



ENVIRONMENT AUDIT REPORT

MAR IVANIOS COLLEGE OF ARTS & SCIENCE
MAVELIKARA

2021



Executed by

OTTOTRACTIONS
Energy-Engineering-Environment



ENVIRONMENT AUDIT REPORT

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MAVELIKARA

December 2021





Environment Audit Report
Mar Ivanios College of Arts & Science
Report No: EA 873
2021- December

Environment Audit Team

Ottotractions

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About OTTOTRACTIONS

OTTOTRACTIONS established in 2005, is an organization with proven track record and knowledge in the field of energy, engineering, and environmental services. They are the first Accredited Energy Auditor from Kerala for conducting Mandatory Energy Audits in Designated Consumers as per Energy Conservation Act-2001. Government of Kerala recognized and appreciated **OTTOTRACTIONS** by presenting its prestigious “**The Kerala State Energy Conservation Award 2009**” for the best performance as an Energy Auditor.

Acknowledgment

We were privileged to work together with the administration and staff of Mar Ivanios College of Arts & Science, Mavelikara. for their timely help extended to complete the audit and bringing out this report.

We thank the management of Mar Ivanios College, Trivandrum for entrusting Ottotractions to conduct the audits in all its mentee institutes as part of its Paramarsh Scheme.

With gratitude, we acknowledge the diligent effort and commitments of all those who have helped to bring out this report.

We also take this opportunity to thank the bona-fide efforts of team OTTOTRACTIONS for unstinted support in carrying out this audit.

We thank our consultants, engineers and backup staff for their dedication to bring this report.

Thank you.

B V Suresh Babu
Accredited Energy Auditor
AEA 33, Bureau of Energy Efficiency

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Certification

This is to certify that

The data collection has been carried out diligently and truthfully;

All data monitoring devices are in good working condition and have been calibrated or certified by approved agencies authorised and no tampering of such devices has occurred;

All reasonable professional skill, care and diligence had been taken in preparing the energy audit report and the contents thereof are a true representation of the facts;

Adequate training provided to personnel involved in daily operations after implementation of recommendations; and

The environmental audit for the year 2020-21 has been carried out in accordance with the various rules and regulations in India.

This Certificate is issued to Mar Ivanios College of Arts and Science , Mavelikara on their request.

Dated this 10th day of December 2021.



SURESH BABU B V

ACCREDITED ENERGY AUDITOR (AEA 33)
BUREAU OF ENERGY EFFICIENCY, GOVT OF INDIA





INTRODUCTION

Ottotractions was asked by the **Mar Ivanios college of Arts & Science , Mavelikara** to carry out an environmental audit of their campus building.

Each section contains recommendations for improvements relating to environmental issues, which are consolidated in the action plan in section 4.



BACKGROUND

Mar Ivanios College of Arts and Science, Kallumala, Mavelikara is the fruition, in the fullness of time, of a cherished dream of the Servant of God Archbishop Geevarghese Mar Ivanios. The Father of the Reunion movement Mar Ivanios found education as the means to dispel the darkness of the human mind. His Grace envisaged social change brought about by imparting knowledge to all those who yearned for it. He established a series of educational institutions which serve as beacon lights across the land.

This educational institution is run by the Malankara Catholic Educational Society of the Catholic Diocese of Mavelikara under the Chairmanship of His Grace Most Rev. Dr. Joshua Mar Ignathios, the Metropolitan of the Diocese of Mavelikara, and the Chairman for CBCI Commission for Education and Culture. Set in the verdant environs of the birthplace of the saintly prelate Mar Ivanios, the college banks on the academically fertile soil of Mavelikara. The land has given birth to revered sages, sagacious statesmen, renowned scholars and acclaimed artistes. Above all it has bequeathed a secular culture of peace, progress and harmony to the people of a wide region known as Onattukara. Mar Ivanios College envisions an intellectually empowered, ethically fortified, socially committed civil society. The academic programme of this College is scheduled for the integral development of the entire society. The thrust of this Institution is to empower the young generation. By establishing this Institution, the Diocese of Mavelikara is taking a significant step in the noble realm of higher education.

