Macau University of
Science and Technology

Sustainability Report

2026



Academic Year 2024/2025

Macau University of Science and Technology Sustainability Report 2026

Abstract

Macau University of Science and Technology (MUST) continues to embed the United Nations Sustainable Development Goals (SDGs) across campus operations, talent development, research innovation, and community engagement. The University has published annual campus sustainability reports since 2023. Covering primarily the 2024/25 academic year (September 2024 to August 2025), this report reviews key initiatives and outcomes in sustainable campus development, education for sustainable development, scientific research, and related practices, and outlines core priorities for future progress.

In green campus development, MUST conducts ongoing monitoring of greenhouse gas emissions and electricity consumption, implements targeted energy conservation measures, and expands its solar photovoltaic (PV) capacity. Campus greening initiatives improve local ecological quality and enhance carbon sequestration. The University has also upgraded its waste management framework and rolled out separate sorting and collection channels for waste paper, plastics, batteries, and e-waste. Campus-wide low-carbon campaigns further raise environmental awareness among faculty, staff and students. These efforts align closely with and contribute significantly to SDG 7 (Affordable and Clean Energy), SDG 12 (Responsible Consumption and Production), and SDG 13 (Climate Action).

In teaching and research, MUST offers a portfolio of courses covering environmental protection, clean energy, public health, corporate social responsibility, and regional development, fostering students' systemic understanding of sustainability and advancing SDG 4 (Quality Education). Its research agenda addresses health and well-being, clean energy, industrial innovation, urban development, and environmental governance. Through interdisciplinary collaboration, academic exchanges and joint research networks, scholars explore real-world sustainability challenges and deliver evidence-based solutions.

MUST also places high priority on the well-being of faculty, staff and students, campus safety, and social outreach. Initiatives across staff professional development, mental health support, sports programs, community services, charitable student aid, and ecological conservation foster an inclusive, sustainable campus culture. Collaborative partnerships with government agencies, higher education institutions, research bodies and community organizations extend the University's impact beyond campus boundaries, in full alignment with SDG 17 (Partnerships for the Goals).

Looking ahead, MUST will further integrate sustainability into all campus operations, education, research and social services. The University will strengthen energy management,

circular resource utilization and environmental performance evaluation; refine its sustainability-focused curriculum; expand research collaboration networks; and encourage wider participation from the entire campus community and broader society. Through these concerted efforts, MUST aims to elevate its overall sustainability performance and contribute to the sustainable development of Macao and the wider region.

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1. Overview of MUST

1.1 Vision, Mission and Sustainability Commitment

Macau University of Science and Technology (MUST) has long embraced the United Nations Sustainable Development Goals (SDGs), embedding sustainability principles throughout campus operations, academic delivery, research and daily administration. The University works to improve the energy performance of campus buildings, optimize energy consumption patterns, and conserve campus green spaces and ecological assets. It actively expands the deployment of solar and other clean energy technologies to drive improvements in overall energy efficiency. Complementing these efforts, MUST has upgraded its waste sorting and recycling infrastructure, promoted resource circularity, and rolled out targeted environmental education programmes to reduce waste generation and mitigate its environmental footprint. A suite of ongoing energy conservation campaigns and low-carbon initiatives actively engage faculty, staff and students in the co-creation of a greener, low-carbon campus.

MUST is growing its global sustainability partnership network, forging long-term collaborations with universities, research institutes and industry partners across Macao, mainland China and worldwide. Through joint research projects, academic exchange programmes, and joint talent development initiatives, the University supports the translation of sustainability knowledge and technologies into real-world applications, bridging higher education and societal impact. These efforts align closely with SDG 17 (Partnerships for the Goals) and demonstrate the University's commitment to multi-stakeholder collaboration for sustainable development.

Established in 2000, MUST has developed into the largest comprehensive university in Macao in terms of student enrolment. Guided by its motto "Dedication to practical studies, enhancement of knowledge, ability, and quality" and its founding ethos of equal emphasis on teaching and research, the University continuously enhances academic standards, research innovation and talent development to meet the evolving needs of Macao and the nation. Its educational philosophy prioritises strong disciplinary fundamentals, hands-on practical skills, creative thinking, and exposure to international collaboration and cross-border academic exchange. In May 2022, MUST became the first higher education institution in Macao to be awarded full institutional accreditation by the UK Quality Assurance Agency for Higher

Education (QAA) — a mark of international recognition for its academic quality and institutional governance.

1.2 Campus Resources and Academic Structure

MUST is situated on Taipa Island, Macao, and covers a total area of approximately 210,000 m^2. It is home to state-of-the-art teaching and research buildings, specialist laboratories, dedicated research facilities and a comprehensive university library, all of which create a high-quality environment for study and research. The integrated academic complex houses a performing arts auditorium, a cinema and multi-purpose teaching spaces. Continuous upgrades to campus infrastructure strike a balance between academic functionality, user experience and resource efficiency, laying a solid foundation for green campus development.

On-campus sports and recreational amenities include an Olympic-standard athletics stadium, an indoor sports complex, tennis courts and a student activity centre. Student residences, on-site banking services, dining halls, culinary training labs and cafés cater to the daily needs of the campus community. MUST Hospital delivers 24/7 on-campus medical support for students, supported by dedicated campus security and student affairs services. Together, these facilities form a fully integrated campus ecosystem that supports teaching, research, recreation and daily living (Figure 1).



Figure 1. Overview of the MUST Campus

MUST's academic structure comprises 11 faculties, schools and departments: the Faculty of Innovation Engineering, the Medical Sciences Division (which houses the Faculty of Chinese Medicine, the Faculty of Medicine and the School of Pharmacy), the School of

Business, the Faculty of Law, the Faculty of Hospitality and Tourism Management, the Faculty of Humanities and Arts, the University International College, the School of Liberal Arts, and the Department of General Education.Its programme portfolio covers a broad spectrum of disciplines, including humanities, natural sciences, engineering, law, management, business, medicine, pharmacy, tourism, arts, communication and languages. The School of Liberal Arts additionally delivers evening degree programmes and short-term training courses to support lifelong learning for working professionals. In July 2023, the School of Business was awarded AACSB accreditation by the Association to Advance Collegiate Schools of Business, placing it among the top 6% of business schools worldwide. MUST awards bachelor's, master's and doctoral degrees across all disciplines, with select programmes taught in Portuguese or Spanish. Total student enrolment stands at over 25,000, comprising approximately 4,000 doctoral candidates, 6,100 master's students and 15,000 undergraduates.

MUST is home to more than 1,400 teaching and research faculty, spanning ranks from chair professors, full professors and special professors to associate and assistant professors. A significant share of faculty members have prior work or study experience at leading universities and research institutions globally. The University also appoints renowned visiting scholars to teach and supervise postgraduate students, including academicians of the Chinese Academy of Sciences and Chinese Academy of Engineering, members of Academia Sinica Taiwan, Fellows of the Royal Academy of Engineering (UK), members of the US National Academy of Sciences, and Clarivate Highly Cited Researchers. Their expertise brings cutting-edge research insights directly into the classroom and expands students' global perspectives.

MUST has established five national-level research platforms (including two national key laboratories) and more than 20 major institutes and centres focused on Chinese medicine, lunar and planetary science, environmental science, artificial intelligence, and sustainability. In recent years, it has undertaken nearly 350 national, provincial or ministerial research projects annually, published over 2,000 papers per year in SCI- or SSCI-indexed international journals, and secured more than 550 granted patents in China and overseas. These key institutional indicators are summarized in Figure 2. The University will continue upgrading its teaching and research facilities to nurture innovative, globally minded graduates.

The University hosts five national-level research platforms (including two national key laboratories) and over 20 leading research institutes and centres, with core focus areas spanning Chinese medicine, lunar and planetary science, environmental science, artificial

intelligence and sustainable development. In recent years, MUST has led nearly 350 national, provincial and ministerial research projects per year; published over 2,000 papers annually in SCI- and SSCI-listed international journals; and been granted more than 550 patents in mainland China and abroad. These key institutional metrics are summarised in Figure 2. Moving forward, the University will continue to enhance its teaching and research infrastructure to nurture innovative graduates with a global mindset.



Figure 2. MUST by the Numbers

1.3 International Rankings and Sustainability Performance

MUST has maintained steady upward momentum across leading global university rankings. In the Times Higher Education (THE) rankings, it secured 269th place worldwide in the 2027 World University Rankings, retaining its position among the global top 300; it also ranked 52nd in the 2026 THE Asia University Rankings and 38th in the 2024 THE Young University Rankings. In the QS World University Rankings 2027, MUST climbed to 398th place, up from 440th in the 2026 edition. These results reflect tangible advances in teaching quality, research output and internationalisation.

MUST also participates in the THE Impact Rankings, which evaluate higher education institutions' delivery against the United Nations Sustainable Development Goals (SDGs). In the 2025 edition, the University placed 35th globally for SDG 11 (Sustainable Cities and Communities) out of 1,154 participating institutions. It also ranked within the global top 20% for SDG 9 (Industry, Innovation and Infrastructure) and the top 25% for SDG 12 (Responsible

Consumption and Production). These outcomes, summarised in Figure 3, underscore the University's sustained investment in sustainable urban development, innovation capacity and resource stewardship.

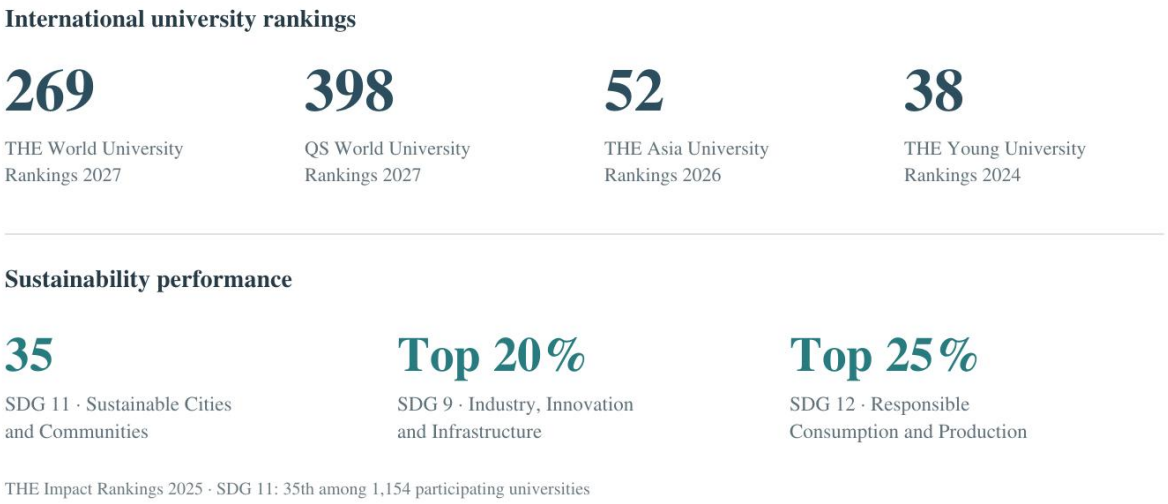


Figure 3. MUST International Rankings and Sustainability Performance

1.4 SDG Priorities and Reporting Scope

Guided by the United Nations 17 Sustainable Development Goals, MUST has established an institutional SDG framework that integrates campus operations, academic delivery, research innovation and community engagement. The University has defined its strategic priority areas as SDGs 3, 4, 7, 8, 9, 11, 12, 13 and 17, while its activities also deliver supporting contributions to all remaining goals. This holistic approach aligns every dimension of university development with the global sustainability agenda.

This report presents an overview of MUST's sustainability performance for the 2024/25 academic year (1 September 2024 to 31 August 2025). It covers campus environmental stewardship, renewable energy deployment, circular waste management, sustainability-focused curricula, related research outputs, and low-carbon initiatives involving all faculty, staff and students. The report also identifies gaps and outlines key areas for future improvement.

2. Sustainable Campus Development

MUST embeds sustainability across the full lifecycle of campus planning, infrastructure development and daily operations. Centred on four core priorities of energy conservation, emissions reduction, ecological enhancement and circular resource use, the University continued to advance its green campus agenda throughout the 2024/25 academic year. It refined its greenhouse gas (GHG) inventory, systematically mapped campus energy consumption and emissions structures, and strengthened performance monitoring to inform targeted mitigation measures. The University also rolled out electricity efficiency upgrades, expanded solar photovoltaic capacity, preserved and enhanced green spaces and vegetation, and operated dedicated recycling streams for used batteries, waste paper, plastic bottles and end-of-life equipment. Campus-wide initiatives such as the annual Lights Out Hour actively engaged faculty, staff and students. These collective efforts strengthen campus carbon governance and deliver tangible contributions to SDG 7 (Affordable and Clean Energy), SDG 12 (Responsible Consumption and Production) and SDG 13 (Climate Action).

