge into practical applications.

The programme aligns with green audit objectives by promoting renewable energy awareness, encouraging low-carbon technological solutions, and strengthening sustainability-oriented innovation among students.

Outcomes and Impact:

- Significant improvement in student understanding of renewable energy systems and sustainable practices
- Development of technical skills related to model design, solar applications, and energy-efficient systems
- Promotion of innovation-driven learning and interdisciplinary problem-solving approaches
- Increased motivation among students to engage in research and projects focused on sustainable energy
- Strengthening of an institutional culture that supports environmentally responsible technological advancement

**DEPARTMENT OF PHYSICS
IN COLLABORATION
WITH IQAC, ENERGY CLUB AND
ENERGY CONSERVATION SOCIETY
Presents
'FUEL THE FUTURE':
A HACKATHON FOR SUSTAINABLE ENERGY AND BEYOND**

**11 AM
THEME TALK:**
'energy conservation for
sustainable energy'

DR. K. SOMAN
President,
energy
conservation
society

MAR DIONYSIUS COLLEGE PAZHANJI
Kunnamkulam, Thrissur district (affiliated to
the university of Calicut)
Re-accredited with 'B' grade by NAAC

06/03/2025 ROOM NO 40

AT 2.00PM

- **SUSTAINA TALKS:**
sharing ideas on sustainability
and energy (powerpoint presentations).
- **RENEWABLE RUSH:**
A competition for energy still model presentations.
- **RAY RACERS:**
A challenge for solar powered working models.

**Cash awards to
the winners!**

Staff coordinators: Kalajanan, Sreekala R
Student coordinators: Fathima Hannath, Harshid



2. Power Quiz 2024

The Power Quiz 2024, conducted on 26 September 2024 in association with the KSEB Officer's Association, was an academic initiative aimed at enhancing knowledge in the domain of electricity and energy systems. A total of 57 students actively participated in the programme.

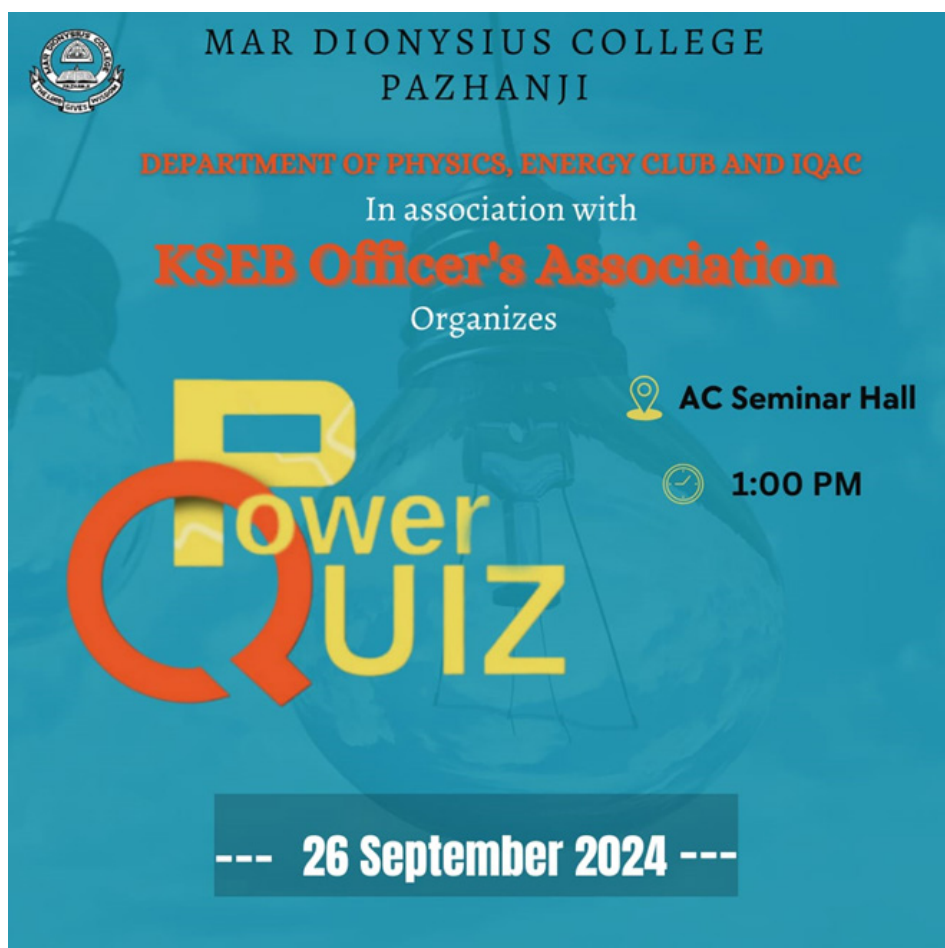
The quiz covered a wide range of topics including power generation, transmission, electrical principles, renewable energy, and current developments in the energy sector, thereby integrating theoretical concepts with practical knowledge.

The programme contributed to knowledge dissemination on efficient energy utilization and improved awareness of the power sector, which is

essential for fostering responsible energy consumption behavior.

Outcomes and Impact:

- Enhanced conceptual clarity in electrical and energy-related topics among participants
- Increased awareness of energy generation, distribution systems, and sustainability challenges
- Strengthening of analytical, critical thinking, and decision-making skills through competitive learning
- Encouragement of student interest in energy-related careers and higher studies
- Improved collaboration between academic institution and industry (KSEB), supporting experiential learning





3. SET 2K25: Energy Conservation Awareness Campaign

The outreach programme SET 2K25 (Save Energy for Tomorrow) was conducted on 26 March 2025 at Kattakampal Grama Panchayath as part of the institution's community engagement initiatives.

The campaign involved door-to-door awareness activities, pamphlet distribution, and direct interaction with the public. The information disseminated focused on practical energy-saving techniques, safe electricity usage, and methods to reduce household energy consumption.

This initiative reflects the extension of institutional sustainability practices beyond campus boundaries, contributing to community-level environmental awareness and behavioral change towards energy conservation.

Outcomes and Impact:

- Noticeable increase in awareness among local residents regarding energy conservation practices
- Improved understanding of cost-effective energy usage and reduction of electricity consumption
- Adoption of basic energy-saving measures at the household level
- Enhanced public knowledge on electrical safety and prevention of hazards
- Strengthening of institution–community linkage in promoting environmental sustainability

4. SET 2K25: Preparatory and Training Session

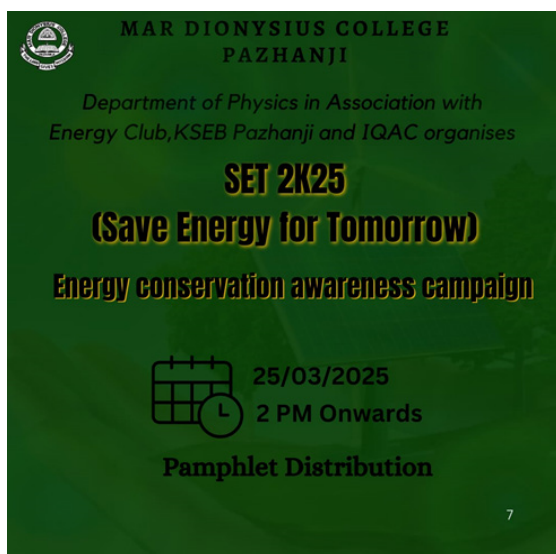
A preparatory session for the SET 2K25 campaign was conducted on 25 March 2025 with the support of KSEB officials. The session included expert lectures on energy conservation strategies, electrical safety protocols, and energy management services.

The programme was designed to equip student volunteers with the necessary knowledge and skills required for effective implementation of the awareness campaign.

The session contributed to capacity building and ensured the quality and effectiveness of sustainability outreach activities, thereby enhancing the overall impact of the awareness programme.

Outcomes and Impact:

- Improved technical understanding of energy conservation methods and sustainable practices among students
- Increased awareness of electrical safety standards and risk prevention measures
- Development of communication and outreach skills for conducting community awareness programmes
- Strengthened institutional collaboration with KSEB, supporting future sustainability initiatives
- Creation of a trained student group capable of contributing to long-term environmental awareness efforts.



ELCB നിർബന്ധമായും തങ്ങളുടെ വീടുകളിലും മറ്റും ഘടിപ്പിക്കുക.



- പഴകിയതും ചീത്തയായതുമായ ഉപകരണങ്ങളും വയറുകളും ഉപയോഗിക്കരുത്. ഇലക്ട്രിക് ഫേഡിലോ, സ്റ്റെ വയറിലോ ചാടിനിൽക്കരുത്. അതിൽ കണുകാലികളെ കെട്ടരുത്. ചെടി പടരുമ്പോൾ അനുവദിക്കരുത്.
- ഫ്ലൂസ് മാറ്റിയടുത്തോൾ ഫ്ലൂസ് വയറിനുകൾ ഉപയോഗിക്കാതിരിക്കുക.
- താൽക്കാലികവും അനധികൃതവുമായ മാറ്റങ്ങൾ വയറിംഗിൽ വരുത്താതിരിക്കുക.

വൈദ്യുതി ലൈനിനടുത്താഴെ വൈക്കോൽവണ്ടി പാർക്ക് ചെയ്യരുത്



- പന്നികളെയും മറ്റും പിടിക്കാൻ വൈദ്യുതി വേലി ഉപയോഗിക്കാതിരിക്കുക.
- തീൻപിടിക്കാൻ ലൈനിൽ നിന്നും മറ്റും വൈദ്യുതി എടുത്ത് ഉപയോഗിക്കരുത്.

KSIEB
കേരളത്തിന്റെ ഊർജ്ജം

കെ.എസ്.ഇ.ബി. ലിമിറ്റഡ്
ഇല. ഡിവിഷൻ കൗതുകമുള്ള

വൈദ്യുതി അമൂല്യമാണ് അത് സുരക്ഷിതമായി ഉപയോഗിക്കുക. അതേപോലെ ശ്രദ്ധിച്ചാൽ വിലയേറിയ നമ്മുടെയോ നമ്മുടെ പ്രിയപ്പെട്ടവരുടേയോ ജീവൻ രക്ഷിക്കാം...

വൈദ്യുതി സുരക്ഷാ പ്രവർത്തനങ്ങളിൽ മാനു ഗുണഭോക്താക്കൾ വൈദ്യുതി വകുപ്പ് ജീവനക്കാരോടൊപ്പം പങ്കുചേരുക...

എല്ലാവർക്കും വൈദ്യുതി... സുരക്ഷിതമായി...

വൈദ്യുതി ലൈനിനടുത്ത് ലോഹ നിർമ്മിത വൈപ്പളയോട്ടി കൊണ്ടുവരരുത്



- വൈദ്യുതി കമ്പികൾക്ക് സമീപം പട്ടം പറത്തരുത്
- വൈദ്യുതി പ്രതിഷ്ഠാപനങ്ങളിൽ തട്ടാൻ സാധ്യതയുള്ള പ്രകാരം കമ്പി അയ കെട്ടരുത്
- ഹെട്ടി കിടക്കുന്ന വൈദ്യുതി കമ്പികളിൽ സ്പർശിക്കരുത്

ട്രാൻസഫോർമറിന്റെ തൂണുകളിൽ വൈദ്യുത അലങ്കാരങ്ങൾ, യോരണങ്ങൾ തുടങ്ങിയവ കെട്ടരുത്



- വൈദ്യുതി ലൈനുകൾക്ക് താഴെ കെട്ടിടങ്ങൾ, കെട്ടുകൾ മുതലായ പണിയുന്നതിന് ഇലക്ട്രിക്കൽ ഇൻസ്പെക്ടറുടെ മുൻകൂട്ടിയുള്ള അനുമതി വാങ്ങിക്കുക
- ഇലക്ട്രിക് ഉപകരണത്തിലോ സമീപത്തോ തീപിടുത്തമുണ്ടായാൽ സ്വിച്ച് ഓഫാക്കാൻ ശ്രമിക്കുക.
- കാലാകാലങ്ങളിൽ വൈദ്യുതി ലൈനുകൾക്ക് സമീപത്തുള്ള മരങ്ങൾ വെട്ടിമാറ്റുന്ന വൈദ്യുതി അധികൃതരുടെ പ്രകൃതയുമായി സഹകരിക്കുക.

വൈദ്യുതി തൂണുകളിലുള്ള പ്രതിഷ്ഠാപനങ്ങളിൽ കണുകാലികളെ കെട്ടരുത്



- പൂർ ഫേയിന്റുകൾക്കു നിയന്ത്രണ സ്ഥലങ്ങൾ നിർബന്ധമായും ഫേയിന്റുകൾക്കു അടുത്തായിരിക്കണം. പൂർ പീൻ ഇടുന്നതോടൊപ്പം എടുക്കുന്നതോടൊപ്പം അതിന്റെ സ്വിച്ച് ഓഫാക്കാൻ ഉറപ്പുവരുത്തുക. വയറിൽ പിടിച്ച് പൂർ ഓരാതിരിക്കുക. ശരിയായ രീതിയിൽ എർത്തിംഗ് ചെയ്യുക. വൈദ്യുതി വയറിംഗിലോ ഉപകരണങ്ങളിലോ അറ്റകുറ്റപ്പണികൾ ചെയ്യുന്നതിന് മുമ്പ് വൈദ്യുതി ബന്ധം വിച്ഛേദിക്കുക.
- ടേബിൾ ഫാൻ ഉപയോഗിച്ച് തലമുടി ഉണക്കരുത്. സ്വിച്ച്, പൂർ മുതലായവയിൽ വസ്ത്രങ്ങൾ തൂക്കരുത്. അയഞ്ഞ വസ്ത്രങ്ങൾ ധരിച്ച് കറങ്ങിക്കൊണ്ടിരിക്കുന്ന യന്ത്രത്തിന്റെ അടുത്ത് ചെല്ലരുത്.
- കുട്ടികൾക്ക് കയ്യെത്താത്ത വിധം വൈദ്യുതി സാമഗ്രികളോ ഉപകരണങ്ങളോ സ്ഥാപിക്കരുത്.

**കേരള സംസ്ഥാന വിദ്യാഭ്യാസ ബോർഡ്
വൈദ്യുതി സംരക്ഷണം**

ഊർജ്ജ സംരക്ഷണം പരമധർമ്മമാണ്. ഊർജ്ജം കാര്യക്ഷമവും വിവേകപൂർണ്ണവുമായി ഉപയോഗിക്കുന്ന പ്രക്രിയയാണ് ഊർജ്ജസംരക്ഷണം. ഊർജ്ജ സംരക്ഷണത്തിലൂടെ വൈദ്യുതി ചെലവും കുറയ്ക്കാം.

- രാവിലെ 6 മുതൽ 10 മണി വരെയും വൈകുന്നേരം 6 മുതൽ 10 വരെയും വൈദ്യുതി ഹാമ്പും ഒഴികെയുള്ള ഉപകരണങ്ങളുടെ ഉപയോഗം പരമാവധി കുറയ്ക്കുക/ഒഴിവാക്കുക.
- ആവശ്യം കഴിഞ്ഞാലുടൻ വൈദ്യുതി ഉപകരണങ്ങൾ സ്വിച്ച് ഓഫ് ചെയ്യുന്നത് ശീലമാക്കുക.
- സാധാരണ ബൾബുകൾക്ക് പകരം സി.എഫ്.എൽ. ലാമ്പുകൾ, സിംഗിൾ ട്യൂബുകൾ, എൽ.ഇ.ഡി. ലൈറ്റുകൾ ഉപയോഗിക്കുക.
- ടി.വി. റിമോട്ടിൽ മാത്രം ഓഫാക്കാനെ സ്വിച്ച് ഓഫ് ചെയ്യുക.
- എല്ലാ ഉപകരണങ്ങളും ഒരു സ്ഥലം ഉപയോഗിക്കാതിരിക്കുവാൻ ശ്രമിക്കുക. സീറോ വാട്ട് ബൾബുകൾ തഥാർത്ഥത്തിൽ 15 വാട്ട് ആണ്. ഇതിനു പകരം ഒരു വാട്ടിന്റെ എൽ.ഇ.ഡി. ലൈറ്റ് ഉപയോഗിക്കുക.
- ഫ്രിഡ്ജ് നിർബന്ധമായും 6.30 മുതൽ 9.30 വരെ ഓഫ് ചെയ്തിടുക. ഇത് വൈദ്യുതി ഉപയോഗത്തിൽ ഗണ്യമായ കുറവ് വരുത്തുന്നു.
- വസ്ത്രങ്ങൾ ഒരുമിച്ച് ഇസ്തിതിയിൽ ഇടാൻ ശ്രമിക്കുക.
- ഹാമ്പുകൾക്ക് ഇലക്ട്രോണിക് റെഗുലേറ്റർ ഉപയോഗിക്കുന്നത് വൈദ്യുതിയുടെ ഉപയോഗം കുറയ്ക്കുന്നു. ഹാമ്പിന്റെ സ്പീഡ് കുറച്ചാൽ വൈദ്യുതി ലാഭിക്കാം.
- കൂടുതൽ ഊർജ്ജക്ഷമതയുള്ള ഉപകരണങ്ങൾ ഉപയോഗിക്കുക.
- വൈദ്യുതി മോഷണം ഊർജ്ജനഷ്ടവും ക്രിമിനൽ കുറ്റവുമാണ്. മലിന്യഭരണിന്റെ അനുമതിയില്ലാതെ കേസ് എടുക്കാവുന്നതും 6 വർഷംവരെ തടവും ശിക്ഷയും ലഭിക്കാവുന്നതുമായ ക്രിമിനൽ കുറ്റമാണ്. ശ്രദ്ധയിൽപ്പെട്ടാൽ വിവരമറിയിക്കുക.

ഉപയോഗിച്ചു ശേഖരിച്ചുവെക്കുവാൻ സാധിക്കാത്ത ഊർജ്ജമാണ് വൈദ്യുതി. ഉപയോഗിക്കാൻ ഓരോ അധിക വൈദ്യുതി ഉപകരണങ്ങളും പ്രവർത്തിപ്പിക്കുമ്പോൾ അവയ്ക്ക് ആവശ്യമായ വൈദ്യുതി അധികമായി ഉൽപ്പാദിപ്പിക്കേണ്ടിവരുന്നു. അതിനനുസരിച്ച് വാടിലെ ഔദ്യോഗിക താപനിലയെ കർശിച്ച് ഡിസ്കി ഏരിയയും തീരുന്നു. വൈദ്യുതി ഉപയോഗം കുറച്ചാൽ മിഷൻ വരുന്ന ഇസംഗം പിന്നീട് പ്രയോജനപ്പെടുന്നു.

**ഇത് നമ്മുടെ ധർമ്മമാണ്, നാടിനുവേണ്ടി.....
നമ്മുടെ നാളുകൾ ഇരുട്ടിലാക്കാതിരിക്കുവാൻ നമുക്ക് ഒരുമിച്ച് പ്രവർത്തിക്കാം.**



കേരളത്തിന്റെ കൊമ്പിനും സ്വാദിന്...
ഏറ്റവും ശുദ്ധമായ വെളിച്ചെണ്ണ

തനിമ വെളിച്ചെണ്ണ

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**കേരള സംസ്ഥാന വിദ്യാഭ്യാസ ബോർഡ്
വൈദ്യുതി സുരക്ഷാപാലനം**

അല്പം ശ്രദ്ധ.....വിലപ്പെട്ട ജീവൻ രക്ഷിക്കും

“ഇരുമ്പ് തോട്ടി”
ഉപയോഗിച്ച് വൈദ്യുതി ലൈനിന് സമീപം പണിയെടുക്കരുത്

അല്പം ശ്രദ്ധ.....വിലപ്പെട്ട ജീവൻ രക്ഷിക്കും

“വിടുകളിൽ ELCB”
(എർത്ത് ലീക്കേജ് സർക്യൂട്ട് ബ്രേക്കർ)
ഘടിപ്പിക്കുക

അല്പം ശ്രദ്ധ.....വിലപ്പെട്ട ജീവൻ രക്ഷിക്കും

വൈദ്യുതി ലൈനുകൾക്ക് സമീപം പണിയെടുക്കുമ്പോൾ

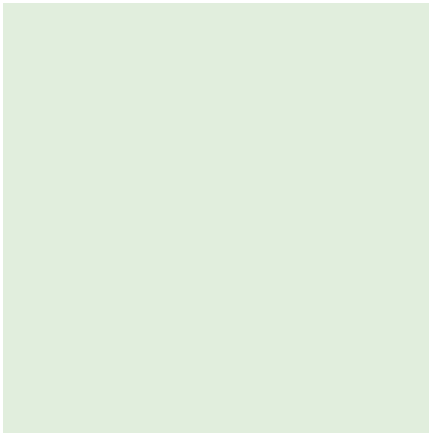
“വൈദ്യുതി വിച്ഛേദനം”
ഉറപ്പ് വരുത്തുക



Chapter V

WATER EFFICIENCY MANAGEMENT SYSTEM (We MS): AUDIT REPORT



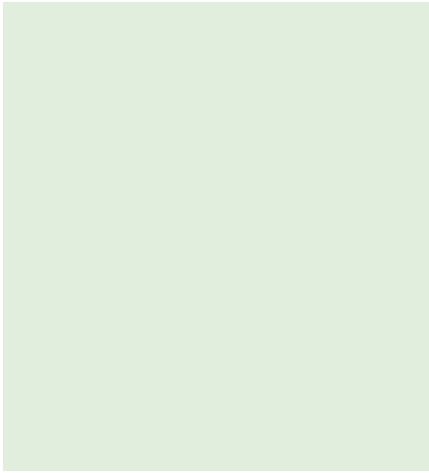


WATER EFFECIENCY MANAGEMENT SYSTEM (WEMS 2025-26)

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Water Efficiency Management System : Audit Report

5.1 INTRODUCTION

All living organisms, including plants and animals, depend on water for essential metabolic functions, while in plants it plays a key role in photosynthesis and growth. Water resources include all naturally available forms such as surface water bodies (rivers, lakes) and groundwater reserves. In an institutional setting, water demand is continuous and arises from multiple uses including drinking, sanitation, cleaning, and landscape maintenance. Considering the scale and diversity of these activities, overall water consumption can be considerably high, and in certain cases, total daily usage may reach several hundred litres per person. Continuous availability of water is therefore critical, as any shortage can directly affect both human activities and campus vegetation. This emphasizes the need for efficient water management practices to ensure sustainability and minimize wastage.

India receives an average annual rainfall of about 4,000 billion cubic metres (BCM), though its availability varies significantly across regions and seasons. A major proportion, nearly 75%, is received during the monsoon period, and much of it occurs in short bursts spanning around 15 days and less than 100 hours, which results

in rapid runoff rather than effective storage. Kerala, with an annual average rainfall of approximately 3,000 mm, exhibits a similar seasonal concentration, receiving about 60% of rainfall during the monsoon phases while the remaining 40% occurs as summer showers. In recent years, shifts in climatic conditions have led to irregular and localized rainfall patterns, often accompanied by flooding, thereby affecting water availability and management efficiency. In this context, ISO standards provide a structured approach to water management by standardizing terminology and guiding systematic practices for monitoring and optimizing water use. These standards also cover wastewater treatment, reuse, and the management of water services and irrigation systems across various sectors, along with procedures for handling sludge and related by-products from wastewater and stormwater systems, supporting improved resource efficiency and sustainability.

Environmental management guidelines, including those related to water footprint assessment, enable institutions to evaluate the impact of their water usage and identify opportunities for improving efficiency and reducing consumption. These guidelines also outline procedures for handling and treating sludge and other by-products

generated from wastewater, stormwater, and water treatment processes. Adoption of such practices supports systematic water and wastewater management and contributes to overall resource efficiency within the campus.

5.1.1 What is Water Audit?

A water audit is a systematic assessment of water usage within an entity, covering the entire flow from the point of water intake to final discharge. It examines each stage of water utilization to determine total consumption and identify areas of loss such as leakages, wastage, and inefficient usage. The audit also evaluates existing treatment systems and operational practices to assess their effectiveness and scope for improvement. Based on the analysis, recommendations are made to reduce wastage, optimize consumption, and improve treatment efficiency. It further supports decision-making through cost-benefit evaluation of proposed measures. In addition, the audit suggests the implementation of a monitoring system to track water intake, distribution, and overall usage for better management and control.

The key requirements for conducting a water audit include:

- Documentation of the total volume of water supplied and consumed within the institution.
- Identification of water losses along with appropriate corrective measures to address issues such as leakages, overflow, and other forms of unaccounted or inefficient usage.
- A sustainable water conservation strategy (including behavioural changes, promoting water reuse, recycling wastewater, and tapping into alternative water sources) focuses on improving efficient water utilization within the institution, reducing dependency on conventional supply systems, and encouraging practices that support long-term water sustainability.

The water audit involves a systematic process of developing a water balance by measuring and tracking the flow of water from the point of extraction or treatment, through the distribution network, to different points of usage, and finally to its discharge. This process includes detailed calculation of water inputs and outputs, assessment of consumption patterns across various uses,

and identification of potential areas for water saving and efficiency improvement within the system.

5.1.2 Need for Water Audit

Water audits act as a systematic tool to identify zones of high water consumption, evaluate the effects of wastewater pollutants, and formulate mitigation strategies based on the 3R principles (Reduce, Reuse, and Recycle). The water audit services have helped industries adopt efficient approaches to reduce water usage, limit wastewater generation, and improve resource recovery. These audits deliver comprehensive water efficiency solutions that lead to cost savings while ensuring compliance with internal policies, legal regulations, and reinforcing a commitment to sustainability.

The objectives of the water audit include:

- Reduction of water losses
- Improvement in financial performance
- Increased reliability of the supply system (quality water)
- Better performance of the distribution system
- Enhanced protection of public health and property
- Serving as an effective educational and public relations tool for the water system
- Reduction of legal risks
- Minimization of disruptions, thereby improving service levels for the entire college/university community

By increasing awareness among water users such as students, staff, and guests, water audits adopt a multi-stage approach aimed at delivering both short-term and long-term sustainable water management solutions. In this process, teams of analytical, design, and engineering experts collaborate to evaluate the audit findings and develop enhanced strategies for water management and sustainability.

5.1.3 Benefit of Water Efficiency Management System

Implementing a water efficiency management plan leads to considerable savings in water and energy use, while also reducing the environmental impacts associated with wastewater discharge and the transport of water over long distances.

The proper establishment and execution of a water

efficiency management system is intended to improve overall water use efficiency and may result in the following outcomes:

- Integration of water as a resource within organisational and financial planning
- Improved management of water consumption and optimisation of demand
- Better understanding of the effects that changes in water use may have on other users and systems
- Increased accountability in the use of water resources
- A structured system for continuous assessment to identify opportunities for improving efficiency
- Reduction in costs through lower water consumption achieved by sustainable design practices, water-saving devices, and effective monitoring systems.

5. 2 WATER EFFICIENCY MANAGEMENT POLICY

5.2.1 Statement Of Commitment

Mar Dionysius College, Pazhanji, formally affirms its commitment to environmental sustainability and responsible water resource management as an integral component of its institutional environmental governance.

The College shall ensure that its water management practices are aligned with relevant international frameworks, including the United Nations Sustainable Development Goals (SDG 6 – Clean Water and Sanitation and SDG 13 – Climate Action); national legislations and policies, including the Water (Prevention and Control of Pollution) Act, 1974, the Environment (Protection) Act, 1986, and the National Water Policy; as well as applicable Government of Kerala rules, regulations, and environmental guidelines pertaining to water conservation and pollution control.

The institution further commits to integrating climate change mitigation and adaptation principles across all environmental policies and institutional practices. Through sustainable water use, pollution prevention,

conservation measures, and continuous compliance monitoring, the College aims to reduce its environmental footprint and contribute to long-term ecological sustainability.

5.2.2 Vision

To establish a water-resilient and environmentally conscious campus that upholds Kerala's tradition of responsible water stewardship and serves as a model for sustainable water management in the state.

5.2.3 Mission

The mission of the College is to conserve freshwater resources through efficient usage, rainwater harvesting, groundwater recharge, and sustainable campus landscaping. The institution is committed to promoting judicious water use, preventing wastage, ensuring the safety and quality of drinking water, and adopting eco-friendly technologies for wastewater treatment and reuse. Through education, community engagement, and continuous monitoring, the College seeks to nurture a culture of water conservation among students and staff.

5.2.4 Resource Management

5.2.4.1 Water Sources

The College shall obtain water only from legally permitted, safe, and sustainable sources such as borewells, open wells, rainwater harvesting systems, or other approved sources in accordance with applicable national and state regulations.

All water sources shall be properly protected, periodically inspected, and maintained to prevent contamination and ensure continuous supply. The institution shall ensure that water extracted for campus use meets prescribed potable water quality standards through regular testing and monitoring.

The College shall adopt responsible groundwater management practices to prevent over-extraction and promote long-term sustainability of water resources.

5.2.4.2. Water Storage and Distribution

The College shall adopt scientific and efficient water storage and distribution systems to ensure safe, adequate, and equitable water supply across the campus. All storage tanks and distribution networks shall be properly designed, covered, and maintained to

prevent contamination, leakage, and water loss.

The institution shall implement periodic inspection, cleaning, and maintenance of storage facilities and pumping systems to ensure operational efficiency and water quality. Modern and sustainable water management practices shall be adopted to optimize distribution and reduce wastage.

Water used for irrigation and landscaping shall be managed through efficient systems to promote responsible water use and conservation.

5.2.4.3 Water Filtration and Quality Management

One borewell supplies drinking water through a double-filtration system, while other supply lines currently lack filtration. Annual water testing is conducted; the first test indicated E. coli presence, which was eliminated after filter installation. Future policy mandates quarterly testing to ensure consistent quality and hygiene.

5.2.4.4 Sewage Treatment and Reuse

A Sewage Treatment Plant (STP) is under construction and is expected to be completed within three months. Once operational, it will facilitate the reuse of treated grey water for gardening purposes.

5.2.5 Curriculum Integration

The College shall integrate the principles of water conservation, sustainable resource management, and environmental sustainability into the teaching and learning process, wherever relevant to the curriculum.

Environmental awareness, water conservation, pollution prevention, and responsible resource use shall be promoted through classroom discussions, assignments, field visits, and student participation in campus sustainability initiatives. Departments shall encourage students to adopt environmentally responsible practices and actively contribute to the conservation of natural resources.

The College shall foster a culture of environmental responsibility by encouraging participation in awareness programmes, campus-based conservation activities, and initiatives that support sustainable water management and environmental protection.

5.2.6 Green Initiatives

The college promotes eco-friendly practices that support environmental sustainability. Treated grey water from the sewage treatment plant (STP) is intended for reuse in landscaping and other non-potable applications. Flood-prone areas are addressed through appropriate surface drainage and rainwater channel management. Regular maintenance and cleaning of stormwater drains are carried out to prevent monsoon-related water stagnation and infrastructure damage.

5.2.7 Purchasing and Procurement

The college follows a sustainable procurement approach that prioritizes the purchase of water-efficient and durable plumbing materials. Future procurements will strictly adhere to the Water-Efficient Fixture Procurement Standard ensuring installation of dual-flush systems, low-flow faucets, and press-type taps in all areas. Eco-friendly cleaning materials are used to prevent groundwater contamination and promote a healthy environment.

5.2.8. Research and Innovation

The College shall encourage the integration of environmental sustainability and water conservation principles into academic and institutional practices, wherever feasible. The institution shall promote awareness of responsible water use and encourage innovative ideas that contribute to the efficient management and conservation of water resources within the campus. The College shall support initiatives that foster environmental responsibility and continuous improvement in sustainable water management, in accordance with its academic scope and available resources.

5.2.9 Community Engagement

The college recognizes community engagement as an integral component of its water management policy and maintains collaboration with the local panchayath on matters related to water conservation and sustainable water use. The institution upholds the promotion of awareness on household water conservation, rainwater harvesting, and wastewater reuse as part of its social responsibility. Through this policy approach, the college affirms its commitment to water literacy and environmental responsibility within the community.

5.2.10 Monitoring and Reporting

The Water Management Committee is responsible for monitoring and reporting water-related activities through standardized registers and documentation. These include the Water Infrastructure Asset Register (WIAR), which records borewells, tanks, and pipelines; the Daily Pumping and Usage Register (DPUR), which documents borewell usage hours, tank refilling frequency, and pumping cycles; the Maintenance, Complaint, and Repair Log (MCRL), which records leak reports, repairs, and follow-up actions; and the Water Quality Test History Register (WHTR), which maintains quarterly test reports and tank-cleaning certificates. Periodic internal reviews and annual water audits form part of the institutional framework for assessing water consumption, efficiency, and maintenance status.

5.2.11 Compliance and Review

The water management framework functions under a defined hierarchy of responsibilities. The Principal provides overall leadership and institutional oversight for water-related matters. The Administrator is responsible for financial allocation related to maintenance and infrastructure requirements. The Maintenance Supervisor holds responsibility for supervision of pumping operations, inspections, and repair activities. The Faculty Representative coordinates awareness-related matters and documentation, while the Student Representative supports participation, feedback, and communication activities.

The policy is subject to periodic review by the Water Management Committee to ensure continued compliance, address emerging challenges, and align with relevant technological advancements, audit recommendations, and applicable government guidelines.

5.2.12 Leadership and Accountability

The Water Management Committee of the institution functions on the principles of participatory leadership and shared responsibility to ensure effective water governance and sustainable water management practices on campus. The committee is constituted with representation from academic, administrative, maintenance, and student bodies to facilitate inclusive decision-making and coordinated action.

The Principal serves as the Chairperson, providing strategic direction, policy oversight, and institutional leadership for all water conservation initiatives. A Management Representative acts as the Administrator, ensuring alignment of water management activities with institutional policies and resource allocation. The Water Audit Coordinator, drawn from the Science Department, is responsible for monitoring water usage, conducting audits, analysing consumption data, and recommending efficiency measures. The Maintenance Supervisor oversees the operational aspects, including the upkeep of pumps, storage tanks, pipelines, and repair works, ensuring timely maintenance and prevention of water loss. A Student Representative supports awareness creation, documentation, and community participation, fostering responsible water-use behaviour among stakeholders.

This structure ensures shared accountability for implementing water-saving measures and achieving the set reduction targets.

5.2.13 Conclusion

This Water Management Policy of Mar Dionysius College, Pazhanji establishes a structured and accountable framework for sustainable water governance in alignment with international frameworks, national legislations, and applicable Government of Kerala regulations. By integrating climate change mitigation and adaptation principles across institutional practices, the College reinforces its commitment to environmentally responsible and legally compliant water management.

Through clearly defined provisions on water sourcing, storage, quality assurance, sewage treatment and reuse, sustainable procurement, academic integration, research engagement, monitoring registers, and participatory leadership, the institution ensures systematic oversight and measurable performance in water resource management.

The defined roles of the Water Management Committee, structured documentation systems, periodic audits, and review mechanisms provide transparency, accountability, and continuous improvement. The policy therefore serves not only as

a regulatory framework but also as an operational and academic guide that supports conservation, innovation, community engagement, and long-term water security within the campus.

The College shall periodically review and update this policy to address emerging environmental challenges, technological advancements, audit recommendations, and statutory requirements, thereby ensuring sustained institutional responsibility and environmental stewardship.

5.3 METHODOLOGY

A detailed water efficiency assessment was conducted to support sustainable development by examining water usage patterns and maintenance practices across the college campus. The audit was carried out through an on-site survey following a structured schedule. For effective execution, the team was organized into specialized groups responsible for tasks such as activity documentation, inspection of plumbing fixtures, and block-wise site assessment. The entire process was systematically managed using standardized assessment formats, field records, and relevant reference documents to ensure a comprehensive and consistent evaluation.

5.3.1 Internal audit training

Green audit training adopts a structured and participatory approach to encourage active involvement and a sense of responsibility within the institution. As part of the preparation, the Environmental Management System (EMS) selects students and faculty members for training as internal auditors. A one-day training program is conducted on 27.06.2025, equipping the participants to carry out a water audit effectively. The internal water audit process includes key stages such as evaluation, risk assessment, data collection, policy formulation, and the development of records and programs focused on water conservation and efficient resource management.

5.3.2 Water infrastructure survey

The internal audit team carried out a thorough assessment of the water infrastructure across the campus. This involved listing all taps and faucets based on their type and number, examining their condition, and identifying the location and frequency of any leakages. The team also prepared block-wise maps

showing all water sources, including external supply points, and documented details of storage facilities such as type, capacity, installation year, and location. This data supported an evaluation of the efficiency and working condition of the system, including taps, faucets, and distribution lines. In addition, the audit covered water quality analysis, reviewed existing water risk management measures, and examined routine maintenance practices.

5.3.3 Sampling Data Collection

Water consumption and distribution were assessed through manual field measurements conducted at selected water outlets across the campus. Water discharged from taps was collected in a measuring container over a fixed time interval to determine the flow rate of each outlet. Visual observations were also carried out to identify leakages, assess the operational condition of plumbing fixtures, and evaluate water usage patterns. The collected data were used to estimate water consumption, identify areas requiring maintenance, and assess the overall efficiency of the campus water distribution system.

5.3.4 Registers for the monitoring and analysis

The audit also included an assessment of water footprint records, analysis of consumption patterns, evaluation of grey water recycling practices, and identification of measures to minimize water loss, along with an overall review of water resource management. In addition, systematic documentation of meetings and activities related to water conservation and sustainability helped establish a clear baseline of the institution's existing water resources and management practices.

5.3.5 External auditing

An external water management audit is conducted by TIES to evaluate the institution's compliance with the applicable ISO standards and established water management audit criteria. The audit includes a comprehensive review of the institution's water management practices, site inspections, verification of relevant records, and identification of any non-conformities or opportunities for improvement. Based on the audit findings, recommendations are provided to support corrective actions and the continual

improvement of the Water Management System.

5.3.6 Water Footprint Verification

Water footprint verification provides a systematic approach for assessing and validating water consumption and its associated environmental impacts. ISO 14046 offers an internationally recognized framework for evaluating water footprints and ensuring consistency, transparency, and reliability in reporting. The standard considers both direct and indirect water use and supports the assessment of potential environmental impacts associated with water consumption.

Water footprint assessments may be conducted independently or integrated with broader environmental and life cycle assessment (LCA) studies. The verification process helps institutions understand water-use patterns, identify opportunities for improvement, and strengthen sustainable water management practices. By adopting ISO 14046 principles, institutions can enhance accountability, support informed decision-making, and demonstrate their commitment to responsible water resource management.