Mar Ivanios College of Arts and Science, Mavelikara is a project of the Diocese of Mavelikara which was established in Mavelikara in 2015. Mar Ivanios College of Arts and Science, Mavelikara is located very close to Mavelikara Town and Mavelikara Railway Station. The Patron of the “Mar Ivanios College of Arts and Science” is His Grace Dr. Joshua Mar Ignathios. The Director is Fr. Thomas Puthenparampil and Principal Prof. Dr. K C Mathai (Former vice Principal and HOD Physics, St. Aloysius College, Edathua). Our Departments Heads- English- Prof. Prabha Alice Varkey (Rtd. HOD Bishop moore College, Mavelikara), Commerce- Prof. Dr. Abraham Punnoose (Rtd. HOD Bishop moore College, Mavelikara) , Economics- Prof. Dr. P.K Varghese (Rtd.HOD Bishop moore College, Mavelikara).

Mar Ivanios College of Arts and Science, Mavelikara affiliated to University of Kerala conduct PG, UG degree courses in MCom. Finance and Accounting, B.A. English Language and Literature, B. A. Economics, B.Com Tax, B.Com Tourism & Travel Management, B.Com Finance. The College encompasses the best of the infrastructure, computer labs, language labs and library with internet facilities, for more international and national journal we are providing through Open Access Resources and audio visual rooms. The teaching faculty here is the best of its kind. Students are given opportunities to participate in extracurricular activities, training programme, seminars, and debates and quiz competitions. Periodical evaluation of students through internal assessments and class tests help them for the examinations.

Our highlights are: Well qualified faculty with academic repute, Campus with serene, ambience, Value based courses, Personality development programme, Club activities, Talent training programme, Playground, Tele class facility, Language lab, Counselling centre, Food Court, Hostel

facility, Medicare insurance coverage, Campus recruitment coordination, Extra care for slow learners.



Occupancy Details					
Particulars	2016-17	2017-18	2018-19	2019-20	2020-21
Total Students	268	416	438	475	517
Teaching Staff	17	19	22	22	27
Non-Teaching Staff	13	13	13	13	13
Total Occupancy of the college	298	448	473	510	557

Total student strength of the campus is 510. For calculating per capita carbon emission estimation, the student strength is taken into account.



ENVIRONMENTAL ISSUES

This section is broken down into the following different areas: waste, water, energy, resource and materials use and procurement. A final 'other' section is also included for any additional issues.

1.1. Waste

The way communities generate and manage their waste plays an absolutely key role in their ability to use resources efficiently. All buildings contain bins for both general waste and mixed recyclables (plastic bottles, card, cans and paper). On average each floor in the buildings areas has its own general waste bin and one recycling bin. When the bins are emptied by the cleaning staff. Bins are marked and kept in different colors for identification, however in some locations throughout the building it was unclear which bins were for which waste streams.

There are four basic ways in which campus can do **plastic** recycling **collection** services for **plastic** bottles and containers – curbside, drop-off, buy-back or deposit/refund programs. The first, and most widely accessible, **collection** method is curbside **collection** of recyclables. The campus is installed bins to collect plastic bottles and single use plastics. SGC has given a proper awareness on plastic waste problems and they are discouraging the students or teachers to carry plastics to the campus. The ECO club is very active in the campus and do a verity of programs to build awareness on waste management. The reports on different activities of the club are attached as technical supplement of this report.

The major concern of waste management will be focused on the solid waste produced by the campus. Solid wastes produced in the campus are mainly of three types, food waste, paper waste, and plastic waste. Food wastes produced in the campus are mainly by two means. The vegetable wastes produced in the kitchen during the food preparation. The food waste produced by the students and staffs of the campus after the consumption of meals.

Degradable Waste Generation					
Mar Ivanios College of Arts and Science					
	2016-17	2017-18	2018-19	2019-20	2020-21
Total Occupancy	268	416	473	510	557
Waste generated in kg /day	5.36	8.32	9.46	12.75	4.456
Waste generated in kg /Yr	707.52	1098.24	1248.72	1683	588.192

Burning plastics shall be strictly restricted inside the campus. **Burning plastic** and other wastes releases dangerous substances such as heavy metals, Persistent Organic Pollutants, and other

toxics into the air and ash waste residues. ... Such pollutants contribute to the development of asthma, cancer, endocrine disruption, and the global burden of disease.