2.1 Greenhouse Gas Accounting and Climate Action

In alignment with ISO 14064-1: *Greenhouse Gases—Part 1: Specification with guidance at the organization level for quantification and reporting of greenhouse gas emissions and removals*, MUST has compiled its institutional greenhouse gas (GHG) inventory for the 2024/25 academic year. The inventory covers three primary greenhouse gases—CO_2, CH_4 and N_2O—as well as hydrofluorocarbon (HFC) refrigerant R-410A used in campus cooling systems. Emissions are categorised into three scopes: Scope 1 (direct emissions), Scope 2 (indirect emissions from purchased electricity) and Scope 3 (other indirect emissions), as illustrated in Figure 4.

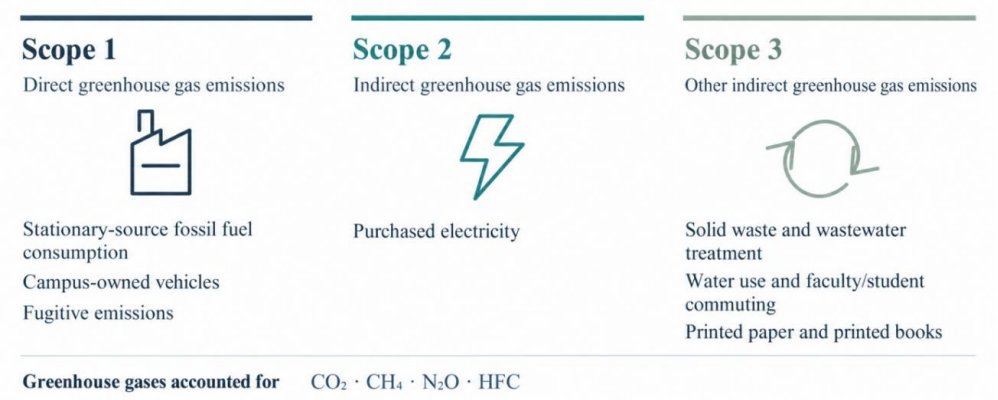


Figure 4. Scope of Greenhouse Gas Accounting

For the reporting period covering September 2024 to August 2025, MUST recorded total greenhouse gas (GHG) emissions of 19,625.18 tonnes of carbon dioxide equivalent (t CO_2e). Per capita emissions stood at 0.80 t CO_2e, with an area-based emission intensity of 0.09 t CO_2e/m^2 of campus area. The emissions breakdown by scope is set out below:

Scope 1 emissions totalled 2,192.74 t CO_2e, representing 11.17% of the overall emissions footprint, and were primarily attributed to fugitive emissions.

Scope 2 emissions reached 14,881.98 t CO_2e, making up 75.83% of the total. All Scope 2 emissions stem from purchased electricity, which constitutes the single largest source of emissions on campus.

Scope 3 emissions amounted to 2,550.46 t CO_2e, equivalent to 13.00% of total emissions. Key contributing sources include staff and student commuting, wastewater treatment and solid waste management (see Table 1 and Figure 5).

Table 1. Greenhouse Gas Emissions Summary, 2024/25 Academic Year

Scopes and Emission Sources	Carbon Emissions (t CO_2e)	Share (%)
Scope 1	**2,192.74**	**11.17%**
Fossil Fuel Use—Buildings	0.00	0.00%
Fossil Fuel Use—Machinery	1.05	0.01%
Campus Vehicles	135.32	0.69%
Fugitive Emissions	2,056.37	10.48%
Scope 2	**14,881.98**	**75.83%**
Purchased Electricity	14,881.98	75.83%
Scope 3	**2,550.46**	**13.00%**
Solid Waste	852.46	4.34%
Water Consumption	43.34	0.22%
Staff and Student Commuting (Cars and Motorcycles)	274.52	1.40%
Wastewater Treatment	1,369.68	6.98%
Printed Paper and Books	10.46	0.05%
Total	**19,625.18**	**100.00%**

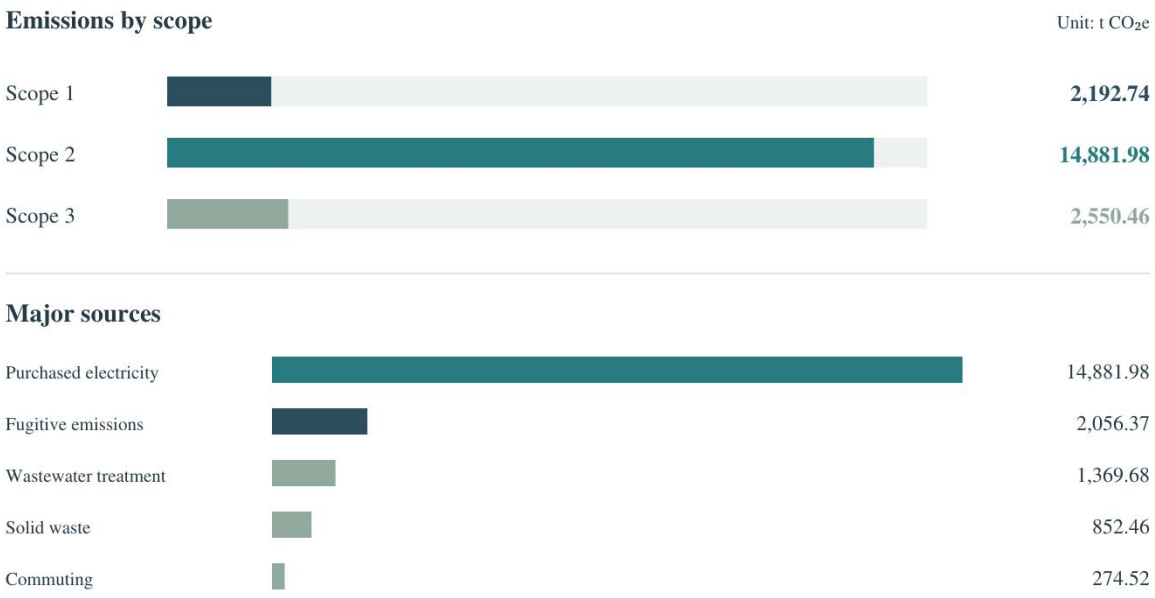


Figure 5. Greenhouse Gas Emissions by Source and Volume, 2024/25

As presented in Table 2, MUST employed 1,795 staff members and enrolled 22,671 students during the 2024/25 academic year, bringing the total campus community to 24,466. The University's total campus footprint spans 211,635 square metres. These core operational metrics form the baseline for calculating both per capita emissions and area-based emission intensity.

Table 2. Key Campus Operational Baseline Indicators, 2024/25

Basic Information	Quantity	Unit
Employees	1,795	Persons
Students	22,671	Persons
Total Staff and Students	**24,466**	**Persons**
Campus Area	211,635.00	m^2

Table 3 sets out the 2024/25 emissions intensity metrics: per capita emissions of 0.80 t CO_2e and an area-based emissions intensity of 0.09 t CO_2e/m^2. Per capita emissions decreased from 0.90 t CO_2e in 2023/24 to 0.80 t CO_2e in the current reporting year. The area-based indicator, derived from total campus area and aggregate emissions, fell from 0.10 to 0.09 t CO_2e/m^2. These intensity metrics form a consistent benchmark for tracking and evaluating the University's emissions performance year on year.

Table 3. Per Capita and Area-Based Emissions Intensity, 2024/25

Category	Quantity	Unit
Per Capita Carbon Emissions	0.80	t CO_2e/person
Carbon Emissions per Unit Area	0.09	t CO_2e/m^2

As illustrated in Figure 6, per capita greenhouse gas emissions have followed a steady downward trajectory, falling from 1.08 t CO_2e in 2021/22 to 0.80 t CO_2e in 2024/25 — representing a cumulative reduction of approximately 25.93%. Between the 2023/24 and 2024/25 academic years, per capita emissions decreased from 0.90 to 0.80 t CO_2e, marking a year-on-year drop of roughly 11.11%. This sustained declining trend serves as a robust benchmark for evaluating future emissions performance and guiding campus carbon management efforts.



Figure 6. Per Capita Carbon Emissions Comparison

As illustrated in Figure 7, the University's total greenhouse gas (GHG) emissions have seen moderate fluctuation across four consecutive academic years: 19,337.78 t CO_2e in 2021/22, 19,577.06 t CO_2e in 2022/23, 19,337.78 t CO_2e in 2023/24, and 19,625.18 t CO_2e in 2024/25.

Purchased electricity remained the dominant emissions source throughout the period, with associated emissions falling to 14,881.98 t CO_2e in 2024/25. By contrast, fugitive emissions rose from 510.63 to 2,056.37 t CO_2e; emissions from wastewater treatment and staff-student commuting also increased, from 1,114.95 to 1,369.68 t CO_2e and from 119.02 to 274.52 t CO_2e respectively. Solid waste emissions held steady at 852.46 t CO_2e for four years running, while water-related emissions declined from 49.89 to 43.34 t CO_2e.

The University's comprehensive emissions inventory covers a full spectrum of emission sources. It provides a robust data foundation for tracking long-term trends, identifying priority areas for improvement, and formulating targeted climate action plans in support of SDG 13 (Climate Action).



Emissions by source

	2021/2022	2022/2023	2023/2024	2024/2025
Stationary fuel: diesel	0.00	0.00	0.00	0.00
Stationary fuel: natural gas	0.63	0.63	0.63	1.05
University vehicles	100.00	120.43	100.00	135.32
Fugitive emissions	510.63	599.56	510.63	2,056.37
Purchased electricity	16,582.14	16,504.47	16,582.14	14,881.98
Solid waste	852.46	852.46	852.46	852.46
Water	49.89	50.95	49.89	43.34
Commuting	119.02	149.13	119.02	274.52
Wastewater	1,114.95	1,289.65	1,114.95	1,369.68
Paper, books and printed materials	8.06	9.78	8.06	10.46

Figure 7. Greenhouse Gas Emissions Trend, 2021/22 - 2024/25

2.2 Energy Management and Clean Energy Applications

Total electricity consumption across all teaching and residential buildings reached 28,669,084 kWh over the 2024/25 academic year (September 2024 to August 2025), corresponding to 14,881.98 t CO_2e of greenhouse gas emissions.

Building N (University Library) registered the highest electricity use, consuming 5,671,220 kWh and accounting for 19.78% of the campus total. It was followed by Building P (Student Residence Hall) with 4,679,970 kWh (16.32%) and Building O (Academic Building) with 4,036,335 kWh (14.08%).

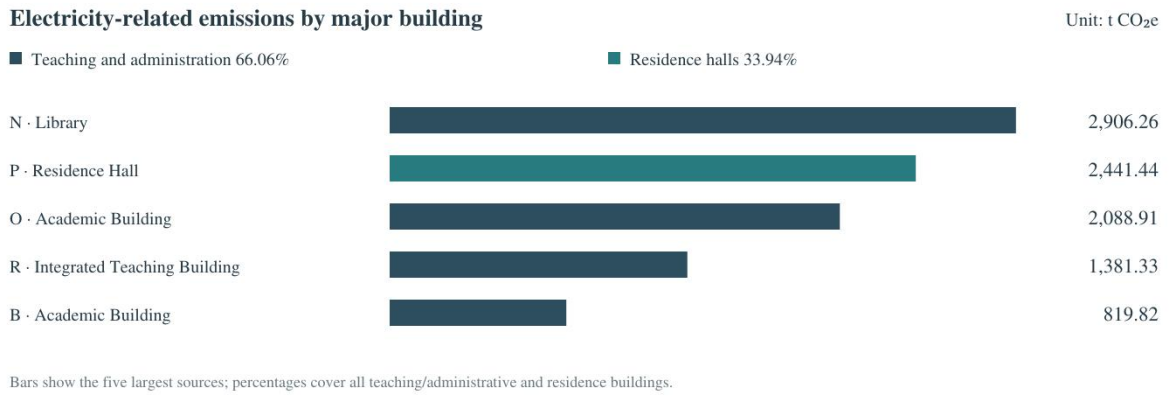


Figure 8. Electricity-Related Greenhouse Gas Emissions by Building, 2024/25

As set out in Table 4, academic buildings generated 9,831.25 t CO_2e of electricity-related emissions, representing 66.06% of the campus total. Student residence halls accounted for the remaining 5,050.73 t CO_2e, or 33.94%.