5.3.7 Stages of water audit

Water audit has the following three phases:

5.3.7.1 Pre audit phase

- Formation of audit team; scheduling audit programmes
- Setting up of scope and objectives (in tune with the water conservation policy of the institution)
- Discuss with the responsible persons of each location (staff, teachers, lab assistants, sweepers, watchmen, students, etc.) about the usage pattern and habits related to water consumption.

This phase includes the following specific activities:

5.3.7.1.1. System audit (inventory of infrastructure)

- The current water usage and systems for water use under various sectors, such as canteen, toilets, departments, common facilities, wash areas, and others, need to be studied to check their

operational efficiency and level of maintenance.

- The scope for any modification or up-gradation will depend on the status of existing systems.

5.3.7.1.2 Water Supply and Usage audit (Usage pattern of the campus)

- Water audit comprises the preparation of a layout of water sources, distribution network, and service/delivery points to water users (lab, mess, canteen, toilets, office, public etc.) and return flow of waste or excess water.
- The layout should include locations and capacities of flow measurement devices installed at key points, dimensions of pipes and fittings in the water supply system, locations and particulars of flow control devices and history sheets of all measuring and control devices including pipes and fittings.

5.3.7.1.3 Audit phase

Auditors collect all data collected to ensure that nothing is overlooked completely in the audit. The following information regarding process has been collected during

the audit phase:

- Flow measurement devices may be installed at all strategic points so that water losses from various components such as raw water source, conveyance system from raw water source to treatment plant, from treatment plant to treated water storage system, treated water storage system to distribution networks, individual users, etc. could be assessed at regular intervals (WEMS).
- Such an audit will also prove useful for future extension, renovation, and modernization of the system.
- Water quality of the distribution system needs to be monitored regularly at strategic points to find out the level and nature of contaminants present in the supplied water. Depending on the types of application and degree of purity needed, the treatment system can be designed and developed.
- The water distribution system, leakage assessment etc., will form an integral part of this study.

5.3.7.1.4 Post audit phase

- The plan of action for the post-audit phase is implementation and follow-up. The result is to assist and implement or enhance existing WEMS with sustainability solutions and monitor the performance.
- WEMS committee will ensure that the WEMS is in place and the college is participating, by making the entire college/university community well informed through regular communications, monitoring through periodical evaluation programmes etc.

Two major activities are included in this phase

Source sustainability audit

- A study of the availability of water from the current sources and past consumption patterns for various sectors of the college/university is necessary to understand the present water utilization and project future requirements.
- Data on the development of a sustainable source of water through rainwater harvesting and wastewater (grey water) recycling should also be taken into consideration.
- Water conservation measures shall be identified and included in the action plan.

Discharge audit

The quantity of grey water from all points of water usage shall be calculated. Based on such statistics, recycling or wastewater treatment options shall be implemented.

5.3.8 Steps of Water Audit

The standard water balance or methodology is the framework for categorizing and quantifying all water uses in the water audit. It is called a 'balance' because

when it is completed, all uses of water in the system equal the amount of water input by the sources.

5.3.8.1 . Site assessment

Collection of contour maps and campus diagrams
Preparing an inventory of the water infrastructure of each building:

- Water meter data (from various points of use)
- Data on the quantity of water pumped every day (pump-wise/location-wise)
- Data on leaking infrastructure and the quantity of lost water
- List of water conservation measures (WCM) and sustainability measures (SM) implemented.
- Discussion with responsible persons of each infrastructure (on utility method, working condition, operation and maintenance procedures etc.)
- Date entry in prescribed forms (water spread sheets).

5.3.8.2 . Data analysis

- Analysis of current and past performance (water usage data and water loss data, before and after the implementation of WCM, SM etc.).
- Regression analysis involves the comparison of water consumption on the Y axis versus the potential water. driver on the X axis (weather, working days/holidays etc.).
- Preparation of checklists and verification Water footprint calculation.

5.3.8.3 . Final audit by external audit team

- Checklists verification- identifying non-conformities
- Action plan –long-term and short-term
- Final report & certification as per ISO standards

5.3.9. Work plan and schedule of water audit

Date to date	Work Plan
15-07-2025	WEMS Committee Formation
04-08-2025	Policy Making , Sample Data Collection, Develop Agenda & schedule for activities.
05-08-2025	Campus Visit & First Working Day Data Collection
06-08-2025	Second Working Day Data Collection
07-08-2025	Third Working Day Data Collection
09-08-2025	Policy Finalization & First Semi Working day Data Collection
10-08-2025	First Holiday Data Collection
15-08-2025	Second Semi Working Day Data Collection
16-08-2025	Third Semi Working Day Data Collection
17-08-2025	Second Holiday Data Collection
24-08-2025	Third Working day Data Collection
25-08-2025	Submission for the approval

Table 5.1 Schedule of water efficiency management audit

5.4.RESULT DISCUSSION

5.4.1 Water Source

Sl. No.	Water Sources	Count
1	Borewells	3
2	Open well	1
3	External water sources	0

Table 5.2 Water Source of the college

5.4.2. Water storage facilities of the college

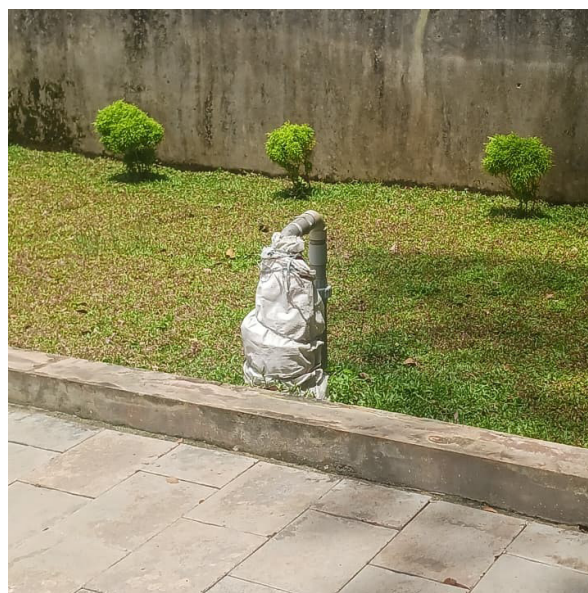


Fig 5.1 Water sources

In addition to the above water sources, the institution has an existing rainwater harvesting system with a storage capacity of 1,000 litres. The system collects rainwater from rooftop catchments, which is filtered and stored for non-potable purposes such as gar-

dening and cleaning. This initiative supports water conservation, enhances groundwater recharge, and reduces dependence on groundwater resources, thereby contributing to sustainable water resource management on the campus.



Fig 5.2 Rainwater harvesting system

Sl. No.	Type	Capacity	Year of Installation	Location
1	Main Tank (Polyethylene)	750 L	2020	Rooftop (Aided Block)
2	Main Tank (Polyethylene)	750 L	2020	Rooftop (Aided Block)
3	Main Tank (Polyethylene)	750 L	2020	Rooftop (Aided Block)
4	Sub Tank (Polyethylene)	500 L	2020	Rooftop (Aided Block)
5	Main Tank (Polyethylene)	1000 L	2023	Rooftop (Self-financing Block)
6	Main Tank (Polyethylene)	1000 L	2023	Rooftop (Self-financing Block)
7	Main Tank (Polyethylene)	1000 L	2023	Rooftop (Self-financing Block)
8	Main Tank (Polyethylene)	1000 L	2023	Rooftop (Self-financing Block)
9	Main Tank (Concrete)	15,000 L	2024	Rooftop – BMP
10	Tank (Concrete)	15,000 L	2023	Rooftop (Self-financing Block)

Table 5.3. Water storage facilities of the college (Total storage capacity of tanks – 36,750 L).

The college has established an adequate water storage system to ensure a continuous and reliable water supply for its daily operations. The storage infrastructure consists of both polyethylene and concrete tanks installed at different periods to meet the increasing water demand of the institution. Initially, three 750 L main polyethylene tanks and one 500 L sub-tank were installed in 2020. Subsequently, four additional main polyethylene tanks, each with a

capacity of 1,000 L, were installed in 2023 to enhance the storage capacity. To further strengthen the water management system, two large concrete tanks with a capacity of 15,000 L each were commissioned during 2023 and 2024. These facilities collectively demonstrate the institution's commitment to maintaining adequate water reserves and ensuring efficient water distribution across the campus.



Fig 5.3 Water storage tanks

5.4.3. Water infrastructure of the college

Sl. No.	Location / Area	Tap	Flush	Faucet	Filters	Shower	Sprinklers	Leakage	Damage
1	Canteen	6	–	–	–	–	–	Nil	Nil
2	BMP Block – Common Washroom	4	–	10	–	–	–	Nil	Nil
3	BMP Office	3	–	6	–	–	–	Nil	Nil
4	BMP Principal Room	1	–	3	–	–	–	Nil	Nil
5	BMP Management Room	1	–	3	–	–	–	Nil	Nil
6	BMP Guest Room	1	–	3	–	–	–	Nil	Nil
7	BMP Garden	–	–	84	–	–	–	Nil	Nil

8	Aided Block – Library	1	–	3	–	–	–	Nil	Nil
9	Aided Block – English Department	1	–	3	–	–	–	Nil	Nil
10	Aided Block – BBA Department	1	–	2	–	–	–	Nil	Nil
11	Aided Block – BCA Department	1	–	3	–	–	–	Nil	Nil
12	Aided Block – Economics Department	1	–	3	–	–	–	Nil	Nil
13	Aided Block – Physics Department	2	–	1	–	–	–	Nil	Nil
14	Aided Block – Mathematics Department (2nd Floor)	1	–	2	–	–	–	Nil	Nil
15	Aided Girls Toilet (Ground Floor)	10	–	13	–	–	–	Nil	Nil
16	Aided Boys Toilet (Ground Floor)	3	–	22	–	–	–	Nil	Nil
17	Self Block – Boys Toilet	–	–	15	–	–	–	Nil	Nil
18	Self Office	2	–	3	–	–	–	Nil	Nil
19	Self Admin Room	1	–	3	–	–	–	Nil	Nil
20	Self Girls Toilet (1st Floor)	2	–	12	–	–	–	Nil	Nil
21	BTTM Department	1	–	3	–	–	–	Nil	Nil
22	Commerce Department	1	–	3	–	–	–	Nil	Nil
23	Self Girls Toilet (2nd Floor)	3	–	10	–	–	–	Nil	Nil
24	Self Department (2nd Floor)	1	–	3	–	–	–	Nil	Nil
25	Outside Pipes	5	–	–	–	–	–	Nil	Nil
Total		53	–	213	–	–	–	Nil	Nil

Table 5.4. Water infrastructure of the college

5.4.4. Water consumption study using manual water discharge data

(Full-Open Rates)

5.4.4.1 Aided Girls Washroom

No. of Taps	Rate (L/min)	Total (L/min)	Per Capita
7	9.23	64.61	0.46
13	11.97	155.61	1.12
3	8.27	24.81	0.18
Total	23	245.03	1.76

Table 5.5. Manual Water Discharge Aided Girls Washroom

5.4.4.2 Aided Boys Washroom

No. of Taps	Rate (L/min)	Total (L/min)	Per Capita
3	9.23	27.69	0.25
4	11.97	47.88	0.44
Total	7	75.57	0.69

Table 5.6. Manual Water Discharge Aided Boys Washroom

5.4.4.3 Canteen

No. of Taps	Rate (L/min)	Total (L/min)	Per Capita
3	6.08	18.24	0.06
4	8.11	32.44	0.12
1	7.14	7.14	0.03
1	6.12	6.12	0.02
Total	9	63.94	0.23

Table 5.7 Manual Water Discharge

5.4.4.4 BMP Block

No. of Taps	Rate (L/min)	Total (L/min)	Per Capita
9	6.08	54.72	6.08
9	7.14	64.26	7.14
9	6.12	55.08	6.12
Total	27	174.06	19.34

Table 5.8 Manual Water Discharge BMP Block

5.4.4.5 Self Departments

No. of Taps	Rate (L/min)	Total (L/min)	Per Capita
4	6.08	24.32	6.08
1	6.08	6.08	6.08
4	6.08	24.32	6.08
6	6.08	36.48	6.08
10	6.08	60.8	6.08
Total	25	152.0	30.4

Table 5.9. Manual Water Discharge Self Departments

5.4.4.6 Aided Departments

No. of Taps	Rate (L/min)	Total (L/min)	Per Capita
10	6.08	60.8	6.08
4	6.08	24.32	6.08
5	6.08	30.4	6.08
5	6.08	30.4	6.08
4	6.08	24.32	6.08
4	6.08	24.32	6.08
3	6.08	18.24	6.08
Total	35	212.8	42.56

Table 5.10 Manual Water Discharge Aided Departments

5.4.4.7 Self Girls Washroom – 1st Floor

No. of Taps	Rate (L/min)	Total (L/min)	Per Capita
2	6.08	12.16	0.09
7	7.14	49.98	0.36
2	6.12	12.24	0.09
Total	11	74.38	0.54

Table 5.11 Manual Water Discharge Self Girls Washroom – 1st Floor

5.4.4.8 Self Girls Washroom – 2nd Floor

No. of Taps	Rate (L/min)	Total (L/min)	Per Capita
3	6.08	18.24	0.13
6	7.14	42.84	0.31
Total	9	61.08	0.44

Table 5.12 Manual Water Discharge Self Girls Washroom – 2nd Floor

5.4.4.9 Self Boys Washroom

No. of Taps	Rate (L/min)	Total (L/min)	Per Capita
4	7.14	28.56	0.22
Total	4	28.56	0.22

Table 5.13 Manual Water Discharge Self Boys Washroom

5.4.4.10 Rate of Discharge of Water Fixtures

Type of Fixture	Half-Open (L/min)	Full-Open (L/min)	Seconds to Fill 1 L Bottle (Half)	Seconds to Fill 1 L Bottle (Full)
Utility Type 1	3.12	6.08	19.2	9.9
Wash Basin Tap	4.18	7.06	14.4	8.5
Kitchen Tap	5.07	8.11	11.8	7.4
Bathroom Faucet 1 (Inside Tap)	4.26	7.14	14.1	8.4
Bidet Pipe (Bathroom Faucet 2)	3.64	6.12	16.5	9.8
Flush (Bathroom Faucet 3)	—	6 L/flush	—	—
Urinal Flush	—	3 L/flush	—	—

Table 5.14 Rate of Discharge of Water Fixtures

5.4.4.11 Average water use per year

Sl. No.	Location	Total Discharge Rate (L/min)	Average Usage per Year (L)
1	Aided Girls Washroom	245.03	2,940,360
2	Aided Boys Washroom	75.57	906,840
3	Canteen	63.94	767,280
4	BMP Block	174.06	2,088,720
5	Self Departments	152.0	1,824,000
6	Aided Departments	212.8	2,553,600
7	Self Girls Washroom – 1st Floor	74.38	892,560
8	Self Girls Washroom – 2nd Floor	61.08	732,960
9	Self Boys Washroom	28.56	342,720

Total Estimated Annual Water Usage: 15,049,040 L/year

Table 5.15 Average water use per year



Fig 5.4 Data collection of manual water discharge

5.4.5. Grey water

Block / Location	Grey-Water Fixtures Included	Avg Rate of Discharge (L/min)	Daily Grey Water (L/day)	Yearly Usage (m ³ /year)
Self Block	Utility Type 1 + Bathroom Faucet 1	6.08 – 7.14 ($\approx$ 6.6)	$\approx$ 1 850 L/day $\approx$ 1.85 m ³ /day	$\approx$ 675 m ³ /year
Aided Block	Utility Type 1 + Utility Type 2 + Bathroom Faucet 1	8.27 – 11.97 ($\approx$ 9.8)	$\approx$ 1 376 L/day $\approx$ 1.38 m ³ /day	$\approx$ 504 m ³ /year
BMP BLOCK (Office + Principal + Mgmt + Guest)	Utility Type 1 + Bathroom Faucet 1	6.08 – 7.14 ($\approx$ 6.6)	$\approx$ 29 L/day $\approx$ 0.03 m ³ /day	$\approx$ 9.8 m ³ /year
CANTEEN	Kitchen Tap + Utility Type 1 (hand-wash)**	6.08 – 8.11 ($\approx$ 7.1)	$\approx$ 1 408 L/day $\approx$ 1.41 m ³ /day	$\approx$ 423 m ³ /year
TOTAL Grey Water Recoverable on Campus	—	—	$\approx$ 4 663 L/day $\approx$ 4.66 m ³ /day	$\approx$ 1 612 m ³ /year

Table 5.16. Water infrastructure of the college

The estimated grey-water generation within the campus is approximately 4,663 L/day (4.66 m³/day), resulting in an annual recoverable volume of about 1,612 m³. Among the assessed facilities, the Self Block contributes the largest share of grey water, generating approximately 1,850 L/day (1.85 m³/day), which accounts for nearly 40% of the total campus grey-water production and translates to an annual volume of about 675 m³. The Aided Block generates around 1,376 L/day (1.38 m³/day), contributing approximately 504 m³/year, while the Canteen produces about 1,408 L/day (1.41 m³/day), equivalent to roughly 423 m³/year. In contrast, the BMP Block, comprising the office, principal's room, management office, and guest facilities, generates only about 29 L/day (0.03 m³/day), corresponding to an annual volume of 9.8 m³.

The observed grey-water generation is primarily associated with utility sinks, bathroom faucets, kitchen taps, and hand-washing stations, with measured discharge rates ranging from 6.08 to 11.97 L/min. The highest discharge rates were recorded in the Aided Block (average 9.8 L/min), reflecting the presence of multiple utility fixtures and higher user density. The substantial annual grey-water yield of over 1,600 m³ demonstrates a significant opportunity for water conservation through the implementation of a grey-water collection, treatment, and reuse system. Recovered water could be effectively utilized for non-potable applications such as landscape irrigation, toilet flushing, and cleaning activities, thereby reducing dependence on freshwater sources and improving overall campus water management.

5.4.6 Water motor pumping data

PUMPING HISTORY			
Date	Time on	Turn off	Duration in minutes
12-07-25	12.31 pm	12.48pm	17 minutes
	9.24 am	10.10 am	46 minutes
	2.30 pm	2.56 pm	26 minutes
	3.20 pm	4.07 pn	47 minutes
	3.35 pm	3.50 pm	15 minutes
15-07-2025	8.13 am	8.26 am	13 minutes
	8.18 am	8.28 am	10 minutes
	2.05 pm	2.30 pm	25 minutes
	2.10pm	3.10pm	60 minutes
	3.30 pm	4.49 pm	19 minutes
16-07-2025	4.15 pm	4.23pm	8 minutes
	6.50 pm	7.10pm	20 minutes
	8.10 am	8.28am	18 minutes
	8.31 am	8.36am	5 minutes
	2.34pm	3.30pm	56 minutes
17-07-2025	1.35pm	2.03pm	28 minutes
	2.32pm	3.09 pm	37 minutes
	8.19 am	8.31 am	10 minutes
	8.35 am	8.45 am	10 minutes
	2.24 pm	3.18 pm	54 minutes
15-10-2025	3.48 pm	4.00pm	12 minutes
	8.02am	8.19 am	17 minutes
	8.09 am	8.20 am	11 minutes
	8.07 am	8.48 am	41 minutes
	1.16 pm	1.50 pm	34 minutes
16-10-2025	1.40pm	3.16 pm	36 minutes
	2.48pm	3.01 pm	13 minutes
	4.18pm	4.35 pm	17 minutes
	4.10 pm	4.32 pm	22 minutes
	8. 50 am	9.10 am	20 minutes
	9.00 am	9.15 am	15 minutes
	10.00 am	11.00 am	60 minutes

	3.00pm	3.30 pm	30 minutes
	3.10pm	3.30pm	20 minutes
	3.00pm	4.00pm	60 minutes
	4.30pm	5.30pm	60 minutes
17-10-2025	7.44 am	8.21 am	37 minutes
	7.59 am	8.09 am	10 minutes
	8.00 AM	8.45 AM	45 minutes

Table 5.17. Water pumping frequency record

The water pumping records collected during July and October 2025 indicate a high frequency of pump operation to maintain the campus water supply system. A total of 39 pumping cycles were recorded across the monitoring period, with individual pumping durations ranging from 5 to 60 minutes. The cumulative daily pumping duration varied considerably, reflecting fluctuations in campus water demand and storage tank replenishment requirements.

During the July monitoring period, the total daily pumping duration ranged from 86 to 183 minutes. The highest pumping duration in July was observed on 15 July 2025, with seven pumping cycles totaling approximately 155 minutes, while 17 July 2025 recorded four pumping events with a cumulative duration of 86 minutes. In October, pumping activity was generally higher, with cumulative daily durations of approximately 191 minutes, 265 minutes, and 92 minutes recorded on 15, 16, and 17 October 2025, respectively. The longest individual pumping events lasted 60 minutes and were observed on both 15 and 16 October 2025.

The recorded data reveal that pumping operations are concentrated primarily during the morning (7:45–10:00 AM) and afternoon (1:00–5:30 PM) periods, corresponding to peak water consumption hours within the campus. The frequent occurrence of both short-duration and extended pumping cycles suggests

variable water demand patterns across academic, administrative, and service facilities. These observations indicate a substantial reliance on mechanical pumping for water distribution and highlight the importance of efficient pump scheduling, adequate storage capacity, and demand-side water management measures to optimize energy consumption and improve the overall efficiency of the campus water supply system.

5.4.7. Water quality report

The M D College water system draws its supply from two borewells and stores it across a large network of tanks, including one 15,000 L tank, four 1000 L tanks, three 750 L tanks, and one 500 L tank. The institution tests the water only once a year and the collective water storage is cleaned only once in a time, the series of water quality tests became critical for ensuring safety. The initial analysis revealed significant problems, specifically a low pH value (6.35) and a worrying count of Total Coliform bacteria, which peaked at 120 MPN/100ml, necessitating immediate intervention. Recognizing the issue, required steps were taken, involving proper disinfection/service of filtration to eliminate the bacterial risk and the use of techniques to increase the pH. A subsequent re-testing confirmed that the intervention was successful, demonstrating no water quality issues and a final result of Coliforms Absent in 100 ml.

Sl. No.	Characteristic	Unit	Desirable Limit	Actual Content
1	Turbidity	NTU	1	0.6
2	Colour	Hazen	5	1
3	Odour	–	–	Agreeable
4	pH Value	–	6.50–8.50	7.48
5	Electrical Conductivity	µS/cm	–	349
6	Total Dissolved Solids (TDS)	mg/L	500	196
7	Acidity	mg/L	–	25.3
8	Alkalinity (Total)	mg/L	200	128
9	Total Hardness (as CaCO ₃)	mg/L	200	75.7
10	Calcium	mg/L	75	24.0
11	Magnesium	mg/L	30	3.6
12	Chloride	mg/L	250	56.2
13	Iron	mg/L	1	0.07
14	Nitrate	mg/L	45	0.2
15	Sulphate	mg/L	200	9.3
16	Ammonia	mg/L	0.5	BDL (Below Detection Limit)
17	Residual Free Chlorine	mg/L	0.2	BDL (Below Detection Limit)
18	Total Coliform	MPN/100 mL	0	12
19	E. coli	No. of colonies/100 mL	Absent/100	Absent

Table 5.18. Water quality assesment

5.5 CONCLUSION

- The Water Efficiency Management System audit found that Mar Dionysius College maintains an adequate water supply system supported by three borewells, one open well, and sufficient storage infrastructure. The campus water distribution network was found to be in satisfactory condition, with no major leakages or damaged fixtures observed during the assessment.
- Water quality testing confirmed that the supplied water meets acceptable standards following the implementation of corrective measures. The audit also identified substantial grey-water generation within the campus, which can be utilized

effectively after the commissioning of the Sewage Treatment Plant. The existing Water Management Policy, monitoring framework, and conservation initiatives provide a systematic approach for improving water-use efficiency and supporting sustainable management of water resources within the institution.

5.6 RECOMMENDATIONS

- Complete the installation and commissioning of the Sewage Treatment Plant (STP) at the earliest and implement systematic reuse of treated greywater for gardening, landscaping, and other non-potable applications.

- Strengthen the existing rainwater harvesting system through regular maintenance, periodic inspection, and optimization to enhance groundwater recharge and reduce dependence on borewell water. Where feasible, consider expanding the system to additional suitable rooftop and open areas.
- Conduct quarterly water quality testing instead of annual testing to ensure continuous monitoring of drinking water safety and compliance with prescribed standards.
- Install water meters at major consumption points, including academic blocks, canteen facilities, and irrigation systems, to enable accurate monitoring and analysis of water usage patterns.
- Replace conventional fixtures gradually with water-efficient fixtures such as low-flow faucets, sensor-based taps, dual-flush systems, and water-saving plumbing devices.
- Establish a systematic greywater collection and reuse network to maximize recovery of the estimated 4.66 m³/day of reusable wastewater generated on campus.
- Develop a digital water monitoring system for maintaining records related to water consumption, tank cleaning schedules, water quality results, maintenance activities, and infrastructure performance.
- Continue periodic leak detection surveys and preventive maintenance programmes to ensure that water losses remain minimal.
- Strengthen campus landscaping practices by promoting native and drought-resistant plant species that require less irrigation and contribute to groundwater conservation.
- Conduct regular awareness campaigns, workshops, seminars, and student-led water conservation activities to encourage behavioural changes and responsible water usage.
- Establish annual targets for reducing freshwater consumption and periodically evaluate progress through water audits and performance reviews.
- Encourage research projects, student internships, and innovation-based studies related to water conservation, wastewater treatment, rainwater harvesting, and sustainable water management technologies.
- Strengthen collaboration with local communities, Panchayath authorities, and environmental agencies to promote water conservation practices beyond the campus and contribute to regional water sustainability initiatives.
- Periodically review and update the Water Management Policy and Water Efficiency Management Plan to incorporate emerging technologies, climate resilience measures, and audit recommendations.
- Develop a long-term campus water sustainability roadmap focusing on water conservation, groundwater recharge, wastewater reuse, climate adaptation, and continuous improvement in resource efficiency.

5.7 WATER EFFICIENCY MANAGEMENT PLAN

5.7.1. Establish and Implement Water Management System

- The institution has established a structured framework for the implementation of water management activities, with clearly defined responsibilities assigned to specific bodies for effective execution and supervision.
- The Water Management Committee functions as the central authority responsible for coordinating all water-related activities, including planning, implementation, monitoring, and reporting. The committee ensures that scheduled activities such as awareness programmes, audits, and inspections are carried out within the defined timelines.
- Infrastructure-related interventions, particularly the completion and operation of the Sewage Treatment Plant (STP), are undertaken by the Management and Engineering Team. The Maintenance Team is responsible for routine inspection, cleaning, and maintenance of water infrastructure, including pipelines, storage tanks, drainage systems, and treatment facilities, ensuring uninterrupted functioning and minimisation of losses.
- NSS actively supports plantation activities and

awareness programmes, while the Environment Club facilitates student participation through engagement programmes such as audits, campaigns, and observation-based studies. The coordinated functioning of these bodies ensures accountability and systematic implementation of water management practices across the campus.

5.7.2. Implementation of Water Management Activities

- Water management activities are implemented in a phased manner based on the institutional schedule to ensure systematic improvement in water efficiency and conservation.
- Installation of water-saving awareness boards is carried out in strategic locations such as wash areas, toilets, hostels, and canteen spaces. These boards provide clear instructions on responsible water usage and act as continuous visual reminders to reduce wastage.
- Leak detection surveys are conducted periodically to identify leakages in taps, pipelines, and overhead tanks. The identified issues are documented and communicated for timely rectification, thereby reducing water loss and improving system efficiency.
- The Sewage Treatment Plant (STP) is completed and commissioned to ensure scientific treatment of wastewater generated within the campus. The treated water can be managed effectively, contributing to improved sanitation and potential reuse.
- Drainage cleaning activities, including desilting and removal of blockages in stormwater and wastewater channels, are carried out to maintain proper flow and prevent water stagnation. These activities help in avoiding overflow, contamination, and infrastructure damage.
- Plantation and green belt expansion are undertaken through the planting of native and low water-consuming plant species. This activity contributes to improved groundwater recharge and enhances the ecological condition of the campus.
- Awareness and training sessions are

conducted every semester through workshops, demonstrations, and campaigns to educate students and staff on water conservation practices and responsible usage.

- Student engagement programmes such as water audits, quizzes, awareness campaigns, and observation studies are organised regularly to ensure active participation and to build a sense of responsibility among students towards sustainable water management.
- Annual water audits are conducted to assess water usage patterns, recycling practices, and conservation measures. Based on the findings, Water Management Reports are prepared and submitted annually, documenting progress, identifying issues, and recommending corrective actions.

5.7.3. Short-Term and Long-Term Action Framework

5.10.3.1 Short-Term Actions

Short-term actions focus on immediate and implementable measures aimed at reducing water wastage and improving operational efficiency.

- Installation of awareness boards in high water-use areas to promote responsible consumption
- Conduct of leak detection surveys and timely reporting of identified leakages
- Completion and commissioning of the Sewage Treatment Plant (STP)
- Cleaning and desilting of drainage systems to prevent blockages and stagnation
- Conduct of semester-wise awareness and training programmes
- Organisation of student engagement activities including audits, campaigns, and observation studies
- Annual water audit and submission of Water Management Report

These actions ensure immediate control over water

losses, improved system functionality, and increased awareness among campus users.

5.10.3.2 Long-Term Actions

Long-term actions focus on sustaining implemented measures and ensuring continuous improvement in water management practices.

- Expansion and maintenance of green belt through plantation of native and low water-consuming species
- Continuous monitoring and maintenance of water infrastructure, including taps, pipelines, storage systems, drainage networks, and the Sewage Treatment Plant

These actions contribute to long-term sustainability, improved groundwater recharge, and efficient functioning of water systems.

5.7.4. Monitoring and Evaluation

A systematic monitoring and evaluation mechanism is followed to ensure effective implementation and performance of water management activities.

The Water Management Committee regularly reviews the status of scheduled activities and ensures adherence to timelines. Maintenance records, inspection reports, and audit findings are maintained to track implementation and performance.

Continuous monitoring of water infrastructure, including taps, pipelines, tanks, and the Sewage Treatment Plant, is carried out by the Maintenance Team to detect issues at an early stage and prevent water loss.

Annual water audits and reports serve as key evaluation tools to assess water usage patterns, efficiency improvements, and effectiveness of conservation measures. Based on these evaluations, corrective actions are implemented to address identified gaps.

Participation in awareness programmes and student engagement activities is also reviewed to ensure sustained involvement of stakeholders.

5.10.5. Conclusion and Follow-Up

The Water Efficiency Management Plan establishes a structured and action-oriented approach for managing

water resources within the institution. Through defined timelines, clear allocation of responsibilities, and continuous monitoring, the plan ensures effective implementation of all activities.

Follow-up actions are carried out through regular audits, reporting, and maintenance practices, enabling continuous improvement and long-term sustainability in water management. The plan supports efficient resource utilisation while promoting awareness and active participation across the campus.

5.8 SUMMARY

- The Water Efficiency Management System (WEMS) audit was conducted to assess water sources, storage facilities, distribution infrastructure, water consumption, water quality, grey-water generation, and water management practices at Mar Dionysius College, Pazhanji.
- The institution meets its water requirements through three borewells and one open well. Water is stored in ten storage tanks comprising polyethylene and concrete tanks with a combined storage capacity of 36,750 litres. The water distribution network includes 53 taps and 213 faucets located across academic blocks, administrative offices, washrooms, the canteen, and outdoor areas. No leakages or damaged fixtures were observed during the infrastructure survey.
- Water discharge measurements showed flow rates ranging from 6.08 to 11.97 L/min depending on the type of fixture. Pump operation records indicated that water is pumped several times daily, with individual pumping durations varying from 5 to 60 minutes. The highest daily pumping duration recorded during the monitoring period was 265 minutes.
- Grey-water assessment estimated a total generation of approximately 4,663 litres per day (4.66 m³/day), equivalent to about 1,612 m³ annually. The Self-Financing Block generated the highest volume of grey water (1,850 L/day), followed by the Canteen (1,408 L/day) and Aided Block (1,376 L/day). The ongoing construction of the Sewage Treatment Plant provides scope for

future treatment and reuse of this wastewater for non-potable purposes.

- Water quality testing showed that earlier issues related to microbial contamination were rectified through corrective measures. The final analysis recorded a pH of 7.48, TDS of 196 mg/L, absence of E. coli, and compliance of all tested parameters within the prescribed limits.
- The audit also reviewed the institutional Water Management Policy, monitoring system, maintenance practices, awareness programmes, and Water Efficiency Management Plan. The framework includes regular infrastructure inspections, water quality monitoring, annual audits, awareness activities, and proposed wastewater reuse measures aimed at improving water-use efficiency and reducing freshwater demand across the campus.

5.9 ACTIVITIES CONDUCTED

As part of the institution's Water Efficiency Management and Green Audit initiatives, various awareness-oriented and sustainability-focused programmes were conducted to promote responsible water consumption and environmental stewardship among students. These activities aimed to enhance water literacy, encourage sustainable behavioural practices, and create awareness regarding the importance of conserving water resources in the context of increasing environmental challenges and water scarcity.

Water Conservation Awareness Seminar

The National Service Scheme (NSS) organized a seminar titled "Every Drop Counts" – Building a Water-Saving Culture on 05 February 2026 in Room No. 38 as part of the institution's Green Audit activities. The programme was conducted with the objective of sensitizing

students to the significance of water conservation and promoting a culture of sustainable and responsible water usage within the campus community.

The seminar was led by Dr. Manjusha K K, NSS Coordinator, who delivered a detailed and informative session addressing the growing global water crisis, major causes of water scarcity, and the environmental implications associated with unsustainable water consumption practices. The resource person emphasized the urgent need for collective responsibility and active public participation in the conservation and management of water resources.

The session also highlighted practical and sustainable approaches to water conservation, including rainwater harvesting, reduction of water wastage, greywater reuse practices, and efficient water management strategies applicable to households and educational institutions. The programme further encouraged students to integrate eco-friendly water usage practices into their daily routines and to contribute actively towards environmental protection initiatives.

Students participated actively in the seminar and engaged in meaningful discussions on environmental sustainability, water security, and conservation strategies. The programme significantly contributed to improving awareness regarding water resource management and reinforced the institution's commitment towards sustainable environmental practices and Green Audit objectives.

The seminar concluded with an awareness message emphasizing that individual actions play a crucial role in environmental conservation and that "Every Drop Counts" in ensuring a sustainable and water-secure future.





The Environment is where we all meet;
where all have mutual interest;
it is the one thing all of us share.

- Lady Bird Johnson -

Chapter VI

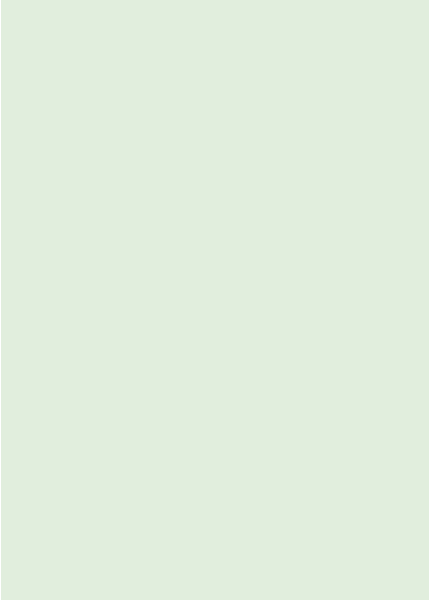
CAMPUS BIODIVERSITY (CBR): AUDIT REPORT



BIODIVERSITY MANAGEMENT COMMITTEE
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Campus Biodiversity: Audit Report

6.1 INTRODUCTION

Biodiversity is fundamental to the sustenance of life on Earth, encompassing the diversity of living organisms and their interactions within ecosystems, and supporting essential ecological services such as food production, water purification, regulation of floods and droughts, nutrient cycling, and climate stabilization. These functions are crucial for maintaining ecological balance, human well-being, and economic development. Biodiversity represents an integrated expression of the biosphere, closely linked with the Earth's physical components including soil, water, air, and geological formations, all driven by solar energy, and shaped through billions of years of evolutionary processes that have resulted in a complex and dynamic system facilitating the continuous exchange of energy, materials, and information between living and non-living components. However, despite its immense ecological, economic, and cultural importance, biodiversity is experiencing rapid decline due to increasing anthropogenic pressures such as pollution, habitat destruction, urban expansion, industrialization, population growth, and unsustainable exploitation of biological resources, with

habitat loss and overexploitation identified as major contributing factors. The degradation of biodiversity disrupts ecosystem structure and functioning, leading to species decline and extinction, altering food web dynamics, and reducing the resilience of ecosystems to environmental stresses, which in turn results in consequences such as decreased agricultural productivity and increased vulnerability to natural hazards including floods and droughts. Furthermore, the loss of biodiversity leads to a reduction in genetic diversity and increased uniformity in plant and animal populations, ultimately threatening ecosystem stability and long-term sustainability, thereby highlighting the urgent need for effective biodiversity conservation and management practices.

The functioning of ecosystems is closely tied to human well-being, as they provide resources and processes essential for daily life, including food, medicinal inputs, raw materials, and the maintenance of air and water quality. These benefits, referred to as ecosystem services, are commonly grouped into four categories: provisioning services such as food, freshwater, and timber; regulating services including climate balance,

flood control, and water purification; cultural services covering recreational and aesthetic values; and supporting services such as soil formation, pollination, and nutrient cycling. In recent years, increasing pressure from human activities has altered the capacity of ecosystems to sustain these functions. As demand continues to rise, many of these services are being used beyond sustainable limits. The Millennium Ecosystem Assessment indicates that a significant proportion of ecosystem services around 60% are currently degraded or under stress, with regulating and cultural services showing notable decline. This situation reflects a gradual weakening of ecosystem performance and raises concerns about the continued reliability of these services in the future, making their conservation and careful management increasingly important.

Standardizing biodiversity management systems is important to ensure a clear and consistent approach to conservation within organizations. It helps in defining responsibilities, guiding planning and implementation, and ensuring that biodiversity aspects are properly considered in routine activities. A structured system also supports regular monitoring and evaluation, making it easier to track progress and identify gaps. This approach improves the overall effectiveness of biodiversity management and supports informed decision-making for sustainable environmental practices.