Solid non degradable Waste Generation					
Mar Ivanios College of Arts and Science					
	2016-17	2017-18	2018-19	2019-20	2020-21
Total Occupancy	268	416	473	510	557
Waste paper generated in kg /day	0.05	0.08	0.09	0.11	0.06
Waste plastic generated in kg /day	0.08	0.12	0.14	0.17	0.08
Waste paper generated in kg /Yr	11.79	18.30	20.81	24.93	12.25
Waste plastic generated in kg /Yr	17.69	27.46	31.22	37.40	18.38

WASTE MINIMIZATION AND RECYCLING		
1	Does your institute generate any waste? If so, what are they?	Yes, Solid waste Canteen waste, paper, plastic, Horticulture Waste etc
2	What is the approximate amount of waste generated per day? (In Kilograms/month) (approx.)	Bio Non- Hazardous Others Degradable Biodegradable
3	How is the waste generated in the institute managed? By	Reuse of one side printed Paper for internal communication. Sewage water is discharged to public Sewer. Kitchen waste is used to generate manures. Two types of Waste bins are provided at campus for biodegradable and non-biodegradable waste.
	1 Composting	In-house
	2 Recycling	In-house
	3 Reusing	In-house
	4 Others (specify)	
4	Do you use recycled paper in institute?	Yes
5	Do you use reused paper in institute?	Yes
6	How would you spread the message of recycling to others in the community? Have you taken any initiatives? If yes, please specify.	Number of awareness programs through ECO Club
7	Can you achieve zero garbage in your institute? If yes, how?	Not yet achieved. Possible through waste management plan.

Green Cover Audit			
1	Is there a garden in your institute?	Yes	
2	Do students spend time in the garden?	Yes	
3	Total number of Plants in Campus	Plant type	Approx. number
		Trees	0
		Ornamental	Not estimated
4	Number of Tree Plantation Drives	Yes, Through ECO club	
5	Number of Trees Planted in Last FY.	NA	
	Survival Rate	80%	

All the activities including energy consumption and waste management have their equivalent carbon emission and they positively contribute to the carbon footprint of the campus. Carbon sequestration is the reverse process, at which the emitted carbon dioxide will get sequestered according to the type of carbon sequestration employed. Even though there are many natural sequestration processes are involved in a campus, the major type of sequestration among them is the carbon sequestration by trees.

Trees sequester carbon dioxide through the biochemical process of photosynthesis and it is stored as carbon in their trunk, branches, leaves and roots. The amount of carbon sequestered by a tree can be calculated by different methods. In this study, the volumetric approach was taken into account, thus the details including CBH (Circumference at Breast Height), height, average age, and total number of the trees, are required. There are no Trees in Campus

Carbon sequestered by a tree can be found out by using different methods. Since this study is employed the volumetric approach, the calculation consists of five processes.

- Determining the total weight of the tree
- Determining the dry weight of the tree
- Determining the weight of carbon in the tree
- Determining the weight of CO₂ sequestered in the tree
- Determining the weight of CO₂ sequestered in the tree per year

Carbon sequestered by each species of trees in the campus compound is given in the Table. Detailed calculation results are listed out in the tables provided in the technical supplements of ‘Carbon sequestration’.

There are no Trees in the campus.

3.1.1 ENERGY

a. Electricity

The total emission of the carbon dioxide per student is **91.22kg** per year (2019-20). Emission reduction plans were prepared to bring the existing per capita carbon footprint to zero or below so as to bring the campus a carbon neutral or carbon negative campus. This can be achieved in many ways but, every alternate plan must be in such a way that, it must fulfill the actual purpose of each activity that is considered.

Here, three major methods are taken in to account as the plans for reducing the carbon emission of the campus.