At the individual building level, Building N recorded the largest emissions footprint at 2,906.26 t CO_2e (19.53%), followed by Building P (2,441.44 t CO_2e, 16.41%) and Building O (2,088.91 t CO_2e, 14.04%).

These findings pinpoint high-priority buildings for targeted energy stewardship and efficiency upgrades, directly supporting progress towards SDG 7 (Affordable and Clean Energy).

Table 4. Electricity Consumption and Associated Greenhouse Gas Emissions by Building Type, 2024/25

Building Type	Carbon Emissions (t CO_2e)	Share (%)
Academic Buildings	**9,831.25**	**66.06%**
Building C (Academic) and Building D (Conference Hall)	626.21	4.21%
Building B (Academic)	819.82	5.51%
Building A (Administration)	215.46	1.45%
Building E (Activity Centre)	748.53	5.03%
Building I (Football/Athletics Ground)	432.88	2.91%
Building J (Indoor Sports Hall)	611.85	4.11%
Building N (Library)	2,906.26	19.53%
Building O (Academic)	2,088.91	14.04%
Building R (Academic Complex)	1,381.33	9.28%
Residence Halls	**5,050.73**	**33.94%**

Building Type	Carbon Emissions (t CO_2e)	Share (%)
Residence Hall M	674.95	4.54%
Residence Hall L	615.70	4.14%
Residence Hall G	788.65	5.30%
Residence Hall F	529.99	3.56%
Residence Hall P	2,441.44	16.41%
Total	**14,881.98**	**100.00%**

2.3 Solar Photovoltaic Deployment

MUST hosts one of the largest solar carport systems in Macao, with photovoltaic (PV) panels installed at multiple sites across the campus. As of the 2024/25 academic year, the campus PV system comprises 2,657 panels spanning a total area of 4,322.62 m^2. It has an estimated annual generating capacity of 1,049,712.75 kWh, translating to an annual emissions reduction of 639.28 t CO_2e.

These installations support the diversification of the campus energy mix and deliver measurable low-carbon benefits, underpinning the University's progress towards SDG 7 (Affordable and Clean Energy) and SDG 13 (Climate Action).

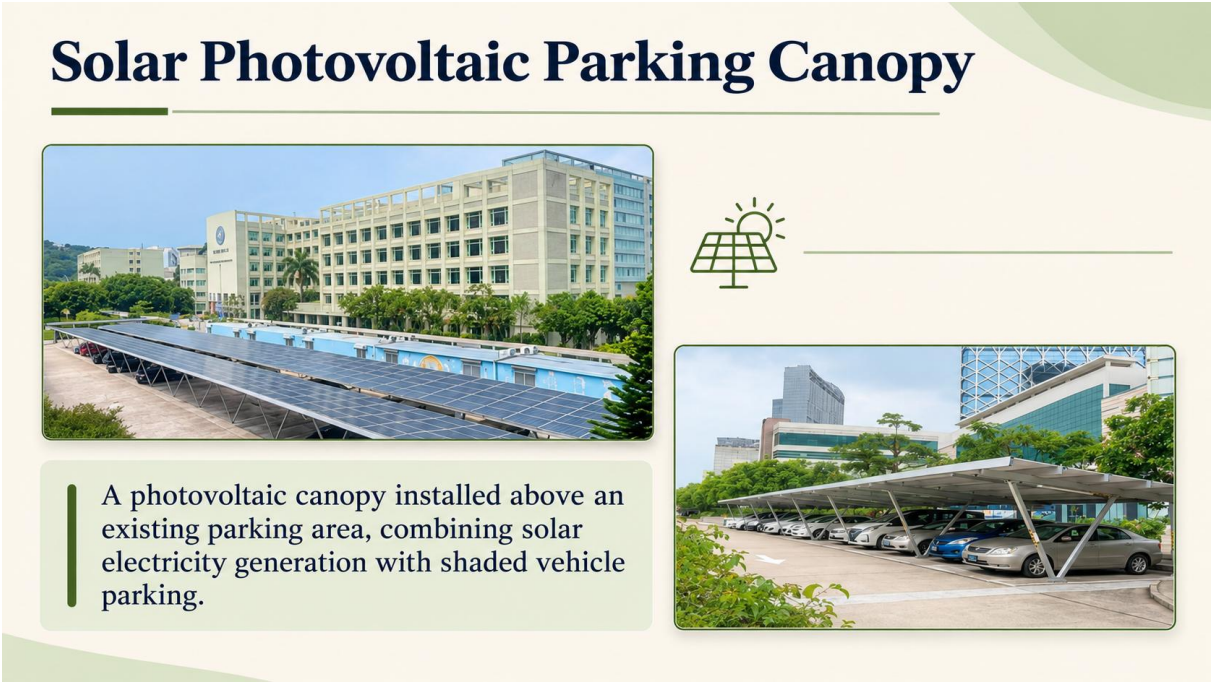


Figure 9. Campus Solar Photovoltaic Installations, 2024/25

Table 5. Estimated GHG Emissions Reductions from Solar PV Systems, 2024/25

PV Panel Location	Number of Panels	Total Area (m^2)	Estimated Annual Generation (kWh/year)	Estimated Annual Emissions Avoided (t CO_2e)
P1	315	512.47	129,701.25	78.99
P2	210	341.64	86,467.50	52.66
Block D	308	501.08	126,819.00	77.23
W1.1	112	182.21	45,360.00	27.62
P3	145	235.90	59,703.75	36.36
W1.2	330	536.87	133,650.00	81.39
W2	182	296.09	73,710.00	44.89
P7	160	260.30	56,160.00	34.20
P4,P5,P6	270	439.26	111,172.50	67.70
P8-A (305W)	125	203.36	51,468.75	31.34
P8-A (260W)	190	309.11	66,690.00	40.61
P8-B	310	504.33	108,810.00	66.27
Total	**2,657**	**4,322.62**	**1,049,712.75**	**639.28**

2.4 Ecological Greening and Carbon Sequestration

MUST preserves and enhances campus green spaces and vegetation to improve local environmental quality and enhance carbon sequestration capacity. In the 2024/25 academic year, the campus has a total landscaped green area of 38,385 m^2, comprising 1,486 trees and palms, 157 potted plants, and 1,756 linear metres of hedgerows of bougainvillea and small-leaved banyan. The total carbon stock of existing campus vegetation is estimated at 1,349.67 t CO_2.

These natural green assets support microclimate regulation and biodiversity on campus, and align closely with the objectives of SDG 13 (Climate Action) and SDG 15 (Life on Land).



Figure 10. Campus Green Spaces and Landscaping

Image source: MUST Sustainable Campus.

2.5 Resource Recycling and Waste Management

MUST embeds resource conservation and emissions reduction into daily campus operations by refining collection infrastructure, rolling out source-separated waste disposal, and advancing circular resource reuse. In the 2024/25 academic year, the University operated dedicated recycling schemes for waste paper, plastic bottles, end-of-life equipment, empty toner cartridges and used batteries, with quantified recycling volumes and estimated emissions reduction benefits for each key waste stream. These initiatives reduce the environmental footprint of campus waste operations and contribute directly to SDG 12 (Responsible Consumption and Production) and SDG 13 (Climate Action).

Table 6. Campus Recycling Volumes and Associated Emissions Reductions, 2024/25

Recycling Category	Quantity Recycled	Estimated Emissions Avoided
Newspapers and Magazines	1,000 kg	630 kg CO_2e
Red Envelopes	21,360 g	10 kg CO_2e
Used Batteries (approx. annual)	20.160 kg	0.08 t CO_2e
Plastic Bottles	177,988 items	1,170 kg CO_2e
Discarded Equipment	2,461 items	41.15 t CO_2e
Empty Toner Cartridges	188 items	220 kg CO_2e

Note: All figures reflect 2024/25 recycling results, with the exception of used battery data, which is presented as an approximate annual average. The six recycling schemes listed deliver a combined estimated emissions reduction of 43.26 t CO_2e. When including the 7.73 t CO_2e saved through the annual Lights Out Hour initiative, the total annual emissions reduction reaches 50.99 t CO_2e.

(1) Waste Paper (Newspapers & Magazines) Recycling

Dedicated recycling bins for newspapers and magazines are placed across high-footfall campus locations, including Buildings A, I, N and O, and the Hotline Building. In the 2024/25 academic year, 1,000 kg of waste paper was collected, equivalent to an estimated 630 kg CO_2e of avoided emissions. Cumulative collections between 2020 and 2025 totalled 5,487 kg, translating to approximately 3.43 t CO_2e of emissions avoided. Ongoing paper recycling schemes improve overall resource efficiency and mitigate the environmental footprint of waste disposal.

(2) Red Packet Recycling

Each year following the Lunar New Year, the University runs a dedicated two-week red packet recycling drive, with collection bins deployed in the ground-floor lobbies of Buildings A, B, C, N, O and R. In 2024/25, 21,360 g of used red packets were collected, representing an estimated 10 kg CO_2e of avoided emissions. From 2020 to 2025, cumulative collections reached approximately 108,312 units, accounting for around 0.068 t CO_2e of total avoided emissions. This initiative embeds resource conservation into local cultural customs, raising awareness of circular economy principles across the campus community.

(3) Used Battery Recycling

Six purpose-built used battery collection points are situated across campus: Buildings F, G, L (4^{th} floor), M, N (1^{st} floor, University Library) and P. Annual collections of used batteries stand at an estimated 20.160 kg, associated with approximately 0.08 t CO_2e of avoided emissions. These designated facilities support the safe disposal of hazardous waste and mitigate environmental risks linked to improper battery handling.

(4) Plastic Bottle Recycling

Since September 2020, MUST has operated smart plastic bottle reverse vending machines in Buildings I and O, as well as in the ground-floor lobby adjacent to the football pitch. In 2024/25, a total of 177,988 plastic bottles were collected, equivalent to an estimated 1,170 kg CO_2e of avoided emissions. By August 2025, cumulative collections had reached 531,806 units, delivering total estimated emissions savings of 3.494 t CO_2e. This scheme

encourages standardised waste sorting practices and reduces the environmental burden of single-use plastic waste.



Figure 11. Campus Plastic Bottle Reverse Vending Machines

(5) End-of-Life Equipment Recycling

The University collects end-of-life assets including computers, laboratory instruments, furniture, photocopiers and vehicles for compliant disposal and material recovery. In 2024/25, 2,461 items were collected, delivering an estimated 41.15 t CO_2e in avoided emissions. Between January 2020 and August 2025, cumulative recoveries totalled 6,037 items, corresponding to an estimated 100.939 t CO_2e of avoided emissions. This programme diverts usable materials from landfill, supports circular resource utilisation and strengthens end-to-end campus resource stewardship.

(6) Empty Toner Cartridge Recycling

MUST operates a dedicated collection scheme for used toner cartridges from office printing and copying equipment to optimise office consumable waste management. In 2024/25, 188 cartridges were recovered, generating an estimated 220 kg CO_2e of emissions savings. From October 2019 to August 2025, cumulative collections reached 1,204 cartridges, accounting for an estimated 1.41 t CO_2e of total avoided emissions. This initiative supports

standardised, circular management of office consumables across all administrative and academic units.

(7) Lights Out for One Hour Campaign

MUST has taken part in World Environment Day initiatives organised by the Environmental Protection Bureau of the Macao SAR Government since 2010. Its flagship annual Lights Out for One Hour campaign mobilises students and staff to integrate energy conservation into daily practice. Complementary energy-saving measures include a minimum indoor air-conditioning setpoint of 25°C and a summer business-casual dress policy for staff, both of which reduce overall cooling demand and electricity consumption.

According to internal university estimates, the Lights Out for One Hour campaign avoids approximately 7.73 t CO_2e of emissions per year. When combined with the 43.26 t CO_2e reduction delivered by the six recycling schemes detailed in Table 6, the total annual emissions reduction from these seven initiatives reaches an estimated 50.99 t CO_2e. These long-running efforts embed energy conservation as a core element of everyday campus culture and reinforce shared low-carbon values across the university community.