6.1.1. What is Biodiversity Audit?

A Biodiversity Audit constitutes a systematic evaluation of the ecological diversity and environmental value of the campus. Its implementation is intended to provide a structured baseline that can guide future biodiversity planning and management initiatives. A central component of the audit is the examination of the capacity of campus green spaces to sustain ecologically significant and protected species and their associated habitats. The audit process also focuses on identifying and documenting existing habitat types, developing detailed habitat maps for designated areas, and assessing the overall condition and quality of these habitats. Furthermore, it includes a critical review of current management practices, with recommendations proposed where improvements are necessary to enhance ecological performance. In addition, the audit offers strategic guidance aimed at

strengthening biodiversity conservation and promoting sustainable habitat management. The overarching objective is to enable the monitoring of measurable ecological improvements over time, thereby supporting informed decision-making and long-term biodiversity enhancement on the campus.

6.1.2. Why measure Biodiversity?

- The accelerated degradation of natural habitats necessitates immediate assessment of their current status to prevent irreversible loss and potential extinction.
- Biodiversity indicators serve as essential measures for evaluating the overall health and stability of ecological systems.
- Biodiversity conservation has emerged as a central priority in both ecological research and sustainable development planning.
- Comprehensive assessment of biodiversity requires the application of diverse methodologies and analytical tools across different habitat types.
- Conducting biodiversity assessments aligns with obligations under the Convention on Biological Diversity (1992), to which India is a signatory.

6.1.3. Need for Biodiversity Audit

A biodiversity audit evaluates the capacity of a college or university campus to sustain natural flora and fauna, including species that are not artificially cultivated or managed by humans. It provides a systematic understanding of existing ecological conditions and habitat availability within the campus. Furthermore, the audit serves as an important tool for raising awareness and fostering environmental responsibility among members of the academic community by highlighting the ecological and functional importance of biodiversity.

The key objectives of the biodiversity audit are as follows:

- To create awareness among students and staff about the biodiversity present on the campus.
- To improve and maintain greenery, making the campus more lively and environmentally healthy.
- To enhance the overall appearance and natural beauty of the campus.

- To support learning by using campus biodiversity as a teaching resource (for example, labeling trees and plants).
- To help protect public health and the environment by ensuring better air, water, and food quality.
- To serve as a useful resource for education and outreach, such as developing thematic gardens.
- To involve the community by sharing knowledge and encouraging feedback, including traditional understanding of plants and animals.

6.2 CAMPUS BIODIVERSITY MANAGEMENT POLICY

6.2.1 Statement of commitment

Mar Dionysius College, Pazhanji recognises the critical role of biodiversity in maintaining ecological balance, supporting academic enrichment, and contributing to environmental well-being. In alignment with UN SDG 15: Life on Land, the College is committed to conserving terrestrial ecosystems, safeguarding species diversity, and promoting sustainable use of biological resources.

The College's Biodiversity Policy is guided by the principles of the Convention on Biological Diversity (CBD), the National Biodiversity Policy, and the Biodiversity Act, 2002, ensuring that all institutional strategies and practices contribute to global, national, and regional biodiversity objectives. Specifically:

- The CBD provides an international framework for the conservation, sustainable use, and equitable sharing of benefits arising from biodiversity.
- The National Biodiversity Policy (India) outlines strategies for safeguarding biological resources, promoting sustainable use, and enhancing public awareness.
- The Biodiversity Act, 2002 establishes a legal framework for protection of species, regulation of access to biological resources, and formation of biodiversity management committees at the local level.
- Through this policy, Mar Dionysius College commits to integrating biodiversity conservation into academics, research, administration, and campus operations, fostering awareness, stewardship, and

environmentally responsible practices among students, staff, and the wider community.

6.2.2 Vision

To foster a biologically vibrant and ecologically resilient campus that serves as a living laboratory for conservation, learning, and sustainable development, while contributing meaningfully to regional and national biodiversity conservation goals.

6.2.3 Mission

- To conserve, enhance, and sustainably manage the biodiversity within the campus through scientifically informed planning and responsible stewardship.
- To integrate biodiversity conservation into academic curricula, research, extension activities, and campus governance.
- To promote awareness, capacity building, and participatory engagement among students, staff, and the local community.
- To develop the campus as a model institution for biodiversity-friendly infrastructure, habitat protection, and sustainable landscape management.
- To align institutional practices with national biodiversity policies and global sustainability frameworks.

6.2.4 Resource Management

The institution is committed to the responsible management of natural, physical, and institutional resources in alignment with the principles of sustainability, conservation, and ecological integrity. All practices shall prioritise minimal environmental impact, efficient utilisation of resources, and ethical stewardship of biodiversity and ecosystems.

6.2.4.1 Green Infrastructure and Land Stewardship

The institution shall prioritise the development and maintenance of ecologically sustainable campus infrastructure that supports biodiversity, strengthens ecosystem resilience, and protects natural habitats. All land and landscape management practices shall uphold

ecological integrity and minimise environmental impact.

6.2.4.2 Promotion of a Sustainable Campus Culture

Sustainability shall be embedded as a core institutional value. All stakeholders are expected to demonstrate environmentally responsible behaviour, integrating ecological considerations into academic, administrative, and operational activities..

6.2.4.3 Institutional Green Practices

The College shall embed structured environmental practices into governance, decision-making, and operations to ensure long-term ecological sustainability. Policies shall guide responsible resource use, habitat conservation, and minimisation of environmental impact.

6.2.4.4 Sustainable Mobility and Carbon Footprint Management

Policies shall encourage practices that minimise carbon emissions, including adoption of low-impact transportation options and strategies to reduce environmental pollution.

6.2.4.5 Biodiversity and Ecosystem Conservation

The College shall prioritise biodiversity conservation through policy-guided habitat protection, ecological restoration, and sustainable land-use principles. All campus operations shall consider ecological sustainability as a guiding principle.

6.2.4.6 Management of Invasive Alien Species

The College shall actively avoid planting invasive alien species and implement measures to control or remove such species from campus areas. Native plants and local biodiversity shall be promoted to maintain ecosystem balance, strengthen resilience, and support local flora and fauna.

6.2.4.7 Promotion of Local and Traditional Foods

The College shall encourage the use of local and traditional foods in campus dining and programs to promote eco-friendly dietary habits, support local biodiversity, and strengthen sustainable food practices.

6.2.5 Curriculum integration

Biodiversity conservation and sustainability principles shall be systematically incorporated into the College curriculum in alignment with institutional learning outcomes and regulatory frameworks. Academic programmes across disciplines shall reflect institutional commitment to environmental ethics, climate awareness, and sustainable development.

6.2.5.1 Experiential and Field-Based Learning

Campus biodiversity shall serve as a resource for academic learning, research, and practical exposure, reinforcing the application of theoretical knowledge within the framework of institutional sustainability policies.

6.2.5.2 Research and Project Alignment

Faculty and student research initiatives shall align with institutional biodiversity priorities, supporting documentation, innovation, and knowledge development consistent with policy objectives.

6.2.5.3 Co-curricular and Extension Integration

Co-curricular and extension activities shall complement curriculum objectives and contribute to environmental awareness and sustainability education, guided by the principles of the Biodiversity Policy.

6.2.5.4 Continuous Academic Review

Curriculum integration efforts shall be periodically evaluated to ensure relevance, effectiveness, and alignment with evolving environmental challenges, national educational policies, and global sustainability standards.

6.2.6 Purchasing and procurement

6.2.6.1 Sustainable Sourcing

All institutional procurement shall prioritise environmentally sustainable, ethical, and low-impact options. Sustainability principles shall guide sourcing decisions to minimise ecological impact and support biodiversity and resource conservation.

6.2.6.2 Supplier Assessment

Vendors and suppliers shall be evaluated based on adherence to environmental regulations, sustainability standards, and ethical practices. Preference shall

be given to suppliers demonstrating minimal ecological footprint and compliance with sustainable procurement principles.

6.2.6.3 Eco-Friendly Materials

Procurement practices shall prioritise materials and products that are reusable, recyclable, or environmentally sustainable. Policies shall ensure that resource consumption and waste generation are minimised across all institutional operations.

6.2.7 Research, innovation and academic integration

6.2.7.1 Academic Integration

The institution shall integrate biodiversity and sustainability principles across curricular and co-curricular frameworks. Academic programmes shall reflect the commitment to environmental stewardship, ecological literacy, and sustainability ethics.

6.2.7.2 Research Promotion

Policy shall support faculty and student engagement in research on biodiversity, environmental conservation, climate resilience, and sustainability. Interdisciplinary approaches shall be encouraged to strengthen knowledge generation and application across science, humanities, and social sciences.

6.2.7.3 Innovation and Best Practices

The institution shall promote innovative approaches and sustainable practices aligned with biodiversity conservation and environmental responsibility. Policies shall guide the development and dissemination of knowledge, solutions, and eco-responsible practices across academic and institutional domains.

6.2.8 Community engagement

6.2.8.1 Awareness Programs:

The institution is committed to fostering a culture of environmental responsibility by raising awareness about biodiversity conservation and sustainable practices among all stakeholders, including students, faculty, staff, and the wider community. Engagement initiatives shall align with institutional sustainability goals and policy principles.

6.2.8.2 Collaborative Projects:

The College shall encourage collaborations with governmental agencies, non-governmental

organisations, and community stakeholders to advance biodiversity conservation, ecological research, and sustainable development. All partnerships shall comply with institutional policies and ethical sustainability standards.

6.2.8.3 Volunteer Participation:

All members of the institution are expected to uphold biodiversity and sustainability principles in their respective roles. Policies shall ensure accountability, promote environmentally responsible behaviour, and integrate ecological considerations into governance and institutional decision-making.

6.2.9 Monitoring and reporting

6.2.9.1 Biodiversity Oversight

The institution shall maintain systematic oversight of campus biodiversity to ensure alignment with sustainability goals, ecological integrity, and regulatory requirements. Monitoring shall be guided by institutional policy principles and strategic objectives.

6.2.9.2 Data Governance

Biodiversity-related data shall be collected, managed, and maintained in a structured manner to support policy evaluation, research, and informed decision-making. Data practices shall ensure accuracy, security, and accessibility for authorized institutional use.

6.2.9.3 Periodic Reports

Periodic reporting mechanisms shall be established to assess progress, identify challenges, and guide strategic planning. Reports shall inform institutional governance, support accountability, and facilitate continuous improvement in biodiversity management.

6.2.10 Compliance and review

6.2.10.1 Regulatory Compliance:

All institutional activities related to biodiversity and ecological management shall comply with national, state, and local environmental laws, regulations, and ethical standards, ensuring responsible and legally compliant operations. Specifically, the College aligns its practices with:

International Frameworks:

- Convention on Biological Diversity (CBD), 1992: Provides global principles for the conservation,

sustainable use, and equitable sharing of benefits arising from biodiversity.

- Nagoya Protocol on Access and Benefit Sharing (2010): Establishes procedures for fair and equitable sharing of benefits from genetic resources.
- National Legislation (India):
- Biological Diversity Act, 2002: Regulates conservation, sustainable use of biological resources, and creation of Biodiversity Management Committees at local levels.
- National Biodiversity Action Plan (NBAP): Guides strategies for species conservation, habitat protection, and public awareness.
- Wildlife Protection Act, 1972: Ensures protection of endangered species and their habitats.
- Environment Protection Act, 1986: Provides overarching environmental safeguards relevant to biodiversity management.

Kerala State Regulations:

- Kerala Biological Diversity Rules (State-level implementation of BD Act, 2003): Supports local biodiversity governance, protection of endemic species, and coordination with local self-government bodies.
- State Forest and Wildlife Conservation Policies: Promote protection of natural habitats, mangroves, wetlands, and native species, ensuring ecological integrity of the campus and surrounding areas.
- Through adherence to these frameworks, Mar Dionysius College ensures its biodiversity management activities are legally compliant, scientifically grounded, and ethically responsible, supporting both institutional sustainability goals and national and international biodiversity commitments.

6.2.10.2 Policy Review:

The Biodiversity Committee shall periodically review the policy to incorporate emerging scientific knowledge, updated regulatory frameworks, and evolving institutional priorities.

6.3.10 Audit and Feedback:

Internal audits will assess adherence to the policy, and

feedback from stakeholders will guide continuous improvement of biodiversity initiatives.

6.2.11 Leadership and accountability

The Biodiversity Committee shall oversee the implementation, monitoring, and review of the Biodiversity Policy, ensuring compliance with institutional and regulatory standards.

The principal shall provide strategic leadership and institutional oversight, while faculty, staff, and students shall actively support policy objectives through curriculum integration, research, awareness initiatives, and sustainable practices.

All departments and units are accountable for aligning activities with the policy, and periodic audits and reviews will ensure transparency, accountability, and continuous improvement in biodiversity management.

6.2.12 Conclusion

The Biodiversity Policy of Mar Dionysius College, Pazhanji reaffirms the institution's steadfast commitment to the conservation, sustainable management, and enhancement of biodiversity across the campus and within the wider community. Guided by international frameworks such as the CBD and Nagoya Protocol, national legislation including the Biological Diversity Act, 2002, and relevant Kerala state regulations, this policy provides a comprehensive, legally compliant, and ethically responsible framework for institutional biodiversity governance.

The policy integrates biodiversity conservation into academic curricula, research, experiential learning, and co-curricular activities, fostering awareness, stewardship, and environmental responsibility among students, faculty, staff, and local communities. Through green infrastructure, habitat protection, invasive species management, promotion of native plants, and sustainable food practices, the College aims to strengthen ecosystem resilience, preserve local biodiversity, and model sustainable campus practices.

Institutional oversight through the Biodiversity Committee, periodic monitoring, structured audits, and stakeholder engagement ensures accountability, transparency, and continuous improvement. By

embedding sustainability principles into governance, operations, and community engagement, Mar Dionysius College contributes meaningfully to SDG 15 (Life on Land) and aligns with national and global biodiversity objectives.

Through sustained commitment, proactive management, and ongoing evaluation, the College seeks to nurture an ecologically vibrant campus, foster environmental literacy, and ensure the long-term protection and sustainable use of biodiversity, establishing itself as a model institution for responsible environmental stewardship.

6.3 METHODOLOGY

As part of its commitment to sustainability, the college has incorporated biodiversity conservation into its overall environmental strategy. A structured approach has been developed to support the protection and improvement of campus biodiversity. This process is carried out by a dedicated Biodiversity Audit Team including students and faculty members. The team is responsible for conducting detailed biodiversity assessments across the campus and for monitoring and reviewing conservation-related activities on a regular basis.

6.3.1 Internal audit training

Green audit training follows a structured yet engaging approach aimed at encouraging active involvement and a sense of responsibility within the institution. As part of this process, the Environmental Management System (EMS) identifies and selects interested students and faculty members for internal audit training. The training was conducted on 27.06.2025 conducted as a one-day programme, after which participants are certified as internal auditors and are prepared to carry out biodiversity audits effectively. The internal biodiversity audit process includes key stages such as evaluation, risk assessment, data collection, policy formulation, and proper documentation of biodiversity-related activities and conservation records.

6.3.2 Data collection through field survey

The audit team was responsible for collecting detailed

information on flora and fauna through regular and systematic field surveys. These surveys were carried out multiple times to ensure accurate and reliable data collection across the campus.

For flora, data on herbs, shrubs, and trees were collected using methods such as random sampling, spot observations, and transect walks. These methods helped in identifying different species and understanding their distribution in various parts of the campus.

For fauna, bird species were recorded using survey methods, where observations were made along fixed paths. Butterflies and other insects were studied using quadrat methods, which involve observing species within a defined area to assess their presence and number.

6.3.3 Calculating the campus diversity

The data obtained from these surveys were used to calculate biodiversity indices, including Simpson's Diversity Index. These indices help in understanding the variety of species present and their relative abundance. They also provide useful information about the overall condition and stability of the campus ecosystem.

6.3.4 Preparing the checklist & threat and challenges to the biodiversity of the college campus

The audit team identifies potential threats to campus biodiversity in a systematic manner and develops suitable management measures based on both field data and available secondary information.

Regular reviews are carried out through meetings to assess ongoing sustainability programmes and awareness activities. During these sessions, progress is evaluated and necessary improvements are discussed.

Assigned students and faculty members are responsible for maintaining proper records of all activities and observations. This coordinated approach helps in strengthening sustainability practices within the campus and also supports the spread of environmental awareness in the surrounding community.

6.3.5 External Audit

An external audit is conducted by TIES, the independent external auditor, to evaluate whether the institution meets the required biodiversity management criteria. The audit also helps in identifying any gaps or areas that need improvement. If only minor issues are observed, the auditor may recommend certification for the institution in line with the applicable ISO standards.

6.3.6. Principles of biodiversity field estimation techniques

Field estimation of biodiversity is conducted using three key parameters for assessment:

6.3.6.1 Species richness- No. of species:

It refers to a systematic count of the total number of species present in a given area or sample. Species richness generally increases with the size of the area. It is commonly used as an indicator to assess the overall biodiversity and detect changes or impacts on it.

6.3.6.2 Abundance:

This is the total number of individuals of each species found in a given area or sample. It shows how many members of a species are present in a community and is usually counted per sampling unit like a quadrat or transect. For plants, it can also be shown as biomass or percentage ground cover.

6.3.6.3 Relative species abundance:

This describes how common or rare a species is when compared with other species in the same area.

6.3.6.4 Species evenness:

It refers to the relative abundance of each species present in a given area. An ecosystem is considered to have high evenness when all species are present in similar proportions. When one or a few species dominate, the ecosystem shows low evenness. It mainly reflects how species are distributed within a habitat. It also indicates the relative contribution of each species to the total biomass and overall functioning of the ecosystem.

6.3.6.5 Biodiversity indices:

It is a mathematical measure of species diversity within a community, representing a combined value. It

considers species richness, abundance, and evenness in varying proportions. It also helps in understanding how common or rare different species are within a community. Overall, it is an important tool for analyzing and interpreting community structure.

6.3.6.5.1 Simpson Index D:

This is a simple and widely used measure of biodiversity. It represents the probability that two individuals randomly selected from a population will belong to different species. The calculation involves sampling individuals one at a time from the population.

Simpson's Diversity Index considers both species richness and the relative abundance of each species in a community. It reflects how diversity changes with variations in species number and distribution. As both richness and evenness increase, the overall diversity of the ecosystem also increases.

$$D = \sum (n / N)^2$$

$$D = \frac{\sum n(n-1)}{N(N-1)}$$

n = the total number of organisms of a particular species
 N = the total number of organisms of all species

$$D = \sum n(n-1) / N(N-1)$$

n = number of individuals of each species

N = total number of individuals of all species

6.3.7 Stages of biodiversity audit

Biodiversity audit has the following three phases:

6.3.7.1 Pre audit phase

Formation of audit team; scheduling audit programmes

- Setting up of scope and objectives (in tune with biodiversity conservation policy of the institution)
- Assigning each and every area of the campus (excluding interior of buildings) for specific groups of auditors

This phase includes following specific activities:

- Preliminary observations will be made by each group in their assigned area for visible organisms

including plants and animals (selected fauna and flora only- see

- scope/objectives)
- Scheduling the sampling dates for quadrat/ transect study.
- Preparing data entry sheets and field equipment, devices or instruments (e.g., binoculars; GPS device, identification field guides etc.)

6.3.7.2 Audit phase

The following data will be recorded. Photographs of the audit process and the observations also will be taken as much as possible in order to include in the report.

- Quadrat study for grasses, herbs, shrubs etc. All the trees will be identified and counted.
- Quadrat sampling: Sampling plots with identical measurements are laid in the study area in a random or systematic manner. The target species is searched on foot or from any vehicle within these plots. Quadrats can be of various shapes. Most common are square or rectangular. Circular quadrats are also useful since they have minimum bias related to the 'edge effect' i.e., whether a specimen is inside or outside a quadrat. The optimum number of quadrats necessary to sample a population is decided based on the rarefaction curve, which reaches a plateau if enough samplings are done. Quadrat sampling is widely used to sample vegetation.
- Transect study for butterflies, birds, dragonflies, and damselflies of the campus.
- Line transect: In this method, the observer searches for the focal organisms along straight lines or transect lines, either selected randomly or laid in a systematic manner for repeated surveys. For the observations which are not on the transect

line, the perpendicular distance is measured. Line transect method is useful in calculating population density when it follows the assumptions that a) No specimen on the transect line is missed, b) specimens do not move before they are sighted; in case of movement, the first detection is considered; utmost care is taken to avoid replicative observation, c) the sighting angle and the exact distance of any sighting away from the transect line, is calculated, d) each sighting is independent. For birds, mammals etc. this is a good method.

- Sign count: In case of animals, which are hard to detect, signs like fecal matter, movement tracks, scratch marks are considered. Other signs include nests or burrows.
- Point count method for birds/butterflies/dragonflies: In this method the observer stands at a specific point and counts the specimens within the circle of a certain radius. Usually the radius is determined based on the maximum distance, which can be sampled by the observer. While conducting many point count samplings in an area, the radius for all should be the same to compare the data. Point count is widely used to sample bird populations. The numbers of birds seen or heard within a circle are recorded in this method.

6.3.7.3 Post audit phase

- Analysis of data: species list of fauna and flora in the campus; calculation of Simpson index for the biodiversity of the campus
- Biodiversity conservation action plan preparation (awareness and sensitisation programmes; display boards; tree naming project; planting drives; promotion of native wild and medicinal plants etc.)

6.3.8. Work plan and schedule of the biodiversity audit

Date to date	Work Plan
05-01-2026 to 09-01-2026	Request and collect the registers and formats required for documentation of flora and fauna on campus. Allocate specific campus areas to individuals or groups to ensure focused and effective task management. Assign responsibility for flora and fauna documentation and initiate sample surveys in the designated areas.
12-01-2026 to 23-01-2026	Proceed with data sampling in accordance with the reference documents available on campus flora and fauna. Ensure that all documentation includes geotagged photographs. Schedule group discussions periodically and compile minutes of meetings for reporting purposes.
26-01-2026 to 06-02-2026	Conduct a detailed assessment of flora and fauna documented by students. Prepare comprehensive checklists of flora for the Science Block, Central Block, Centenary Block, and Arts Block. Additionally, compile a thorough fauna checklist for the entire campus.
09-02-2026 to 20-02-2026	Document various species including herbs, shrubs, trees, butterflies, odonates, birds, amphibians, insects, and mammals in an Excel sheet. Record scientific names, English names, Malayalam names, and common names. Maintain a standardised register for recording meeting minutes, checklists, activities, and action plans.
23-02-2026 to 27-02-2026	Finalisation of documentation and verification of the biodiversity checklists and data recorded by students. Rectification of errors and validation of species identification.
02-03-2026 to 06-03-2026	Data entry and photo upload. Organise photographic evidence block-wise and species-wise. Ensure proper labelling and referencing of images.
09-03-2026 to 20-03-2026	Preparation and finalisation of the Biodiversity Management System (BMS) Policy and Biodiversity Audit Report based on the verified data. Incorporate conservation strategies and sustainability measures.

Table 6.1 Schedule of the Biodiversity management audit



Fig 6.1 Campus flora

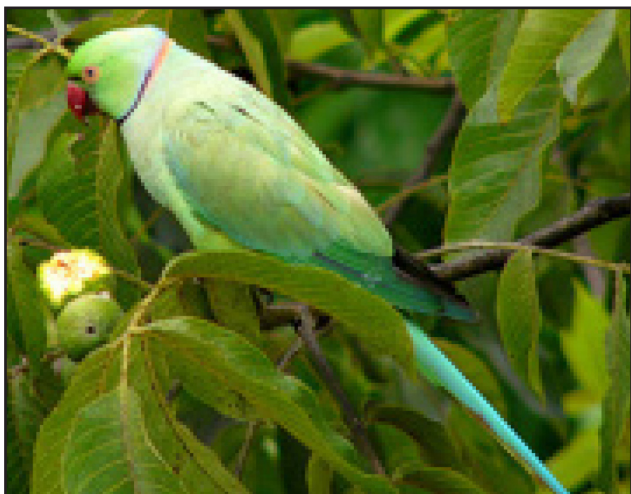
6.4 RESULT AND DISCUSSION

6.4.1 Checklist of Fauna

6.4.1.1 Checklist of Birds

SI No	ENGLISH NAME	SCIENTIFIC NAME	MALAYALAM NAME	Density
1	BLACK DRONGO	<i>Dicrurus macrocerus</i>	ആനാഞ്ചിപക്ഷി	3
2	BLACK RUMPED FLAMEBACK	<i>Dinopium benghalense</i>	നാട്ടുമരംകൊത്തി	1
3	BRAHMINY KITE	<i>Haliastur indus</i>	കൃഷ്ണപരുന്ത്	1
4	CATTLE EGRET	<i>Ardea coromanda</i>	കാലിമുണ്ടി	1
5	COMMON MYNA	<i>Acridotheres tristis</i>	നാട്ടു മൈന	1
6	GREATER COUCAL	<i>Centropus sinensis</i>	ചെമ്പോത്ത്	1
7	GREATER RACKET TAILED DRONGO	<i>Dicrurus paradiseus</i>	ഇരട്ടവാലൻപക്ഷി	1
8	HOUSE CROW	<i>Corvus splendens</i>	പേനകാക്ക	15
9	INDIAN POND HERON	<i>Ardeola grayii</i>	കുളക്കൊക്ക്	1
10	JUNGLE BABBLER	<i>Turdoides striata</i>	കരിയിലകിളി	5
11	JUNGLE OWLET	<i>Glaucidium radiatum</i>	ചെമ്പൻനത്ത്	1
12	LARGE BILLED CROW	<i>Corvus macrorhynchos</i>	ബലികാക്ക	1
13	LESSER WHISTLING DUCK	<i>Dendrocygna javanica</i>	ചുളൻ എരണ്ട	1
14	ORIENTAL MAGPIE ROBIN	<i>Copsychus saularis</i>	മണ്ണാത്തിപ്പുള്ളി	1
15	REDWISKERD BULBUL	<i>Pycnonotus jocosus</i>	ഇരട്ടത്തലച്ചി	1
16	ROCK PIGEON	<i>Columba livia</i>	അമ്പലപ്രാവ്	1
17	ROSE RINGED PARAKEET	<i>Psittacula krameri</i>	മോതിരത്തത്ത	1
18	ROUFUS TREEPIE	<i>Dendrocitta vagabunda</i>	ഓലേഞ്ഞാലി	5
19	SHIKRA	<i>Accipiter badius</i>	പുള്ളി	1
20	WHITE CHEEKED BARBET	<i>Psilopogon viridis</i>	ചിന്നകുട്ടുറുവാൻ	5
21	WHITE THROTED KINGFISHER	<i>Halcyon smyrnesis</i>	മീൻകൊത്തിചാത്തൻ	1
22	ASIAN KOEL	<i>Eudynamys scolopaceus</i>	കുയിൽ	8
23	ASIAN OPEN BILL	<i>Anastomus oscitans</i>	ചേരകൊക്കൻ	2
24	PURPLE RUMPED SUNBIRD	<i>Leptocoma zeylonica</i>	മഞ്ഞതേൻക്കിളി	3
25	RED WATTLED LAPWING	<i>Vanellus indicus</i>	ചെങ്കണ്ണിതിത്തിരി	1
26	PAINTED STORK	<i>Mycteria leucocephala</i>	വർണകൊക്ക്	1
27	ASHY WOOD SWALLOW	<i>Artamus fuscus</i>	ഇണക്കാത്തേവൻ	1
28	LONG BILLED SUNBIRD	<i>Cinnyris lotenius</i>	കൊക്കൻ തേൻകുരുവി	1
29	BARN SWALLOW	<i>Hirundo rustica</i>	വയൽകോതികൃതിക	2
30	PADDY FIELD PIPIT	<i>Anthus rufulus</i>	വയൽവരമ്പൻ	2
Simpson Index				0.07

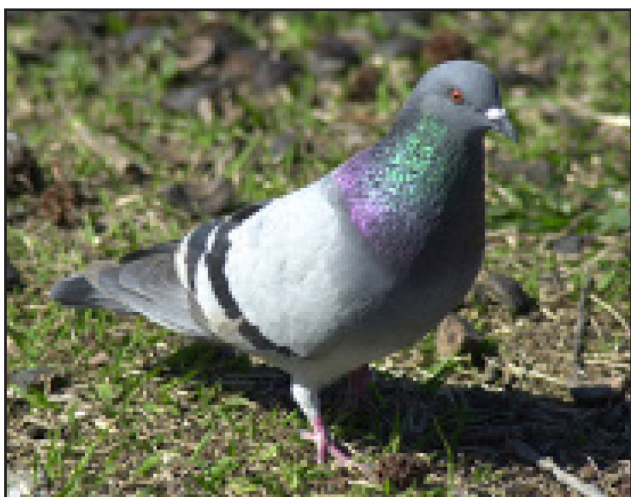
Table 6.2: Avifaunal Species Recorded in the College Campus



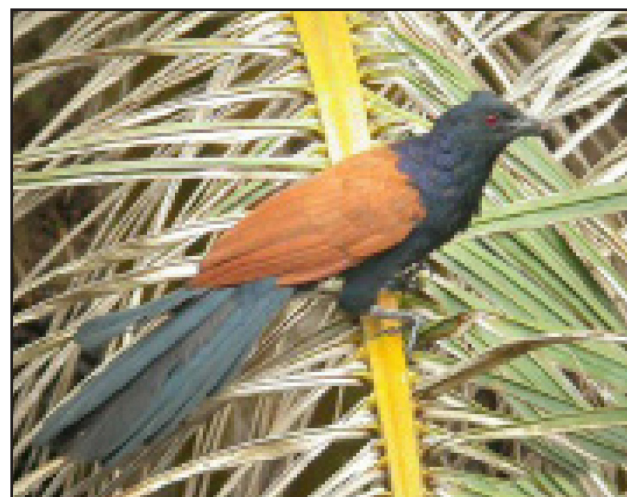
Rose-ringed parakeet



White Cheeked Barbet



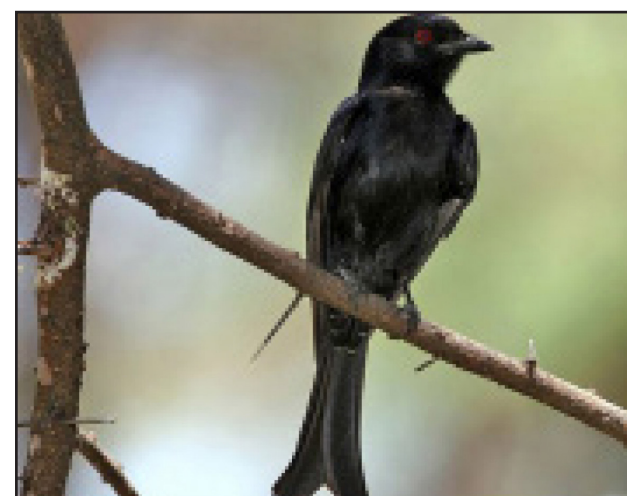
Rock pigeon



Greater coucal



Large-billed crow



Black drongo



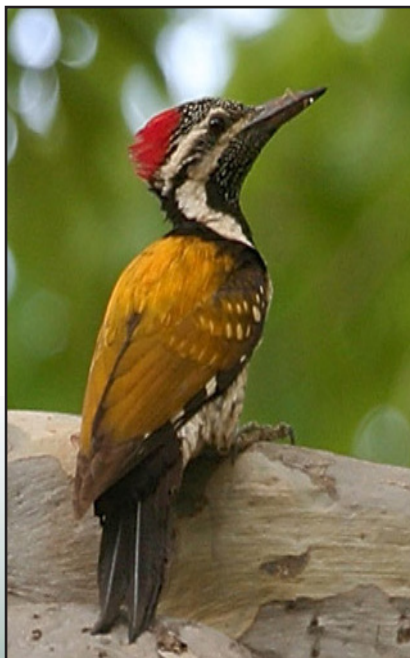
House-crow



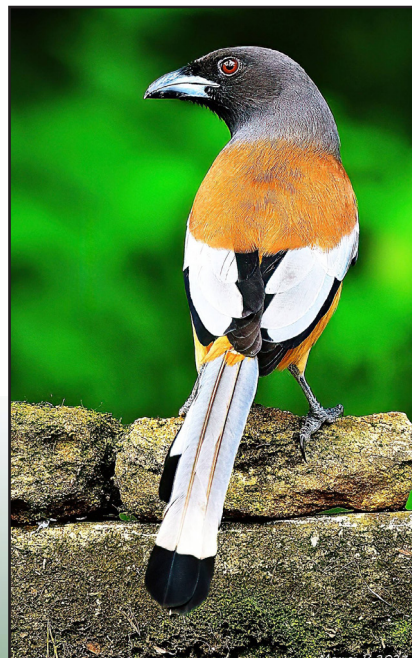
Asian koel



Common myna



Black rumped flameback



Rufous tree pie



Indian pond heron

The campus recorded a total of 30 bird species, indicating moderate avian diversity within the study area. Species such as House Crow (15 individuals) and Asian Koel (8 individuals) showed higher abundance, suggesting their adaptability to campus conditions. Most other species were recorded in low numbers, indicating uneven species distribution. The presence

of insectivores, omnivores, and water-associated birds reflects the availability of diverse food resources and habitats within the campus ecosystem, while the nearby wetland supports the occurrence of aquatic bird species by providing suitable feeding and resting habitats.

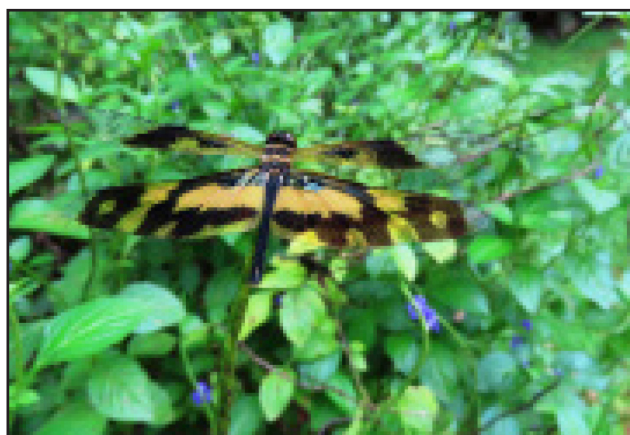
6.4.1.2. Checklist of Dragonflies

SI No	COMMON NAME	SCIENTIFIC NAME	MALAYALAM NAME	Density
1	PIED PADDY SKIMMER	<i>Neurothemis tullia</i>	സ്വാമിത്തുമി	2
2	COMMON PICTUREWING	<i>Rhyothemis variegata</i>	ഓണത്തുമി	14
3	WANDERING GLIDER	<i>Pantala flavescens</i>	തൂലാത്തുമി	25
4	SCARLET SKIMMER	<i>Crocothemis servilia</i>	വയൽ തുമി	21
Simpson Index				0.32

Table 6.3: Odonata Species Recorded in the College Campus

A total of 4 dragonfly species were recorded within the campus, indicating low species richness but relatively high abundance. Species such as Wandering Glider (25 individuals) and Scarlet Skimmer (21 individuals) showed dominance, suggesting favorable conditions

for a few adaptable species. The uneven distribution reflects low species evenness, which is consistent with the higher Simpson Index value. The presence of dragonflies indicates availability of water sources and suitable breeding habitats within the campus.



Rhyothemis variegata

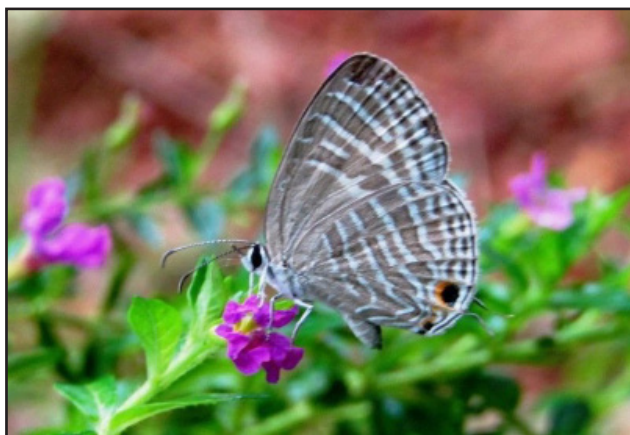


Neurothemis tullia female

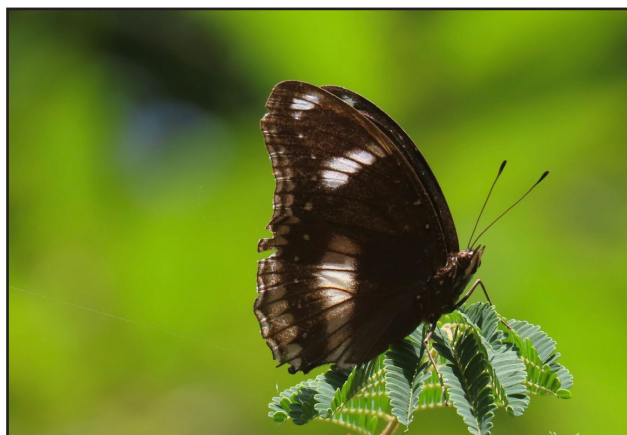
6.4.1.3. Checklist of Butterflies

COMMON NAME	SCIENTIFIC NAME	MALAYALAM NAME	Density
BLUE MORMON	<i>Papilio polymnestor</i>	കൃഷ്ണശലഭം	5
BLUE TIGER	<i>Tirumala limniace</i>	നീലക്കടുവ	8
CHESTNUT BOB	<i>Lambrix salsala</i>	ചെങ്കുറുമ്പൻ	9
CHOCOLATE PANSY	<i>Junonia iphita</i>	കരിയില ശലഭം	10
COMMON BLUEBOTTLE	<i>Graphium sarpedon</i>	നീലകുടുക	1
COMMON BUSHBROWN	<i>Mycalesis perseus</i>	തവിടൻ	1
COMMON CERULEAN	<i>Jamides celeno</i>	പൊട്ടുവാലാട്ടി	1
COMMON CROW	<i>Euploea core</i>	അരളി ശലഭം	1
COMMON EMIGRENT	<i>Catopsilia pomona</i>	മഞ്ഞതകരമുത്തി	3
COMMON FOUR-RING	<i>Ypthima huebneri</i>	നാല്ക്കണ്ണി	1
COMMON GRASS YELLOW	<i>Eurema hecabe</i>	മഞ്ഞപാപ്പത്തി	13
COMMON MORMON	<i>Papilio polytes</i>	നരകക്കാളി	1
COMMON PALM FLY	<i>Elymnias hypermnestra</i>	ഓലക്കൻ	1
COMMON ROSE	<i>Pachliopta aristolochiae</i>	നാട്ടുറോസ്	1
COMMON SAILOR	<i>Neptis hylas</i>	പൊന്തച്ചുട്ടൻ	1
DARK GRASS BLUE	<i>Zizeeria karsandra</i>	ഇരുളൻ പുൽനീലി	7
DARK SMALL BRANDED SWIFT	<i>Pelopidas mathias</i>	ചെറുവരയൻ ശലഭം	1
GREAT EGG FLY	<i>Hypolimnas bolina</i>	വൻചൊട്ടശലഭം	2
LESSER GRASS BLUE	<i>Zizina otis</i>	ചെറുപുൽനീലി	6
MOTTLED EMIGRANT	<i>Catopsilia pyranthe</i>	തകരമുത്തി	1
PLAIN TIGER	<i>Danaus chrysippus</i>	എരുക്കുത്തപ്പി	1
PSYCHE	<i>Leptosia nina</i>	പൊട്ടുവെള്ളാട്ടി	16
COMMON RUSTIC	<i>Cupha erymanthis</i>	വയ്ക്കതൻ	7
GREY PANSY	<i>Junonia atlites</i>	വയൽക്കോത	7
Simpson Index			0.07

Table 6.4: Lepidopteran Species Recorded in the College Campus



Common cerulean



Great eggfly

A total of 24 butterfly species were recorded within the campus, indicating moderate species richness. Species such as Psyche (16 individuals) and Common Grass Yellow (13 individuals) showed relatively higher abundance, while several species were observed in low numbers, indicating uneven distribution. The

presence of a variety of butterfly species reflects the availability of nectar plants and suitable microhabitats. Overall, the butterfly diversity suggests a functionally active pollinator community, though further habitat enhancement can improve species evenness.