- Resource optimization
- Energy efficiency
- Renewable energy
- Electricity Consumption

Base Line Energy Data						
Mar Ivanios College of Arts and Science						
		2016-17	2017-18	2018-19	2019-20	2020-21
1	Electricity KSEB (kWh)	15092	23025	11476	15488	12249
2	Electricity Solar - Off grid (kWh)	0.00	0.00	0.00	0.00	0.00
3	Electricity (KSEB + Off grid) kWh	15092	23025	11476	15488	12249
4	Electricity Grid Tied (kWh)	0.00	0.00	0.00	0.00	0.00
5	Diesel (L)	2444	2715	2386.18	2727	1704
6	Petrol(L)	1222.4	299.3	3869.80	7105.95	2842.38
7	LPG (kg)	133	152	159.6	228	76
8	Biogas (kg)	0.00	0.00	0.00	0.00	0.00

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Sl.No		Location	LIGHT				FAN	IT		AC
			T8	CFL	LED BULB	LED TUBE	CF	PC	Printer	1.5
1	Second Floor	Class 307				6	5			
2		308				6	5			
3		306				6	5			
4		304				6	5			
5		303				6	5			
6		302				6	5			
7		301				6	5			
8		Class 1				6	5			
9		Class 2				6	5			
10		Staff Room				5	4			
11		Department				4	4			
12		Yoga Corner				7	4			
13	First Floor	201	4				5			
14		202	4				5			
15		Department	6			1	4			
16		203	4				5			
17		IQ NC	4				4			
18		Office	4		1	2		4		
19		205	4				5			
20		Principal	3	1	1	2	4			1
21		207	1		1	1	5			
22		Computer Lab	9	4			6	45		
23	208	2	2	3	2	5				
24	Ground Floor	106	4				5			
25		107	4				5			
26		108	4				5			
27		Library	4		3	3	2	1	1	
28		Department	1			1	5	3		
29		104	2				2			
30		Seminar Hall	2			3	10			
31		101	4							
32		102	4							
33		103	4							
34	Canteen				2	5				
35	HOSTEL	27 Room				27	27			
		TOTAL	78	7	9	114	171	53	1	1

During the energy audit filed studies, 78 T-8 and 7 CFL lamps identified, which is considered as inefficient. 9 LED bulbs and 114 LED tubes were found during the audit. The detailed energy efficiency projects are given in the respective chapters of this report.

Mar Ivanios College of Arts and Science		
Sl. No	Location	Avg. Lux
1	Department	89
2	Yoga Corner	78
3	201	46
4	202	74
5	Department	59
6	203	68
7	IQ NC	73
8	Office	79
9	205	78
10	Principal	75
11	207	89
12	Computer Lab	101
13	208	59
14	106	78
15	107	88
16	108	86
17	Library	134
18	Department	88
19	104	89
20	Seminar Hall	154
21	101	68
22	102	73
23	103	79
24	Canteen	78
25	27 Room	85

RESOURCE OPTIMISATION

The effective use of resources can limit its unnecessary wastage. Optimal usage of the resources (such as fuels) can save the fuel and can also reduce the carbon emission due to its consumption. This technique can be effectively implemented in the 'transportation' and 'waste' sectors of the campus.

WASTE MINIMISATION

Optimal utilization of paper and plastic stationaries can reduce the frequency of purchase of items. This can reduce the unnecessary wastage of money as well as the excess production of waste. In the case of food, proper food habits and housekeeping practices can optimize its usage.

Currently, they taking an appreciable effort to reduce the unnecessary production of wastes. But the campus still has opportunities to reduce the generation of waste and can improve much more. Resource optimization can be effectively implemented in all type of waste generated in the campus and the campus can expect about 50% reduction the total waste produced.

ENERGY EFFICIENCY

Energy efficiency is the practice of reducing the energy requirements while achieving the required energy output. Energy efficiency can be effectively implemented in all the sectors of the campus.

FUELS FOR COOKING

The campus can install a solar water heater to rise the water temperature to a much higher level, then it has to consume only very less amount of thermal energy for preparing the same amount of food. This can make a positive benefit to the campus by saving money, energy and can reduce the carbon emission of the campus due to thermal energy consumed for cooking.

TRANSPORTATION

Energy efficiency of the transportation sector is mainly depended on the fuel efficiency of the vehicles used. Here mileage of the vehicle (kmpl - Kilometers per Litre) is calculated to assess the fuel efficiency of the vehicle. Percentage of closeness is the ratio of actual mileage of the vehicle to its expected mileage. If the percentage of closeness of mileages of each vehicle is greater than that of its average, then the efficiency status of the vehicle is considered as 'Above average' and else, it is considered as 'Below average'

Renewable Energy

After analyzing the historical and measured data the following projects are proposed to make the campus carbon neutral. The projects are from energy efficiency and renewable energy. The further additions in the green cover increase will also give positive impact in the carbon mitigation.