Figure 12. World Environment Day Campus Activities



Figure 13. Annual Lights Out for One Hour Event

3. Education for Sustainable Development

MUST integrates the United Nations Sustainable Development Goals (SDGs) into its curricula across all faculties and disciplines, embedding principles of environmental protection, social responsibility and inclusive economic development into student learning. Courses such as Topics in Urban and Regional Sustainable Development and Innovation and Entrepreneurship Management explore the intersections of regional development, business innovation and cross-sector collaboration, fostering students' understanding of SDG 17 (Partnerships for the Goals).

This cross-disciplinary approach enables students to identify shared sustainability challenges and appreciate the distinctive contributions of different academic fields in addressing them. It also bridges applied technologies, institutional frameworks and real-world societal needs. Covering clean energy, environmental governance, public health, cultural heritage and responsible business, the University's sustainability-focused curricula advance progress towards SDG 4 (Quality Education) and equip graduates to contribute to sustainability initiatives in Macao and the wider region.

3.1 Overview of the Sustainability Curriculum

MUST embeds sustainability throughout its academic curriculum to nurture graduates with a global outlook and a robust sense of social responsibility. Sustainability-themed teaching spans all degree levels and a wide range of disciplines, covering core themes including environmental protection, public health and corporate responsibility.

Relevant courses are delivered by 12 academic units across the University: the Faculty of Innovation Engineering, Faculty of Humanities and Arts, School of Business, Faculty of Law, Faculty of Hospitality and Tourism Management, Faculty of Chinese Medicine, Faculty of Medicine, University International College, School of Liberal Arts, Institute for Sustainable Development, Institute for Social and Cultural Research, and the Department of General Education.

Sustainability themes are integrated into the curriculum across three core disciplinary perspectives.In the science and engineering domain, the Faculty of Innovation Engineering delivers courses including *New Energy Materials and Technologies, Environment and Sustainable Development* and *Environmental Impact Assessment,* laying the scientific groundwork for understanding energy transition and environmental governance.

On the socio-economic front, the School of Business and the Institute for Sustainable

Development lead teaching on *Business Ethics and Corporate Social Responsibility, Social Enterprise and Social Innovation* and *Environmental and Resource Economics*, building students' grasp of sustainable business models and circular resource management.

From the humanities and legal perspective, the Faculty of Humanities and Arts and the Faculty of Law explore curricular themes spanning *Cultural Heritage Conservation and Research*, *Conservation and Adaptive Reuse of Historic Buildings*, and *Topics in Environmental and Resource Protection Law,* underscoring the vital role of cultural heritage transmission and institutional safeguards. *Public Nutrition and Nutrition Policy* offered by the School of Medicine, further link sustainability outcomes to population health and overall quality of life.

In Spring 2025, the University launched AI-MUST, a general education course in artificial intelligence. The programme explores cross-disciplinary AI applications, including real-world use cases in sustainable development.

Full details of all relevant courses are provided in Table 7, with newly added courses for this reporting cycle highlighted in red. Collectively, this curriculum framework helps students develop a systemic understanding of the interconnections between environmental, social and economic systems.

Table 7. Catalogue of Sustainability-Related Courses, 2024/25

College / Unit	Degree Level	Program	Course	Course Type	Credits
School of Liberal Arts	Doctoral	Leisure Management	Sustainable Leisure Management	Elective	3
	Bachelor's	Hospitality Service Management	Promotion and Development of Cultural Industries	Compulsory	3
	Bachelor's	Business Studies	Business Ethics and Corporate Social Responsibility	Compulsory	3
Faculty of Innovation Engineering	Doctoral	Materials Science and Engineering	New Energy Materials and Technologies	Elective	2
	Doctoral	Materials Science and Engineering	Environmentally Functional Nanomaterials	Elective	2
	Doctoral	Environmental Science and Engineering	Soil Pollution Control and Remediation Technologies	Elective	3
	Master's	Environmental Science and Management	Environment and Sustainable Development	Compulsory	3
	Master's	Materials Science and Engineering	Frontiers and Foundations of Environmental Materials	Elective	2

	Master's	Materials Science and Engineering	Nanomaterials for New Energy and Catalysis	Compulsory	3
	Master's	Materials Science and Engineering	Modern Solar Energy Conversion Materials	Elective	2
	Master's	Environmental Science and Management	Environmental Impact Assessment	Compulsory	3
	Master's	Environmental Science and Management	**Climate Change (new)**	Elective	3
	Bachelor's	Environmental Science and Engineering	**Water Pollution Control Engineering (new)**	Compulsory	3
Faculty of Hospitality and Tourism Management	Doctoral	Tourism Management	Research on Sustainable Tourism Development	Elective	2
	Bachelor's	Hotel Management	Innovation and Sustainable Development in the Hotel Industry	Elective	3
Faculty of Law	Doctoral	Law	Topics in Environmental and Resource Protection Law (I)	Compulsory	3
	Doctoral	Law	Topics in Environmental and Resource Protection Law (II)	Compulsory	3
	Bachelor's	Law	**Labor and Social Security Law / Macao Labor and Social Security Law (new)**	Elective	3
Faculty of Humanities and Arts	Doctoral	Design	Cultural Heritage Conservation and Research	Elective	3
	Doctoral	Architecture	Research on Contemporary Green Building Design and Methods	Elective	3
	Doctoral	Architecture	Topics in Sustainable Architectural Design	Compulsory	3
	Master's	Design	Foundations and Practice of Cultural Heritage Conservation	Elective	6
	Master's	Architecture	Principles of Waterfront Urbanism and Sustainable Architectural Design	Compulsory	3
	Master's	Architecture	Adaptive Reuse of Buildings and Cultural Creativity	Elective	3
	Master's	Architecture	Conservation and Adaptive Reuse of Historic Buildings	Elective	3
	Bachelor's	Digital Media Arts	Environmental Science	Elective	2

School of Business	Master's	Business Administration	Corporate Social Responsibility and Ethics	Compulsory	3
	Master's	Philanthropy and Social Organization Management	Corporate Social Responsibility	Elective	3
	Master's	Executive Business Administration	Innovation and Entrepreneurship Management	Elective	1.5
	Master's	Philanthropy and Social Organization Management	Social Enterprise and Social Innovation	Compulsory	3
	Master's	Public Administration	**Public Policy Analysis (new)**	Compulsory	3
	Bachelor's	Business Administration	Business Ethics and Corporate Social Responsibility	Compulsory	3
Faculty of Chinese Medicine	Bachelor's	Chinese Pharmacy	Research and Development of New Chinese Medicine Products	Elective	3
Faculty of Medicine	Master's	Public Health	Data and Innovation in Public Health	Compulsory	3
	Master's	Public Health	**Environmental and Occupational Health (new)**	Compulsory	3
	Bachelor's	Food and Nutritional Sciences	**Food Safety and Quality Management (new)**	Compulsory	3
	Bachelor's	Food and Nutritional Sciences	**Fundamentals of Nutrition (new)**	Compulsory	3
	Bachelor's	Food and Nutritional Sciences	**Public Nutrition and Nutrition Policy (new)**	Compulsory	3
University International College	Doctoral	Education	**Cross-Cultural Communication in Global Education (new)**	Elective	3
Institute for Sustainable Development	Doctoral	Urban and Regional Economics	Topics in Urban and Regional Sustainable Development	Compulsory	3
	Doctoral	Urban and Regional Economics	Environmental and Resource Economics	Elective	3
Department of General Education	Bachelor's	General Education	Topics in Ecological Civilization and Sustainable Development	Elective	2
	Bachelor's	General Education	World Cultural Heritage	Elective	2
	Bachelor's	General Education	**AI-MUST (new)**	Compulsory	2

Note: The "(new)" marker denotes courses included for the first time in this reporting cycle. AI-MUST is a compulsory general education course for all students other than those enrolled in the Faculty of Innovation Engineering.

3.2 Courses Mapped to the SDGs

Clean Energy and Low-Carbon Transition

New Energy Materials and Technologies

Faculty of Innovation Engineering | PhD in Materials Science and Engineering

Relevant SDGs Addressed



SDG 7: Foundations of Clean Energy Technologies

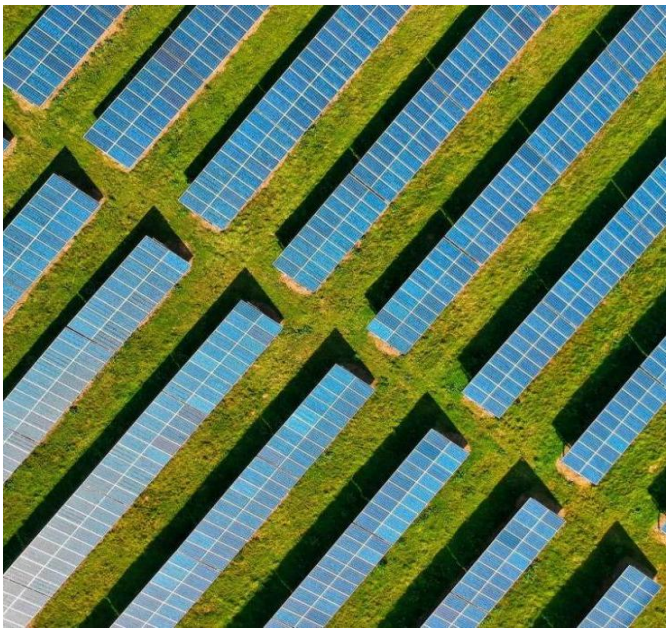
SDG 9: Materials and Devices Innovation

SDG 13: Scientific Underpinnings for Low-Carbon Transition

Advancements in clean energy are underpinned by sustained research in materials science and engineering. Delivered by the Faculty of Innovation Engineering, *New Energy Materials and Technologies* integrates semiconductor device principles, nanotechnology and practical clean energy applications. Students build a rigorous understanding of energy device operating mechanisms and apply literature-based research methodologies to investigate core technical challenges.

The course cultivates sound technical judgement and robust research competencies. Students are required to evaluate the feasibility of their analytical work, identify the strengths and limitations of state-of-the-art tools, and deploy predictive modelling and simulation techniques to tackle complex problems. This lays a solid knowledge foundation for comprehending clean energy technologies, materials innovation and the broader low-carbon transition.

Complementing classroom teaching, the University's Solar Energy and Environmental Catalysis Laboratory conducts cutting-edge research into solar energy conversion and storage, spanning photocatalysis, photoelectrocatalysis and photothermal catalysis.



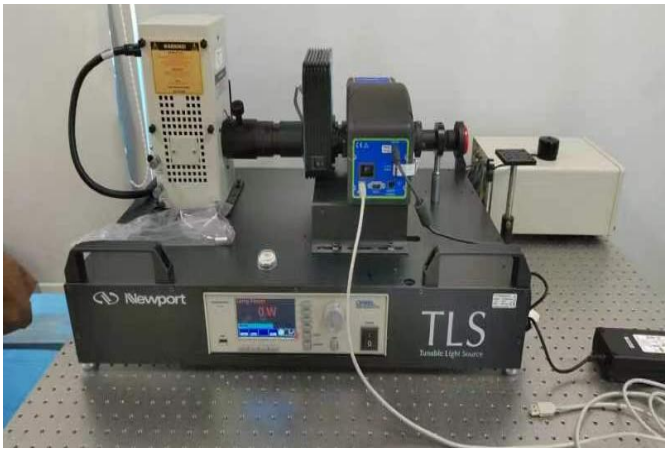


Figure 14.Top: Photovoltaic array (Image credit: Red Zeppelin / Pexels)

Bottom: Laboratory equipment at MUST's Solar Energy and Environmental Catalysis Laboratory, Faculty of Innovation Engineering

Image credit: Faculty of Innovation Engineering, MUST

Environmental Governance and Ecological Conservation

Environment and Sustainable Development

Faculty of Innovation Engineering | MSc in Environmental Science and Management

Relevant SDGs



SDG 6: Water Environment Management and Pollution Abatement

SDG 12: Resource Utilisation and Environmental Stewardship

SDG 15: Terrestrial Ecosystem Conservation

Environmental challenges emerge from the complex interplay between natural ecosystems and human activities. *Environment and Sustainable Development* examines the impacts of pollution on human health and ecosystem integrity, and introduces core frameworks for pollution prevention and abatement.

The curriculum spans environmental standards, monitoring protocols, environmental quality assessment, planning and governance, establishing a clear pathway from pollution source identification to impact evaluation and mitigation responses. Students develop the ability to assess development initiatives across four core dimensions: resource utilisation, ecological conservation, environmental quality and societal needs.