6.4.1.4. Checklist of Reptiles

SI No	COMMON NAME	SCIENTIFIC NAME	MALAYALAM NAME
1.	ORIENTAL RAT SNAKE	<i>Ptyas mucosa</i>	ചേര
2.	ORIENTAL LIZARD	<i>Calotes versicolor</i>	ഓന്ത്
3.	DUSSUMIERS FOREST SKINK	<i>Sphenomorphus dussumieri</i>	അരണ
4.	BENGAL MONITOR	<i>Varanus bengalensis</i>	ഉടുമ്പ്

Table 6.5: Reptilian Species Recorded in the College Campus

The campus recorded 4 reptile species, indicating low species richness within this group. The presence of reptiles such as snakes and lizards reflects the availability

of basic terrestrial conditions within the campus. The limited diversity indicates that reptiles are present but not widely distributed across the study area.

6.4.1.5. Checklist Of Mammals

SI No.	COMMON NAME	SCIENTIFIC NAME	MALAYALAM NAME
1.	INDIAN FLYING FOX	<i>Pteropus medius</i>	ഇന്ത്യൻ പഴുവന്മാൽ
2	INDIAN GREY MONGOOSE	<i>Herpestes edwardsii</i>	കീരി
3.	INDIAN PALM SQUIRREL	<i>Funambulus palmarum</i>	അണ്ണാൻ
4	COMMON PALM CIVET	<i>Paradoxurus hermaphroditus</i>	മരപ്പട്ടി
5.	BLACK RAT	<i>Rattus rattus</i>	കറുത്ത എലി

Table 6.6: Mammalian Species Recorded in the College Campus

The campus supports a low diversity of mammals, with a total of 5 species recorded. The observed species mainly include small to medium-sized mammals such as rodents, squirrels, and civets, along with one volant species (*Pteropus medius*).

The limited number of species indicates low species richness, which is typical for a campus environment where space and habitat complexity are relatively restricted. However, the presence of these species reflects the basic ecological functioning and adaptability of mammals within the area.



Indian palm squirrel

6.4.2. Checklist Of Flora

6.4.2.1. Checklist of Trees

SI No.	SCIENTIFIC NAME	MALAYALAM NAME	COMMON NAME	Density
1	<i>Araucaria heterophylla</i>	ക്രിസ്തുമസ് ട്രീ	ARAUCARIA	7
2	<i>Artocarpus heterophyllus</i>	പ്ലാവ്	JACK FRUIT TREE	11
3	<i>Bridelia retusa</i>	മുള്ളുവേങ്ങ	SPINOUS KINO TREE	1
4	<i>Carica papaya</i>	പപ്പായ	PAPPAYA	2
5	<i>Cassia fistula</i>	പിങ്ക് കൊന്ന	GOLDEN SHOWER	2
6	<i>Cocos nucifera</i>	തെങ്ങ്	COCONUT TREE	6
7	<i>Couroupita guianensis</i>	നാഗലിംഗമരം	CANNON BALL TREE	1
8	<i>Cyrtostachys renda</i>	അലങ്കാര പന	RED PALM	1
9	<i>Ficus benjamina</i>	വെള്ളാൽ	WEeping FIG	4
10	<i>Ficus hispida</i>	ചിത്തീര പാല	HAIRY FIG	2
11	<i>Ficus religiosa</i>	അരയാൽ	PEEPALTREE	7
12	<i>Garcinia gummi-gutta</i>	കുടംപുളി	CAMBOGE TREE	2
13	<i>Lagerstroemia speciosa</i>	പൂമരുത്	QUEEN'S CRAPE MYRTLE	10
14	<i>Libidibia coriaria</i>	ഡിവി ഡിവി	DIVI DIVI	8
15	<i>Mangifera indica</i>	മാവ്	MANGO TREE	65
16	<i>Mimusops elengi</i>	ഇലഞ്ഞി	SPANISH CHERRY	3
17	<i>Monoon longifolium</i>	അരണമരം	FALSE ASHOKA	30
18	<i>Murraya paniculata</i>	മരമുല്ല	ORANGE JASMINE	1
19	<i>Phyllanthus emblica</i>	നെല്ലി	INDIAN GOOSEBERRY	3
20	<i>Psidium guajava</i>	പേര	GUAVA	3
21	<i>Saraca asoca</i>	അശോകം	ASHOKATREE	5
22	<i>Simarouba glauca</i>	ലക്ഷ്മി തരു	PARADISE TREE	1
23	<i>Sweietenia macrophylla</i>	മഹാഗണി	MAHAGONI	20
24	<i>Syzygium cumini</i>	ഞാവൽ	BLACK PLUM	2
25	<i>Terminalia arjuna</i>	നീർമരുത്	ARJUN TREE	13
26	<i>Terminalia bellarica</i>	ഇന്ത്യൻ ബദാം	BELLARIC MYROBALAN	10
27	<i>Terminalia eliptica</i>	കരിമരുത്	INDIAN LAUREL	45
28	<i>Carallia brachiata</i>	വല്ലഭം	FRESH WATER MANGROVE	1
29	<i>Azadirachta indica</i>	ആരുവേപ്പ്	NEEM	1
30	<i>Citrus limon</i>	നാരകം	LEMON	1
31	<i>Erythrina variegata</i>	മുരിക്ക്	INDIAN CORAL TREE	2
32	<i>Samanea saman</i>	മഴമരം	RAIN TREE	18
33	<i>Spathodea campanulata</i>	ആഫ്രിക്കൻ പൂമരം	AFRICAN TULIP	15
34	<i>Ailanthus triphysa</i>	മട്ടി	MALABAR TREE OF HEAVEN	31

35	<i>Syzygium samarangense</i>	വലിയ ചാമ്പ	JAVA APPLE	1
36	<i>Lannea coromandelica</i>	ഉദി	INDIAN ASH TREE	2
37	<i>Bauhinia purpurea</i>	മരമന്ദാരം	PURPLE ORCHID TREE	9
38	<i>Senegalia catechu</i>	കരിങ്ങാലി	BLACK CATECHU	1
39	<i>Casuarina equisetifolia</i>	ചുളുമരം	COAST SHE OAK	6
40	<i>Manilkara zapota</i>	സപ്പോട്ട	SAPOTTA	2
41	<i>Phyllanthus acidus</i>	അരിനെല്ല്	STARGOOSEBERRY	2
42	<i>Baccaurea courtallensis</i>	മുട്ടിപ്പഴം	BACCAUREA	1
43	<i>Averrhoa bilimbi</i>	ഇരുമ്പൻപുളി	BILIMBI	1
44	<i>Gmelina arborea</i>	കുമിഴ്	WHITE TEAK TREE	1
			Simpson Index	0.07

Table 6.7: Tree Species Composition of the College Campus

The campus exhibits moderate tree diversity, with a total of 45 species recorded. The distribution shows high dominance of certain species, particularly *Mangifera indica*, *Terminalia eliptica*, and *Monoon longifolium*, which contribute significantly to the total abundance.

Most other species are represented by low individual counts, indicating uneven distribution. This suggests that while species richness is relatively high, the evenness is low, resulting in moderate overall diversity.

6.4.2.2. Checklist Of Herbs

SI. NO.	COMMON NAME	SCIENTIFIC NAME	MALAYALAM NAME	Density
1	STONE BREAKER	<i>Phyllanthus niruri</i>	കീഴാർനെല്ല്	25
2	SINGAPORE DAISY	<i>Sphagneticola trilobata</i>	കമ്മൽ ചെടി	12
3	TOUCH ME NOT PLANT	<i>Mimosa pudica</i>	തൊട്ടാവടി	29
4	PURPLE FLEABANE LITTLE IRONWEED	<i>Vernonia cinerea</i>	പൂവാംകുറുന്തൽ	16
5	DIAMOND FLOWER	<i>Sclerometrion diffusum</i>	പർപ്പടകപ്പുല്ല്	42
6	BANDICOOT BERRY	<i>Leea idica</i>	ചൊറിയൻ താളി	12
7	HOG WEED	<i>Boerhavia diffusa</i>	തഴുതാമ	21
8	BERMUDA GRASS	<i>Cynodon dactylon</i>	കറുക പുല്ല്	26
9	GOAT WEED	<i>Scoparia dulcis</i>	കല്ലുരുക്കി	34
10	CREEPING WOOD SORREL	<i>Oxalis corniculata</i>	പുളിയാറില	7
11	NET VEINED BLADDERWORT	<i>Utricularia reticulata</i>	കാക്കപ്പു	26
12	TRIDEX DAISY	<i>Tridax procumbens</i>	കമ്മൽപു	52
13	TOOTHACH PLANT	<i>Acmella calva</i>	ഏറുപച്ച	10
			Simpson Index	0.10

Table 6.8: Herbaceous Species Recorded in the College Campus

The herbaceous layer of the campus shows high abundance with moderate species diversity, comprising 13 species and a total of 312 individuals. A few species such as *Tridax procumbens* (52), *Sclerometrion diffusum* (42), and *Scoparia dulcis* (34) exhibit higher dominance, contributing significantly to the total count.

Several other species are present in moderate to low numbers, indicating an uneven distribution

pattern. This suggests that while the herb layer is well represented in terms of abundance, the species evenness is comparatively low, influencing overall diversity.

The dominance of fast-growing and common herb species reflects typical ground vegetation characteristics of managed or semi-natural environments.

6.4.2.3. Checklist Of Shrubs

COMMON NAME	SCIENTIFIC NAME	MALAYALAM NAME	Density
BIRDS EYE CHILLI	<i>Capsicum futescens</i>	കാത്താരിമുളക്	5
ELEPHANTS EAR	<i>Colocasia esculanta</i>	ചേമ്പ്	9
HIBISCUS	<i>Hibiscus rosa-sinensis</i>	ചെമ്പരത്തി	4
IXORA	<i>Ixora coccinea</i>	ചെത്തി	5
RATTLE WEED	<i>Crotalaria retusa</i>	കിലുക്കി	15
ROSE	<i>Rosa spp.</i>	റോസ്	6
Simpson Index			0.19

Table 6.9: Shrub Species Composition of the College Campus

The shrub layer of the campus shows low to moderate diversity, with a total of 6 species and 44 individuals recorded. Among these, *Crotalaria retusa* (15) exhibits relatively higher abundance, while the remaining species are present in lower numbers.

The distribution pattern indicates low species richness and uneven abundance, suggesting limited diversity within the shrub category. However, the presence of commonly occurring shrub species contributes to the structural composition of vegetation within the campus.

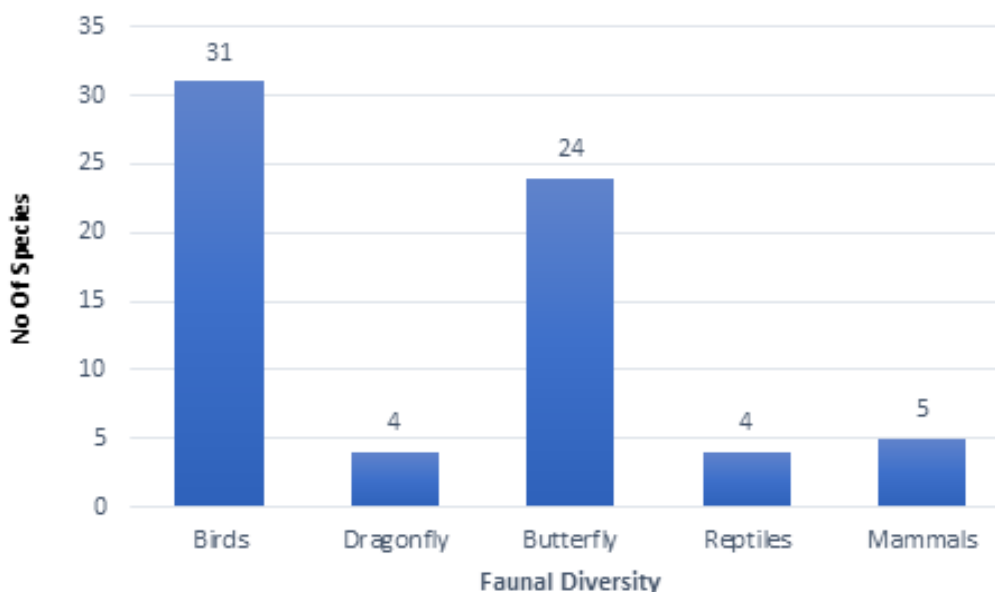


Fig. 6.1. Faunal diversity of the campus

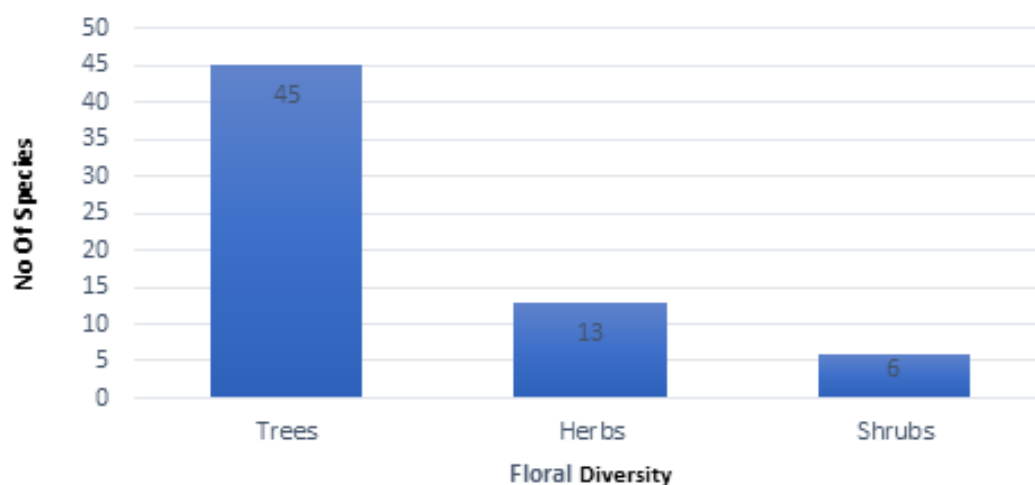


Fig. 6.2. Floral diversity of the campus

6.4.3 Taxa-wise Simpson Diversity Index Values

SL.NO	TAXA	SIMPSON INDEX
1.	Birds	0.07
2.	Dragonfly	0.32
3.	Butterfly	0.07
6.	Trees	0.07
7.	Herbs	0.10
8.	Shrubs	0.19

Table 6.10: Taxa-wise Simpson's Diversity Index Values of the College Campus

The calculated Simpson Index values reveal notable variation in diversity across different taxa within the campus ecosystem. Among the groups studied, dragonflies (0.32) exhibit the highest diversity, indicating comparatively better species distribution and lower dominance. Shrubs (0.19) and herbs (0.10) demonstrate moderate diversity levels, suggesting a reasonable degree of species representation, though still influenced by partial dominance of certain species. In contrast, birds (0.07), butterflies (0.07), and trees (0.07) show low diversity values, reflecting limited species evenness and the dominance of a few taxa within these groups. Overall, the results suggest that while certain taxa show moderate diversity, the majority of groups exhibit low diversity, pointing towards uneven species distribution within the campus ecosystem.

6.5 CONCLUSION

The findings of the biodiversity audit indicate that the campus supports a moderately diverse ecosystem comprising a variety of floral and faunal species. The recorded biodiversity reflects the ecological value of the campus and its role in supporting local biodiversity within the institutional landscape.

The audit documented the presence of diverse plant and animal groups, including trees, herbs, shrubs, birds, butterflies, dragonflies, reptiles, and mammals, indicating that the campus provides habitats capable of supporting multiple ecological components. The observed biodiversity pattern suggests that the ecosystem is functionally active, although variations in species distribution and dominance exist among different taxonomic groups.

The total campus area extends to 13.3 acres; however, a considerable portion is occupied by built-up infrastructure, limiting the area available for biodiversity conservation and natural habitat development. Furthermore, much of the existing vegetation consists of intentionally planted species, which influences the overall biodiversity composition and distribution within the campus.

Overall, the audit establishes a baseline understanding of the current biodiversity status of the campus and highlights its ecological significance. The findings provide valuable information for future biodiversity assessment, monitoring, and conservation planning within the institution.

6.6 RECOMMENDATIONS

- The institution should prioritize the plantation of native and indigenous species to enhance ecological stability, improve habitat suitability, and support local fauna. Native species are better adapted to local conditions and require less maintenance.
- The diversification of lower vegetation layers (herbs and shrubs) should be strengthened to improve structural complexity of the ecosystem and provide shelter and food resources for insects, reptiles, and small mammals.
- Dedicated pollinator-supporting habitats, such as butterfly gardens and nectar-rich plant zones, should be expanded to improve the diversity and distribution of butterflies and other pollinating organisms.
- The campus should establish microhabitats such as small water bodies, leaf litter zones, and undisturbed patches to support amphibians, reptiles, insects, and soil organisms.
- Regular monitoring and control of invasive alien plant species should be undertaken to prevent ecological imbalance and ensure the protection of native biodiversity.
- The institution should strengthen annual biodiversity monitoring programmes, including systematic field surveys and periodic calculation of biodiversity indices (such as Simpson Index), to track ecological changes over time.
- A georeferenced biodiversity register with photographic documentation should be maintained and updated regularly to ensure accurate record-keeping and long-term ecological assessment.
- Degraded or less vegetated areas within the campus should be identified and prioritized for ecological restoration, including soil enrichment, organic compost application, and targeted plantation programmes.
- The use of chemical fertilizers and pesticides should be minimized, and organic alternatives should be adopted to protect soil health, beneficial organisms, and overall ecosystem balance.
- The institution should further strengthen waste management practices, including composting of organic waste and reduction of non-biodegradable materials, to reduce environmental stress on biodiversity.
- Rainwater harvesting and water conservation practices should be enhanced to support vegetation growth and maintain microclimatic stability within the campus.
- Biodiversity-related activities should be more deeply integrated into academic programmes, student projects, and field-based learning, encouraging active student participation in ecological monitoring and conservation.
- Regular awareness programmes, workshops, nature walks, and exhibitions should be conducted to promote environmental responsibility among students, faculty, and the local community.
- Collaborations with government agencies, NGOs, and environmental organizations should be strengthened to improve technical knowledge, resource sharing, and outreach activities.
- Future campus development and infrastructure expansion should follow eco-sensitive planning, ensuring minimal disturbance to existing green spaces and biodiversity-rich areas.
- The Biodiversity Management Committee should conduct periodic reviews and internal audits to evaluate the effectiveness of implemented strategies and introduce corrective measures where necessary.
- Long-term planning should focus on developing

the campus into a self-sustaining ecological system, with interconnected green spaces, improved species evenness, and enhanced ecosystem resilience.

6.7 BIODIVERSITY MANAGEMENT PLAN

6.7.1 Campus Biodiversity Audit

- The institution conducts a systematic and comprehensive biodiversity audit on an annual basis to document and assess the ecological status of the campus. The audit involves detailed field surveys covering all major campus zones, including green spaces, landscaped areas, water bodies, and open land patches. Flora and fauna are identified and recorded through direct observation, sampling methods, and photographic documentation.
- Species inventory is prepared by recording trees, shrubs, herbs, birds, insects, and other observable organisms present within the campus ecosystem. Particular attention is given to identifying native species, invasive species, and ecologically sensitive or declining species. Along with species documentation, supporting ecological parameters such as soil condition, water quality in campus water bodies, and green cover density are also assessed.
- A structured campus biodiversity register is maintained and continuously updated to reflect seasonal variations and long-term ecological changes. Based on audit findings, biodiversity-rich zones and degraded or disturbed areas are identified for targeted action such as plantation, restoration, or protection measures. The data generated through this audit serves as the primary foundation for all biodiversity-related planning and implementation activities within the campus.

6.7.2 Integration of Biodiversity in Academic Activities

- Biodiversity-related learning is actively integrated into academic programmes through structured and field-oriented approaches. Students are engaged in practical exposure activities such as field surveys, species identification exercises,

ecosystem observation studies, and environmental mapping. These activities are conducted as part of coursework, project work, seminars, and laboratory-linked assignments.

- Departments incorporate biodiversity themes into relevant subjects by designing assignments and field-based tasks that encourage direct engagement with natural ecosystems. Students are encouraged to document plant and animal diversity within the campus and surrounding areas, analyze ecological interactions, and report findings in structured formats.
- Interdisciplinary participation is promoted by linking biodiversity studies with environmental science, botany, zoology, chemistry, and allied disciplines. Regular field visits are organized to nearby ecosystems to enhance observational learning. These academic engagements ensure continuous student involvement in biodiversity documentation and environmental understanding through practical exposure rather than theoretical learning alone.

6.7.3 Conservation and Ecological Restoration Activities

- The institution undertakes continuous conservation and restoration activities to improve and maintain campus biodiversity. Native tree plantation is carried out systematically in identified open spaces, degraded land patches, and campus edges to enhance green cover and restore ecological balance. Preference is given to indigenous species that support local fauna and require minimal maintenance.
- Degraded or less productive land areas are gradually converted into functional ecological zones through soil enrichment, organic compost application, and structured plantation programmes. Herbal gardens consisting of medicinal and traditional plant species are developed to promote biodiversity conservation as well as educational value. Butterfly gardens and pollinator-friendly zones are established using nectar-rich plant species to support insect diversity and ecosystem stability.

- Organic waste generated within the campus is converted into compost and used for plant nourishment, reducing dependency on chemical fertilizers. Mulching practices are adopted to retain soil moisture, improve soil quality, and support plant health. Regular maintenance activities such as watering, pruning, and protection of newly planted saplings are carried out to ensure high survival rates and sustainable growth of vegetation across the campus.

6.7.4 Institutional Coordination and Implementation Structure

- Biodiversity management activities are coordinated through a structured institutional mechanism involving faculty members, administrative staff, and student representatives. A Biodiversity Management Committee is responsible for planning, coordinating, and reviewing all biodiversity-related initiatives across the campus.
- Responsibilities are distributed among departments based on academic expertise. The Botany department leads plant identification, plantation activities, and green cover documentation. The Zoology department undertakes fauna monitoring, bird and insect surveys, and ecological interaction studies. The Administration supports infrastructure development, land allocation, and resource facilitation for biodiversity initiatives.
- Regular coordination meetings are conducted to review ongoing activities, assess progress, and plan future interventions. Campus areas are systematically allocated for monitoring, plantation, and conservation activities to ensure organized implementation. All biodiversity-related actions are recorded and documented for review and evaluation purposes.

6.7.5 Sustainable Practices Supporting Biodiversity

- Sustainable environmental practices are implemented to reduce ecological stress and

support biodiversity conservation within the campus. Eco-friendly materials are prioritized in landscaping and plantation activities, reducing reliance on plastic-based and non-biodegradable materials.

- Organic methods are adopted in place of chemical fertilizers and pesticides to maintain soil health and protect beneficial organisms. Composting of biodegradable waste is practiced regularly to enhance soil fertility and reduce waste accumulation. Rainwater harvesting systems are utilized to support vegetation growth and maintain groundwater levels, thereby contributing to ecosystem sustainability.
- Energy-efficient and environmentally safe maintenance practices are also followed in campus operations. These combined efforts help maintain ecological balance while reducing the environmental footprint of campus activities.

6.7.6 Research and Field-Based Biodiversity Studies

- The institution promotes continuous research and field-based learning activities focused on biodiversity conservation and ecological assessment. Students and faculty undertake research projects on topics such as species diversity, habitat mapping, ecological interactions, and environmental change within the campus ecosystem.
- Field studies are conducted regularly to observe seasonal variations in flora and fauna. Data collected from these studies is systematically documented and analyzed to understand biodiversity trends over time. Students are encouraged to develop research-based reports and presentations based on field observations.
- These activities strengthen scientific understanding of biodiversity and contribute to the creation of a campus-level ecological knowledge base that supports long-term conservation planning.

6.7.7 Community Engagement and Awareness Activities

- Biodiversity conservation efforts are extended beyond the campus through structured community engagement and awareness programmes. Plantation drives are organized with active participation from students, faculty, and local community members.
- Nature walks, biodiversity exhibitions, and environmental awareness campaigns are conducted regularly to promote understanding of local ecosystems and conservation practices. Eco-clubs and student groups actively participate in organizing and executing these initiatives.
- Collaborative activities with external organizations such as NGOs and environmental agencies are undertaken to strengthen outreach efforts. These engagements help spread awareness about biodiversity conservation and encourage collective environmental responsibility.

6.7.8 Monitoring and Documentation

- Biodiversity monitoring is carried out through regular field surveys and systematic documentation practices. Changes in species diversity, vegetation cover, and ecological conditions are recorded periodically. Survival rates of planted species are monitored across seasons to assess plantation success.
- Photographic records and field observation notes are maintained to track ecological changes over time. The biodiversity register is updated annually based on field data and survey findings. Monitoring outcomes are used to evaluate the effectiveness of conservation activities and guide future biodiversity management actions.

6.7.9 Review and Corrective Actions

- An annual review of biodiversity activities is conducted to assess progress and identify implementation gaps. Field data and biodiversity records are analyzed to evaluate changes in ecological conditions over time. Based on the review findings, corrective plantation, restoration,

or conservation measures are implemented wherever required.

- Continuous refinement of biodiversity management activities is carried out based on monitoring results and ecological observations. This ensures that biodiversity enhancement activities remain effective and aligned with campus ecological needs.

6.7.10 Short-Term Action Plan

- In the short-term phase, baseline biodiversity documentation is completed through detailed field surveys and preparation of a comprehensive species register. Native species plantation is initiated across identified campus zones to enhance green cover. Biodiversity clubs and student groups are established to support continuous field-based engagement.
- Regular awareness programmes, seminars, and nature-based learning activities are conducted to strengthen environmental understanding. Composting systems for organic waste are introduced to support soil fertility and reduce waste accumulation. Basic ecological monitoring of campus vegetation and biodiversity zones is initiated to track early ecological changes.

6.7.11 Long-Term Action Plan

- In the long-term phase, the campus is progressively developed into a biodiversity-rich and ecologically balanced ecosystem. Herbal gardens and butterfly conservation zones are fully established to support species diversity and ecological stability. Green corridors are developed to interconnect fragmented green spaces and improve habitat continuity.
- Native species gradually replace ornamental and non-native vegetation to strengthen ecological integrity. Biodiversity monitoring becomes integrated into academic research and field training activities. Continuous habitat improvement and ecosystem restoration activities are implemented to ensure long-term sustainability and resilience of campus biodiversity.

6.7.12 Conclusion

The biodiversity management plan ensures continuous improvement of ecological conditions within the campus through structured and sustained action-based initiatives. Regular plantation, monitoring, and restoration activities contribute to enhancing species diversity and habitat quality. Active participation of students and staff strengthens biodiversity documentation and conservation efforts.

Through systematic implementation of short-term and long-term actions, the campus ecosystem is progressively developed into a stable, diverse, and environmentally sustainable habitat that supports long-term ecological balance.

6.8 SUMMARY

- The Biodiversity Audit of Mar Dionysius College, Pazhanji was conducted to assess the status of campus biodiversity, evaluate existing biodiversity management practices, and establish a baseline for future conservation, monitoring, and sustainability initiatives.
- The biodiversity audit indicates that the college campus supports a moderately diverse ecosystem, with a comparatively higher representation of flora than fauna, forming the structural and ecological base of the campus.
- The floral composition consists of 45 tree species, 13 herb species, and 6 shrub species, indicating a well-developed vegetation structure, though lower vegetation layers require further enrichment to enhance habitat complexity and ecological balance.
- Faunal diversity recorded in the campus includes 31 bird species, 24 butterfly species, 4 dragonfly species, 4 reptile species, and 5 mammal species, reflecting the presence of multiple ecological niches and trophic levels within the campus environment.
- The Simpson Index values show variation among taxa, where birds (0.07), butterflies (0.07), and trees (0.07) indicate relatively higher diversity and better species distribution, while dragonflies (0.32), shrubs (0.19), and herbs (0.10) indicate moderate diversity with uneven distribution.
- The relatively higher Simpson Index value for dragonflies suggests lower diversity and dominance of a few species, whereas lower values in birds and butterflies indicate comparatively better ecological balance within these groups.
- The presence of ecologically important groups such as pollinators (butterflies) and insect regulators (birds and dragonflies) highlights the functional role of the campus in maintaining essential ecosystem processes.
- The biodiversity pattern suggests that the campus ecosystem is functionally active but unevenly distributed, with certain species or groups showing localized dominance, which may influence overall ecosystem stability.
- Institutional initiatives such as native plantation programmes, composting practices, biodiversity documentation, environmental awareness programmes, and academic integration have contributed positively toward maintaining and improving ecological conditions within the campus.
- The total campus area extends to 13.3 acres; however, a considerable portion is occupied by built-up infrastructure, limiting the area available for biodiversity conservation. Furthermore, much of the existing vegetation consists of intentionally planted species, which influences the overall biodiversity composition and distribution patterns within the campus.
- The observed biodiversity status indicates the need for enhancing species evenness, improving habitat diversity, and strengthening faunal support systems, particularly through the development of microhabitats and ecological niches.
- Overall, the campus exhibits moderate biodiversity with strong potential for improvement, and with continuous monitoring, scientifically guided conservation measures, and effective implementation of biodiversity management strategies, it can be developed into a more stable, resilient, and ecologically sustainable ecosystem.

6.9 ACTIVITIES CONDUCTED

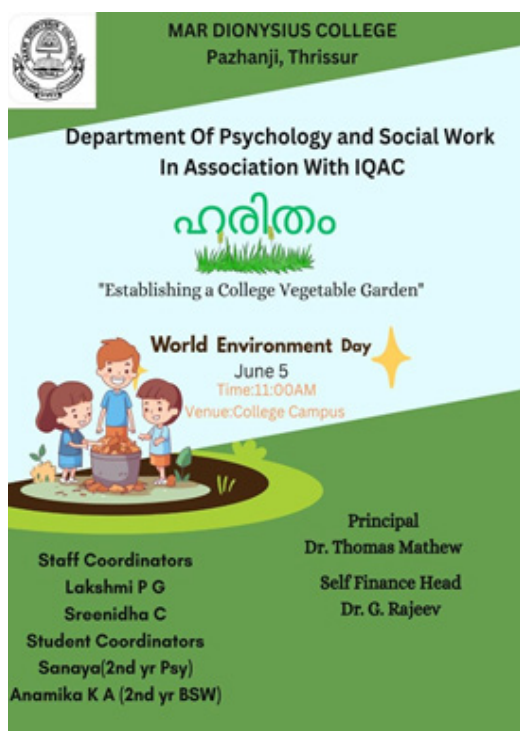
On 5th June 2025, the Department of Social Work observed World Environment Day through a series of campus-based environmental initiatives aimed at promoting ecological awareness and sustainability among students. As part of the programme, a college garden was developed within the campus premises, where plantation and seed sowing activities were carried out at designated locations. The initiative encouraged student participation in enhancing green spaces and fostering environmental responsibility.

In connection with the observance, the NSS Unit of the college organized a tree plantation drive to promote afforestation and biodiversity conservation. The activity emphasized the importance of environmental protection and encouraged students to actively engage

in sustainable practices.

The Department of Computer Applications also conducted an eco-friendly initiative aimed at reducing plastic usage. As part of this programme, students prepared pens using sustainable materials such as paper, thereby promoting environmentally responsible alternatives and reinforcing the concept of waste reduction.

Furthermore, the Language Club of College organized an exhibition showcasing rare, endangered, and medicinal plant species as part of the Environment Day celebrations. The exhibition was conducted to enhance student awareness on plant diversity, conservation of threatened species, and the significance of herbal resources in ecological and traditional knowledge systems.

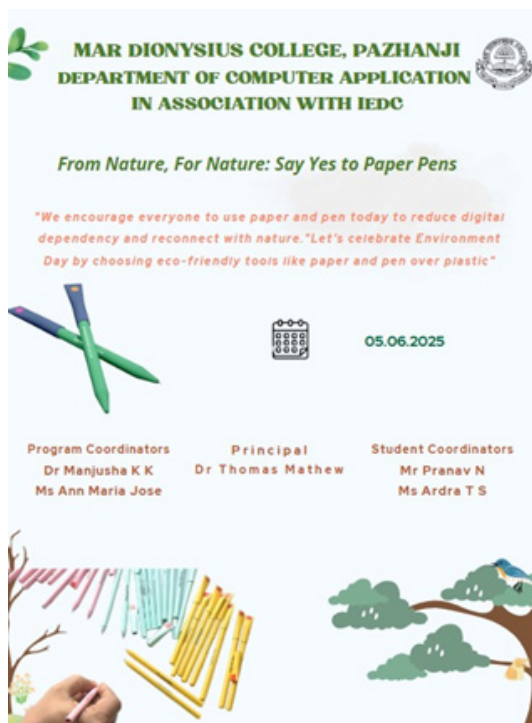


On June 5 2025, the Department of Social Work observed the significance of World Environment Day and facilitated a college garden at college premises—the event aimed to promote environmental consciousness among students and contribute to campus greening efforts. The





The NSS unit of the college organised a tree plantation drive to foster a greener planet. The initiative aims to combat deforestation and promote biodiversity by planting trees and nurturing nature.



As part of an effort to reduce carbon dependency and reconnecting with nature, the Department of Computer Application, organized a unique initiative where the students made pens from eco-friendly materials like paper over plastic.



The Language Club of M D College organised an exhibition of rare and endangered plant and herbal species as part of the Environment Day Celebrations. The program aimed to foster awareness among students regarding variety of plants and herbs.



Chapter VII

WASTE MANAGEMENT SYSTEM (WMS): AUDIT REPORT

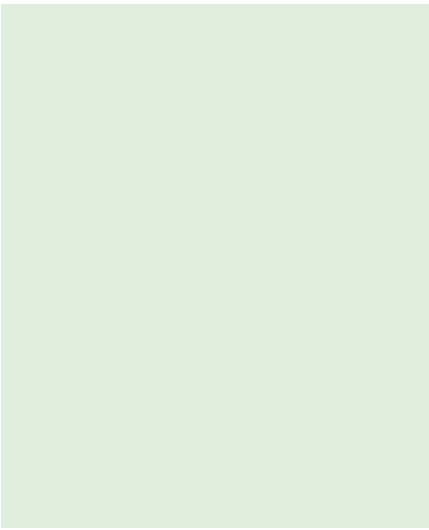


WASTE MANAGEMENT COMMITTEE
(WMC 2025-26)

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Waste Management System: Audit Report

7.1 INTRODUCTION

Solid waste management (SWM) is a significant challenge for governments and local authorities, particularly in developing countries, where poor management systems exacerbate social, environmental, and health problems. Globally, approximately 2.01 billion tons of waste are generated each year, with the East Asia and Pacific region accounting for 468 million tons equivalent to the weight of 46,337 Eiffel Towers or 4.5 million blue whales. The rising volume and complexity of waste, driven by modern consumption patterns and economic growth, pose serious threats to ecosystems and public health. About 5% of global greenhouse gas emissions result from the decomposition of organic waste. In India, one of the fastest-growing economies, annual waste production amounts to 62 million tons; however, only 70% of this is collected, and just 12 million tons are processed. As a result, 31 million tons end up in landfills, causing significant air, water, and soil pollution. Estimates suggest that municipal solid waste (MSW) generation in India could reach 165 million tons by 2030 due to evolving consumption trends and rapid urbanisation. Major challenges include inefficient collection systems, open and unsanitary landfills, and inadequate treatment

facilities. Additionally, the situation with e-waste, which contains hazardous materials, is critical and is expected to worsen in both developed and developing nations.

In India, the informal sector plays a crucial role in recovering waste value. Nevertheless, inefficiencies in the collection, sorting, and recycling processes lead to a substantial amount of recyclable materials being sent to landfills. Urban areas, with a population of 377 million, produce significant waste but only manage to collect 43 million tons annually, leaving much untreated. The lack of infrastructure is apparent, with just 21 million waste collectors compared to China's 700 million, and only 30% of waste is sorted correctly.