Executive Summary					
Consolidated Cost Benefit Analysis of Energy Efficiency Improvement Projects					
Mar Ivanios College of Arts and Science					
SI No	Projects	Investment	Cost saving	SPB	Energy saved
		(Lakhs Rs)	(Rs)/Yr	Months	kWh/Yr
1	Energy Saving in Lighting by replacing existing 78 No's T8 (40W) Lamps to 20 W LED Tube	0.23	0.05	60.33	582
2	Energy Saving in Lighting by replacing existing 7 No's CFL (20W) Lamps to 9 W LED Bulb	0.01	0.00	34.04	28
3	Energy Saving by replacing existing 171 No's in-efficient ceiling fans with Energy Efficient Five star fans	4.28	0.18	277.83	2308
	Total	4.52	0.23	124.06	2917.67
(The saving are projected as per the assumed operation time observed based in the discussions with the plant officials. The data of saving percentages are taken from BEE guide books and field measurements.)					
Consolidated Cost Benefit Analysis of Renewable Energy Projects					
4	Installation of 40kWp Solar Power Plant	30.00	4.09	88.06	51100
5	Installation of 15Kg/day Biogas plant	0.2	0.26	9.39	5647

Water Conservation Activities	
List four uses of water in your institute	Basic use of water in campus:
	1. Drinking – Ground Water
	2. Gardening – Rain water
	3. Kitchen and Toilets –
	4. Others –
How does your institute store water? Are there any water saving techniques followed in your institute?	Overhead Water Tanks and Sumps installed for storage of water.
	Water conservation are in place
If there is water wastage, specify why and How can the wastage be prevented / stopped?	No
Record water use from the institute water meter for six months (record at the same time of each day). At the end of the period, compile a table to show how many liters of water have been used.	No logbooks are available
Does your institute harvest rain water?	Yes
Is there any water recycling system?	Yes

General Environmental Awareness Questioner	
Are you aware of any environmental Laws pertaining to different aspects of environmental management?	Yes
Does your institute have any rules to protect the environment? List possible rules you could include.	Yes
Dose Environmental Ambient Air Quality Monitoring conducted by the Institute?	Yes
Dose Environmental Water and Wastewater Quality monitoring conducted by the Institute?	Yes
Dose stack monitoring of DG sets conducted by the Institute?	Yes
Is any warning notice, letter issued by state government bodies?	No
Dose any Hazardous waste generated by the Institute? If yes explain its category and disposal method	Yes
Are you aware of any environmental Laws pertaining to different aspects of environmental management?	Yes
Does your institute have any rules to protect the environment? List possible rules you could include.	No
Does housekeeping schedule in your campus?	Yes
Are students and faculties aware of environmental cleanliness ways? If Yes Explain	Yes
Dose Important Days Like World Environment Day, Earth Day, and Ozone Day etc. eminent in Campus?	Yes
Dose Institute participated in National and Local Environmental Protection Movement?	Yes
Dose Institute has any Recognition/certification for environment friendliness?	Yes
Dose Institute using renewable energy?	Yes
Dose Institution conducts a green/environmental audit of its campus?	Yes
Has the institution been audited / accredited by any other agency such as NABL, NABET, TQPM, NAAC etc.?	Yes

Best Practices and Initiatives	
Renewable Energy	No
Solar Power Plant	
Energy Audit and Green Audit Conducted	
Biogas Plant installed	
Biodiversity Conservation	Yes
Green Cover	
Tree Plantation Drives	Yes
ECO clubs	
Ground Water Recharge	Yes
Rain Water Harvesting System.	
Pollution Reduction Public Transportation	Yes
E Waste Management	Yes
Connected to authorized recycler	
Solid Waste Management	Yes
Lifting of garbage from campus on alternate day by Municipal Corporation.	
Adoption of Village	Yes
CSR	
Water Conservation	Yes
Energy Conservation	Yes



RECOMMENDATIONS

1. Implement a utility monitoring program.
 - Allocate staff to carry out meter readings for electricity, waste and water on regular basis
 - Add monitoring data to spreadsheet so results can be viewed graphically
 - Compare with the utility bills meter readings in order to ensure accuracy;
2. Consider adopting and implementing a sustainable procurement policy which takes into account the whole life cycle of a product, and make sure environmental issues are written

into tenders when contracting out.