Complementing classroom instruction, MUST's Environmental Engineering Laboratory provides hands-on learning support, with specialist facilities for solid waste resource recovery, water pollution control and ecohydraulics.



Figure 15. Top: Mangrove wetland and waterway (Image credit: Teofilo Narvaez / Pexels);
Bottom: MUST Environmental Engineering Laboratory (Image credit: Faculty of Innovation Engineering, MUST)

Food, Nutrition, and Healthy Living

Public Nutrition and Nutrition Policy

Faculty of Medicine | BSc in Food and Nutritional Sciences

Relevant SDGs Addressed



SDG 2: Improved Nutrition and Population Dietary Adequacy

SDG 3: Healthy Diets and Public Health Advancement

Sound nutrition forms a foundational pillar of lifelong health and well-being. Delivered by the Faculty of Medicine, *Public Nutrition and Nutrition Policy* examines dietary patterns and nutritional requirements across diverse population groups. Students master core research methodologies for public nutrition, standard approaches to nutritional status assessment, and evidence-based strategies for dietary improvement.

The curriculum covers population nutrition surveys, dietary reference intakes (DRIs), meal planning and menu design, alongside a systematic overview of nutrition and health outcomes in China. It bridges nutritional science with population health needs and underscores the role of nutrition policy in advancing health promotion. Complementary courses including *Fundamentals of Nutrition and Food Safety and Quality Management* extend this knowledge base to population dietary requirements, food safety risk management and quality control standards.



Figure 16. Food and Nutrition Thematic Course Illustration
Image credit: Selma Nigar Baştürk / Pexels

Cultural Heritage and Urban Regeneration

Conservation and Adaptive Reuse of Historic Buildings

Faculty of Humanities and Arts | Master of Architecture

Relevant SDGs Addressed



SDG 11: Cultural Heritage Conservation and Sustainable Urban Renewal

SDG 12: Circular Reuse of Existing Built Assets

Historic buildings embody the cultural memory of urban communities; their conservation and adaptive reuse extend the functional lifespan of built assets and support the sustainable utilisation of urban space. *Conservation and Adaptive Reuse of Historic Buildings* integrates building construction technology, architectural history and regulatory frameworks to examine core methodologies and practical challenges in the adaptive reuse of heritage structures. Research-based assignments deepen students' grasp of architectural conservation principles and urban revitalisation practice.

The course fosters the translation of disciplinary knowledge into design practice. By recognising the historical, cultural and functional value of existing building stock, students explore evidence-based approaches to extending building functionality and service life. This pedagogical approach links cultural heritage conservation with circular resource reuse, and advances an urban regeneration vision rooted in cultural continuity.

To support hands-on learning, the University's cultural heritage conservation laboratory delivers practical training for postgraduate architecture students. For instance, Zheng Yuchan, a Master of Architecture student, mastered standard protocols for the cleaning, sieving and drying of rammed-earth samples, and received structured training on X-ray diffraction (XRD) and X-ray fluorescence (XRF) analytical instruments — extending architectural conservation studies into the realm of building materials analysis.



Figure 17. Top: Student Learning to Use Analytical Instruments; Bottom: Laboratory Class in Conservation and Adaptive Reuse of Historic Buildings.

Image source: Faculty of Humanities and Arts.

Business Ethics and Corporate Social Responsibility

School of Business | Bachelor of Business Administration

Relevant SDGs Addressed



SDG 8: Decent Work, Employment Rights and Workplace Ethics

SDG 12: Responsible Corporate Operations and CSR Practice

SDG 16: Responsible Governance and Ethical Managerial Decision-Making

Sustained business success hinges on recognising and addressing the legitimate interests of employees, communities and the full spectrum of stakeholders. Delivered by the School of Business, *Business Ethics and Corporate Social Responsibility* introduces core frameworks for ethical decision-making, employment rights, workplace privacy and corporate social responsibility (CSR). Students develop the ability to identify ethical dilemmas embedded in day-to-day management practice.

Through interactive lectures, case study discussions and group presentations, students apply these theoretical frameworks to real-world business scenarios, analyse ethical challenges both within and beyond organisations, and formulate practical, principled responses. The course bridges management theory with responsible decision-making and fosters an awareness of business activities' broader social impacts.

These curricular themes are further reinforced through campus academic exchange events. In May 2025, the Faculty of Hospitality and Tourism Management hosted a dedicated hospitality industry forum featuring Professor Seoki Lee. The session explored cutting-edge research on corporate social responsibility and environmental, social and governance (ESG) practices in the hospitality sector, with a focus on stakeholder relationships and value co-creation between businesses and society.



Figure 18. Hospitality Forum on CSR and ESG in the Hospitality Industry, 21 May 2025
Image credit: Faculty of Hospitality and Tourism Management

Social Enterprise and Social Innovation

School of Business | Master's Program in Philanthropy and Social Organization Management

Relevant SDGs Addressed



SDG 8: Social Entrepreneurship and Inclusive Value Creation

SDG 10: Reduced Inequality and Responsive Support for Vulnerable Groups

SDG 17: Cross-Sector Partnerships and Community Engagement

Social enterprises integrate commercial operations with core social missions, providing diverse organisational solutions to unmet public needs. Delivered by the School of Business, *Social Enterprise and Social Innovation* examines key topics including social entrepreneurship, venture positioning, organisational governance models and profit allocation mechanisms. It guides students to understand the operations of commercial enterprises and non-profit organisations (NPO) through the lens of social value creation.

Through case study discussions and analytical exercises, students learn to identify innovation opportunities for social enterprises, and apply theoretical knowledge to practical challenges facing philanthropic and social organisations. The course encourages students to align creative project proposals with real community needs, while taking into account operational feasibility and the priority interests of beneficiaries.

These curricular concepts are put into practice through campus initiatives. In April 2025, the Student Association of the Faculty of Hospitality and Tourism Management organised an entrepreneurship competition market, donating approximately MOP 15,000 in proceeds to the Macau Association of the Hearing Impaired. The activity blended hands-on entrepreneurial experience with community outreach, demonstrating the tangible social value of business-led initiatives.



Figure 19. Top: Entrepreneurship Competition Market
Bottom: Students presenting donation to the Macau Association of the Hearing Impaired, April 2025
Image credit: Faculty of Hospitality and Tourism Management

Sustainable Tourism and Hospitality Management

Innovation and Sustainable Development in the Hotel Industry

Faculty of Hospitality and Tourism Management | Bachelor of Hotel Management

Relevant SDGs Addressed



SDG 8: Inclusive Tourism Innovation and Quality Industry Development

SDG 12: Responsible and Low-Impact Hotel Operations

SDG 13: Climate Action and Low-Carbon Hospitality Practice

The long-term viability of the tourism and hospitality sector rests on service innovation and a steadfast commitment to environmental stewardship. *Innovation and Sustainable Development in the Hotel Industry* examines how service innovation strengthens customer brand loyalty and embeds sustainability principles into end-to-end hotel operations. It links the systemic challenges of climate change with day-to-day management practice, guiding students to identify actionable pathways to improve environmental performance. Students develop the ability to integrate environmental considerations into core decision-making, from guest experience design and service delivery to daily operational protocols.

To bridge classroom learning with real-world industry insight, the Faculty organised a field study visit to Shunde in June 2025. Located in Foshan City, Guangdong Province of the People ' s Republic of China, Shunde holds the UNESCO designation of Creative City of Gastronomy – the same prestigious international title shared by Macao – and is widely regarded as the cradle of Cantonese culinary culture.Students toured leading organisations and enterprises across the industrial design, cultural heritage and creative arts sectors. The visit deepened students' understanding of industry innovation models and local cultural resources, and fostered critical reflection on the synergies between tourism development, cultural preservation and industrial upgrading.



Figure 20. Top: Green hotel property (Image credit: Cyrill / Pexels)

Bottom: MUST students on field study visit to Shunde, 9–10 June 2025

Image credit: Faculty of Hospitality and Tourism Management

AI-MUST

Department of General Education and Faculty of Innovation Engineering | Undergraduate General Education

Relevant SDGs Addressed



SDG 4: Interdisciplinary AI Literacy and Inclusive Quality Education

SDG 9: Technological Capacity Building and Innovative Cross-Disciplinary Applications

Artificial intelligence is reshaping the core knowledge and competencies required across all academic disciplines. In Spring 2025, MUST launched *AI-MUST*, a compulsory general education course for all undergraduate students outside the Faculty of Innovation Engineering. The programme equips students with a solid foundational understanding of AI principles and their real-world application potential. It comprises foundational and thematic modules covering core AI concepts, alongside domain-specific applications in science, sustainable development, medicine, law, humanities and business. This cross-disciplinary structure enables students to map technological advances onto their respective major fields of study.

Complementing classroom instruction, hands-on workshops extend students' practical AI competencies. On 30 April 2025, the Faculty of Hospitality and Tourism Management and the University Library co-hosted the Exploring Generative AI: Innovation Empowerment Workshop. During the session, participants gained hands-on experience with mainstream AI tools and explored their practical applications in academic learning and creative practice.





Figure 21. Generative AI Workshop: Group Discussion and Hands-On Practice, April 30, 2025

Image credit: Faculty of Hospitality and Tourism Management.

3.3 Representative Teaching Cases

MUST embeds sustainable development into professional education through academic research presentations, practical competitions and interdisciplinary collaborative projects. In the 2024/25 academic year, students from design, hospitality and tourism management, business and engineering disciplines conducted in-depth investigations into urban ecology, food resource utilisation and financial governance. The following cases demonstrate diverse pathways to align disciplinary expertise with real-world sustainability challenges.

Case 1: Design Research for Urban Biodiversity Conservation (SDGs 11 and 15)

On 10 May 2025, faculty and students from MUST's Faculty of Humanities and Arts attended the 2025 Hengqin International Biodiversity Day Forum & Nature Education Forum. Adjacent to Macao, Hengqin is home to the Guangdong-Macao In-Depth Cooperation Zone in Hengqin-a core strategic platform dedicated to supporting the appropriate economic diversification of Macao-and serves as a key hub for cross-border ecological governance and urban sustainability innovation in the Guangdong-Hong Kong-Macao Greater Bay Area (GBA) . The forum connects design-led research with pressing urban ecological issues across the region.

Two Master of Design candidates delivered dedicated research presentations: Zhang Yihan shared findings on the ecological resilience of navigation channels in the Pearl River Estuary adjacent to Macao, while Xu Ran presented a study on the biodiversity status in Macao's Nam Van Lake.Both projects took local aquatic environments as case samples to examine habitat conditions and overall urban ecological health.

Third-year undergraduate students on the Art and Design programme presented their work through academic posters and physical models. The team of Li Ruoning and Zhang Manhui was awarded first prize. Huang Chutong and Xu Shiqi demonstrated ecological restoration concepts via immersive spatial models, while Chen Jiayi, Ruan Junyao and Dong Xinyu conducted an investigation into invasive species and biodiversity decline in Nam Van Lake. The latter two teams each received third prize. All participating students explained their projects and engaged in interdisciplinary discussion with forum attendees from diverse professional backgrounds.

This experience extends design education beyond studio practice to cover ecological problem identification, research communication and evidence-based solution development.

Interactive models translate restoration concepts into tangible spatial forms, while oral presentations require students to articulate their supporting evidence and design rationale. By centring on local environments such as Nam Van Lake, the projects make the links between urban life and natural habitats more concrete, and deliver practical contributions to SDG 11 (Sustainable Cities and Communities) and SDG 15 (Life on Land).