The Union Ministry of Environment, Forests, and Climate Change is responsible for solid waste management in India, following principles of "sustainable development," "precaution," and "polluter pays." The Environmental Protection Act of 1986 provides the legal structure for waste management regulations, emphasising the responsibility of cities and businesses to lessen environmental harm and implement sustainable practices. On educational campuses, Municipal Solid Waste (MSW) includes items like stationery, organic waste, food scraps, metals, packaging, hazardous

material containers, and electronic waste. Sustainability initiatives at these institutions aim to enhance MSW management and liquid waste management through waste audits. Higher Education Institutions (HEIs) play an essential role in promoting sustainability by combining knowledge with community engagement and advancing societal improvement through research and innovation.

The ISO 14001 standard serves as a global guideline for environmental management systems, offering a framework for developing and maintaining effective waste management practices. This framework aids institutions in reducing waste, minimizing environmental impacts, and enhancing overall efficiency. It assesses the performance of waste management systems, encourages responsible resource use, and identifies areas for improvement to ensure ongoing progress in waste reduction and sustainability efforts.

7.1.1 What is Waste Management Audit?

A waste audit entails a comprehensive analysis of all waste generated by an organisation. It offers valuable information regarding the types of items being discarded, their amounts, and the typical contaminants produced by individuals. This process evaluates the efficiency of the current waste management system and identifies potential areas for implementing new strategies. A detailed inventory of the different types of waste produced on the college campus from various sources, including canteens, dormitories, classrooms, offices, and laboratories.

A comprehensive evaluation of current waste management methods at each source, focusing on their environmental impact and effects on stakeholder well-being.

The creation of a robust scientific waste management system on campus designed to improve waste management practices while promoting environmental sustainability, which includes encouraging behavioural changes and establishing facilities like a biogas plant, composting units, and materials recovery centres.

7.1.2 Need for Waste Management Audit

The goals of the waste management and environmental policy are to educate and inform stakeholders about the significance of adhering to environmental standards in order to maintain a clean environment. This policy is relevant for all faculty and students at colleges and universities, promoting an eco-friendly culture. The Waste Management Policy underscores the necessity of keeping the campus clean through appropriate waste disposal methods and recycling guidelines for biodegradable materials, alongside the use of environmentally safe products to prevent hazardous waste and pollution (Cardenas and Halman, 2016). Awareness-raising initiatives contribute to developing an environmentally conscious mindset among students and the surrounding rural community. Leadership, such as Department Heads and Senior Managers/Management Representatives, is responsible for overseeing the institution's waste management practices and ensuring a tidy campus, while all organizational members are required to follow the policy. Efficient waste management plays a vital role in supporting the institution's green initiatives, helping to preserve the planet for future generations. Furthermore, conducting a Waste Management audit every three years is essential, as it deepens the understanding of students and staff regarding the importance of waste management and its positive impact on advancing the 'Go Green' initiative, positioning the institution as an environmental leader in the community. Implementing effective waste management is a crucial approach for organizations to assess their ability to maintain an eco-friendly campus (Kaseva and Gupta, 1996).

7.1.3. Waste Management in a College in alignment with SDGs

Efficient waste management in educational institutions involves reducing, reusing, and recycling campus-generated waste through education, appropriate sorting, and sustainable practices. This contributes to the attainment of Sustainable Development Goals (SDGs) such as:

- SDG 11: Sustainable Cities and Communities
- SDG 12: Responsible Consumption and Production
- SDG 13: Climate Action

Establishing environmentally friendly waste management systems contributes to a cleaner campus and fosters a sense of environmental responsibility among students.

7.2 WASTE MANAGEMENT POLICY

7.2.1 Statement of Commitment

Mar Dionysius College, Pazhanji is committed to promoting a clean, healthy, and environmentally sustainable campus through effective waste management practices. The institution strives to minimize waste generation and encourages segregation at source, reuse, recycling, and responsible disposal of all types of waste generated within the campus.

The college follows sustainable environmental practices in alignment with the United Nations Sustainable Development Goals, particularly SDG 12: Responsible Consumption and Production. All waste management activities in the campus are carried out in accordance with applicable environmental regulations and guidelines.

Through awareness initiatives, responsible resource use, and the active participation of students, faculty, and staff, the institution aims to foster environmental stewardship and contribute to long-term sustainability.

7.2.2 Vision

Mar Dionysius College, Pazhanji envisions a clean, sustainable, and environmentally responsible campus that reflects Kerala's commitment to conservation and scientifically sound waste management, in alignment with national and state waste management regulations and UN SDG 12: Responsible Consumption and Production.

7.2.3 Mission

The College is committed to minimizing waste generation, promoting source segregation, and ensuring safe, scientific disposal of all waste streams in compliance with applicable waste management rules. Through awareness, institutional responsibility, and collaboration with local self-government bodies, the College seeks to cultivate environmental responsibility among students, staff, and the wider community. By

integrating sustainable waste management principles into academics, administrative processes, and campus operations, the College aims to foster a culture of sustainability that extends beyond the campus.

7.2.4 Resource Management

7.2.4.1 Waste segregation and collection

The College shall ensure systematic segregation of waste at source in accordance with prescribed environmental categories and regulatory standards. Institutional mechanisms and appropriate infrastructure shall be maintained to support efficient, hygienic, and environmentally responsible waste collection practices across all campus units.

7.2.4.2 Waste Processing and Disposal

The College shall adopt scientifically sound, environmentally sustainable, and legally compliant methods for the processing and disposal of all categories of waste, including biodegradable, recyclable, sanitary, and hazardous waste. Waste shall be managed through authorized systems and agencies to minimize environmental impact and ensure public health safety.

7.2.4.3 Plastic Reduction and Eco-Responsible Practices

The College shall promote the reduction of single-use plastics and encourage the adoption of reusable, biodegradable, and environmentally sustainable alternatives in academic, administrative, and campus activities. Sustainable consumption and responsible resource use shall be integral to institutional operations.

7.2.4.4 Campus Hygiene and Environmental Culture

The College shall uphold high standards of campus cleanliness, sanitation, and environmental responsibility. A culture of environmental stewardship shall be fostered through institutional norms that promote accountability, participation, and shared responsibility among all stakeholders.

7.2.5 curriculum integration and academic engagement

7.2.5.1 Curriculum Integration

The College shall actively integrate waste management, sustainability, and environmental responsibility into

curricular and co-curricular activities by incorporating seminars, workshops, research projects, field studies, and community outreach programs. This approach aims to enhance students' environmental literacy, foster practical problem-solving skills, and cultivate ethical responsibility towards sustainable resource use.

7.2.5.2 Research and Knowledge Development

The College shall promote and support faculty and student research in areas related to waste reduction, circular economy, sustainable waste management technologies, and environmental conservation. Interdisciplinary research approaches shall be encouraged to strengthen academic contributions to sustainable development and evidence-based environmental practices.

To ensure that research and sustainability principles are integrated into the academic curriculum, the College shall incorporate these themes into assignments, project work, and internships. This integration reinforces experiential learning, enhances student engagement in sustainability, and aligns academic programs with the institution's commitment to environmental stewardship.

7.2.5.3 Innovation and Best Practices

The College shall foster a culture of innovation and environmental best practices by supporting knowledge-sharing platforms, eco-responsible initiatives, and academic engagement that advance sustainable waste management principles.

7.2.6 Purchasing and procurement

7.2.6.1 Sustainable Sourcing

The College shall prioritise the procurement of reusable, recyclable, compostable, and environmentally sustainable materials in all purchasing decisions to reduce waste generation and environmental impact.

7.4.2 Responsible Supplier Engagement

Preference shall be accorded to suppliers and vendors who adhere to recognised environmental standards, sustainable production practices, and eco-friendly packaging norms.

7.4.3 Environmentally Conscious Procurement Practices

All procurement for academic, administrative, and

campus activities shall promote resource efficiency, waste reduction, and environmentally responsible material selection in accordance with institutional sustainability principles.

7.2.7 community engagement

7.2.7.1 Environmental Stewardship and Public Awareness

The College shall cultivate environmental stewardship by fostering awareness, ethical responsibility, and informed engagement in sustainable waste management among students, staff, and the larger community.

7.2.7.2 Strategic Institutional Partnerships

The College shall pursue strategic collaboration with governmental agencies, authorised waste management bodies, and community-based organisations to strengthen environmentally responsible practices and contribute to regional sustainability goals.

7.2.7.3 Participatory Environmental Governance

The College shall promote participatory environmental governance by encouraging collective responsibility, inclusive involvement, and shared accountability in advancing sustainable waste management initiatives.

7.2.8 monitoring and reporting

7.2.8.1 Institutional Waste Assessment

The College affirms its commitment to institutional monitoring of waste generation and management performance as an integral component of environmental governance and accountability. Waste assessment shall serve as a policy instrument to evaluate compliance with waste management regulations and alignment with institutional sustainability objectives.

The Waste Management Policy is aligned with the principles of a zero-waste campus, carbon responsibility and long-term carbon neutrality, and a campus-wide prohibition on single-use plastics. Monitoring and reporting mechanisms shall ensure adherence to these commitments and consistency with statutory requirements and sustainability standards.

Assessment outcomes shall be formally documented and subjected to periodic review by the appropriate institutional authorities to support transparency, compliance, and continuous policy-level improvement.

7.2.8.2 Environmental Data Governance

The College shall maintain appropriate documentation and data management systems to ensure accuracy, traceability, and accountability in waste management practices, in alignment with regulatory and institutional requirements.

7.2.8.3 Review and Continuous Improvement

The College shall adopt a periodic review process to evaluate policy performance, identify areas for improvement, and strengthen institutional sustainability outcomes through informed corrective measures.

7.2.9 Compliance and review

7.2.9.1 Statutory Conformity Framework

Mar Dionysius College, Pazhanji affirms its commitment to full compliance with all relevant environmental legislation, statutory guidelines, and regulatory directives governing waste management at international, national, and state levels. This includes, but is not limited to, the Basel Convention (1989), Stockholm Convention (2001), the Solid Waste Management Rules (2016, amended 2026), Plastic Waste Management Rules (2016), Biomedical Waste Management Rules (2016), E-Waste Management Rules (2016), and the Kerala Municipal Solid Waste (Management and Handling) Rules, 2018.

To operationalize this compliance, the College shall:

- Establish and maintain robust monitoring systems to ensure that all waste management activities adhere to statutory requirements.
- Document and report compliance performance to institutional governance bodies for transparency and accountability.
- Integrate legal obligations into operational protocols, including segregation, collection, handling, and disposal of waste streams.
- Conduct periodic audits and reviews to assess adherence to regulations, identify gaps, and implement corrective measures.
- Ensure continuous alignment with emerging legal mandates, policy updates, and best practices in

sustainable waste management.

Through this framework, the College reinforces its role as a model institution for environmental stewardship, ensuring that all waste management practices are legally compliant, ethically responsible, and in line with national and international standards.

7.2.9.2 Dynamic Policy Review and Strategic Alignment

This Policy shall be subject to structured review by the designated institutional authority to ensure its continued relevance, strategic alignment, and responsiveness to emerging environmental standards, technological developments, and sustainability imperatives.

7.2.9.3 Accountability, Transparency and Continuous Enhancement

The College shall embed accountability and transparency within its waste management governance framework through institutional oversight mechanisms and stakeholder engagement processes that facilitate ongoing evaluation and progressive refinement of practices.

7.2.10 Leadership and accountability

Mar Dionysius College, Pazhanji recognises that effective waste management is sustained through strong leadership, clearly defined responsibilities, and a culture of shared accountability. The Waste Management Policy shall be guided by an institutional governance structure that ensures strategic oversight, transparency, and collective responsibility across all levels of the College.

7.2.10.1 Institutional Leadership

The Principal shall provide strategic direction and institutional oversight to ensure that waste management practices align with the College's environmental commitments and sustainability objectives.

7.2.10.2 Governance and Policy Stewardship

The Waste Management Committee shall function as the designated institutional body responsible for policy guidance, oversight, evaluation, and continuous strengthening of the waste management framework.

7.2.10.3 Academic and Administrative Responsibility

Faculty members, administrative units, and support staff shall uphold and reinforce the principles of this Policy within their respective areas of responsibility, ensuring adherence to institutional sustainability standards.

7.2.10.4 Collective Participation

Students and all campus stakeholders shall demonstrate environmentally responsible conduct and contribute to fostering a culture of sustainability consistent with the objectives of this Policy.

7.2.10.5 Accountability and Performance Oversight

The College shall maintain appropriate accountability mechanisms to monitor adherence to this Policy, reinforce institutional responsibility, and promote continuous environmental improvement.

7.2.11 Conclusion

Mar Dionysius College, Pazhanji formally institutionalizes sustainable waste management as a core operational and ethical responsibility. The College recognizes that effective waste governance is not merely a regulatory requirement but a strategic commitment to environmental protection, public health, and long-term campus sustainability.

Through structured waste segregation, scientific processing and disposal, reduction of single-use plastics, promotion of circular economy principles, and integration of sustainability concepts into the curriculum, research, assignments, projects, and internships, the College demonstrates a comprehensive and policy-driven approach to environmental stewardship.

Institutional mechanisms for monitoring, environmental data governance, policy review, and accountability ensure compliance with international conventions, national legislation, and Kerala state regulations, while advancing the College's objectives of a zero-waste campus and carbon responsibility.

With committed leadership, clearly defined responsibilities, collective stakeholder participation, and continuous policy review, the College aims to

embed a culture of environmental discipline, ethical responsibility, and resource-conscious practices across academic, administrative, and operational domains. This Waste Management Policy remains a dynamic document, subject to periodic evaluation and refinement to respond effectively to emerging environmental challenges, technological developments, and evolving sustainability mandates.

Through this sustained commitment, Mar Dionysius College aspires to uphold institutional excellence and serve as a model environmentally progressive academic institution, fostering both knowledge and practice of sustainable waste management within and beyond the campus.

7.3 METHODOLOGY

Proper waste management is essential for upholding tidy surroundings, diminishing pollution, preserving resources, and safeguarding public health. An established Waste Management System Committee, including student representatives and faculty members, oversees these initiatives according to a detailed policy. This policy delineates specific goals, action plans, and strategies, which are consistently evaluated and improved during group meetings to guarantee maximum effectiveness.

7.3.1 Internal Audit Training

Green Audit training promotes a sense of ownership and involvement within the institution by utilizing thorough, participatory methods. To prepare the college for this endeavour, the existing Environmental Management System (EMS) selected students and faculty members to participate in an Internal Auditor Training Programme. The one-day training was conducted on 27.06.2025, certifying the participants as internal auditors and equipping them to carry out waste audits. The internal waste audit process consists of several crucial phases, including evaluation, risk assessment, data collection, policy development, and the creation of registers and initiatives for water conservation and resource management.

7.3.2 Data sampling and categorization of waste

The annual waste management audit evaluates the generation of different types of waste, including food waste, plastics, litter, and electronic waste. Individual records are kept for each waste category, noting the amounts produced in key locations like the canteen and throughout the campus. Collected waste is sorted and organized into Six separate streams: (1) Plastics (2) Paper – writing, packing and cartons etc. (3) Bio-waste, (4) E-waste (5) Chemical Waste (Chemical samples, stain, dye, cultured media contaminated substance, including hazardous materials) and (6) Other Wastes which includes items such as broken glass, construction debris, textiles, packaging, and office supplies.

7.3.3 Registers and Documents to monitor the process

Detailed records of waste disposal are kept, monitoring the amounts sent to recycling centres, composting sites, and other disposal methods. The data collection process is supported by institutional records and registers, including paper usage registers, waste collection logs, and relevant documentation maintained by authorized agencies such as Harithakarmasena service records. These records ensure accuracy, traceability, and validation of the waste data

7.3.4 External Audit

An external waste audit is conducted by the TIES to assess the institution's waste management practices and compliance with Green Audit criteria. Based on record verification, site inspections, and audit findings, TIES provides recommendations to strengthen waste management practices and promote continual environmental improvement.

7.3.6 Stages of Waste Management Audit

Waste Management audit has three phases: Pre audit, audit and post audit.

7.3.6.1. Pre audit phase

- Formation of audit team; scheduling audit programmes
- Setting up of scope and objectives (in tune with waste management policy of the institution)
- Discusses with the responsible persons of each

location (staff, teachers, lab assistants, sweepers, watchmen, students etc.) about the waste generation pattern, and provisions of their management.

- Preparation of inventory for quantity of various types of solid waste generation (location wise): MSW (general- litter, paper, stationary waste etc.); bio-wastes (food, plant litter etc.); plastic waste; hazardous waste (chemical residue from labs; discarded e wastes etc.); construction and demolition wastes; biomedical waste (e.g., from life science laboratories); e wastes (computers, CDs, pen drives, mobile phones etc.).
- Documentation of all existing practices and provisions of solid waste management in the campus

7.3.6.2. Audit phase

- Auditors collect all data collected to ensure that nothing is overlooked completely in the audit. The following information has been collected during the audit phase:
- Assessment of collected data in relation with environmental policy and waste management policy of the college/university
- Review of present waste management systems and enhancement suggestions

7.3.6.3. Post audit phase

- The plan of action for the post-audit phase implementation and follow-up. All possible suggestions for the improvement of WMS of the institution is implemented.
- WMS committee will ensure that the Waste Management System is functional at expected level and the college is participating, by making the entire college/university community well informed through regular communications, monitoring through periodical evaluation programmes etc.

7.3.7 Steps of Waste Management Audit

7.3.7.1. Site assessment

Collection of contour map and campus diagram; mark

the waste generation points and storage points in the diagram.

Walk through survey; quantification process of each kind of waste at each location;

Survey on existing waste management practices in the campus. Data on quantity and type of processing of each kind of waste is recorded

7.3.7.2. Data analysis

Analysis of current and past performance (pre audit and post audit performances, previous audit data etc.)

Regression analysis involves the comparison of waste production on the Y axis versus the potential waste management driver on the X axis (weather, working days/holidays etc.).

Carbon credit calculation

7.3.7.3. Final audit by external audit team

Data verification- identifying non conformities

Action plan –long term and short term

Final report & certification as per ISO standards.

7.3.8. Work plan and Schedule of Waste Management Audit

Date to date	Weekly Work Plan
12-07-2025	A meeting was held to define the team's goals and formulate a strategy for collecting information on waste management practices. Team members were asked to examine the manual to help in developing the action plan. The college campus map was collected, showing various blocks, with each group designated to a specific block for the survey. The internal audit team has been divided into three groups, and each group will reach out to the housekeeping staff in their assigned blocks to understand existing practices. Data sheets were provided, and each group is anticipated to commence data collection the following week.
05-08-2025	Identify major waste sources (cafeteria, classrooms, hostels, offices) Each group is asked to understand the current waste handling procedure in their assigned area
06-09-2025	Oversee the categorisation of waste into groups, including organic, recyclable, and hazardous materials. Each team will establish registers in high-waste areas such as the canteen and hostel to facilitate data collection. Teams should also identify the different waste management systems present in their assigned locations, such as biogas plants, incinerators, and landfills. Document any inoperative equipment. Lastly, teams are tasked with collecting information regarding the disposal of materials, such as paper and plastic, that are sent to outside organisations.
27-09-2025	Become acquainted with the current waste management practices and the challenges they face. Keep track of the frequency of waste disposal and pinpoint any areas where regulations may not be adhered to. Ensure that all documents and records are accurately completed.

Table 7.1. Schedule of the audit of the waste management

Activities	Frequency	Dates of study	Mode of data collection
Recording waste generation and collection food waste, plastic, litter, and e-waste) OR manual one time evaluation	Three-week, one time a day of sampling	Three working day: 12/07/2025, 05/08/2025, 08/09/2025 Holidays (Sunday): 13/07/2025, 10/08/2025, 07/09/2025 Three semi holiday Saturday: 12/07/2025, 09/08/2025, 06/09/2025	Entry in the given format

Table 7.2. Work plan for the audit of the waste management

7.4 RESULT AND DISCUSSION

7.4.1 Analysis of Waste Generation And Quantities

1. college Office

Plastic		
Samplings days	Per day quantity (kg/day) (Mean $\pm$ SD)	Average waste generation (Kg) /year
Working day	6.67 $\pm$ 2.08	1334 kg
Semi holiday	1.50 $\pm$ 0.50	142.5 kg
Holiday	0.00 $\pm$ 0.00	0 kg
Total waste generated per year		1476.5 kg/year

Table 7.3 Plastic waste quantity at college Office

The plastic waste generation profile of the college office indicates a clear variation across different operational days.

During regular working days, the office generates an average of 6.67 $\pm$ 2.08 kg/day, contributing substantially to the annual total with 1334 kg/year. In contrast, waste generation during semi-holidays is considerably lower, with an average of 1.50 $\pm$ 0.50 kg/day, accounting for 142.5 kg/year. No plastic waste generation was recorded on holidays, reflecting the absence of administrative activities.

Overall, the total annual plastic waste generated from the college office amounts to 1476.5 kg/year, with working days alone contributing more than 90% of the total. This distribution highlights that routine administrative operations are the primary source of plastic waste generation within the office, while reduced activity periods significantly limit waste output.

Food/Bio Waste		
Samplings days	Per day quantity (kg/day) (Mean $\pm$ SD)	Average waste generation (Kg) /year
Working day	2.67 $\pm$ 2.08	534 kg
Semi holiday	1.67 $\pm$ 1.15	158.65 kg
Holiday	0.17 $\pm$ 0.29	11.9 kg
Total waste generated per year		704.55 kg/year

Table 7.4 Food/Bio Waste quantity at college Office

The food and biodegradable waste generated from the college office reflects a consistent dependence on occupancy patterns rather than strictly defined working schedules. Although the highest contribution is recorded during working days (2.67 ± 2.08 kg/day; 534 kg/year), the relatively close values observed during semi-holidays (1.67 ± 1.15 kg/day; 158.65 kg/year) indicate that waste generation does not decline proportionately with reduced institutional activity.

The presence of measurable waste even during holidays

(0.17 ± 0.29 kg/day; 11.9 kg/year) further suggests that biodegradable waste generation is linked to intermittent usage and residual activities within the office environment.

The total annual bio-waste generation of 704.55 kg/year highlights that, unlike plastic waste, this category exhibits continuity across all day types. This behaviour points to the need for uninterrupted management and disposal mechanisms, as bio-waste generation persists irrespective of formal operational intensity.

Paper Waste		
Samplings days	Per day quantity (kg/day) (Mean $\pm$ SD)	Average waste generation (Kg) /year
Working day	7.00 ± 2.65	1400 kg
Semi holiday	3.00 ± 1.73	285 kg
Holiday	0.67 ± 0.58	46.9 kg
Total waste generated per year		1731.9 kg/year

Table 7.5 Paper waste quantity at college office

Paper waste generation in the college office emerges as the most substantial waste stream, showing a strong association with routine administrative and documentation-related activities. The highest generation is recorded during working days, with an average of 7.00 ± 2.65 kg/day, contributing 1400 kg/year, which forms the dominant share of the total output.

A noticeable decline is observed during semi-holidays, where waste generation reduces to 3.00 ± 1.73 kg/day (285 kg/year), yet remains comparatively high,

indicating continued documentation or partial office functioning. Even on holidays, a measurable quantity (0.67 ± 0.58 kg/day; 46.9 kg/year) is present, reflecting residual or intermittent paper usage.

The total annual paper waste amounts to 1731.9 kg/year, making it the largest contributor among the waste categories in the office. This pattern highlights the intensity of paper-based operations and suggests significant potential for reduction through digitization and improved paper management practices.

Classroom

Plastic		
Samplings days	Per day quantity (kg/day) (Mean $\pm$ SD)	Average waste generation (Kg) /year
Working day	3.67 ± 1.53	734 kg
Semi holiday	1.67 ± 0.58	158.65 kg
Holiday	0.00 ± 0.00	0 kg
Total waste generated per year		892.65 kg/year

Table 7.6 Plastic waste quantity in the Classroom

Plastic waste generation in classrooms reflects patterns closely aligned with student presence and academic activity intensity. The highest generation is observed during working days, with an average of 3.67 ± 1.53 kg/day, contributing 734 kg/year, indicating that routine classroom engagement is the primary driver of plastic waste accumulation.

During semi-holidays, the generation decreases to 1.67 ± 0.58 kg/day (158.65 kg/year), yet remains notable, suggesting partial academic use or limited student

presence. No plastic waste generation is recorded on holidays, confirming that classroom-related waste is directly linked to active usage.

The total annual plastic waste generated from classrooms is estimated at 892.65 kg/year. The absence of waste during holidays and the clear reduction during semi-holidays emphasize that plastic waste generation in this setting is highly activity-dependent, with minimal residual contribution outside regular academic schedules.

Food/Bio Waste		
Samplings days	Per day quantity (kg/day) (Mean $\pm$ SD)	Average waste generation (Kg) /year
Working day	1.83 ± 0.29	366 kg
Semi holiday	0.00 ± 0.00	0 kg
Holiday		0 kg
Total waste generated per year		366 kg/year

Table 7.7 Food/Bio Waste quantity in classroom

Food and biodegradable waste generation in classrooms is highly limited and occurs only during active working days. An average of 1.83 ± 0.29 kg/day is recorded, contributing 366 kg/year, indicating that such waste is directly associated with student presence and consumption-related activities within the classroom setting.

No waste generation is observed during semi-holidays and holidays, reflecting the absence of regular

classroom use during these periods. This complete decline outside working days highlights that bio-waste in classrooms is episodic and strictly activity-driven, with no residual or background contribution.

The total annual generation is estimated at 366 kg/year, demonstrating that classroom bio-waste remains minimal and confined to periods of active academic engagement.

Paper Waste		
Samplings days	Per day quantity (kg/day) (Mean $\pm$ SD)	Average waste generation (Kg) /year
Working day	7.67 ± 2.52	1534 kg
Semi holiday	2.83 ± 1.76	268.85 kg
Holiday	0.00 ± 0.00	0 kg
Total waste generated per year		1802.85 kg/year

Table 7.8 Paper waste quantity in classroom

Paper waste generation in classrooms is distinctly concentrated during periods of active academic use. On working days, the generation reaches 7.67 ± 2.52 kg/day, contributing 1534 kg/year, indicating that routine teaching, note-taking, and distribution of printed materials are the primary drivers of this waste stream.

During semi-holidays, the quantity declines to 2.83 ± 1.76 kg/day (268.85 kg/year), reflecting reduced classroom engagement while still maintaining a

measurable level of paper usage. In contrast, no paper waste is recorded on holidays, confirming the absence of residual generation in unused classroom spaces.

The overall pattern suggests that paper waste in classrooms is tightly linked to structured academic activity, with a sharp drop once regular usage is interrupted, and no evidence of carry-over waste during non-operational periods.

E-Waste		
Samplings days	Per day quantity (kg/day) (Mean $\pm$ SD)	Average waste generation (Kg) /year
Working day	0.33 ± 0.29	66 kg
Semi holiday	0.07 ± 0.12	6.65 kg
Holiday	0.00 ± 0.00	0 kg
Total waste generated per year		72.65 kg/year

Table 7.9 E-Waste quantity in classroom

E-waste generation in classrooms remains comparatively low and exhibits an irregular pattern, reflecting its non-continuous nature. During working days, an average of 0.33 ± 0.29 kg/day is recorded, contributing 66 kg/year, indicating that electronic waste arises primarily from occasional disposal or replacement of small electronic components.

The quantity further declines during semi-holidays to 0.07 ± 0.12 kg/day (6.65 kg/year), suggesting minimal

but intermittent generation. No e-waste is observed during holidays, confirming the absence of disposal activities in unused classroom spaces.

The total annual e-waste generation amounts to 72.65 kg/year, highlighting that, unlike other waste categories, this stream is not driven by daily academic activities but occurs sporadically, likely associated with maintenance cycles and equipment turnover rather than routine use.

Canteen and Cafeteria.

PLASTIC		
Samplings days	Per day quantity (kg/day) (Mean $\pm$ SD)	Average waste generation (Kg) /year
Working day	3.50 ± 0.50	700 kg
Semi holiday	1.50 ± 0.50	142.5 kg
Holiday	0.00 ± 0.00	0 kg
Total waste generated per year		842.5 kg/year

Table 7.10 Plastic waste quantity at Canteen and Cafeteria.

Plastic waste generation in the canteen and cafeteria is closely linked to consumption intensity and service activity. During working days, an average of 3.50 ± 0.50 kg/day is recorded, contributing 700 kg/year, indicating steady generation associated with regular food service operations and high user turnout.

On semi-holidays, the quantity decreases to 1.50 ± 0.50 kg/day (142.5 kg/year), reflecting reduced patronage

while maintaining consistent waste output from limited functioning. No plastic waste is generated on holidays, suggesting complete cessation of canteen activities during these periods.

The total annual plastic waste amounts to 842.5 kg/year, demonstrating that this waste stream is directly proportional to usage levels and operational continuity of the facility.

Food/Bio Waste		
Samplings days	Per day quantity (kg/day) (Mean $\pm$ SD)	Average waste generation (Kg) /year
Working day	15.67 ± 1.53	3134 kg
Semi holiday	6.00 ± 1.00	570 kg
Holiday	0.00 ± 0.00	0 kg
Total waste generated per year		3704 kg/year

Table 7.11 Food/Bio Waste quantity at Canteen and Cafeteria

Food and biodegradable waste from the canteen and cafeteria constitutes the most dominant waste stream within this functional unit, reflecting the scale of food preparation and consumption. On working days, waste generation reaches 15.67 ± 1.53 kg/day, contributing 3134 kg/year, indicating a consistently high output driven by regular meal services and peak user activity.

Even during semi-holidays, a substantial quantity of 6.00 ± 1.00 kg/day (570 kg/year) is generated, demonstrating that bio-waste production remains

significant despite reduced operations. No waste is recorded on holidays, corresponding to the closure of food service activities.

The total annual generation amounts to 3704 kg/year, underscoring the continuous and high-volume nature of biodegradable waste in this area. This pattern reflects the direct linkage between food handling processes and waste generation, with only partial reduction observed during periods of lower activity..

Paper		
Samplings days	Per day quantity (kg/day) (Mean $\pm$ SD)	Average waste generation (Kg) /year
Working day	5.50 ± 1.32	1100 kg
Semi holiday	3.17 ± 1.04	301.15 kg
Holiday	0.00 ± 0.00	0 kg
		1401.15 kg/year

Table 7.12 Paper waste quantity at Canteen and Cafeteria

Paper waste generation in the canteen and cafeteria reflects operational activities such as food packaging, billing, and the use of disposable paper-based materials. During working days, an average of 5.50 ± 1.32 kg/day is recorded, contributing 1100 kg/year, indicating consistent paper usage associated with regular service operations.

On semi-holidays, the generation reduces to 3.17 ± 1.04 kg/day (301.15 kg/year), showing a decline in

usage corresponding to lower service demand. No paper waste is recorded during holidays, aligning with the non-functioning of the facility.

The total annual paper waste amounts to 1401.15 kg/year, demonstrating that paper-based materials form a steady component of the waste stream, primarily driven by routine service operations, with minimal contribution from non-operational periods.

Summary of Annual Waste Generation Across Different Locations

Sl. No.	Location	Plastic Waste (kg/year)	Food/Bio Waste (kg/year)	Paper Waste (kg/year)	Chemical Waste (kg/year)	E-waste (kg/year)
1.	College Office	1476.5	704.55	1731.9	0	0
2.	Classroom	892.65	366	1802.85	0	72.65
3.	Canteen & Cafeteria	842.5	3704	1401.15	0	0
	Total	3211.65	4774.55	4935.90	0	72.65

Table 7.13 Summary of annual waste generation across different locations

The comparative assessment of annual waste generation across different functional units of the institution reveals distinct patterns linked to the nature and intensity of activities in each location. Overall, paper waste (4935.90 kg/year) emerges as the

most dominant waste stream, followed by food and biodegradable waste (4774.55 kg/year) and plastic waste (3211.65 kg/year), while e-waste (72.65 kg/year) contributes only a marginal fraction. No chemical waste was recorded across the assessed locations.

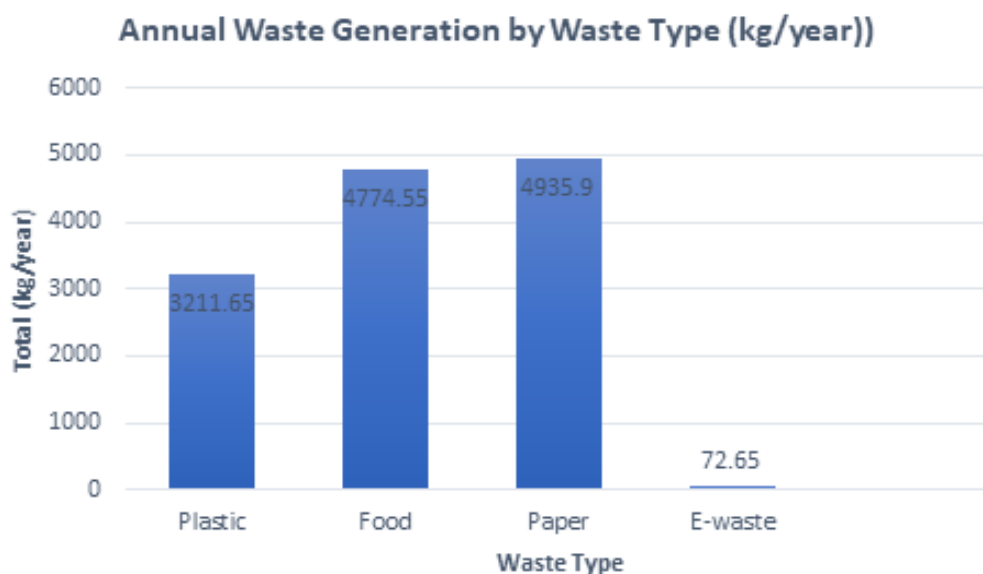


Fig:7.1 Comparative Analysis of Annual Waste Generation by Type (kg/year)

The canteen and cafeteria account for the highest contribution to food and biodegradable waste (3704 kg/year), significantly exceeding other locations. This reflects the concentration of food preparation and consumption activities, making it the primary source

of organic waste within the campus. In contrast, the college office and classrooms contribute comparatively lower quantities, indicating that bio-waste generation outside food service areas is limited and activity-specific.

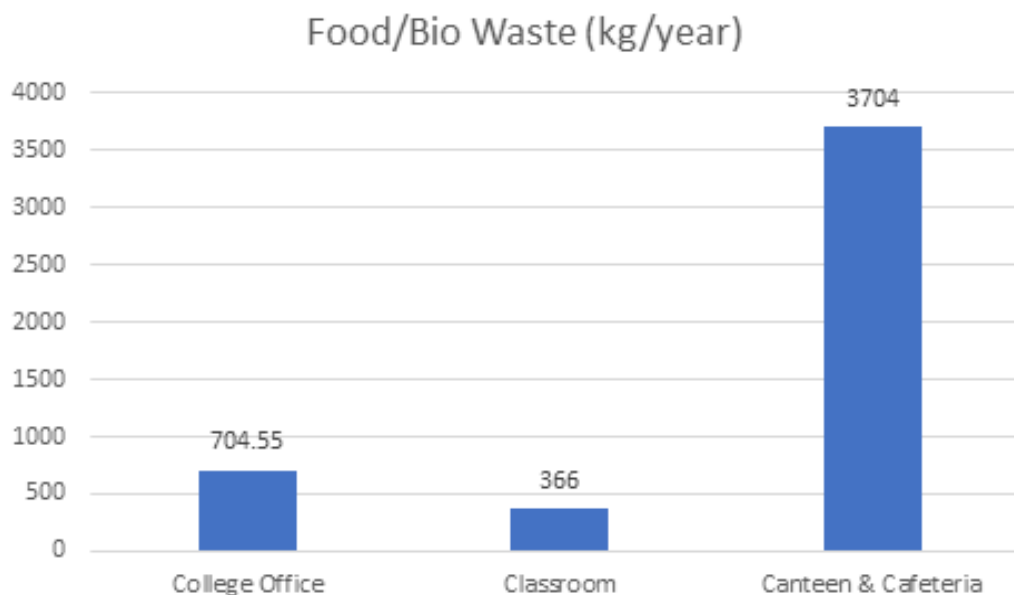


Fig 7.2. Annual food and biodegradable waste generation (kg/year) across different functional locations within the college.

Paper waste is predominantly generated from classrooms (1802.85 kg/year) and the college office (1731.9 kg/year), highlighting the continued reliance on paper-based academic and administrative practices. The canteen also contributes a substantial amount

(1401.15 kg/year), though comparatively lower, likely associated with packaging and service-related usage. The distribution indicates that paper consumption is widespread across all functional units, but is particularly intensive in academic and administrative settings.



Figure 7.3. Annual paper waste generation (kg/year) across different functional locations within the college.

Plastic waste generation is highest in the college office (1476.5 kg/year), followed by classrooms (892.65 kg/year) and the canteen (842.5 kg/year). This suggests that plastic usage is not confined to a single activity domain

but is distributed across administrative, academic, and service functions, with the office contributing the largest share.

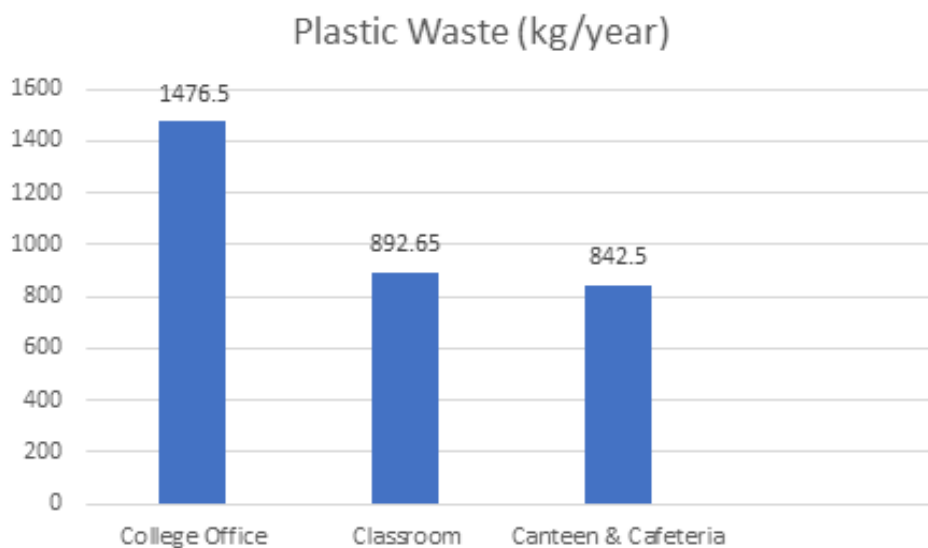


Figure 7.4. Annual plastic waste generation (kg/year) across different functional locations within the college

E-waste generation is exclusively recorded in classrooms (72.65 kg/year), indicating that disposal of electronic components is localized and occurs intermittently, likely associated with maintenance or replacement cycles of teaching-related equipment.