3. Consider trialing recycled paper again – many recycled brands today, such as Evolve, are just as good as virgin paper.
4. Trial the use of re-manufactured (i.e., Refilled) in toner cartridges rather than purchasing new ones.
5. Consider producing some designated ‘environmental’ pages on the intranet to make it easier for staff to find environmental information. If possible, a discussion forum could be setup to allow easy internal communications and staff to make suggestions for environmental improvements.
6. Environmental training could be formalized and carried out for all staff. It does not have to be too long or onerous, providing it covers key points, particularly in relation to wastes of all staff are aware of the legal requirements. At the very least, environmental information should be included in the induction pack.
7. It is strongly recommended that environmental information is also given to students and staff during induction. It is particularly important for them to be aware of what waste they can dispose on site and where they can dispose of it, and what waste streams they must take away with them.
8. Consider implementing an environmental management system to incorporate all improvements and monitoring requirements. It does not need to be a complex system certified to any particular standard, merely a way of ensuring that baselines are set and progress is measured. Formation of Environment Policy and communicated to all faculties and other staff.
9. Plan for Zero Waste Campus Project
10. E-waste monthly inventory be maintained at campus as per E waste rules 2016.
11. Water Meter should be installed at institute for monitoring of water consumption per capita.
12. Increase in Environmental promotional activities for spreading awareness at campus.
13. Environment/Green committee formation for regulating eco-friendly initiatives at campus premises and periphery.



CONCLUSION

This audit involved extensive consultation with all the campus team, interactions with key personnel on wide range of issues related to Environmental aspects. The audit has identified several observations for making the campus premise more environmental friendly. The recommendations are also mentioned with observations for the team to initiate actions.

However, there is scope for further improvement, particularly in relation to waste minimization and energy monitoring. By implementing a basic environmental management system, current good practice can be formalized and a framework can be setup for monitoring, implementation of action plans and continual improvement.

The audit team observed that the overall site is maintained well from environmental perspective. There is no major observations but few things are important to initiate urgently are waste management records by monthly inventory of hazardous waste, rainwater harvesting recharge; water balance cycle and periodic inspection of buildings; environment policy and initiation of composting at campus.

References

- The Environment [Protection] Act– 1986(Amended 1991) & Rules-1986(Amended 2010)
- The Petroleum Act:1934–The Petroleum Rules:2002
- The Central Motor Vehicle Act: 1988 (Amended 2011) and The Central Motor Vehicle Rules:1989(Amended in 2005)
- Energy Conservation Act 2010.
- The Water [Prevention & Control Of Pollution] Act–1974 (Amended 1988)& the Water(Prevention & Control of Pollution) Rules– 1975
- The Water [Prevention & Control of Pollution] Cess Act-1977(Amended 2003) and Rules- 1978
- The Air [Prevention & Control Of Pollution] Act– 1981(Amended 1987) The Air (Prevention & Control of Pollution) Rules– 1982
- The Gas Cylinders Rules–2016 (Replaces the Gas Cylinder Rules– 1981
- E-waste management rules 2016
- Electrical Act 2003(Amended 2001)/ Rules 1956(Amended 2006)
- The Hazardous Waste (Management and Handling and Trans-boundary Movement) Rules, 2008 (Amended 2016)
- The Noise Pollution Regulation & Control rules, 2000(Amended 2010)
- The Batteries (Management and Handling) rules, 2001(Amended 2010)
- Relevant Indian Standard Code practices

TECHNICAL SUPPLEMENTS

Compost units and pits made by NSS volunteers at their homes during lockdown.



Tree planting by NSS volunteers during lockdown days at their homes



Exhibition organic and non-organic things 2019



Workshop on paper carry bag and pen making by differently abled persons in March 2019



MARIVANIOS COLLEGE OF ARTS AND SCIENCE
MAVELIKKARA
NSSUNIT: 120 A & B



MAY 29th - JUNE 5th



The biggest plant drive week
challenge of
University of Kerala

പരിത്രാണം

"മാനവവംശത്തിന്റെ നിലനിൽപ്പ്
പ്രകൃതിയിലൂടെ"



MARIVANIOS COLLEGE OF ARTS AND SCIENCE
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MAY 29th - JUNE 5th



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