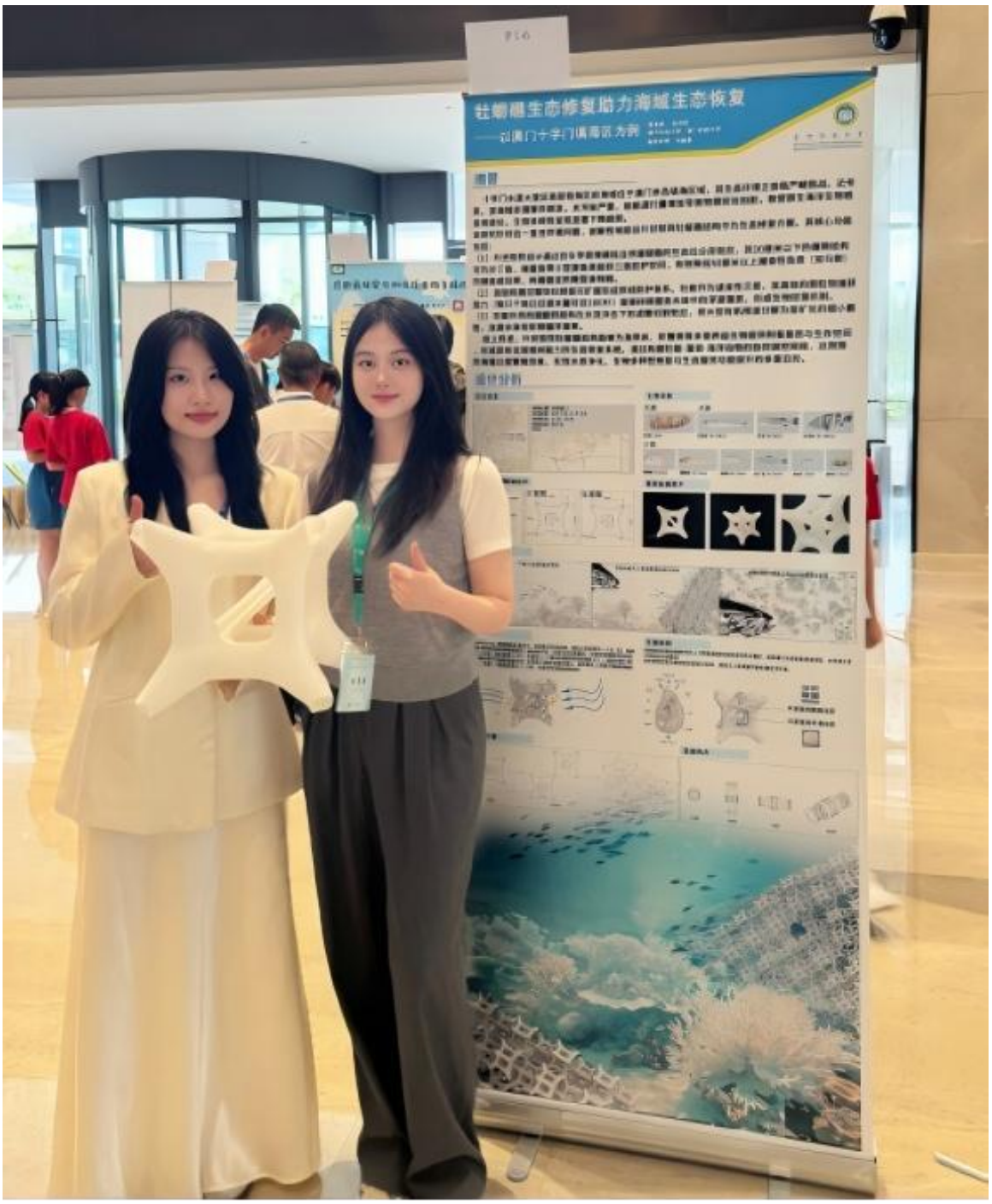


Figure 22. Design Students Presenting Ecological Research Models at the Forum

Case 2: Practice Promoting Ingredient Stewardship and Low-Waste Cooking Through Culinary Practice (SDG 12)

On 26 April 2025, the Faculty of Hospitality and Tourism Management hosted its 8th *Culinary Excellence* cooking competition at the University's specialist culinary training laboratory. Centred on eggs as the core ingredient and all-day breakfast cuisine, the competition drew 26 students across 13 teams from undergraduate, master's and doctoral programmes. Marking the first time the event was open to all programmes within the Faculty, the contest brought together students from diverse educational backgrounds for collaborative, creative culinary practice.

Participants developed a diverse range of dishes using the same principal ingredient, including scrambled eggs, Boston-style omelettes and cloud eggs. A panel of industry adjudicators from Wynn Palace and XINA Restaurant scored each entry against three core criteria: creativity, flavour profile and visual presentation. A defining theme of the competition was the emphasis on maximising ingredient utilisation and minimising food waste throughout the cooking process, linking resource conservation directly to on-site culinary decision-making.

This hands-on exercise provides hospitality students with an intuitive, practice-based understanding of food resource value. Students balanced inherent ingredient properties, menu design and dish presentation while working in teams to deliver their final creations. The initiative translates the principles of SDG 12 (Responsible Consumption and Production) into everyday culinary practice, and deepens students' grasp of responsible, low-waste approaches to hospitality operations.



Figure 23. 8th Culinary Excellence Campus Cooking Competition

Case 3: Laundering Interdisciplinary AI Innovation for Anti-Money Laundering Governance (SDGs 9 and 16)

On 15 March 2025, the SuperAML team – comprising Guo Haoxuan from the Faculty of Innovation Engineering, and Mou Bingqian and Yuan Yining from the School of Business——was awarded the Grand Prize at the national finals of the 15th ICBC Cup National College Student FinTech Innovation Competition. Under the supervision of Professor Lin Yongjia and Assistant Professor Peng Yi, the team presented their project *SuperAML-1: Application of AI Models in Anti-Money Laundering Management*, integrating engineering technical expertise with real-world financial governance challenges.

The team advanced through three competitive stages: university-level selection, the Macao regional heat and the national final. On 21 February, the School of Business hosted a campus selection round with 12 teams delivering project presentations, shortlisting three entries for the Macao regional competition. SuperAML claimed first prize at the regional round on 26 February, and went on to represent Macao at the national finals. The project deploys AI model distillation technology to strengthen money laundering detection and prevention, with a core focus on upholding lawful, transparent and compliant financial transactions.

This case exemplifies the complementary strengths of business and engineering disciplines: financial crime mitigation provides a high-impact real-world scenario for AI application, while technical solutions must be tailored to meet the strict regulatory and operational requirements of financial management. Through successive rounds of presentations and expert evaluations, students refined their methodological frameworks and received targeted feedback from industry specialists.

The project directly advances the objectives of SDG 16 (Peace, Justice and Strong Institutions) by addressing the reduction of illicit financial flows, and aligns with SDG 9 (Industry, Innovation and Infrastructure) by building students' innovative technological capacity and fostering responsible, regulation-aligned technology deployment.



Figure 24. SuperAML Team Awarded Grand Prize at the National College Student FinTech Innovation Competition

4. Sustainable Development Research

The United Nations Sustainable Development Goals (SDGs) serve as a unifying strategic framework for MUST to identify societal needs, coordinate interdisciplinary research endeavours and assess the real-world impact of academic knowledge. Throughout the 2024/25 academic year, the University continued to advance the integrated development of teaching and research, with core focus areas including health and well-being, technological innovation, energy transition and environmental governance. Research activities draw on expertise across medicine, engineering, management and the social sciences, exploring the intersections between disciplines to address pressing real-world sustainability challenges. This chapter analyses Scopus-indexed research outputs produced by MUST and their alignment with the SDGs, with the 2024–2025 calendar years as the core reporting period and 2021–2025 as the basis for longitudinal trend analysis.

4.1 Overall Landscape and Growth Trend of SDG-Aligned Research

MUST's sustainability research features well-established areas of strength alongside a broad and expanding range of thematic topics. As recorded in Scopus (Figure 25), a total of 2,901 SDG-related publications were documented in the 2024–2025 calendar period, with 1,281 published in 2024 and 1,620 in 2025. These research outputs span 16 SDGs, addressing priority areas including public health, clean energy, industrial innovation, economic development and environmental governance, reflecting a robust and diversified research foundation.

SDG 3 (Good Health and Well-being) accounts for the largest share of MUST's SDG-aligned research outputs, underscoring the University's core disciplinary strengths in medicine and health sciences. SDG 9 (Industry, Innovation and Infrastructure) and SDG 7 (Affordable and Clean Energy) also represent major publication clusters. Research aligned with SDGs 8, 11, 12 and 13 further extends the University's research footprint across economic, social and environmental sustainability dimensions. Collectively, health technology and industrial innovation form the cornerstone of the University's broad-based sustainability research portfolio.

Each thematic area has distinct research priorities. Health-focused research spans disease prevention, pharmaceutical development, biomedical science and public health. Clean energy and industrial innovation research explores efficient energy utilisation, advanced materials

and technologies enabling the green transition. Studies in urban development, resource management and socio-economic governance link sustainability outcomes to public policy, business practices and institutional frameworks. Together, these fields embody MUST's disciplinary strengths and the breadth of sustainability challenges it addresses.

The distribution of SDG-related research is not uniform across all goals. Health and medicine, energy technology and industrial innovation have relatively well-established research foundations, while environmental governance, resource utilisation and social development represent growing and diversifying areas of the University's research portfolio. This differentiated structural layout allows MUST to consolidate its existing competitive advantages while exploring new interdisciplinary research frontiers.

Overall, MUST has built a substantial and distinctive body of research across the full spectrum of sustainability fields. Ongoing work in healthcare, clean energy, industrial innovation and socio-economic governance provides a solid foundation for further academic advancement and enhanced contributions to regional and global sustainable development.



Figure 25. Overview of SDG-Aligned Research Outputs and Thematic Areas, 2024–2025

4.2 Research Output Growth and Long-Term Development Trends

SDG-aligned research publications have maintained sustained growth over the observation period, rising from 757 in 2021 to 1,002 in 2022, 1,012 in 2023, 1,281 in 2024 and 1,620 in 2025, representing a cumulative growth of approximately 114% across the

five-year period. Following a sharp 32.4% annual increase in 2022, growth moderated to 1.0% in 2023 before regaining strong momentum, recording year-on-year growth of 26.6% in 2024 and 26.5% in 2025 respectively. The net addition of 339 publications in 2025 represents the largest absolute year-on-year increase within the observation window (Figure 26).

This overall growth was underpinned by expanded outputs across three priority SDG fields. Publications under SDG 3 rose from 623 in 2024 to 778 in 2025, an absolute increase of 155 papers. Outputs aligned with SDG 7 grew from 172 to 229 (a net gain of 57 publications), while SDG 9-related publications increased from 213 to 263 (a net addition of 50). Health-related research contributed the largest absolute volume of new outputs, with clean energy and industrial innovation also showing consistent expansion.

Growth rates exhibited notable variation across research domains. Publications under SDG 12 increased from 118 to 160, registering a 35.6% growth rate; SDG 7 recorded 33.1% growth; and SDG 11 saw outputs rise from 134 to 173, equivalent to 29.1% year-on-year growth. All three areas outpaced the overall 26.5% growth rate for SDG-related research in 2025. By comparison, SDG 3 and SDG 9 grew by approximately 24.9% and 23.5% respectively.

In terms of structural share, SDG 3 retained its dominant position, accounting for 48.6% of all SDG-aligned publications in 2024 and 48.0% in 2025. Meanwhile, the share of SDG 7 rose from 13.4% to 14.1%, and SDG 12's share increased from 9.2% to 9.9%. These modest structural shifts reflect an evolving research landscape, with growing research focus on clean energy and sustainable production.

Taken together, the data demonstrate sustained expansion in overall SDG research output, with accelerated growth in recent years and divergent growth trajectories across individual SDG themes. Health research remains the primary contributor to new publications, while clean energy, sustainable production and urban development are emerging as fast-growing areas. These patterns provide a robust evidence base for assessing MUST's research priorities and comparative strengths across the Sustainable Development Goals.