In summary, the waste generation profile reflects a clear functional differentiation: organic waste is concentrated in food service areas, paper waste is driven by academic and administrative operations, and plastic waste is distributed across all units. The findings highlight the need for location-specific waste management strategies, with priority interventions in the canteen for biodegradable waste reduction and in classrooms and offices for minimizing paper and plastic consumption.

7.4.2 Current Waste Management Practices

The institution follows waste management practices for the collection and disposal of solid and liquid waste generated on campus. The campus has four waste bins designated for biodegradable waste, dry waste, hazardous waste, and e-waste to facilitate waste segregation. At present, food waste generated

on the campus is managed through composting. Housekeeping staff carry out the regular cleaning of classrooms, washrooms, and other campus areas, and disinfectants are used to maintain hygiene in sanitary facilities.

Recyclable materials, including scrap, plastic waste, and electronic waste (e-waste), are collected separately and handed over to the Haritha Karma Sena on a monthly basis for appropriate recycling and disposal. The institution maintains records of each collection, demonstrating a documented and organized approach to waste management and scrap disposal.

With regard to liquid waste, the institution generates only domestic wastewater from washrooms, handwashing areas, and routine cleaning activities. As the college does not have a chemistry laboratory, no hazardous chemical liquid waste is produced. The wastewater is managed through the existing sanitation and drainage infrastructure, ensuring hygienic conditions and minimizing environmental impacts



Figure 7.6 Colour coded waste segregation bins associated with liquid waste generation.

Type of waste	Factors Contributing to Waste Growth	Method of treating	Waste Reduction Strategies in Practice
Paper waste	- Excess use of printed notes, circulars and exam papers - Administrative documentation - Student assignments and record books	- Collection and sale to paper recyclers - Reuse of single-side paper for rough work - Shredding and recycling through authorized vendors	- Adoption of digital communication - Printing only when necessary and double-sided printing - Digital submission for assignments and assessments
Plastic Waste	- Use of disposable cups, covers, and packaging from canteen - Bottled drinks and plastic stationery items - Event-related plastic materials	- Segregation and storage in labelled bins - Periodic handover to authorized plastic recycling units - Ban on single-use plastic inside campus	- Promotion of reusable bottles and cloth bags - Avoiding plastic cutlery and packaging in canteen - Awareness drives on plastic waste reduction
Bio-waste	- Food scraps from canteen - Leaf litter and plant waste - Waste from gardening and plantation activities	- Composting through pits - Periodic burning of leaves	- Food waste reduction awareness "Take only what you can eat" initiative - Leaf composting and mulching for gardens
E-waste	- Damaged digital devices and peripherals - Upgradation of electronic equipment	- Stored in e-waste collection corner - Handover to authorized e-waste recyclers	- Repair and reuse of parts - Upcycling for student training use - Maintenance contracts to extend equipment life

Table 7.14 Waste management practices of the college

7.5 CONCLUSION

The campus waste audit reveals a clear hierarchy in waste generation, closely linked to functional activities and occupancy patterns. Paper waste emerges as the most significant component, predominantly generated in classrooms and administrative offices. This highlights the ongoing reliance on printed materials for examinations, assignments, and official documentation, despite the gradual adoption of digital platforms. The volume of paper waste underscores the potential for targeted reduction strategies through digitisation and improved administrative practices.

Food and bio-waste is the second-largest contributor, with the canteen and cafeteria generating the highest quantities. This trend reflects the intensive meal preparation and service operations, as well as the partial consumption of meals, particularly during peak academic periods. Minimal food waste in classrooms and offices corresponds with limited on-site consumption, confirming that operational zones directly influence waste output.

Plastic waste, though lower than paper and food waste, remains a consistent and visible concern across all areas. Single-use items, packaging materials, and operational supplies drive generation, with offices and classrooms recording higher levels than the canteen during working days. The pattern indicates that even minor operational activities cumulatively contribute to plastic accumulation, emphasising the need for conscious reduction measures and strict adherence to campus-wide green protocols.

The audit also demonstrates that waste generation is strongly correlated with campus activity, with working days showing the highest volumes across all categories, semi-holidays producing moderate quantities, and holidays yielding negligible waste. This correlation provides actionable insight for scheduling waste management interventions, such as enhanced segregation and collection on peak days.

7.6 RECOMMENDATIONS

Digitalization to Reduce Paper Waste

- Transition to paperless systems for communication, assignments, examinations, and

records.

- Encourage the use of digital platforms for submissions, newsletters, announcements, and internal reports to steadily reduce paper consumption across all departments.
- Enhanced Waste Segregation and Infrastructure
- Install clearly labeled, color-coded bins for recyclables, compostables, and non-recyclable waste in high-traffic areas, including classrooms, offices, dining halls, and common quads.
- Ensure standardized signage, educational prompts, and strategically placed bins to encourage proper sorting and minimize contamination.
- For large-scale events or peak activity periods, establish temporary multi-stream sorting stations and donation points for reusable items.
- Fund infrastructure upgrades either through institutional investment or Corporate Social Responsibility (CSR) initiatives from external partners.

Reuse and Recycling Initiatives

- Promote thrift stores, surplus property exchanges, and move-out donation programs to extend the lifecycle of materials.
- Conduct annual e-waste and hazardous waste collections through certified recycling agencies to ensure proper disposal.

Systematic Waste Monitoring

- Implement a robust tracking system to document all types of waste generated, including paper, plastic, food, e-waste, and greywater.
- Assign designated staff to maintain records and ensure accurate logging of all disposals to external agencies.
- Explore advanced greywater treatment options, such as enhanced soak pits, to minimize environmental impact.
- Record financial benefits from selling recyclable materials to monitor trends, identify causes of excess waste, and inform reduction strategies.

Education, Engagement, and Culture

- Establish student-led green teams or sustainability clubs to organize campaigns, audits, and awareness events.
- Integrate waste management education into curricula and conduct workshops, competitions, and reward programs to encourage participation.
- Share success stories and metrics via dashboards, social media, or institutional reports to reinforce a culture of sustainability.

Innovative and Circular Approaches

- Adopt a “zero-waste” mindset, prioritizing reduce and reuse strategies over recycling.
- Utilize technology, such as sensor-equipped bins or mobile apps, for efficient collection and monitoring.
- Pursue environmental certifications (e.g., LEED) or join knowledge-sharing networks to adopt best practices in sustainable campus management.

7.7 WASTE MANAGEMENT PLAN

7.7.1 Introduction

Mar Dionysius College (MD College), Pazhanji recognises its institutional responsibility in addressing environmental challenges through systematic planning and responsible campus management. As part of its Green Audit initiative, the College has developed a structured Waste Management Plan under the broader Environmental Management Plan to ensure environmentally sound handling of waste generated within the campus.

The plan provides a strategic and operational framework for assessing waste generation patterns, strengthening segregation and treatment practices, promoting resource efficiency, and ensuring compliance with applicable environmental regulations. By integrating academic engagement, institutional governance, research support, and community participation, the College seeks to embed sustainable waste management practices into its day-to-day operations and long-term planning.

This Waste Management Plan reflects the College’s commitment to creating a clean, resource-efficient, and environmentally responsible campus while fostering environmental awareness and accountability among students, staff, and stakeholders.

7.7.2 Campus Waste Audit and Baseline Assessment

An annual campus-wide waste audit will be conducted under the supervision of the designated Environmental Management Committee. Waste generation data shall be collected from academic blocks, hostels, laboratories, offices, and common areas. The audit will classify waste into biodegradable, non-biodegradable, recyclable, hazardous, electronic, and sanitary categories. The findings will be documented and used to establish a quantitative baseline, based on which reduction targets and management interventions will be planned and reviewed annually.

7.7.3 Academic and Co-Curricular Integration

Waste management practices will be integrated into teaching, learning, and extension activities through curriculum-linked assignments, field-based studies, project work, student internships, and institutional seminars. Departments will be encouraged to incorporate campus waste data into academic exercises to enable students to analyse waste generation patterns and propose context-specific management solutions. Co-curricular activities will support practical exposure to sustainable waste practices.

7.7.4 Operational Waste Management Interventions

Segregation at source will be implemented across the campus through colour-coded bins and clear signage at all waste generation points. Biodegradable waste shall be treated on-site through composting or other appropriate processing methods. Recyclable materials will be collected separately and channelled to authorised recyclers. Hazardous, biomedical, sanitary, and electronic waste shall be stored, handled, and disposed of strictly in accordance with prescribed regulatory norms. Progressive measures will be undertaken to reduce landfill disposal and improve material recovery.

7.7.5 Institutional Structure and Governance

A defined governance mechanism will be established to oversee waste management operations. Roles and responsibilities shall be clearly assigned to committees, administrative units, and support staff. Standard operating procedures will guide collection, storage, processing, and disposal activities. Inter-departmental coordination mechanisms will ensure uniform implementation and compliance across the campus.

7.7.6. Sustainable Procurement and Resource Use

Procurement processes will be aligned with waste reduction objectives by prioritising materials with minimal packaging, longer service life, and recyclability. Preference shall be given to reusable and refillable products where feasible. Environmental considerations, including life-cycle impact and waste generation potential, will be factored into purchasing decisions to reduce downstream waste generation.

7.7.7 Research, Innovation, and Practice-Based Learning

Faculty members and students will be encouraged to undertake research and innovation related to waste reduction, recycling technologies, circular economy models, and waste-to-resource approaches. Campus waste management challenges shall be used as case studies for applied research, student projects, and pilot initiatives aimed at improving system efficiency and sustainability.

7.7.8 Community Participation and Outreach

Structured awareness and outreach programmes will be conducted to promote responsible waste management practices among students, staff, and the surrounding community. Activities such as workshops, clean-up campaigns, exhibitions, and collaborative programmes with local bodies, NGOs, and academic institutions will be organised to strengthen collective environmental responsibility.

7.7.9 Monitoring, Evaluation, and Reporting

Waste management performance will be monitored

periodically using indicators such as segregation efficiency, waste reduction trends, recycling rates, and compliance status. Monitoring records shall be maintained and reviewed by the responsible committee. An annual waste management report will be prepared, documenting actions taken, outcomes achieved, challenges encountered, and corrective measures proposed.

7.7.10 Regulatory Compliance and Periodic Review

All waste management activities shall be implemented in accordance with applicable national and state regulations. The action plan shall be reviewed periodically to assess effectiveness and updated to reflect regulatory changes, audit observations, and evolving institutional requirements.

7.7.11 Campus-Level Environmental Initiatives

Specific initiatives such as reduction of single-use plastics, promotion of paper-light administrative processes, organised e-waste collection drives, compost utilisation, and integration of waste management with water and energy conservation efforts shall be implemented. Student-led initiatives through Green Clubs and environmental committees will be actively supported.

7.7.12 Capacity Building and Environmental Awareness

Regular capacity-building programmes shall be conducted for students, teaching staff, administrative personnel, and support staff to strengthen understanding of waste segregation, handling procedures, safety requirements, and regulatory compliance. Orientation programmes, training sessions, and awareness campaigns shall reinforce institutional expectations and operational consistency.

7.7.13 Documentation, Evidence Management, and Audit Preparedness

A systematic documentation framework shall be maintained to support Green Audit and accreditation requirements. Records shall include waste audit data, monitoring logs, photographs, training reports, vendor authorisations, and annual performance summaries.

Proper documentation shall ensure traceability, transparency, and readiness for internal and external audits.

7.7.14 Risk Management and Corrective Action Mechanism

Potential operational risks such as improper segregation, storage overflow, contractor non-performance, or regulatory non-compliance shall be identified and addressed through predefined corrective action procedures. Preventive measures and timely interventions shall be implemented to minimise disruptions and ensure continuity of waste management operations.

7.7.15 Action Execution and System Review

Waste management measures shall be implemented in a phased and systematic manner, with clearly defined responsibilities and periodic performance reviews. Data generated through waste audits and routine monitoring shall be used to evaluate effectiveness, identify gaps, and introduce corrective actions. The institution will progressively refine operational practices to enhance segregation efficiency, reduce waste generation at source, improve recycling outcomes, and ensure sustained regulatory compliance. Continuous review and feedback mechanisms shall support long-term system stability and measurable environmental performance improvement.

7.7.16 Conclusion

The Waste Management Plan of Mar Dionysius College (MD College), Pazhanji establishes a clearly defined operational framework for the management of waste generated within the campus. The Plan integrates waste assessment, governance structures, operational procedures, procurement practices, academic linkage, and performance evaluation into a coherent system designed to support effective implementation and regulatory compliance.

Provision for periodic review, documentation, and corrective action ensures that waste management practices remain responsive to audit observations, regulatory requirements, and institutional operational needs. Through structured implementation and shared responsibility across academic and administrative units, the College reinforces accountability and consistency

in waste management practices and strengthens its overall environmental management performance.

7.8 SUMMARY

The waste management system of Mar Dionysius College, Pazhanji represents a structured and systematic approach towards managing both solid and liquid waste generated within the campus. The institution has developed a comprehensive framework that includes source-level segregation, collection systems, recycling mechanisms, composting practices, and compliance with environmental regulations. Waste is segregated at the source using colour-coded bins, with green bins designated for biodegradable waste and blue bins for non-biodegradable waste such as plastics, ensuring proper classification and handling of waste streams.

The institution follows a waste handling system in which food waste generated on the campus is managed through composting. At present, biodegradable food waste is collected separately and processed in the campus compost pit to produce organic compost. Housekeeping staff are responsible for the daily cleaning of classrooms, laboratories, washrooms, and other campus areas, and regular use of disinfectants helps maintain hygiene across sanitary facilities.

Recyclable materials, including paper scrap, plastic waste, and electronic waste (e-waste), are systematically collected and handed over to authorised agencies such as Haritha Karma Sena on a monthly basis for proper recycling and disposal. The institution maintains proper documentation and records of all waste collection and disposal activities, which reflects an organised and accountable waste management system.

The analysis of waste generation across different functional units reveals a clear hierarchy and variation based on activity levels. Paper waste emerges as the most dominant waste stream, primarily generated from classrooms and administrative offices due to the continued reliance on printed materials for academic, examination, and administrative purposes. Although digital practices are gradually being introduced, paper

consumption remains significant, indicating the need for further reduction strategies.

Food and biodegradable waste form the second largest category, with the canteen and cafeteria being the major contributors. This is due to continuous food preparation, service activities, and partial consumption of meals. Smaller quantities are generated in other areas such as offices and classrooms. This waste stream is continuous during working periods, highlighting the importance of efficient composting and organic waste management systems.

Plastic waste is generated across all functional areas of the campus, including academic, administrative, and service units. Major sources include packaging materials, disposable items, bottled products, and event-related waste. Although segregation and recycling mechanisms are in place, plastic waste remains a persistent concern, indicating the need for stronger reduction strategies and increased use of reusable alternatives.

E-waste generation is comparatively low and occurs intermittently, mainly due to replacement or upgrading of electronic equipment used for academic and administrative purposes. Such waste is carefully segregated and handed over to authorised recyclers. Chemical waste generation is negligible as the institution does not have chemistry laboratories, thereby reducing hazardous waste concerns.

The study also shows that waste generation is strongly linked to campus activity levels. Working days record the highest waste generation across all categories, semi-holidays show moderate levels, and holidays generate minimal or no waste. This clearly indicates that waste generation is directly dependent on occupancy and institutional functioning.

In addition to solid waste, the campus generates liquid waste mainly in the form of domestic wastewater from washrooms, handwashing areas, and routine cleaning activities. Since the institution does not operate chemistry laboratories, no hazardous chemical liquid waste is generated. The wastewater is effectively managed through the existing sanitation and drainage infrastructure, ensuring hygienic conditions and minimal environmental impact.

Overall, the waste management system of the institution reflects a structured and functional approach that integrates segregation, composting, recycling, documentation, and hygiene maintenance practices. The system provides a clear understanding of waste generation patterns within the campus and highlights the importance of continued improvement through reduction strategies, increased awareness, and enhanced sustainable practices.

7.8 ACTIVITIES CONDUCTED

On 24th September 2025, a Clean Campus Drive was organized by the NSS Units at the college

- campus with the objective of ensuring a clean, plastic-free, and healthy environment. The
- initiative aimed to engage students in a community-led cleanliness campaign aligned with the
- vision of a Malinya Muktha (waste-free) Kerala. Various activities were conducted during the
- program, including cleaning of the college premises, removal and segregation of waste, and an
- awareness session for NSS volunteers on proper waste management practices. NSS volunteers,
- along with the NSS coordinator and non-teaching staff, actively participated in the event,
- contributing their time and effort towards maintaining campus hygiene. The program resulted
- in enhanced cleanliness within the campus and a noticeable reduction in littering behaviour
- among students, fostering a sense of environmental responsibility and collective action. On
- June 5 2025, the Department of Social Work observed the significance of World Environment
- Day and facilitated a college garden at college premises—the event aimed to promote
- environmental consciousness among students and contribute to campus greening efforts. The

- program included a delightful plantation and seed sowing at selected places on the college grounds





MAR DIONYSIUS COLLEGE, PAZHANJI
NATIONAL SERVICE SCHEME MD UNIT
124&175

NSS DAY
संक्षेप सेवा योजना
NATIONAL SERVICE SCHEME
Sep 24

PROGRAMME
"Mega Campus Cleaning"

- 24/09/25
- 1.30 Pm
- College campus

Programme coordinators: Ms. Anisha Ramdas Dr. Manjusha K K
Principal: Dr. Thomas Mathew

"Ready, Set, Clean"



Department of Travel and Tourism
In Association with Tourism Club
and DTPC Thrissur

ECO-FRIENDLY AWARENESS PROGRAMME

Kalashamala, Agathiyoor
Saturday,
25th October 2025
Time: 11 am

Flash Mob - Spreading
awareness through
art and energy!

Eco Awareness - Promoting Sustainable Tourism

Waste Management for a Greener

Leaflet
Educational
proper

MAR DIONYSIUS COLLEGE
Pazhanji, Thrissur
Affiliated to University of Calicut, Accredited with W Grade by NAAC

**MALINYAMUKTHAM
NAKARLAM
CLUB**
In Association with
National Service Scheme
Organize
**DIGITAL SCRAP
COLLECTION DRIVE**

Collection Centre : BBA Dept.

From
September 22 to 26
2025

MS. Anisha Ramdas
&
Dr. Manjusha KK
NSS COORDINATOR

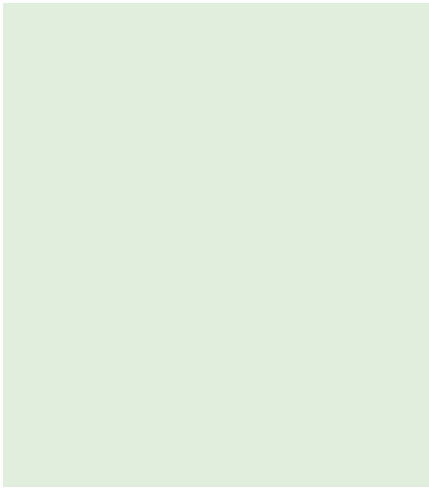
DR. RAJI A.M
malinyamuktham
CONVENER

Dr. Thomas Mathew
PRINCIPAL

Chapter VIII

OCCUPATIONAL HEALTH & SAFETY MANAGEMENT SYSTEM (OHS): AUDIT REPORT





OCCUPATIONAL HEALTH AND SAFETY MANAGEMENT SYSTEM COMMITTEE (2025-26)

Ms. Merlin Mary Thomas

Ms. Sujithra U

Assistant professors

Lavanya

Riza Nazar

Anjana K M

Mufeedha I.M

Amretha P.S

Farsana

Sreya

Amirtha T. K

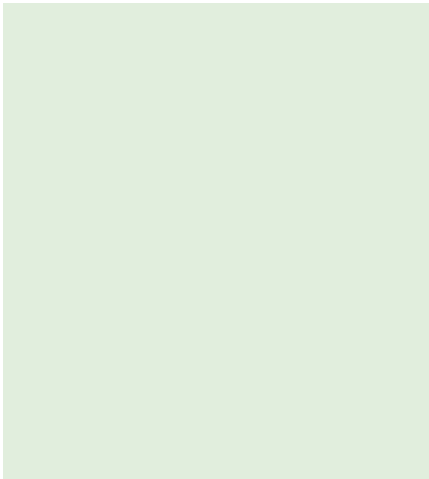
Afsal

Aswani Krishna

Amrutha A S

Malavika

Student representatives





Occupational Health and Safety Management: Audit Report

8.1 INTRODUCTION

A comprehensive review of Occupational Health and Safety (OHS) practices was conducted at Mar Dionysius College, Pazhanji, Thrissur District, to evaluate the institution's compliance with established safety standards and to identify potential hazards within the campus environment. The audit, carried out in accordance with ISO 45001 guidelines, focused on assessing infrastructure, emergency preparedness, chemical management, waste disposal systems, and the overall level of safety awareness among staff and students. This report presents the key findings, observations, and recommendations aimed at enhancing the health, safety, and well-being of all members of the campus community.

ISO 45001 serves as the internationally recognized standard for Occupational Health and Safety (OH&S) Management Systems. It emphasizes risk prevention, encourages innovation, and fosters continuous improvement, thereby providing organizations with a robust framework to enhance resilience and operational efficiency. The adoption of this global standard

strengthens an institution's capacity to effectively manage OH&S responsibilities while promoting greater engagement among students, faculty, and staff by visibly demonstrating a commitment to sustainable practices that ensure a safe and healthy environment. Furthermore, the implementation of health and safety audits at Mar Dionysius College, Pazhanji, Thrissur District, enables the assessment of the effectiveness of internal safety protocols, offering a comprehensive understanding of existing control mechanisms. Such audits facilitate the early identification of risks, allowing for the timely implementation of corrective measures to mitigate hazards and reduce the likelihood of accidents and unforeseen incidents. This proactive approach minimizes potential disruptions, enhances stakeholder confidence and motivation, and reinforces the institution's reputation while safeguarding it from adverse publicity that could affect its operations or collaborations.

ISO 45001 serves to align an organization's Occupational Health and Safety (OH&S) Management System with its strategic goals, thereby enhancing overall safety

performance and reinforcing a firm commitment to employee well-being. It provides a comprehensive framework for managing occupational risks and ensuring a safe and healthy working environment. The implementation of this standard reflects an organization's dedication to safeguarding its workforce while strengthening confidence among customers, investors, and other stakeholders. Furthermore, its alignment with the United Nations Sustainable Development Goals (SDGs) underscores its global relevance and significance. By adopting ISO 45001, institutions such as Mar Dionysius College, Pazhanji, Thrissur District, can demonstrate leadership in sustainable development and affirm their steadfast commitment to protecting and valuing their human resources.

8.1.1 What is health and safety audit?

A Health and Safety Audit entails a systematic evaluation of an organization's systems, procedures, and policies concerning the well-being of both students and staff to ensure compliance with applicable regulations and standards. The primary objective of the audit is to identify potential health and safety hazards, assess the effectiveness of internal risk management controls, and verify adherence to statutory and regulatory requirements.

8.1.2 Need for Occupational Health and Safety Audit

An Occupational Health and Safety (OH&S) audit is essential for identifying deficiencies and gaps within an organization's safety policies and operational procedures. It facilitates the evaluation of compliance with applicable statutory regulations and established safety standards while recommending appropriate measures to enhance the protection of employees and other stakeholders. Furthermore, such audits ensure that machinery, equipment, and institutional facilities conform to prescribed safety norms through systematic and comprehensive inspections, thereby promoting a secure and risk-free working environment.

8.2 OCCUPATIONAL HEALTH AND SAFETY MANAGEMENT SYSTEM POLICY

8.2.1 Statement Of Commitment

M.D. College, Pazhanji is committed to maintaining a safe, healthy, and inclusive environment that supports effective teaching, learning, and personal development. The college recognizes that ensuring occupational health and safety is essential for the well-being of its students, faculty, staff, and visitors. This policy outlines the institution's dedication to promoting a safe and hygienic campus by preventing hazards, encouraging health awareness, and fostering a culture of care and responsibility in all college operations.

Our institution is committed to providing a safe, healthy, and inclusive campus environment in compliance with all applicable national and state laws, including the Occupational Safety, Health and Working Conditions Code, 2020, the Draft Kerala Occupational Safety and Health Rules, 2021, the Kerala Public Health Act, 2023, and related statutory standards on fire safety, laboratory safety, sanitation, and workplace welfare. In addition, the college adheres strictly to all University Grants Commission (UGC) regulations, including the UGC Anti-Ragging Regulations, 2009 and subsequent amendments, and the UGC (Prevention, Prohibition and Redressal of Sexual Harassment of Women Employees and Students in Higher Educational Institutions) Regulations, 2015, ensuring a zero-tolerance approach to ragging and sexual harassment. The institution maintains structured safety systems—such as risk assessment protocols, emergency preparedness plans, first-aid and fire-safety arrangements, safety committees, and regular training for staff and students—to prevent hazards, promote wellbeing, and uphold a culture of responsibility and mutual respect across campus.

Through these measures, the institution aligns its Occupational Health and Safety framework with the United Nations Sustainable Development Goals, particularly SDG 3 (Good Health and Well-being), SDG 4 (Quality Education), SDG 5 (Gender Equality), SDG 8 (Decent Work and Economic Growth), and SDG 16 (Peace, Justice and Strong Institutions).

8.2.2 Vision

To cultivate a safe, healthy, and inclusive campus environment that promotes physical, mental, and emotional well-being, enabling all members of the college community to thrive academically, professionally, and personally.

8.2.3 Mission

- To ensure a hazard-free learning and working environment through systematic identification, assessment, and control of health and safety risks.
- To safeguard the physical, mental, and emotional well-being of students, faculty, staff, and visitors through preventive, promotive, and supportive health measures.
- To comply with all applicable occupational health, safety, and hygiene regulations and standards.
- To promote a culture of health awareness, responsibility, and accountability across academic and administrative functions.
- To strengthen institutional safety practices through regular inspections, audits, and continuous improvement mechanisms.
- To encourage active participation of all stakeholders in maintaining campus safety, wellness, and overall well-being.

8.2.4 Resource management

The institution affirms its responsibility to manage all physical, infrastructural, and operational resources in a manner that supports health, safety, and overall well-being. Campus resources shall conform to established safety, hygiene, and environmental standards to ensure a secure learning and working environment. The institution commits to maintaining conditions that support safe occupancy, functional integrity, and risk reduction, including appropriate environmental comfort, safety provisions, and sanitation standards. Resource management decisions shall reflect institutional accountability toward safety, regulatory compliance, and long-term sustainability.

8.2.5 Curriculum integration

Occupational health, safety, hygiene, and well-being principles shall form an integral part of the institution's academic and co-curricular framework. Teaching–

learning processes shall promote awareness of safety consciousness, risk prevention, personal well-being, and responsible conduct. Academic environments that involve practical engagement shall function within defined safety norms, and safety awareness shall be recognised as an essential component of academic responsibility wherever applicable.

The institution shall integrate occupational safety concepts into coursework through assignments, student projects, fieldwork protocols, internships, laboratory practices, and orientation programmes. Departments shall incorporate risk awareness, emergency response procedures, and ethical conduct into relevant academic activities to ensure that safety competence forms part of students' learning outcomes..

8.2.6 Purchasing and procurement

All purchasing and procurement activities of the institution shall conform to recognised occupational health, safety, and hygiene standards. Materials, equipment, furnishings, installations, and consumables procured by the institution shall comply with applicable safety, quality, and ergonomic norms. Vendors, contractors, and service providers associated with the institution shall be expected to adhere to statutory safety regulations and institutional requirements. Procurement decisions shall reflect the institution's commitment to minimising health risks and workplace hazards.

8.2.7 Research, innovation, and academic practices

All research, innovation, and academic practices undertaken within the institution shall be governed by established occupational health, safety, and ethical principles. Academic, laboratory, and research environments shall function in accordance with approved institutional safety protocols to safeguard physical, mental, and environmental well-being. Members of the academic community engaged in teaching, research, innovation, and scholarly activities shall be responsible for compliance with institutional safety norms, ethical standards, and regulatory requirements.

8.2.8 Community engagement

The institution recognises its responsibility to promote occupational health, safety, and well-being beyond the campus. Community engagement initiatives shall support awareness of healthy lifestyles, safety consciousness, mental well-being, and social inclusiveness. Institutional outreach activities shall align with core values and contribute to the broader objective of fostering a health-conscious, safe, and responsible society.

8.2.9 Monitoring and reporting

The institution shall maintain a structured mechanism for monitoring and reporting occupational health and safety performance. Documentation related to safety observations, incidents, near misses, and compliance status shall be systematically maintained. Periodic institutional reviews and assessments shall facilitate risk identification, ensure regulatory compliance, and support the continuous strengthening of health and safety standards.

The College shall implement a comprehensive and systematic risk assessment framework to identify and evaluate potential hazards across all campus operations, including academic spaces, laboratories, administrative areas, common facilities, and internal campus traffic systems. Risk assessments shall cover physical, environmental, operational, fire, electrical, sanitation, and road safety risks. Special attention shall be given to vehicular movement, pedestrian pathways, parking areas, speed regulation, and traffic control measures within the campus to ensure the safety of students, staff, and visitors. Identified risks shall be analysed based on likelihood and severity, and appropriate preventive and corrective measures shall be implemented in accordance with applicable safety standards. A documented risk register shall be maintained to record hazards, mitigation measures, responsible authorities, and review timelines, ensuring accountability and continuous improvement in occupational health and safety performance.

8.2.10 Compliance and review

All institutional operations shall comply with applicable national, state, and local occupational health, safety, and hygiene regulations. This policy shall be reviewed

at regular intervals to ensure alignment with regulatory updates, institutional priorities, and recognised best practices. Any revision or amendment to the policy shall be undertaken with the approval of the competent authority.

8.2.11 Leadership and accountability

The institution shall ensure effective leadership and shared accountability in the implementation of the Occupational Health and Safety Policy.

8.2.11.1 College Management

The College Management shall provide overall policy direction and institutional oversight for occupational health and safety. It shall ensure the allocation of necessary resources, maintain compliance with statutory safety requirements, facilitate periodic reviews and audits, and coordinate with relevant authorities as required. Monitoring of policy implementation shall be undertaken through the Occupational Health and Safety Committee.

8.2.11.2 Faculty and Staff

Faculty and staff shall be responsible for adhering to institutional occupational health and safety guidelines applicable to their roles. They shall report hazards or unsafe conditions in a timely manner, participate in safety-related training and preparedness measures, and ensure student safety during academic and institutional activities.

8.2.11.3 Students

Students shall comply with institutional safety instructions and established protocols, particularly in laboratories, workshops, and shared facilities. They shall actively cooperate with safety regulations and report health or safety concerns through appropriate channels.

8.2.11.4 Visitors and Contractors

All visitors, contractors, and service providers shall comply with institutional occupational health, safety, and hygiene requirements while present on campus. They shall report any identified hazards or emergencies to the designated authority.

8.2.12 Conclusion:

The Occupational Health and Safety Policy of M.D. College, Pazhanji is implemented through

a structured governance framework under the supervision of the Occupational Health and Safety Committee chaired by the Principal. The Committee is responsible for monitoring policy implementation, reviewing institutional safety performance, ensuring statutory compliance, and strengthening preventive and corrective measures across all academic and administrative domains.

The institution recognises that occupational health and safety extends beyond infrastructure compliance to include academic integration, risk-based planning, emergency preparedness, internal traffic and road safety management, research practices, and community engagement. Through systematic risk assessments, documented monitoring mechanisms, curriculum integration, and stakeholder participation, the college ensures that safety awareness becomes an integral part of institutional culture and academic responsibility.

Occupational health and safety is upheld as a shared institutional commitment. The College Management provides leadership and resources; faculty and staff integrate safety practices into teaching, research, and administration; students actively comply with safety norms; and visitors and contractors adhere to institutional guidelines. This collaborative approach strengthens accountability, promotes preventive safety culture, and ensures the well-being of all campus stakeholders.

M.D. College, Pazhanji remains committed to continuous improvement through periodic review, training, audit mechanisms, and alignment with statutory requirements and Sustainable Development Goals. The institution shall continuously enhance its systems to maintain a safe, healthy, inclusive, and resilient campus environment.

8.3 METHODOLOGY

The Occupational Health and Safety (OHS) Management Committee functions as the institution's internal audit body. The committee consists of designated faculty coordinators and student representatives. A structured system of registers and documentation has been established to facilitate systematic monitoring, evaluation, and continual

improvement of safety practices for staff, students, and campus visitors. This framework includes two registers and four essential documents that support effective record-keeping and compliance verification. The system operates in alignment with the institution's OHS Policy, which defines specific objectives, action plans, and strategic measures for safety management. The committee convenes periodically to review progress, assess compliance, and evaluate the effectiveness of implemented safety initiatives.

8.3.1 Internal Audit Training

Green Audit training promotes institutional commitment and active participation through structured and collaborative approaches. In preparation for this process, the college's Environmental Management System (EMS) identifies and nominates faculty members and students to participate in a one-day Internal Audit Training Programme. This programme was conducted on 27.06.2025 which equips and certifies participants as internal auditors, enabling them to conduct Occupational Health and Safety (OHS) audits effectively. The training encompasses key competencies such as risk identification and analysis, data collection and documentation, policy formulation, compliance evaluation, and audit reporting in accordance with established standards.

8.3.2 List of Registers and Documents to Monitor OHS

A comprehensive review was undertaken to evaluate the organization's Occupational Health and Safety (OHS) framework, encompassing policies, procedures, and compliance records. This assessment involved a systematic examination of: (1) safety protocols, (2) communication mechanisms, (3) emergency preparedness and response plans, and (4) incident and accident reports.

During the audit, potential hazards were identified across various locations on the campus. These included physical hazards in classrooms, corridors, staircases, and other common areas; concerns related to food safety, sanitation, and hygiene; the management of vehicular traffic and pedestrian movement within and around the campus; and ergonomic risks associated with academic and administrative work environments.

8.3.3 Respondents' Comments and Observations

The Internal Audit Team conducted systematic inspections of campus facilities to evaluate safety practices, maintenance conditions, and compliance with Occupational Health and Safety (OHS) regulations. Concurrently, the team engaged with faculty members, administrative staff, and students to obtain their feedback and perspectives on health and safety practices within the institution.

The audit further included a detailed assessment of existing risk control measures to determine their effectiveness in mitigating identified hazards. In addition, documentation related to health and safety training programmes for both staff and students was reviewed to verify adequacy, compliance, and implementation. These observations provided valuable insights into the institution's OHS performance and identified areas for continual improvement.

8.3.4 Campus Noise and Tree Mitigation Study

The assessment evaluates variations in noise levels across the college campus using a systematic sampling methodology. Sound levels were recorded at ten selected locations, including high-noise zones near roadways and areas adjacent to prominent tree cover, with the aid of a portable digital sound level meter. The measurements were documented in decibels (dB).

Noise readings were obtained in three sets—capturing minimum and maximum values—during the morning, midday, and evening periods to ensure temporal representation. The primary objective of this study is to identify noise-prone areas within the campus and analyse the data to assess the effectiveness of urban trees in mitigating noise pollution.

8.3.5 External Audit

An external audit is conducted by TIES to evaluate the organization's compliance with Occupational Health and Safety (OH&S) management standards. This assessment ensures that the established systems and procedures conform to recognized regulatory and ISO 45001 requirements. In instances where only minor non-conformities are identified, the organization may

be considered eligible for ISO certification, subject to the implementation of appropriate corrective actions.

8.3.6 Stages of Occupational Health and Safety Management Audit

Occupational health and safety management audit has three phases: Pre-audit, audit, and post-audit.

8.3.6.1. Pre-audit phase

- Formation of audit team; scheduling audit programmes
- Setting up of scope and objectives (in tune with the occupational health and safety management policy of the institution)
- Discusses with the responsible persons of each location (staff, teachers, lab assistants, sweepers, watchmen, students, etc.) about the waste generation pattern, and provisions of their management.
- Documentation of all existing materials and provisions for health and safety measures inside the campus.

8.3.6.2. Audit phase

Auditors collect all data to ensure that nothing is overlooked completely in the audit. The following information has been collected during the audit phase:

- Assessment of collected data in relation with environmental policy and waste management policy of the college/university.
- Review of present emergency health and safety management systems and enhancement suggestions.

8.3.6.3. Post audit phase

The plan of action for the post-audit phase implementation and follow-up. All possible suggestions for the improvement of OHS in the respective institution.

OHS committee will ensure that the Occupational health and safety Management System is functional at expected level and the college is participating, by making the entire college/university community well informed through regular communications, monitoring

through periodical evaluation programmes etc.

8.3.7 Steps of Occupational Health & Management Audit

8.3.7.1. Site assessment

- Collection of contour map and campus diagram; For ensuring safety infrastructure and alternative method applied during renovation of campus.
- Walk through survey; Identification of risks and their nature, category etc.: recording existing practices and provisions regarding OH&S system in

the college.

8.3.7.2. Data analysis

Analysis of current and past performance (pre audit and post audit performances, previous audit data etc.)

8.3.7.3. Final audit by external audit team

- Data verification- identifying non conformities
- Action plan –long term and short term
- Final report & certification as per ISO standards.

8.3.8. Work plan and schedule of occupational health and safety report

Date to date	Work Plan
15-07-2025	OHS Committee Formation
18-08-2025	Policy Making , Sample Data Collection, Develop Agenda & schedule for activities.
21-08-2025	Data collection
26-08-2025	Data collection
12-09-2025	Awareness among staff and students on safety and sustainability Posters, sessions
15-09-2025	OHS committee Review meeting
23-09-2025	Classroom risk assessment
24-09-2025	Classroom risk assessment
08-10-2025	Canteen risk assessment ,cleanliness, food expiry data
9-10-2025	Fire safety assessment
15-10-2025	Vehicle data -questionnaire circulation
23-10-2025	Data entry and finalisation

Table 8.1. Schedule of occupational health and safety audit

Activities	Frequency	Dates of study	Mode of data Collection
Sound recording data	9 days; three times a day	Three working day 17/03/2026, 18/03/2026, 19/03/2026	Entry in the given format

Table 8.2. Workplan of occupational health and safety audit

8.4 RESULT AND DISCUSSION

Maintaining safety on campus is a fundamental legal duty for academic institutions, regulated by Occupational Health and Safety (OHS) standards. Failure to comply may lead to serious consequences such as legal action and reputational harm. In contrast, following OHS norms offers legal security while building trust within the institutional community. This responsibility is especially important for safeguarding students, including minors, by ensuring proper maintenance of facilities and a safe working environment for staff, thereby improving morale and efficiency. Overall, developing a strong culture of safety is both a legal requirement and an ethical responsibility; it reassures parents, enhances community confidence, and positively influences the institution's reputation and admission prospects.