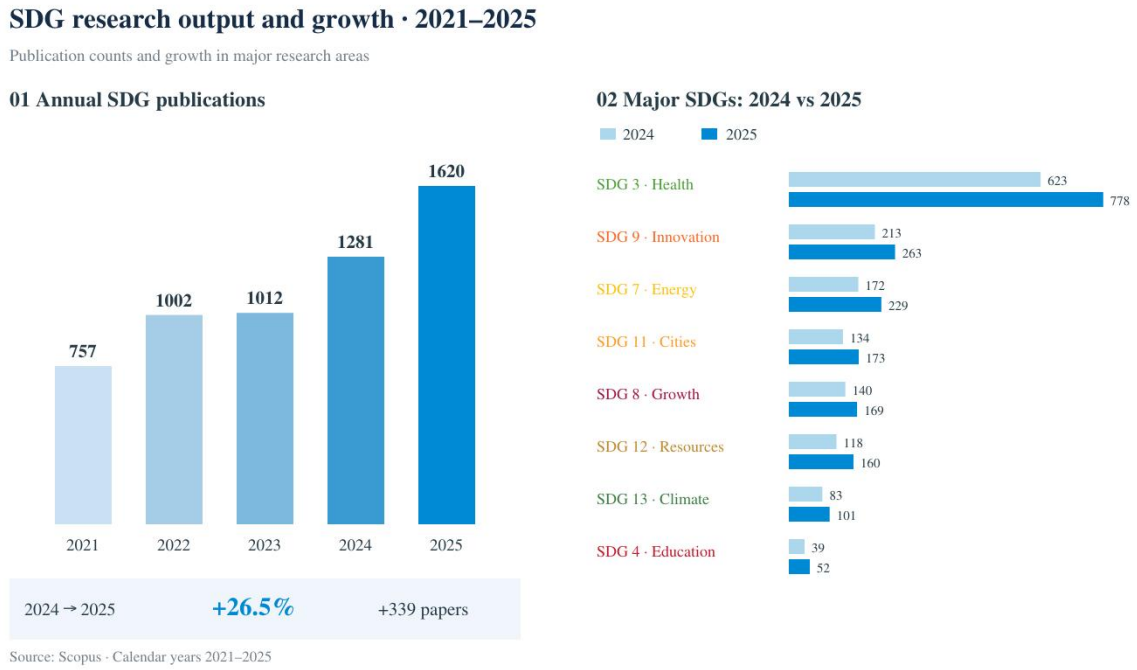


Figure 26. SDG Research Output Trends and Growth in Key Thematic Areas, 2021–2025

4.3 Relative Research Intensity and Core Disciplinary Strengths

To assess MUST's comparative research advantages across sustainability themes, this section adopts the Relative Activity Index (RAI) — a standard bibliometric indicator — to compare research concentration on individual SDGs among MUST, the wider Macao region and the global average. The global baseline is set at 1.0; scores above 1.0 signal a higher degree of research specialisation than the global average. Unlike raw publication counts, the RAI captures the relative prominence of a given field within an institution's overall research portfolio. As illustrated in Figure 27, the 2025 benchmarking analysis shows that MUST exhibits comparatively strong research activity in health, industrial innovation, economic development and sustainable production.

MUST records an RAI of approximately 1.5 for SDG 8 and around 1.4 for both SDG 9 and SDG 12, indicating above-average research concentration in economic development, technological innovation and sustainable resource utilisation. Relative to Macao's overall research landscape, MUST's strengths in SDG 9 and SDG 12 are particularly pronounced. For SDG 3, the University achieves an RAI of roughly 1.3, exceeding both the Macao regional and global baselines, and reflecting the central position of medicine and health sciences within MUST's research portfolio.

In the domain of urban and environmental sustainability, MUST's RAI for SDG 11 stands at approximately 1.4, on par with the Macao regional level and well above the global

benchmark. Its RAI scores for SDG 13 and SDG 14 also outperform the Macao average, with SDG 14 additionally exceeding the global baseline. By comparison, Macao's overall research landscape shows a higher concentration on SDG 4, while MUST stands out for its specialisation in health, technological innovation and sustainable production.

Overall, MUST's SDG-aligned research ecosystem combines a robust foundational base in health research with notable concentrations in industrial innovation, economic development and responsible production, complemented by growing work in urban sustainability and environmental governance. Its relative research activity surpasses the Macao regional average across multiple priority fields and outperforms the global benchmark in selected thematic areas. These established strengths provide a solid platform for expanding interdisciplinary research collaboration and delivering high-impact scholarly contributions to sustainable development.

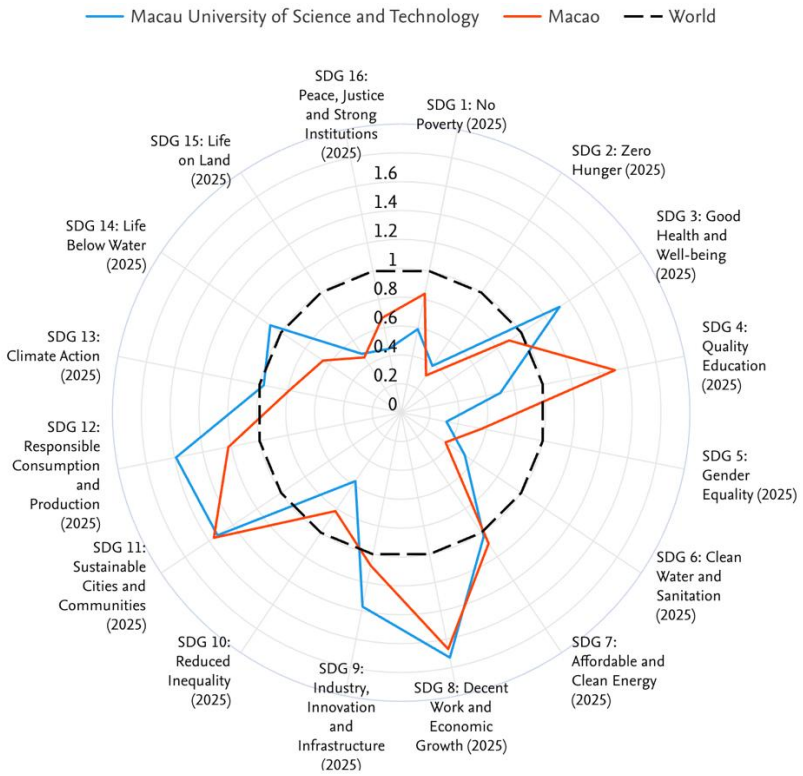


Figure 27. Relative Activity Index (RAI) Benchmarking of SDG Research

4.4 Cross-SDG Interdisciplinary Research Integration

Interdisciplinary linkages across MUST's sustainability research themes have strengthened notably in recent years. Scopus data indicate that 1,036 publications published between 2021 and 2025 are mapped to two or more SDGs. The annual volume of cross-SDG outputs grew from 98 in 2021 to 345 in 2025, while its share of total SDG-aligned

publications rose from 12.9% to 21.3%-an increase of 8.4 percentage points over the period. The share stood at 20.1% in 2024 and 21.3% in 2025.

In 2025, the most frequent SDG pairings included SDGs 8 and 12 (66 joint publications), SDGs 9 and 12 (48 publications) and SDGs 7 and 9 (47 publications). These co-occurrence patterns reflect deepening research intersections between industrial development, green technology advancement and circular resource utilisation (Figure 28).

In public health and environmental risk governance, the 2025 "Nature Water" article "Microbial risk assessment across multiple environments based on metagenomic absolute quantification with cellular internal standards" used absolute metagenomic quantification to evaluate microbial risks in different environments. Classified under both SDGs 3 and 6, it illustrates how environmental monitoring methods can inform health risk assessment and how biotechnology, environmental science, and public health can inform one another.

(1) Public Health and Environmental Risk Governance

At the interface of environmental science and public health, a 2025 paper published in *Nature Water — Microbial risk assessment across multiple environments based on metagenomic absolute quantification with cellular internal standards* — applied absolute metagenomic quantification to evaluate microbial hazards across diverse environmental matrices. Classified under both SDG 3 and SDG 6, the study demonstrates how environmental monitoring methodologies can underpin evidence-based health risk assessment, and exemplifies the mutually reinforcing relationship between biotechnology, environmental science and public health research.

(2) Economic Management and Industrial Innovation

Within the domain of sustainable business and industrial innovation, a 2024 article in *Journal of Cleaner Production — Pricing, greening, and recycling decisions of capital-constrained closed-loop supply chain with government subsidies under financing strategies* — integrated financing strategy, pricing mechanisms, green investment and recycling systems into a unified analytical framework. Aligned with SDGs 8, 9 and 12, the research explores how enterprises balance operational decision-making and environmental accountability under capital constraints and government incentive schemes.

A further 2025 study published in Research in *International Business and Finance*, titled *Bridging social responsibility and grassroots finance: Evaluating the impact of firms'*

targeted pairing assistance on county digital financial inclusion, examined the linkages between corporate social responsibility, targeted support initiatives and digital financial inclusion. Mapped to SDGs 1, 8 and 9, the findings confirm that targeted corporate pairing assistance contributes to improved digital financial inclusion in assisted counties.

(3) Energy and Environmental Technology

Interdisciplinary integration is equally pronounced in energy and environmental technology research. A 2025 paper in *Resources, Conservation and Recycling — Waste photovoltaic wafers-derived SiC-based photocatalysts for pharmaceutical wastewater purification: S-scheme, waste utilization, and life cycle assessment* — investigated the conversion of discarded photovoltaic wafers into SiC-based photocatalysts for pharmaceutical wastewater treatment, validated through full life cycle assessment. Classified under SDGs 6, 7, 9 and 12, the study bridges waste material recovery with water pollution control and clean energy technology.

Another 2025 article published in *Renewable and Sustainable Energy Reviews*, *Large-scale seaweed cultivation as a nature solution for carbon-negative economy and restorative environmental stewardship: Lessons from China*, examined large-scale seaweed cultivation in the context of marine ecosystem restoration, carbon sequestration management and inclusive sustainable economic development. The study is associated with SDGs 8, 13, 14 and 15.

Collectively, these publications demonstrate how economic management, engineering science, resource recycling, environmental governance and public health can converge to address interconnected sustainability challenges. The rising share of multi-SDG publications, paired with the high-impact research examples outlined above, underscores the growing potential for integrated research that evaluates economic performance, technical feasibility, environmental impacts and social value within a unified analytical framework.

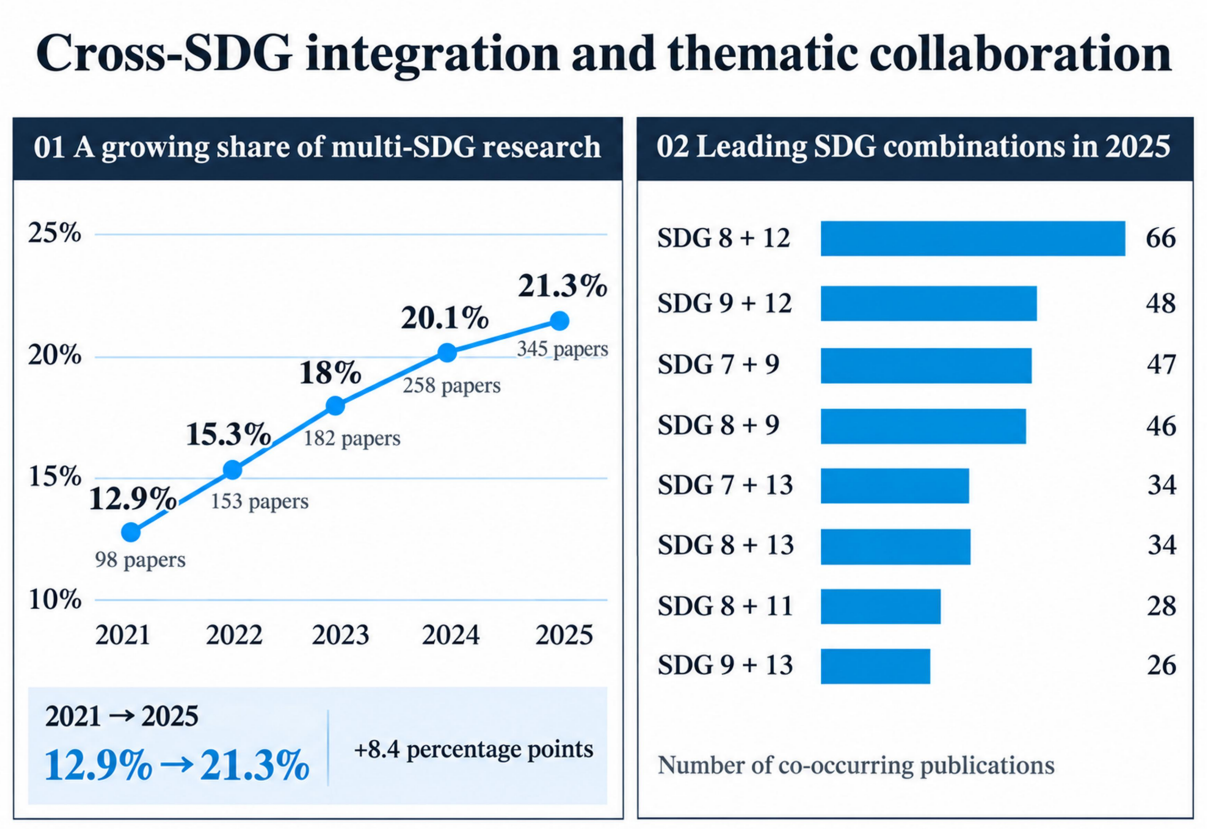


Figure 28. Cross-SDG Research Integration and Interlinkages Between Thematic Research Areas

4.5 Detailed Review of SDG-Aligned Research and Representative Publications

During 2024–2025, MUST produced research associated with the SDGs across medicine and health, clean energy, industrial innovation, environmental governance, and socioeconomic development. Engineering and medical studies appeared in high-level international journals, while management, humanities, and social science research addressed green transition, social equity, and institutional governance. Drawing on Scopus, this section reviews representative journal articles published with MUST participation in 2024 and 2025 across the 16 SDGs represented in its records.