8.4.1.OHS System of the College

The institution has established a comprehensive Occupational Health and Safety (OHS) management system in alignment with ISO 45001 standards to ensure

a safe, secure, and efficient campus environment. This structured system enables the systematic identification and monitoring of potential health and safety hazards, while ensuring the proper functioning and maintenance of essential facilities such as laboratories, canteen services, and first-aid provisions. In addition, controlled visitor management practices are implemented to strengthen campus security and reduce potential risks.

Effective emergency preparedness and response procedures are in place to protect all stakeholders and enhance institutional reliability. In accordance with internationally recognized frameworks (EU-OSHA, HSE, OSHA), the institution follows a "whole-institute" approach to integrate OHS principles into both academic and administrative practices. This includes incorporating risk awareness, health and well-being initiatives, and a sense of shared responsibility into the curriculum and campus activities. Continuous collaboration with relevant authorities and regulatory bodies further supports the effectiveness and sustainability of the institution's OHS framework.

8.4.2.Risk areas of the college and existing OHS facilities

Sl. No.	RISK AREA	TYPE OF RISK	HAZARDS	EXISTING OHS SYSTEM
1	Chemistry, Zoology, Botany, and Biochemistry laboratories	Chemical, physical, biological	Toxins Burning chemicals Pathogenic organisms	not applicable
2	Physics, computer and language laboratories	Electrical	Shock	Breakers and elcb
3	Roads and campus safety	Vehicle accidents	Health issues including fatality Road accident Falling into canal	Signanges are there ,pedestrian walk area exists,
4	Canteen, Hostel mess and other food serving areas	Sanitation, hygiene and food safety issues; drinking water quality. LPG connection safety	Food poisoning; health issues Possibilities for leaking Fire, and when in contact with intense heat	Water quality is regularly checked(yearly) FSAAI certified , staffs have health cards food quality maintained. No cases of food poisoning reported.

5	General issues			Water quality is regularly checked(yearly)
	Water quality-related issues	Water-borne or water-related diseases	Infections; water-borne diseases	
	Electrical distribution system related	Improper earthing Unbalanced and a lack of harmonious	Shocks; damages to equipment	Elcb and breakers
	Ragging Sexual harassment Violence	Mental well being	Conflict between the college students	Anti ragging cell, student and staffs grievance redressal cell.
	Frequent health issues	Physical well being	Infections Diseases Accidents Mental stress	Sick room facility available.
6	Women safety	Psychological well-being	Safety Health Social support	Women cell,
7	Emergency response system	Safety protocol	Diseases Disaster Medical emergency	Basic emergency response procedures in place
8	First Aid Frailties	Emergency medical support	Injuries Diseases Accident	Basic first-aid kits are available on campus.
9	Infrastructure facilities	Outdoor and indoor facilities Hostel	Safety Emergency exit Recreation Networking	Yes available Rails and emergency exits
10	Register and documents	Safety Health Emergency	safety and security framework procedures for incident management, the implementation and practice of emergency protocols through regular drills, and the enforcement of campus access control measures.	Maintained.

Table 8.3. Analysis of identified risks and strategic mitigation measures

The assessment of identified risk areas and corresponding OHS provisions was carried out to examine the nature of hazards and the adequacy of existing control measures across academic, service, and campus environments. The observations indicate that while certain controls are in place, their effectiveness varies across different risk domains.

In the laboratory environments, chemical, biological, and physical hazards are prominent, particularly in chemistry, zoology, botany, and biochemistry laboratories, where exposure to toxic substances, burning chemicals, and pathogenic organisms is reported. The absence of clearly defined OHS systems in these laboratories indicates a significant control gap. In contrast, physics, computer, and language laboratories primarily face electrical risks, which are comparatively better managed through the provision of breakers and ELCB systems.

The evaluation of campus roads and safety conditions highlights critical concerns. The approach road to the second campus experiences congestion, and the adjacent canal-side footpath lacks protective barriers, increasing the likelihood of accidental falls. Internal roads are observed to have no designated pedestrian pathways or adequate signage, thereby elevating the risk of vehicle-related incidents. Although certain measures such as signage and pedestrian provisions are reported, their adequacy and implementation appear inconsistent.

In food service areas, including the canteen and hostel mess, risks related to sanitation, hygiene, and LPG safety are identified. Existing controls such as periodic water quality testing, FSSAI certification, staff health cards, and maintenance of food quality indicate basic compliance with safety standards. However, the inherent risks associated with food contamination, gas leakage, and fire hazards necessitate continuous monitoring and adherence to safety protocols.

General institutional risks include water quality issues, electrical distribution concerns, and student-related safety aspects. Potential hazards such as water-borne diseases and electrical shocks are recognized, with partial mitigation through monitoring systems, ELCBs, and breakers. Psychosocial risks, including ragging, harassment, and student conflicts, are addressed

through established mechanisms such as anti-ragging committees and grievance redressal systems. However, broader health concerns, including infections, accidents, and stress-related issues, indicate the need for more comprehensive health and safety strategies.

The institution has provisions for women's safety, with dedicated support systems such as a women's cell, contributing to psychological and social well-being. Infrastructure-related facilities, including emergency exits, safety rails, and hostel provisions, are available and functional, supporting general safety requirements.

However, emergency response systems and first aid facilities are identified as areas requiring improvement. The absence of a well-defined and uniformly implemented emergency response framework, along with limited accessibility to first aid support, indicates gaps in preparedness for medical emergencies and disaster situations.

Administrative controls, including the maintenance of registers and documentation related to safety, health, and emergency protocols, are in place, reflecting a structured approach to record-keeping and procedural compliance.

Overall, the analysis shows that while basic OHS mechanisms and institutional controls are present, there are notable deficiencies in laboratory safety systems, road safety management, and emergency preparedness, which require strengthening to ensure effective risk mitigation and overall campus safety.

8.4.2.1 Health

- The institution has established basic health support facilities to address the immediate medical needs of students and staff. A dedicated sick room is available on campus to provide temporary care and rest for individuals who become unwell, while first-aid facilities are maintained to manage minor injuries and medical emergencies. These provisions contribute to the overall well-being and safety of the campus community by ensuring prompt initial care whenever required.
- The institution has a Physics Laboratory, Computer Laboratories to support practical learning as part

of the academic curriculum. These laboratories are used for subject-related practical sessions under the guidance of the respective faculty members. Students are expected to follow the prescribed laboratory rules and basic safety instructions while using the facilities. The laboratories provide the necessary infrastructure for conducting practical exercises and assist in reinforcing theoretical concepts through hands-on learning.

- The college canteen operates under a valid FSSAI certification and possesses the necessary licenses and approvals from the relevant authorities, ensuring compliance with applicable food safety regulations. Canteen employees possess valid health cards, undergo regular medical check-ups, and are trained in hygienic food handling practices. Food items are sold at reasonable and clearly displayed prices, and regular inspections are conducted by the college or health authorities to ensure continuous compliance. A first aid box is available within the canteen premises, and the seating arrangements are safe, comfortable, clean, and not overcrowded, providing a secure dining environment for students. The canteen maintains several good hygiene practices, including regular monitoring of ingredient expiry dates, clean and sanitized cooking and serving areas, provision of filtered drinking water, periodic cleaning of water storage tanks, and cleaning of tables, chairs, and utensils after every use. Waste segregation is practiced, and regular pest control measures are implemented to maintain a hygienic environment. Emergency exits are clearly marked and accessible, electrical appliances and wiring are properly maintained, and adequate ventilation is provided in the cooking area. However, the occupational health and safety (OHS) risk assessment identified several areas requiring immediate attention. Fire extinguishers are not available or are not in working condition, representing a critical fire safety concern. Raw food is not stored separately from cooked food, increasing the risk of cross-contamination, and staff are not consistently wearing gloves, aprons, and hair covers while handling food. In addition, food waste is not disposed of properly, allergen information is not displayed for food items, and

vegetarian and non-vegetarian foods are not clearly labelled. Addressing these identified gaps through appropriate corrective measures will further strengthen food safety, hygiene, and consumer protection within the college canteen.

- The institution conducts periodic water quality assessments through an accredited laboratory to evaluate key physical, chemical, and microbiological parameters of the campus drinking water supply. The latest analysis confirms that the water is suitable for consumption and complies with the prescribed safety standards. Water is supplied throughout the campus via a well-maintained distribution network connected to overhead storage tanks. To ensure continued water hygiene, the storage tanks are cleaned at regular intervals, and appropriate sanitation measures, including periodic chlorination of the surrounding areas, are undertaken under the supervision of the designated maintenance personnel. These routine monitoring and maintenance practices ensure the availability of safe and reliable drinking water for the campus community.
- The institution has provided a sanitary napkin vending machine and a sanitary napkin incinerator to support menstrual hygiene management. The vending machine ensures easy access to sanitary napkins for female students and staff, while the incinerator facilitates the safe and hygienic disposal of used sanitary napkins. These facilities promote menstrual hygiene and support the health and well-being of female students and staff.

8.4.2.2 Emergency Management System

The college has established emergency preparedness measures to address medical, fire, and safety-related incidents. Emergency contact details are displayed in key locations, and staff are trained to respond to basic emergencies. Evacuation routes and exits are identified in major buildings. Communication during emergencies is managed through official notices and digital platforms. While basic systems are in place, a more structured and centralized emergency response framework with regular mock drills is required to improve preparedness.

8.4.2.3 Environmental Health

The institution maintains a clean and hygienic campus environment through regular housekeeping, sanitation practices, and routine maintenance of academic and common-use areas. Basic environmental health measures are followed to support the well-being of students and staff, with attention given to cleanliness and proper waste handling. The existing practices contribute to a healthy campus environment, while continued improvements in waste minimization and sustainable resource management can further strengthen environmental performance.

8.4.2.4 Facilities

The institution provides essential facilities to support academic and non-academic activities. Laboratories, classrooms, library services, canteen, and drinking water facilities are available. Basic hygiene and maintenance systems are in place to ensure usability. Sports and recreational facilities contribute to student well-being. However, certain areas require modernization, improved maintenance, and better safety integration to ensure uniform facility standards across the campus.

8.4.2.5 Infrastructure Assessment

The infrastructure of the college includes academic blocks, laboratories, administrative buildings, and common facilities. Electrical systems are monitored with safety devices, and structural safety measures are partially implemented. Some areas show good maintenance, while others require repair and modernization. Issues related to pedestrian movement, signage, and internal safety design are observed. Overall, infrastructure safety is moderate, but requires systematic upgrades for improved risk prevention.

8.4.2.6 Empowering Inclusive Systems in College

The institution is committed to promoting an inclusive environment by providing essential support for differently abled students. Wheelchair facilities are available on campus to assist individuals with mobility needs, and scribe assistance is provided during examinations based on applicable requirements. These measures help facilitate equitable access to academic activities and reflect the institution's efforts to support inclusive participation. The college continues to foster an accessible learning environment while exploring opportunities to further strengthen its inclusivity initiatives.



Fig. 8.1 Existing OHS facilities

8.4.2.7. OHS Facilities Offered in the College

SL NO	FACILITIES OFFER	LOCATION
1	Rails and Ramps	Near physis lab and self finance section
2	Lift	1 st floor, self finance section
4	Emergency exit	Near physics lab
6	Accessible signages	Parking area, pedestral walk,
7	Scribe and examinations	Near pariksha bhavan
8	Wheelchair facilities	Near principals office
9	First aid	Near Office building

Table 8.4. List of facilities available

8.4.2.8. Fire Extinguishers

SL NO	COUNT	CAPACITY	LOCATION
1	3	4KG	Block 1 and block 2, 1 st floor varantha
2	3	4KG	Block 1 and block 2, 2nd floor varantha
3	3	4KG	Block 1 and block 2, 3rd floor varantha
4	3	4KG	AIDED, 1 st floor varantha
5	3	4kg	AIDED, 2 nd floor varantha
6	3	4kg	AIDED, 3 RD Floor varantha
7	1	4kg	AUDITORIUM(INSIDE)
8	1	4kg	AUDITORIUM(OUTSIDE)
9	3	4kg	ADMINISTRATIVE BLOCK(GROUND, 1 ST , 2 ND FLOOR)
10	1	4kg	AIDED (OFFICE)
11	1	4kg	AIDED-ENGLISH DEPT
12	1	4kg	AIDED-LIBRARY
13	1	4kg	BLOCK 1-MANAGEMENT OFFICE
14	1	4kg	BLOCK-1-BCOM DEPT
15	1	4kg	BLOCK-2-PSYCHOLOGY-BSW DEPT
Total	29		

Table 8.5. Fire extinguisher strength

The assessment of fire extinguisher distribution across the campus indicates the availability of a total of 29 units, each with a capacity of 4 kg, installed at various strategic locations including academic blocks, aided sections, administrative areas, and the auditorium.

A significant concentration of extinguishers is observed along the verandah areas of Blocks 1 and 2, as well as the aided block across all floors, ensuring coverage in high-occupancy academic zones. The administrative

block is also equipped with extinguishers on multiple levels, contributing to safety in operational areas. Additionally, individual units are placed in key functional spaces such as the auditorium (both inside and outside), departmental offices, library, and management office, indicating an effort to extend fire protection to critical points within the institution.

However, the placement pattern suggests that extinguishers are largely concentrated in corridor and

common access areas, with comparatively limited allocation within specialized or high-risk zones such as laboratories and service areas. The uniform capacity of all units (4 kg) reflects standardization; however, the suitability of this capacity for different risk categories requires consideration.

While the presence of fire extinguishers across multiple locations demonstrates basic compliance with fire safety requirements, the effectiveness of the system depends on factors such as accessibility, visibility,

maintenance status, and user awareness. The current distribution highlights the need to ensure adequate coverage in all risk-prone areas and proper positioning for immediate use during emergencies.

Overall, the institution has established a foundational fire protection system through the provision of extinguishers, but further optimization in terms of location-specific adequacy and operational readiness is required to enhance fire safety preparedness.

8.4.3.Risk Assessment Report

Sl. No	Location	Block/Area	Risk Assessment Findings	Remarks
1	Aided Classrooms	Academic Block	Adequate lighting (80%); old and damaged furniture observed	Repair and replacement required
2	Self-Financing Classrooms	Academic Block	Excellent lighting (95%) and modern seating facilities	Good condition
3	Aided Classrooms	Academic Block	Old wiring and exposed switches reported	Electrical upgrade needed
4	Self-Financing Classrooms	Academic Block	Concealed and well-maintained wiring	Safe
5	Aided Classrooms	Academic Block	Limited fire safety awareness and lack of extinguishers	Training and equipment required
6	Self-Financing Classrooms	Academic Block	Fire safety equipment installed in corridors	Maintain
7	Aided Classrooms	Academic Block	Overcrowding and unclear emergency exits	Install signage and monitor occupancy
8	Self-Financing Classrooms	Academic Block	Adequate space and visible exit signage	Good
9	Aided Classrooms	Academic Block	Limited ICT facilities (50%)	Upgrade required
10	College Canteen	Service Area	Valid FSSAI certification, regular inspections, safe seating	Good compliance
11	College Canteen	Service Area	Fire extinguishers absent or non-functional	Critical risk
12	College Canteen	Service Area	Raw and cooked food not stored separately	High contamination risk
13	College Canteen	Service Area	Staff not consistently using PPE	Hygiene issue
14	College Canteen	Service Area	Safe drinking water and proper cleaning practices	Good

15	College Canteen	Service Area	Improper disposal of food waste	Needs improvement
16	College Canteen	Service Area	Allergen details not displayed; veg/non-veg not labelled	Consumer safety issue
17	Science Laboratories	Lab Block	Exposure to chemicals, toxins, pathogens	OHS system needs strengthening
18	Physics & Computer Labs	Lab Block	Electrical shock risk	ELCB and breakers installed
19	Internal Roads	Campus Infrastructure	No pedestrian pathway; unsafe canal-side footpath	High accident risk
20	Water Supply System	Utilities	Risk of water-borne diseases	Regular monitoring done
21	Electrical Distribution	Utilities	Improper earthing and load imbalance issues	Controlled using ELCB
22	Student Interaction Areas	Campus	Risk of ragging, harassment, conflicts	Anti-ragging & grievance cell active
23	Women Facilities	Campus	Safety and psychological concerns	Women cell functioning
24	Emergency Systems	Campus	Lack of structured emergency preparedness	Needs improvement
25	First Aid Points	Campus	Limited availability across areas	Improve accessibility
26	Building Infrastructure	Campus	Emergency exits and rails available	Maintain
27	Administrative Records	Campus	Safety documentation maintained	Good
28	Accessibility Facilities	Campus	Ramps, lift, wheelchair available	Good
29	Accessibility Facilities	Campus	Electric exam table not available	Needs provision
30	Physics Laboratory	Lab Block	Clean, organized, safety rules followed	Satisfactory
31	Physics Laboratory	Lab Block	Fire extinguisher, first aid, emergency exits available	Well prepared

Table 8.6. Summary of risk assessments results

The risk assessment was conducted across academic, service, laboratory, and campus infrastructure areas to evaluate compliance with Occupational Health and Safety (OHS) requirements. The findings indicate varying levels of compliance across different functional zones.

In the academic block, self-financing classrooms demonstrate satisfactory conditions with adequate

lighting, proper electrical installations, sufficient space, and clearly indicated emergency exits. In contrast, aided classrooms exhibit multiple deficiencies, including damaged furniture, outdated and exposed wiring, limited ICT facilities, inadequate fire safety measures, and overcrowding. The absence of proper emergency exit signage further increases the risk level in these areas.

The canteen facility shows partial compliance, with valid certification, safe drinking water, and general cleanliness maintained. However, critical issues were identified, including non-functional or absent fire extinguishers, improper segregation of raw and cooked food, inconsistent use of PPE by staff, and inadequate food waste disposal. The absence of allergen information and food labeling also indicates gaps in consumer safety practices.

In the laboratory block, specific facilities such as the physics laboratory maintain satisfactory safety conditions, including adherence to safety protocols and availability of emergency equipment. However, general science laboratories present risks related to exposure to chemicals and hazardous substances, indicating the need for strengthened OHS control measures. Electrical risks in certain labs are partially managed through installed protective systems.

Assessment of campus infrastructure and utilities highlights safety concerns such as the absence of

pedestrian pathways and unsafe walkways, posing accident risks. Utility systems, including water supply and electrical distribution, are under monitoring; however, issues such as load imbalance and potential health risks require continuous supervision.

Institutional mechanisms such as anti-ragging systems, grievance redressal, and women support facilities are functional and contribute positively to campus safety. Accessibility provisions such as ramps and lifts are available, though certain assistive facilities require improvement. Emergency preparedness remains limited, with insufficient structured systems and inadequate distribution of first aid facilities across the campus.

Overall, the assessment indicates that while compliance is observed in selected areas, gaps persist in infrastructure safety, fire protection, hygiene practices, and emergency preparedness, requiring targeted corrective actions to ensure effective OHS implementation.

8.4.4. Vehicle Details of the Institution

Status	Four-wheeler	Two-wheeler	Three-wheeler
Number of four-wheelers	8	0	0
Number of Two-wheeler	0	95	0
Number of electric two-wheeler vehicles	0	5	0
Number of electric four-wheelers	1	0	0
Number of four-wheelers saved	2	0	0
Number of two-wheelers saved	0	34	0
Number of three-wheelers	0	0	0

Table 8.7. Vehicle details

Status	Four-Wheeler	Two-Wheeler	Three-Wheeler
Teaching Staff	3	18	0
Non-Teaching Staff	2	7	0
Students	3	70	0
Total	8	95	0

Table 8.8. Distribution of Four-Wheelers, Two-Wheelers, and Three-Wheelers Among Teaching Staff, Non-Teaching Staff, and Students

The assessment of institutional vehicle data indicates the presence of 8 four-wheelers and 95 two-wheelers, with no three-wheelers reported within the campus. The vehicle profile is therefore predominantly composed of two-wheelers, reflecting a greater reliance on this mode of transportation among the college community.

The survey also identified the use of electric vehicles, comprising 5 electric two-wheelers and 1 electric four-wheeler, demonstrating the presence of low-emission transportation options within the institution. However, conventional fuel-based vehicles continue to constitute the majority of the vehicle population.

Based on the available records, 2 four-wheelers and 34

two-wheelers were reported under the saved category. In addition, the distribution of vehicles among different user groups shows that students account for the largest share of vehicle users, with 70 two-wheelers and 3 four-wheelers. Teaching staff reported the use of 18 two-wheelers and 3 four-wheelers, while non-teaching staff accounted for 7 two-wheelers and 2 four-wheelers.

Overall, the findings indicate that two-wheelers remain the preferred mode of daily commuting across all user groups within the institution. The presence of electric vehicles, although limited, reflects an emerging adoption of sustainable mobility practices and provides opportunities for further promotion of environmentally friendly transportation options in the future.

8.4.5 Noise level analysis of the campus

Sl No	Location	Sound (in dB)	
		Min	Max
1.	Canteen	59.5 ± 3.4	75.3 ± 4.6
2.	Front Gate	68.1 ± 3.1	95.1 ± 6.5
3.	Portico	57.3 ± 2.5	75.7 ± 4.1
4.	Aided Block	58.6 ± 3.0	76.0 ± 3.6
5.	Self-Financing Block	58.8 ± 3.5	78.0 ± 3.4

Table 8.9. Sound recording at different zones of the college



Fig. 8.2 Campus noise monitoring

8.4.5.1 Highest Sound Levels:

The front gate recorded the highest sound levels among all monitored locations, with a maximum noise level of 95.1 ± 6.5 dB and a minimum of 68.1 ± 3.1 dB. The elevated noise levels can be primarily attributed to vehicular movement, traffic-related activities, and the continuous flow of students, staff, and visitors through the main entrance. Owing to its direct exposure to external road traffic, the front gate experiences greater noise intrusion compared to other areas of the campus. The recorded maximum value is substantially higher than the noise levels generally recommended for educational environments by the Central Pollution Control Board (CPCB), indicating the significant influence of transportation-related activities on the campus acoustic environment. These findings identify the front gate as the most noise-prone zone within the institution.

8.4.5.2 Lowest Sound Levels:

The portico area exhibited the lowest recorded sound levels, with a minimum value of 57.3 ± 2.5 dB. This comparatively lower noise environment can be attributed to its semi-enclosed structure and reduced exposure to direct traffic flow. Similarly, the aided and self-financing blocks also maintained relatively controlled sound levels, indicating moderate acoustic conditions within academic zones.

8.4.5.3 Sound Level Variability:

A noticeable variation in sound levels is observed across different campus locations. The front gate shows a wide fluctuation range (68.1 ± 3.1 dB to 95.1 ± 6.5 dB), indicating irregular noise patterns influenced by varying traffic intensity. In contrast, areas such as the aided block, self-financing block, and portico demonstrate relatively stable sound profiles, suggesting limited external disturbances and more controlled internal activity. The canteen area records moderate variability, which may be linked to peak usage periods and human activity levels.

8.4.5.4 Contributing Factors:

Vehicular Traffic: The primary contributor to elevated noise levels, especially near the front gate, due to frequent entry and exit of vehicles.

Human Activity: Increased movement and interaction in

areas such as the canteen contribute to moderate noise levels.

Structural Layout: Semi-enclosed and interior locations such as portico and academic blocks help in reducing direct exposure to external noise sources.

8.5. CONCLUSION

- The Occupational Health and Safety (OHS) audit of Mar Dionysius College, Pazhanji indicates that the institution has established a functional safety management framework supported by an OHS policy, institutional committees, documentation systems, and stakeholder participation. The college demonstrates commitment towards ensuring the health, safety, and well-being of students, staff, and visitors through regular monitoring, awareness programmes, fire safety provisions, accessibility facilities, and welfare initiatives.
- The audit findings reveal that several safety measures are effectively implemented across the campus; however, certain areas require further improvement. Key concerns identified include strengthening laboratory safety practices, improving emergency preparedness, enhancing first-aid accessibility, addressing road and pedestrian safety issues, and ensuring uniform implementation of safety measures across all campus facilities.
- Overall, the institution exhibits a moderate to good level of compliance with Occupational Health and Safety requirements. By implementing the recommended corrective measures and adopting a continuous improvement approach aligned with ISO 45001 principles, the college can further strengthen its safety culture and develop a safer, healthier, more inclusive, and resilient campus environment for all stakeholders.

8.6. RECOMMENDATIONS

- **Upgrade Academic Infrastructure:** It is essential to repair or replace damaged furniture in aided classrooms and upgrade outdated electrical wiring and exposed switches. Improving ICT facilities and ensuring proper lighting and ventilation will

- enhance both safety and the learning environment.
- **Enhance Fire Safety Systems:** Although fire extinguishers are available, their distribution should be extended to high-risk areas such as laboratories and the canteen. Regular maintenance, periodic inspection, and conducting fire safety training and mock drills are necessary to ensure operational readiness during emergencies.
- **Strengthen Laboratory Safety:** Laboratories, especially in chemistry, zoology, botany, and biochemistry, require a structured OHS framework. Standard operating procedures (SOPs), proper chemical storage, hazard labeling, and mandatory use of personal protective equipment (PPE) should be strictly implemented to minimize exposure risks.
- **Improve Canteen Hygiene and Safety:** While basic compliance is maintained, improvements are required in ensuring the functional status of fire extinguishers, proper segregation of raw and cooked food, consistent use of PPE by staff, and scientific waste disposal methods. Displaying allergen information and food labeling will further strengthen consumer safety.
- **Develop Pedestrian and Road Safety Measures:** The absence of designated pedestrian pathways and unsafe canal-side walkways pose significant risks. It is recommended to mark pedestrian zones, install proper signage, and construct protective barriers along canal-side paths. Traffic regulation measures such as speed control, parking management, and awareness programmes should also be introduced.
- **Strengthen Emergency Preparedness:** A well-defined and structured emergency response system needs to be established. Regular emergency drills, clear evacuation plans, and visible emergency signage should be implemented across all blocks to ensure preparedness for fire, medical, and disaster situations.
- **Improve First Aid Accessibility:** First aid facilities should be increased and strategically distributed across the campus. Training programmes on basic first aid and emergency response should be provided to staff and students to ensure immediate response during accidents.
- **Ensure Water Quality and Health Safety:** Continuous monitoring of water quality must be maintained to prevent water-borne diseases. Periodic testing and timely corrective actions should be ensured to safeguard the health of the campus community.
- **Enhance Accessibility and Inclusivity:** Although basic facilities such as ramps and lifts are available, additional provisions like electric examination tables and improved assistive support systems should be introduced to ensure inclusivity for differently-abled individuals.
- **Promote Sustainable Transport Management:** Considering the high number of two-wheelers, proper traffic management strategies, organized parking systems, and promotion of electric vehicles should be encouraged to reduce congestion and environmental impact.
- **Control Noise Pollution:** Elevated noise levels, particularly near the front gate, require monitoring and regulation. Establishing silent zones and implementing green buffers or awareness measures can help maintain a conducive academic environment.
- **Strengthen OHS Framework and Safety Culture:** The institution should further develop its Occupational Health and Safety system into a fully integrated and continuously improving framework. Regular awareness programmes, safety training sessions, and active participation of all stakeholders will help build a strong safety culture across the campus.
- **Targeted Infrastructure Improvements:** Areas under construction or high-risk zones should be clearly marked with caution signage. Coordination with contractors and strict adherence to safety regulations are necessary to prevent accidents and ensure safe movement within the campus.

8.7. OCCUPATIONAL HEALTH AND SAFETY PLAN

8.7.1. Occupational Health and Safety Management Committee Team

The Occupational Health and Safety (OHS) Committee is constituted with representation from faculty members, administrative staff, and student representatives to ensure coordinated implementation of safety measures across the campus. The Committee functions in collaboration with the Internal Quality Assurance

Cell (IQAC) to oversee compliance, monitor ongoing activities, and guide the execution of safety-related initiatives. Regular review meetings are conducted to evaluate progress, address identified risks, and strengthen future planning.

8.7.2. Objectives

- Ensure compliance with occupational health and safety standards and institutional requirements
- Promote a safe, hygienic, and secure campus environment for all stakeholders
- Identify and assess potential hazards across academic and non-academic areas
- Strengthen awareness regarding safety practices and responsible behaviour
- Improve preparedness for emergencies through systematic planning and assessment

8.7.3. Implement Strategies to Accomplish the Objectives

- **Structured Planning and Documentation:** Develop a systematic framework for OHS implementation, including preparation of activity schedules, maintenance of registers, and standardisation of documentation practices to ensure proper record keeping and audit readiness.
- **Campus Inspection and Hazard Identification:** Conduct detailed campus visits to identify existing hazards and assess safety conditions in laboratories, classrooms, canteen facilities, and electrical systems.
- **Data Collection and Safety Assessment:** Carry out systematic data collection through field observations, inspection records, and structured tools to evaluate current safety practices and identify gaps.
- **Area-Specific Risk Assessment:** Perform focused risk assessments in classrooms across aided and self-financing sections, evaluate canteen hygiene and food safety practices, and assess electrical and fire safety conditions within the campus.

- **Safety Review and Analysis:** Undertake comprehensive review of collected data to identify high-risk areas, prioritise concerns, and support informed decision-making for corrective measures.
- **Awareness and Stakeholder Engagement:** Organise awareness programmes, including sessions and visual campaigns, to enhance safety knowledge, promote responsible behaviour, and encourage participation of students and staff in maintaining a safe campus environment.
- **Data Compilation and Reporting:** Ensure systematic compilation, verification, and finalisation of collected data, forming the basis for institutional reporting and further planning.

8.7.4. Establish Effective Communication Channel and Oversight Authority

- **Multi-Channel Communication:** Safety-related information is communicated through institutional platforms such as notice boards, digital media, and departmental interactions to ensure timely dissemination.
- **Defined Roles and Responsibilities:** Committee members are assigned specific areas for monitoring, including classrooms, laboratories, canteen, and infrastructure systems.
- **Faculty Oversight:** Heads of Departments and faculty members ensure that safety instructions and updates are effectively communicated to students.
- **Reporting Mechanism:** Periodic reports on safety activities and observations are submitted to IQAC for institutional documentation and review.

8.7.5. Set Short-Term and Long-Term Targets

8.7.5.1 Short-Term Goals:

- Complete campus-wide hazard identification and risk assessment in all major functional areas
- Strengthen documentation practices, including maintenance of safety registers and inspection records
- Improve safety conditions in classrooms, canteen

facilities, and electrical systems through immediate corrective measures

- Conduct awareness programmes to enhance safety knowledge and behavioural practices among stakeholders
- Assess and improve fire safety preparedness within the campus

8.7.5.2 Long-Term Goals:

- Establish a structured and sustainable OHS management system within the institution
- Strengthen infrastructure safety across academic and support facilities
- Implement continuous monitoring systems for hygiene, safety, and maintenance practices
- Enhance emergency preparedness and response mechanisms
- Develop organised traffic and vehicle management practices within the campus

8.7.6. Implement Ongoing Monitoring and Refinement Mechanism

- Periodic review of safety registers, inspection records, and collected data to ensure accuracy and completeness
- Continuous monitoring of high-risk areas such as electrical installations, laboratories, and canteen facilities
- Collection of feedback from stakeholders to assess awareness programmes and identify areas for improvement
- Regular review meetings of the OHS Committee to evaluate effectiveness of implemented measures
- Refinement of safety strategies based on observations, data analysis, and institutional requirements

8.7.7. Comprehensive Evaluation and Follow-up Procedure

At the end of each review cycle, the OHS Committee

undertakes a comprehensive evaluation of all implemented activities, including hazard identification, risk assessments, and awareness programmes. Progress towards identified targets is assessed, and gaps are documented for corrective action.

A detailed report is prepared and submitted to the Principal and IQAC for further review and institutional action. Identified issues are addressed through appropriate follow-up measures, ensuring continuous improvement in safety performance.

8.7.8. Conclusion

The institution demonstrates a systematic and action-oriented approach to occupational health and safety through structured planning, targeted interventions, and continuous monitoring. The implementation of the OHS Plan supports the identification and mitigation of risks while promoting awareness and responsible practices among stakeholders. Sustained efforts in monitoring and evaluation will further strengthen safety standards and contribute to a secure and well-managed campus environment.

8.8 SUMMARY

- The institution demonstrates a structured commitment towards ensuring the health, safety, and well-being of its students, staff, and visitors through the implementation of an Occupational Health and Safety (OHS) management system aligned with ISO 45001 standards. The presence of defined policies, safety committees, risk assessment frameworks, and documentation systems reflects a systematic approach to safety governance. Regular monitoring of water quality, maintenance of sanitation standards, and compliance with food safety regulations in the canteen indicate the institution's effort to uphold public health. However, the limited distribution of first-aid facilities and the absence of a fully structured emergency response mechanism highlight the need for strengthening centralized health support systems to ensure timely and efficient response during emergencies. Continuous monitoring and periodic review will be essential to maintain and enhance these safety standards.
- The institution maintains a transparent and

accountable safety management system through structured documentation, audit mechanisms, and internal review processes. The existence of registers, incident records, and monitoring frameworks facilitates the identification of hazards and supports continuous improvement. Despite these strengths, certain infrastructural deficiencies—such as inadequate fire safety provisions in specific areas, lack of emergency preparedness systems, and insufficient safety awareness in aided classrooms—pose potential risks. Laboratory environments, particularly in science disciplines, require further strengthening of safety protocols to effectively manage chemical, biological, and physical hazards. Addressing these gaps through improved infrastructure, safety equipment, and training programmes will enhance institutional preparedness and operational safety.

- The assessment highlights that while certain academic and administrative areas demonstrate satisfactory compliance, notable variations exist across different campus zones. Self-financing classrooms and specific laboratory facilities exhibit better safety conditions, whereas aided classrooms show deficiencies such as outdated wiring, damaged furniture, overcrowding, and inadequate fire safety measures. The canteen, although compliant in terms of certification and basic hygiene, presents critical concerns including improper food segregation, inconsistent use of personal protective equipment, and absence of fire safety arrangements. These findings indicate the need for uniform implementation of safety standards across all functional areas to ensure consistent protection for all stakeholders.
- The evaluation of campus infrastructure reveals significant concerns related to road safety and mobility management. The absence of designated pedestrian pathways, lack of proper signage, and unsafe canal-side walkways increase the risk of accidents within the campus. The high number of two-wheelers further contributes to traffic congestion and safety challenges. Although basic monitoring systems are in place, there is a need for improved traffic regulation, structured movement planning, and enhanced safety infrastructure to

minimize risks associated with vehicular movement and pedestrian interaction.

- The institution has taken steps to ensure inclusivity and student welfare through the provision of facilities such as ramps, lifts, wheelchairs, and support systems including anti-ragging mechanisms, grievance redressal systems, and women's safety initiatives. The availability of menstrual hygiene facilities further enhances student health and well-being. Health and well-being programmes, including awareness campaigns, fitness activities, medical camps, and mental health sessions, reflect a holistic approach to student development. However, certain accessibility provisions, such as specialized assistive equipment, require further enhancement to ensure comprehensive inclusivity and equal access for all individuals.
- The analysis of fire safety infrastructure indicates the availability of fire extinguishers across multiple locations within the campus, demonstrating basic compliance with safety requirements. However, the concentration of extinguishers in common areas and limited coverage in high-risk zones such as laboratories and service areas highlight the need for improved distribution and location-specific planning. Ensuring proper maintenance, visibility, and user awareness is essential to enhance the effectiveness of fire safety systems and emergency response capabilities.
- The noise level assessment across the campus indicates moderate to high variation, with the front gate identified as the most noise-prone area due to vehicular traffic and external influences. While interior academic zones maintain relatively stable sound levels, peak noise values at entry points highlight the need for mitigation measures. The implementation of vegetative barriers, traffic control strategies, and regulated entry systems can help reduce noise exposure and create a more conducive learning environment.
- Overall, the institution has established a foundational OHS framework supported by policy, infrastructure, and stakeholder participation. However, the effectiveness of implementation varies across different domains, indicating

the need for a more integrated and risk-based approach to safety management. Strengthening laboratory safety systems, improving emergency preparedness, enhancing first-aid accessibility, and addressing infrastructure-related risks will be critical in advancing the institution's OHS performance. Continuous improvement through training, monitoring, and adherence to regulatory standards will enable the institution to achieve a safe, resilient, and sustainable campus environment.

8.9. ACTIVITIES CONDUCTED

A series of impactful programmes were organized by various clubs and departments of Mar Dionysius College, Pazhanji, during the academic year 2025, with the objective of promoting health, well-being, and social responsibility among students as well as the local community. These initiatives reflected the institution's commitment to holistic development through awareness creation, preventive healthcare, and community engagement.

On 18th July 2025, the Vimukthi Club organized a Drug Awareness Class as part of its Anti-Drug Campaign in the College Auditorium at 1:30 PM. The programme was conducted in connection with National Anti-Drug Addiction Day and focused on creating awareness about the harmful effects of drug abuse. The session emphasized the importance of adopting a drug-free lifestyle and encouraged students to actively participate in spreading awareness within their communities. The initiative played a significant role in sensitizing students towards the social and health implications of substance abuse.

Subsequently, on the same day at 2:30 PM, the Fitness and Yoga Club conducted a Zumba Training Programme titled "Fusion of Rhythm and Resilience" in the College

Auditorium. The programme aimed to promote physical fitness, reduce stress, and enhance mental well-being through engaging dance-based workouts. The session witnessed enthusiastic participation from students, encouraging them to incorporate fitness activities into their daily routines and highlighting the importance of maintaining an active lifestyle.

Earlier, on 28th June 2025, the Fitness Club of Mar Dionysius College, Pazhanji, in collaboration with Ahalia Foundation Eye Hospital, Palakkad, organized a Free Eye Check-Up Camp at the MD College Hall, Pazhanji, from 9:30 AM to 12:30 PM. The camp provided free consultations and basic eye screening services to the local community. A large number of beneficiaries availed the services, and the initiative underscored the institution's dedication to promoting public health and community welfare through accessible healthcare services.

Continuing its focus on mental and emotional well-being, the Centre for Happiness, in association with the Department of Psychology and the Mindscape Club, organized an Art Therapy Session on 26th September 2025 at GVHSS Pazhanji. The session provided participants with a platform for emotional expression and stress management through creative art practices. It highlighted the therapeutic benefits of art in enhancing psychological well-being and encouraged individuals to explore creative methods for coping with stress and emotional challenges.

Overall, these programmes demonstrated the institution's integrated approach towards education by combining awareness, health initiatives, and personal development activities. Such efforts contribute significantly to fostering a balanced, healthy, and socially responsible student community while extending meaningful support to the wider society.



MAR DIONYSIUS COLLEGE, PAZHANJI
 Department of Psychology, Centre for
 Happiness in association with IQAC
 Organizes

ART THERAPY SESSION
 "CREATE, CONNECT, REFLECT"

26-09-2025
 2.30pm

GHSS Pazhanji

PRINCIPAL
 DR. THOMAS MATHEW

SELF FINANCING HEAD
 DR. G. RAJEEV

HEAD OF DEPARTMENT
 SITHA LAKSHMI

PROGRAM COORDINATOR
 CHANDRALEKHA P.D.



മാർ ഡയോണീഷ്യസ് കോളേജിന്റെ ഫിറ്റ്നസ്, യോഗ ക്ലബ്ബുകളും അവില്ലി ഫാണ്ടേഷൻ കണ്ണാശുപത്രിയും സംയുക്തമായി കാട്ടുകാനാൽ ഗ്രാമ പഞ്ചായത്തിലെ നിവാസികൾക്കുവേണ്ടി നടത്തുന്ന

സൗജന്യ നേത്ര പരിശോധനാ ക്യാമ്പ്

2025 ജൂൺ 26 ശനിയാഴ്ച
 രാവിലെ 9.30 മുതൽ 12.30 വരെ

ക്യാമ്പിന്റെ സവിശേഷതകൾ

- കേരളത്തിലെ പ്രശസ്തമായ അപ്രേമ പാണ്ടേഷൻ കണ്ണാശുപത്രിയിലെ വിദഗ്ദ്ധരായ ഡോക്ടർമാർ നേത്രസംബന്ധമായ എല്ലാ രോഗങ്ങളും പരിശോധിച്ച് ചികിത്സ നിർവ്വഹിക്കുന്നതാണ്.
- പരിചയ സ്വന്തമായ ഹിപ്പോമെറ്റ്രിറ്റുകളുടെ സേവനം ലഭ്യമാണ്.
- തിരിശ്ശി ശസ്ത്രക്രിയ ആവശ്യമുള്ള രോഗികൾക്ക് ഫ്രീ പ്രകർ, പ്രമേഹം എന്നിവ സാമ്പത്തിക പരിശോധിക്കുന്നതാണ്. സ്കാനിംഗും ലഭ്യമാണ്.
- മിതമായ നിക്ഷേപം തിരിശ്ശി ശസ്ത്രക്രിയ ചെയ്തു കൊടുക്കുന്നു.
- മറ്റ് നേത്ര രോഗങ്ങളുമായി കൂടി ബന്ധപ്പെട്ട ചികിത്സയ്ക്ക് അവസരമുണ്ട്. ആവശ്യമുള്ളവർക്ക് ആശുപത്രിയിൽ ഡോക്ടർ ഫീസും രജിസ്ട്രേഷൻ ഫീസും സാമ്പത്തികമായി കണ്ണ പരിശോധിച്ച് കണ്ണ നിർദ്ദേശിക്കുന്നവർക്ക് മിതമായ നിക്ഷേപം നൽകുന്നതാണ്. ആവശ്യമുള്ളവർ അഡ്മിൻ നൽകി ബുക്ക് ചെയ്യേണ്ടതാണ്.
- ക്യാമ്പിൽ പങ്കെടുക്കുന്നവർ സ്വന്തം ഫോൺ നമ്പർ കൈയ്യിൽ കരുതേണ്ടതാണ്. രഹിതരായ ഈ സംരംഭം വിജയമാക്കുവാൻ എല്ലാവരും ക്യാമ്പിൽ പങ്കെടുക്കുവാൻ താൽപ്പരപ്പെടുന്നു.

ബുക്കിംഗിന് ബന്ധപ്പെടുക

JISHNU MANIKANDAN 9747364950	MATHEW ISSAC 9847027626	SANJAY V.S. 7510973219
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ആകാംക്ഷകളോടെ...

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FOR ORDER

NEAR 24x7 SUPERMARKET
 PAZHANJI, TRIVANDRUM
 8086 89 40 35

**MAR DIONYSIUS COLLEGE
 PAZHANJI**

NATIONAL SERVICE SCHEME UNIT 124 & 175

Community Outreach Program

HRIDAYA SPARSH

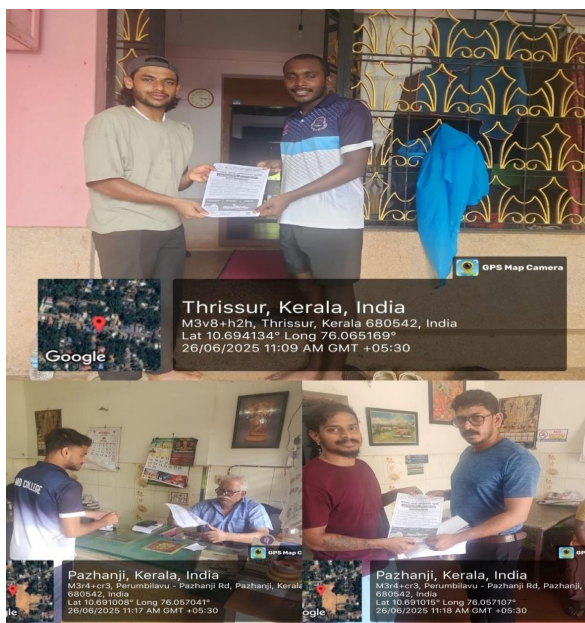
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DIVYADARSHAN
 OLD AGE HOME,
 KUNNAMKULAM

Program Coordinators
 Ms Anisha Ramdas Dr Manjusha K K

Principal
 Dr Thomas Mathew

"Spreading smiles, sharing hearts - NSS with our elders."



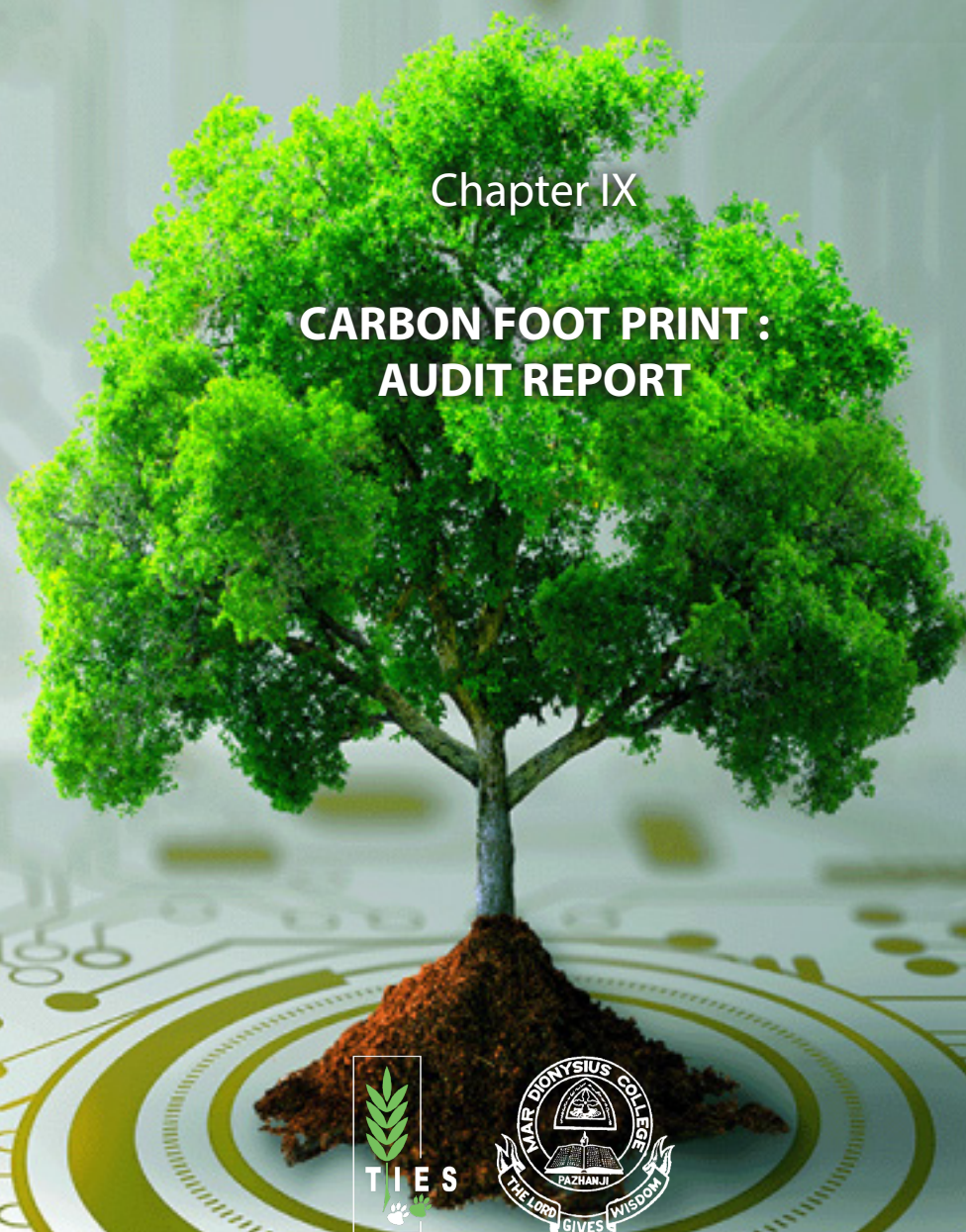


Thousands have lived without love,
not one without water.

- H Auden

Chapter IX

CARBON FOOT PRINT : AUDIT REPORT





Sustainable Development is the pathway
to the future we want for all it offers
a framework to generate economic growth
achieve social justice, exercise, environmental
stewardship, and strengthen governance

- Ban Ki - Moon



9.1. INTRODUCTION

A carbon footprint is the total amount of greenhouse gases (GHGs), primarily carbon dioxide (CO₂) and methane (CH₄), emitted into the atmosphere by an individual, organization, or institution through its daily operations. For higher educational institutions, measuring the carbon footprint is a critical step in assessing environmental sustainability, driving institutional accountability, and fostering climate literacy among the academic community.

This chapter presents a comprehensive Carbon Footprint Analysis for Mar Dionysius College, Pazhanji, evaluating the greenhouse gas emissions associated with its campus infrastructure, energy usage, waste production, water distribution, and transportation patterns during the 2024–25 academic period.

9.2. INSTITUTIONAL BACKGROUND

Mar Dionysius College, Pazhanji, operates as a vibrant academic hub with a well-defined stakeholder base. For the academic year 2024–25, the total strength of the college community stands at 1,136 individuals. The institutional demographic breakdown is as follows:

- Students : 1,053
- Teaching Staff : 53
- Non-Teaching Staff : 30
- Total Campus Population : 1,136

Understanding this baseline population is crucial, as it serves as the primary denominator for calculating per capita emissions, allowing for benchmark comparisons against other regional and global academic institutions.

9.3. METHODOLOGY & EMISSION FACTORS

To accurately quantify the net carbon footprint of the campus, emissions are categorized into three operational boundaries based on internationally recognized protocols:

- Scope 1 (Direct Emissions): On-site fossil fuel combustion, specifically Liquefied Petroleum Gas (LPG) utilized within the campus canteens. (Note: Diesel generator fuel data was noted as incomplete or unquantified in the raw records and is excluded from the quantitative totals to maintain audit integrity).

- Scope 2 (Indirect Emissions): Emissions originating from purchased grid electricity supplied by the Kerala State Electricity Board (KSEB).
- Scope 3 (Other Indirect Emissions): Downstream and upstream value chain impacts, focusing specifically on municipal solid waste generation and municipal water supply operations.
- Carbon Offsets: Emission reductions achieved via renewable energy generation (Solar PV installations) and communal transport initiatives (vehicle pooling and fuel-saving practices).
- Two-Wheelers (Petrol): 2.232 kg CO₂ e / Liter
- Four-Wheelers (Petrol/Diesel Average): 2.493 kg CO₂ e / Liter

9.4. RESULTS & DATA ANALYSIS

9.4.1. Energy Management System & Emissions

Energy consumption data from the external energy audit shows varying baselines depending on the assessment mode. To establish a conservative and verified carbon footprint from the utility grid, the KSEB Bill Analysis value of 23,472 kWh/year is utilized as the baseline for actual imported power.

9.3.1. Emission Factors Applied

The calculations are derived using standard Indian context baseline emission factors:

1. Grid Electricity (KSEB): 0.727 kg CO₂ e /kWh (Central Electricity Authority, India Grid Average).
2. LPG Consumption: 2.983 kg CO₂ e /kg.
3. Water Distribution/Pumping Energy Proxy: 0.00043 kg CO₂ e /Liter.
4. Municipal Solid Waste (Mixed Average): 0.696 kg CO₂ e / kg.
5. Transportation Fuel Proxies (Saved):
 - Scope 2 Grid Electricity Emissions: 23,472 kWh x 0.727 kg CO₂ e/kWh = 17,064.14 kg CO₂e (17.06 t CO₂ e/year)
 - Renewable Energy Mitigation (Solar Offset): The campus houses an active on-grid solar production framework generating 19,071.80 kWh/year. This green power generation offsets grid emissions directly: 19,071.80 kWh x 0.727 kg CO₂ e/kWh = -13,865.20 kg CO₂ e (-13.87 t CO₂ e/year)

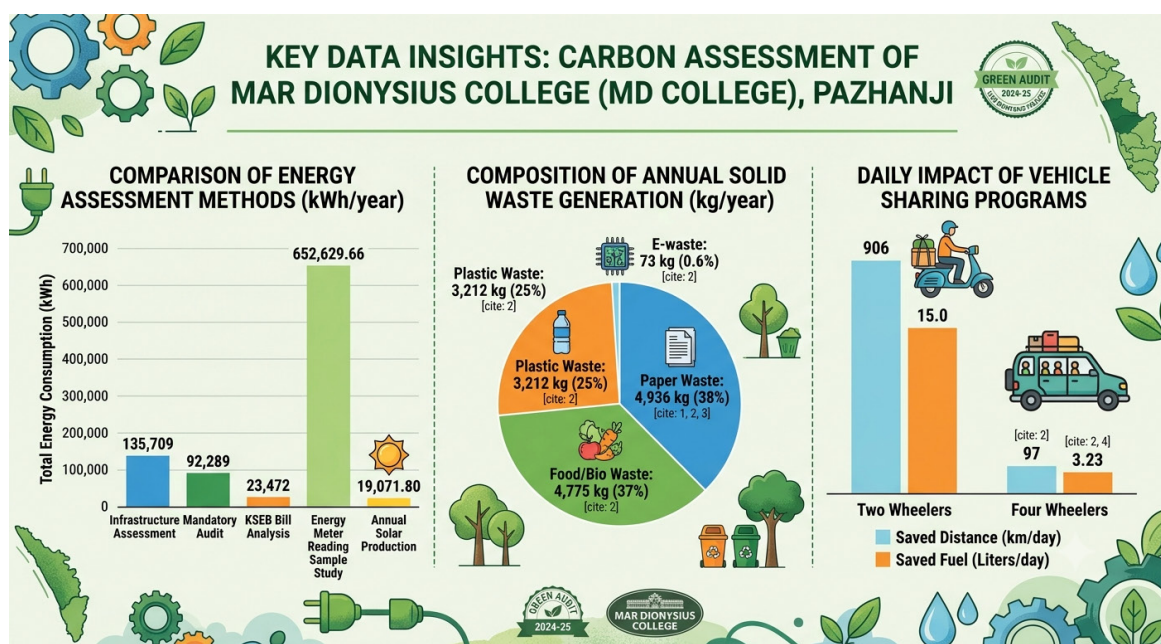


Fig. 9.1. Driving factors of Carbon assessment of M.D. College

9.4.2. Other Energy Resources (LPG)

The institution's primary Scope 1 direct emissions stem from commercial LPG cylinder usage within the campus canteen operations. The documented aggregate annual consumption is 20,380 kg of LPG.

- Scope 1 LPG Emissions:
 $20,380 \text{ kg} \times 2.983 \text{ kg CO}_2 \text{ e/kg} = 60,793.54 \text{ kg CO}_2 \text{ e}$
 $(60.79 \text{ t CO}_2 \text{ e/year})$

9.4.3. Transportation & Commuting Offsets

The campus community actively practices vehicle sharing and green transit. The recorded distance reductions translate directly to avoided carbon footprints:

- Two-Wheeler Carpooling: Saves 905.8 km/day, which totals 181,160 km/year in avoided transit distance. At an average structural efficiency, this equates to substantial fuel preservation.
- Four-Wheeler Carpooling: Saves 97 km/day, totalling 19,400 km/year.
- Electric Vehicle Transition: The adoption of electric two-wheelers and four-wheelers accounts for 48,000 km/year driven emissions-free on the road.

Using regional vehicle fuel economies, the total baseline emissions prevented by community actions calculate to

an offset of -7.44 t CO₂ e/year.

9.4.4. Water Efficiency Management System

The total estimated annual water usage across all washrooms, departments, and canteen infrastructures amounts to 15,049,040 Liters/year. Pumping and filtering water requires electrical overhead, contributing to Scope 3 indirect emissions:

- Scope 3 Water Emissions:
 $15,049,040 \text{ Liters} \times 0.00043 \text{ kg CO}_2 \text{ e/Liter} = 6,471.09 \text{ kg CO}_2 \text{ e}$
 $(6.47 \text{ t CO}_2 \text{ e/year})$

9.4.5. Waste Management System

The aggregate solid waste generated across the college office, classrooms, and cafeteria locations amounts to 12,994.75 kg/year. The composition profile includes:

- Plastic Waste : 3,211.65 kg/year
- Food/Bio Waste : 4,774.55 kg/year
- Paper Waste : 4,935.90 kg/year
- E-Waste : 72.65 kg/year
- Scope 3 Waste Disposal Emissions:
 $12,994.75 \text{ kg} \times 0.696 \text{ kg CO}_2 \text{ e/kg} = 9,044.35 \text{ kg CO}_2 \text{ e}$
 $(9.04 \text{ t CO}_2 \text{ e/year})$

9.5. SUMMARY EMISSION LEDGER & PER CAPITA IMPACT

The institutional carbon balance sheet consolidates all operational parameters below:

Emission Category (Sources)	Gross Emissions (t CO ₂ e/year)	Carbon Offsets (t CO ₂ e/year)
Scope 1: LPG Canteen Fuel	60.79	—
Scope 2: Grid Electricity (KSEB)	17.06	—
Scope 3: Water Usage & Solid Waste	15.51	—
Solar PV Generation Mitigation	—	-13.87
Communal Transport Sharing Savings	—	-7.44
TOTALS	93.36 t CO ₂ e	21.31 t CO ₂ e

Table 9.1. Carbon emission-offset table for M.D. College

9.5.1. Net Carbon Footprint Calculation

Net Carbon Footprint = Gross Emissions – Offsets
 Net Carbon Footprint = 93.36 t CO₂e - 21.31 t CO₂e =
 72.05 metric tons of CO₂e/year

9.5.2. Per Capita Carbon Footprint

Using the actual institutional population strength of
 1,136 campus community members:

Per Capita Footprint = 72.05 t CO₂e X 1,000 kg / 1,136
 individuals = 63.42 kg of CO₂e / person / year

9.6. BIODIVERSITY MANAGEMENT SYSTEM

(Campus Flora & Fauna)

The campus maintains a balanced ecosystem that helps regulate local microclimate conditions. Ecological sampling reveals a rich biological landscape:

- Trees: 45 distinct species recorded with an abundance of 229 individual trees. These trees serve as a natural physical sink, providing continuous baseline carbon sequestration.
- Faunal Diversity: The ecosystem supports 31 bird species, 24 butterfly species, as well as various dragonflies, reptiles, and mammals, indicating low ecological toxicity and functional green cover.

9.7. RECOMMENDATIONS

1. Introduce Biogas Infrastructure: Currently, there is no biogas plant on campus. The canteen and cafeteria discard 4,774.55 kg of food/bio waste annually. Implementing a standard plug-flow anaerobic digester would convert this organic matter into cooking gas, immediately decreasing

the high dependency on commercial LPG cylinders and trapping fugitive methane.

2. Expand Rooftop Solar PV Arrays: While the current solar framework offsets roughly 13.87 tons of CO₂e, expanding panels onto unutilized building roofs can push the college into a net-negative electricity exporter position.
3. Enforce Paperless Administration Systems: Paper waste accounts for the largest solid fraction at 4,935.90 kg/year. Transitioning examinations and administrative filings to digital cloud frameworks would sharply lower indirect Scope 3 procurement emissions.
4. Introduce Water Harvesting Upgrades: Given the baseline flow rate consumption of over 15 million liters, setting up greywater recycling plants for toilet flushing can drastically minimize the electrical pump workloads required to fulfill daily demands.

9.8. CONCLUSION

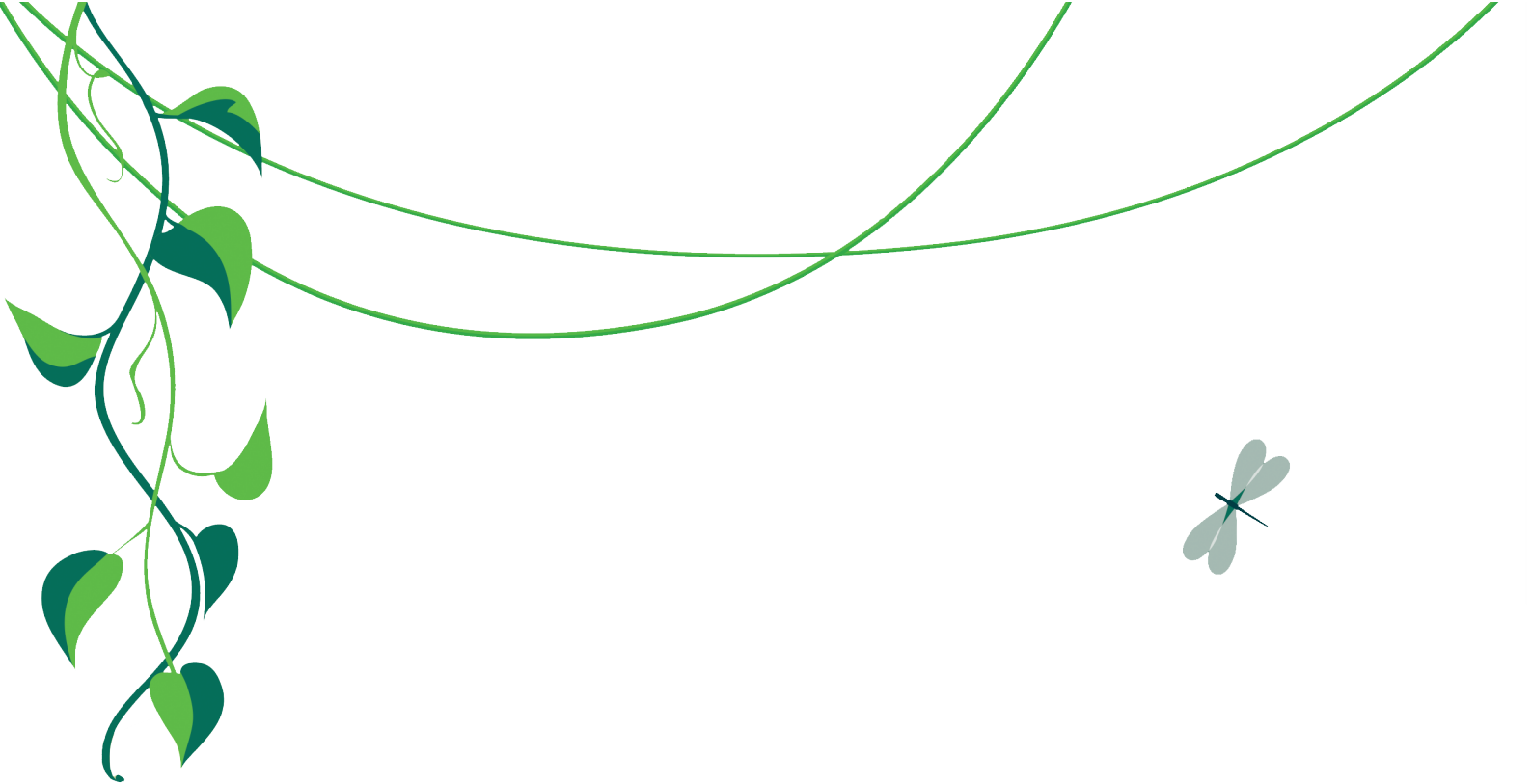
Mar Dionysius College, Pazhanji, exhibits a commendable net carbon footprint profile of 72.05 t CO₂e/year, with a highly sustainable per capita footprint of 63.42 kg of CO₂e per person. While the current clean energy and transit carpooling efforts provide remarkable offsets, the institutional dependency on LPG fuel remains the largest operational contributor to greenhouse gas generation. By expanding solar arrays, building a functional food-waste biogas system, and managing water overhead efficiently, the college is exceptionally well-positioned to lead by example and progress steadily toward a net-zero institutional status.



Chapter X

**GENERAL CONCLUSION OF
GREEN AUDIT &
RECOMMENDATIONS**





Never doubt that a small group of thoughtful,
committed citizens can change the world;
indeed, it is the only thing that ever has.

- Margret Mead

General Conclusions & Recommendations

10.1 GENERAL CONCLUSION

10.1.1 SDG 7 Affordable and Clean Energy

- The Energy Management System (EnMS) assessment indicates that the institution has an established electrical infrastructure to support its academic and administrative operations. The installation of a 40 kWp rooftop solar photovoltaic system demonstrates the institution's commitment to renewable energy adoption and contributes to reducing dependence on grid electricity.
- The assessment identified several areas requiring improvement to enhance electrical safety, operational reliability, and energy performance. Observations related to earthing arrangements, protective devices, electrical panels, cable management, and fire safety measures were noted at various locations. The power quality assessment also indicated phase imbalance and uneven load distribution, highlighting the need for improved load management and periodic monitoring of the electrical system.
- The audit also identified opportunities to strengthen preventive maintenance practices, documentation, and emergency preparedness measures, including the maintenance of electrical records and implementation of safety procedures. Addressing

these observations through appropriate corrective measures and regular monitoring will contribute to improved electrical safety, reduced energy losses, and the continued improvement of the institution's Energy Management System.

10.1.2 SDG 6 Clean Water and Sanitation

- The assessment indicates that the institution maintains an adequate water supply system supported by three borewells, one open wells, and ten water storage tanks with a combined storage capacity of 36,750 litres. The available water storage infrastructure ensures a reliable and continuous water supply for various institutional requirements across different campus buildings and facilities. The campus water distribution network was generally found to be in satisfactory condition, with no major leakages or damaged fixtures observed during the audit. However, the ageing infrastructure and inadequately designed plumbing network make it difficult to accurately quantify annual water consumption and may affect the overall efficiency of the water supply system.
- The water pumping records revealed a high dependence on mechanical pumping, with considerable variations in pumping durations

corresponding to fluctuations in campus water demand. These observations highlight the need for improved pump scheduling, enhanced monitoring, and demand-side water management measures to optimise water and energy use.

- Water quality assessment identified certain concerns during the initial testing phase, including low pH and the presence of coliform bacteria. Following the implementation of corrective measures, subsequent testing confirmed that the supplied water met acceptable quality standards. The recent initiation of rainwater harvesting and the substantial generation of grey water within the campus present significant opportunities for improving water availability and promoting sustainable water resource management. The commissioning of the Sewage Treatment Plant and the effective utilisation of treated grey water can further strengthen water conservation efforts.
- Overall, the institution has established a basic framework for water management through its water supply infrastructure, monitoring mechanisms, and conservation initiatives. Nevertheless, further improvements in infrastructure, periodic water quality monitoring, and the integration of alternative water management practices are necessary to enhance water-use efficiency and ensure the sustainable management of water resources within the campus.

10.1.3 SDG 12 Responsible Consumption and Production

- The existing waste management practices include the collection and segregation of waste, followed by its disposal through appropriate channels. The recent installation of colour-coded waste segregation bins is a positive initiative towards improving source-level waste segregation on the campus. At present, food waste generated on the campus is managed through composting, while other collected waste is handed over to Haritha Karma Sena for further management thereby supporting sustainable waste management practices
- The analysis of waste generation patterns indicates

that paper, biodegradable, and plastic wastes constitute the major waste streams within the institution and that waste generation is directly influenced by campus occupancy and activity levels. While waste segregation practices have been initiated, the continued generation of these waste streams highlights the need to strengthen waste minimisation measures, improve source-level segregation, and promote the adoption of sustainable alternatives.

- The institution manages domestic liquid waste through its existing sanitation and drainage infrastructure. Further improvements in waste collection points, waste segregation, storage facilities, and awareness initiatives can enhance the overall waste management system.
- Overall, the institution has initiated measures to improve waste management through waste segregation and appropriate disposal practices. Further strengthening of waste minimisation strategies, waste management infrastructure, and environmental awareness programmes will contribute to the continuous improvement of the institution's waste management system and support its long-term sustainability goals.

10.1.4 SDG 15 Life on Land

- The biodiversity assessment documented the presence of a variety of floral and faunal groups within the campus. The existing vegetation provides habitat and resources for birds, butterflies, dragonflies, reptiles, and mammals, reflecting the ecological value of the campus.
- The diversity patterns observed across different taxa indicate variations in species composition and distribution within the campus. Some groups exhibit comparatively higher diversity, while others show lower species representation and uneven distribution, highlighting the need for habitat improvement and biodiversity conservation measures.
- The biodiversity management initiatives undertaken by the institution provide a basis for biodiversity conservation and monitoring activities. However, the limited area available for conservation due to

built-up infrastructure and the predominance of planted vegetation influence the overall biodiversity composition and distribution within the campus.

- The present biodiversity assessment provides a baseline for future monitoring and conservation planning. Continued habitat enrichment, diversification of vegetation structure, increased planting of suitable native species, and periodic biodiversity monitoring will support the long-term conservation and sustainable management of campus biodiversity.

10.1.5 SDG 3 Good Health and Well-being

- The Occupational Health and Safety (OHS) audit of Mar Dionysius College, Pazhanji assessed the occupational health and safety measures available on the campus. The audit covered the institution's OHS policy, institutional committees, fire safety provisions, accessibility facilities, and welfare measures.
- The audit findings indicate that the institution has implemented various occupational health and safety measures; however, certain areas require further improvement. Variations in safety provisions were observed across different campus areas, with infrastructural and operational gaps identified in specific locations. Key areas requiring attention include emergency preparedness, first-aid accessibility, road and pedestrian safety, and the consistent implementation of safety measures across campus facilities. The fire safety assessment identified the availability of fire extinguishers at multiple locations; however, limited coverage in certain areas indicates the need for improved placement, maintenance, and awareness. The noise level assessment showed variations across the campus, with comparatively higher noise levels near the front gate due to vehicular traffic, indicating the need for appropriate mitigation measures.
- Overall, the Occupational Health and Safety audit provides a baseline assessment of the existing health and safety measures within the institution. Addressing the identified gaps through improvements in emergency preparedness,

first-aid accessibility, fire safety provisions, noise management, and related infrastructure will strengthen occupational health and safety practices and support the continuous improvement of the campus environment.

10.1.6 SDG 13 Climate Action

The institution exhibits a commendable net carbon footprint of 72.05 tCO₂e/year, with a sustainable per capita carbon footprint of 63.42 kg CO₂e per person per year. While the current clean energy initiatives and transit carpooling efforts provide significant carbon offsets, LPG consumption remains the largest operational contributor to greenhouse gas emissions. By expanding rooftop solar photovoltaic systems, establishing a functional food-waste biogas system, and improving water-use efficiency through conservation and recycling measures, the institution is well-positioned to further reduce its carbon footprint and progress towards achieving a net-zero institutional status.

10.2 GENERAL RECOMMENDATION

- Energy Management System (EnMS): Strengthen the implementation of the Energy Management System by addressing the deficiencies identified in electrical safety, improving preventive maintenance practices, and establishing a systematic monitoring framework for energy consumption. The performance of the existing 40 kWp rooftop solar photovoltaic system shall be periodically evaluated to maximise renewable energy generation and improve overall energy efficiency.
- Water Management and Conservation: Develop a comprehensive water management framework through detailed mapping of the water supply and distribution network, installation of appropriate monitoring mechanisms, and periodic assessment of water consumption patterns. The recently initiated rainwater harvesting system and the potential for grey-water reuse shall be integrated into the campus water management strategy to improve water-use efficiency and reduce dependence on groundwater resources.

- **Waste Management System:** Further strengthen waste management practices by improving waste collection and storage infrastructure, strengthening source-level waste segregation, promoting waste minimisation practices, and enhancing awareness among students and staff to support environmentally responsible waste management and reduce the environmental impacts associated with waste generation.
- **Canteen Hygiene, Safety, and Energy Standards:** Strengthen canteen management practices by ensuring compliance with food hygiene and sanitation requirements and maintaining appropriate standards in food preparation and service areas. Periodic inspection and maintenance of LPG cylinders, gas pipelines, and cooking equipment shall be undertaken to minimise safety risks and ensure regulatory compliance. Measures to reduce food wastage and improve the management of biodegradable waste generated from canteen activities shall also be incorporated into routine operations.
- **Biodiversity Conservation and Campus Ecology:** Strengthen biodiversity management through periodic documentation and monitoring programmes and undertake measures to improve habitat diversity within the campus. Priority shall be given to increasing native vegetation, enriching lower vegetation strata, and creating suitable habitats that support faunal diversity and enhance ecological balance.
- **Occupational Health and Safety Management:** Enhance occupational health and safety measures by strengthening emergency preparedness systems, improving communication mechanisms, and providing adequate safety facilities in high-risk areas. Periodic inspections, documentation, and awareness programmes shall be undertaken to improve the effectiveness of health and safety management within the institution.
- **Information, Education and Communication (IEC) Programmes:** Institutionalise environmental awareness and capacity-building programmes that actively engage students, faculty, non-teaching staff, and the local community in sustainability initiatives, conservation activities, and environmental monitoring programmes to foster environmental responsibility and informed participation in campus sustainability practices.
- **Sustainable Campus Development:** Integrate the findings of the present audit into future institutional planning and developmental activities and establish periodic review mechanisms to monitor environmental performance, facilitate



Chapter XI

**BEST PRACTICES OF
ENVIRONMENT
MANAGEMENT SYSTEM (EMS)**





Plans to protect air and water,
wilderness and wildlife
are infact plans to protect man

- Stewart Udall



Best practices of Environment Management System (EMS)

1. Solar Energy Management

Mar Dionysius College has installed a 20 kWp rooftop solar photovoltaic (PV) system as part of its commitment to renewable energy adoption and sustainable campus development. The solar plant generated 19,071.80 kWh of electricity during the assessment period and yielded an estimated annual financial saving of ₹60,076.17. The system achieved 953.59 full-load operating hours, demonstrating its effective utilisation and contribution to the institution's energy requirements.

In addition, the institution generated a cumulative 34,188.89 kWh of solar electricity, of which 462.38 kWh was exported to the grid under the net-metering ar-

rangement, while 33,726.51 kWh was utilised within the campus. The average daily energy generation during the reporting period was approximately 54.74 kWh.

The installation of the rooftop solar PV system has significantly reduced the institution's dependence on conventional grid electricity, lowered energy expenditure, and contributed to reducing greenhouse gas emissions associated with fossil-fuel-based power generation. The initiative reflects the institution's commitment to environmental stewardship and serves as an effective demonstration of renewable energy utilisation and sustainable resource management for the campus community.





Climate change is
no longer some far-off problem;
it is happening here,
it is happening now

- Barack Obama

Chapter XII

EXECUTIVE SUMMARY





Small acts, when multiplied
by millions of people,
can transform the world

- Howard Zinn

EXECUTIVE SUMMARY

Mar Dionysius College, Pazhanji demonstrates an emerging commitment towards sustainable campus management, with initiatives including a 40 kWp rooftop solar photovoltaic system, established water supply infrastructure, waste segregation practices, biodiversity conservation efforts, and climate action measures. The Energy Management System assessment indicates the availability of renewable energy infrastructure; however, improvements are required in electrical safety provisions, preventive maintenance practices, power quality management, load distribution, and systematic energy monitoring. Water management is supported by three borewells, one open well, and ten water storage tanks with a combined capacity of 36,750 litres, providing reliable water availability for campus operations. However, limitations in water consumption monitoring, ageing infrastructure, and the need for effective rainwater harvesting integration and grey water reuse highlight opportunities to improve water-use efficiency. Waste management practices include source-level segregation, utilisation of food waste through external channels, and disposal through authorised systems; however, improved waste minimisation, segregation efficiency, storage facilities, and awareness programmes are required to strengthen waste management performance. Biodiversity assessment identified the presence of different floral and faunal groups within the campus, although limited habitat availability and the dominance of planted vegetation indicate the need for native species enrichment, habitat improvement, and periodic biodiversity monitoring. The institution's net carbon footprint stands at 72.05 tCO₂e/year (63.42 kg CO₂e per capita/year), with further reduction potential through renewable energy expansion, sustainable waste management practices, improved water conservation, and resource efficiency measures. Prioritising energy performance improvements, effective solar utilisation, water conservation strategies, biodiversity enhancement, waste reduction initiatives, and strengthened environmental management practices will further support Mar Dionysius College, Pazhanji in advancing towards sustainable campus operations.





I can't imagine anything more important
than air, water, soil, energy and
biodiversity. These are the
things that keep us alive

- David Suzuki

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