Over the 2024–2025 calendar period, MUST has generated a substantial body of SDG-aligned research spanning medicine and health sciences, clean energy, industrial innovation, environmental governance and socio-economic development. Engineering and medical research findings have been published in top-tier international journals, while management, humanities and social science scholarship addresses critical themes including

green transition, social equity and institutional governance. Drawing on Scopus-indexed data, this section presents a detailed review of representative journal articles co-authored by MUST researchers between 2024 and 2025, covering all 16 SDGs represented in the University's publication record.

SDG 1 (No Poverty)

Research under SDG 1 has expanded beyond traditional income poverty and welfare analysis to encompass energy affordability, local development and financial inclusion. MUST produced 22 SDG 1-aligned publications in 2024–2025. Published in *Energy, Sustainability and Society* in 2024, the paper *The impact of climate change and environmental regulation on energy poverty: evidence from China* examines the interplay between climate change, environmental regulation and household energy burdens across China, delivering empirical evidence to inform energy equity policy throughout the green transition. A 2025 study in *Research in International Business and Finance, Bridging social responsibility and grassroots finance: Evaluating the impact of firms' targeted pairing assistance on county digital financial inclusion,* analyses corporate targeted support policies and their effects on local financial inclusion. The findings confirm that targeted corporate assistance drives advances in digital financial development in recipient counties, demonstrating how corporate social responsibility can expand development opportunities through inclusive financial access. Together, these studies link poverty reduction outcomes to environmental policy design and inclusive economic development.

SDG 2 (Zero Hunger)

MUST published 52 SDG 2-related outputs in 2024–2025, covering agricultural technology innovation, plant disease control, agricultural supply chain optimisation and sustainable food systems. A 2024 review in *Journal of Agricultural and Food Chemistry, Recent Advances in Microfluidics for the Early Detection of Plant Diseases in Vegetables, Fruits, and Grains Caused by Bacteria, Fungi, and Viruses*, surveys progress in microfluidic methods for the separation, enrichment and detection of plant pathogens, highlighting promising applications for early disease identification across horticultural and grain crops. Improved early detection supports targeted crop protection and reduces avoidable production losses. A 2025 paper in *Socio-Economic Planning Sciences, A hybrid method combining three-way decision and DEA game cross-efficiency for procurement mode selection in contract farming*, integrates three-way decision theory with data envelopment analysis game

cross-efficiency to support robust contract farming procurement decisions under uncertainty. These studies connect technological diagnostic advances with improved agricultural management practices.

SDG 3 (Good Health and Well-being)

SDG 3 represents MUST's largest SDG-aligned research domain, with 1,401 publications recorded in 2024–2025. Research spans cancer therapeutics, drug discovery, neurological and infectious diseases, and biomedical technology innovation. A 2025 *Nature Communications article, Berberine-inspired ionizable lipid for self-structure stabilization and brain targeting delivery of nucleic acid therapeutics*, reports the development of a berberine-derived ionizable lipid system designed to enhance nucleic acid stability and enable brain-targeted delivery. Experimental results demonstrate strong potential for treating neurological conditions. In the field of cancer immunotherapy, a 2025 *Proceedings of the National Academy of Sciences (PNAS) study, Acquired resistance to immunotherapy by physical barriers with cancer cell–expressing collagens in non–small cell lung cancer*, investigates acquired immunotherapy resistance in non-small cell lung cancer. It identifies cancer-cell-expressed collagens as key mediators of physical barriers that restrict immune cell infiltration, identifying new avenues to improve therapeutic response. A further 2025 Nature Communications paper co-authored by MUST researchers, An antimicrobial peptide as a potential therapy for bacterial pneumonia that alleviates antimicrobial resistance, explores antimicrobial peptides as a promising intervention for bacterial pneumonia and a strategy to mitigate antimicrobial resistance. Collectively, these publications span disease mechanism research, molecular design and therapeutic technology development, with direct relevance to precision medicine and public health advancement.

SDG 4 (Quality Education)

MUST recorded 91 SDG 4-aligned publications in 2024–2025, addressing educational philosophy, cultural heritage, curriculum innovation and education for sustainable development. A 2025 study in *Humanities and Social Sciences Communications, Reimagined Confucianism and the 'New Woman': Shen Yiyun and the synthesis of humanism and patriotism in modern Chinese Women's education*, draws on archival documents and textual analysis to examine how educator Shen Yiyun reinterpreted Confucian traditions in relation to women's independence, public participation and modern civic education. A 2024 article in *British Educational Research Journal, Business education and its paradoxes: Linking*

business and biodiversity through critical pedagogy curriculum, explores the interface between business education and biodiversity conservation. It critiques the limited attention to ecological degradation in conventional business curricula and advocates for integrating ecological literacy and critical pedagogy into business training. Together, the studies demonstrate how historical perspectives and curriculum reform can strengthen education's contribution to sustainable development.

SDG 5 (Gender Equality)

MUST produced 21 SDG 5-related publications in 2024–2025, focusing on women's career development, gender diversity in corporate governance, and participation in economic and social life. A 2025 *Global Finance Journal* article, *Gender diversity in the boardroom: The role of female directors in mitigating stock price crash risk*, analyses listed US firms and finds that higher female board representation is associated with lower subsequent stock price crash risk. This relationship is more pronounced in firms with weaker market competition, less independent boards and lower analyst coverage. A 2025 study in *International Journal of Tourism Research, Exploring the Impact of Perceived Liminal Experiences on Female Tourists' Eudaimonic Well-Being Through the Mediation of Travel Satisfaction*, surveys 322 female travellers and examines the roles of gender dynamics, perceived authenticity, empowerment and travel satisfaction in shaping eudaimonic well-being. The findings link perceptions of empowerment and identity formation to well-being outcomes, with travel satisfaction acting as a mediating factor. Together, these studies explore gender equality outcomes across organisational decision-making and individual lived experience.

SDG 6 (Clean Water and Sanitation)

SDG 6 is a core priority within MUST's environmental science and engineering research portfolio, with 76 publications released in 2024–2025. Key themes include water pollution control, wastewater treatment, microbial risk assessment and water safety governance. A 2024 *Nature Water* paper, *Synergetic physical damage and chemical oxidation for highly efficient and residue-free water disinfection*, proposes a combined physical disruption and chemical oxidation approach to control antibiotic-resistant bacteria and resistance genes, demonstrating highly effective disinfection performance under experimental conditions. A further 2025 *Nature Water* article co-authored by MUST researchers, *Microbial risk assessment across multiple environments based on metagenomic absolute quantification with cellular internal standards*, develops a quantitative framework integrating cellular internal standards and

absolute metagenomic measurement to assess microbial risks across diverse aquatic environments. These studies advance pollution control methodologies and strengthen evidence-based environmental risk assessment and public health protection.

SDG 7 (Affordable and Clean Energy)

SDG 7 represents one of MUST's flagship research strengths, with 401 related publications in 2024–2025. Research covers solar cell technology, energy materials, photocatalysis, energy conversion and efficiency and stability enhancement. A 2025 *Nature Communications* article, *Rationally designed universal passivator for high-performance single-junction and tandem perovskite solar cells*, investigates defect formation and nonradiative recombination in perovskite solar cells. It introduces a universal passivation material whose interacting ions suppress defect states and recombination losses, delivering improved photovoltaic efficiency for both single-junction and tandem devices under experimental conditions. A 2025 study in *Advanced Energy Materials, Scalable and Integrated Photocatalytic Reactor Systems for Solar-to-Fuel Production: Photoredox and Photoreforming Processes*, examines reactor design and system integration for solar-driven fuel production, addressing key technical challenges in scaling photocatalytic processes. These studies connect materials innovation with practical solar energy conversion and underscore the University's contribution to global clean energy research.

SDG 8 (Decent Work and Economic Growth)

MUST recorded 309 SDG 8-aligned publications in 2024–2025, covering the digital economy, business operations, labour management, tourism development and sustainable economic growth. A 2025 article in *Journal of Hospitality and Tourism Management, How AI adoption in human resource management practices can enhance tourism employees' organizational commitment*, examines the impact of AI-enabled human resource management on organisational commitment among tourism and hospitality employees. The research identifies dual competing effects: perceived organisational competence strengthens commitment, while perceived reductions in organisational warmth weaken it. Servant leadership is found to reinforce positive outcomes and mitigate negative impacts. The findings highlight why the human and relational implications of digital transformation deserve equal attention alongside efficiency gains, with particular relevance for Macao's tourism and service-driven economy.

SDG 9 (Industry, Innovation and Infrastructure)

SDG 9 generated 476 publications in 2024–2025, addressing technological innovation, smart manufacturing, supply chain optimisation and green industrial development. A 2025 paper in *International Journal of Systems Science: Operations & Logistics, Optimal decisions of closed-loop electric vehicle batteries supply chains under extended producer responsibility policies,* investigates battery recycling decision-making under extended producer responsibility frameworks. Its supply chain game models compare alternative government intervention mechanisms, and indicate that appropriately calibrated subsidies and reward-penalty mechanisms can drive higher battery recovery rates, with differentiated impacts on manufacturers, retailers and overall supply chain performance. A further 2025 Journal of Cleaner Production study, A novel multi-objective optimization model for designing a reverse supply chain network, integrates recovery, inspection, remanufacturing and reuse into a network optimisation model, accounting for uncertainty in return volumes and product quality alongside cost and carbon emission objectives. These studies demonstrate how policy design and operational optimisation can advance more sustainable industrial systems.

SDG 10 (Reduced Inequalities)

MUST's SDG 10 research addresses income disparity, regional development gaps, cultural diversity and social inclusion, with 73 publications in 2024–2025. A 2024 article in *The World Economy, Evaluation of economic inequality in 'the Belt and Road' region – The application of night-time satellite imagery*, combines nighttime satellite imagery with Theil index decomposition to assess economic disparities across multiple geographical scales. It identifies subregional differences as a key driver of overall inequality, and finds that economic growth has heterogeneous implications across countries and regions. At the firm level, a 2025 *British Journal of Management* study, *Cultural Diversity and Value of Multinational Firms, examines cultural diversity and corporate valuation*, finding a negative association driven primarily by cash flow effects and pointing to coordination challenges in cross-cultural operations. The two studies provide complementary perspectives on inequality and diversity at regional and organisational levels.

SDG 11 (Sustainable Cities and Communities)

SDG 11 aligns closely with MUST's regional research priorities. Its 307 publications in 2024–2025 cover urban resource management, low-carbon buildings, pollution control, smart

cities and community development. A 2024 *Resources, Conservation and Recycling* article, *Characterizing temporal and spatial characteristics of urban building material metabolism and embodied carbon emissions through a 4D GIS-MFA-LCA model*, takes Macao as a case study and integrates geographic information systems, material flow analysis and life cycle assessment to map the spatial and temporal patterns of building material stocks, flows and embodied carbon emissions. The framework provides actionable tools for identifying priority areas for urban resource management and building-related emissions reduction. A 2025 *Water Research* study, *Rubber-derived chemicals in urban sewer networks and receiving waters: Fingerprints, driving factors and ecological impacts*, assesses rubber-derived chemicals in urban drainage systems and receiving waters, examining their distribution patterns, driving factors and potential ecological consequences. Together, these studies advance urban sustainability research from material flow and carbon accounting to emerging pollutant risk assessment.

SDG 12 (Responsible Consumption and Production)

SDG 12 is represented by 278 publications in 2024–2025, including research on the circular economy, green innovation, product recovery and sustainable supply chains. A 2024 *Journal of Cleaner Production* article, *Pricing, greening, and recycling decisions of capital-constrained closed-loop supply chain with government subsidies under financing strategies*, examines how financial constraints, government subsidies and financing strategies shape pricing, green investment and recycling decisions. Supply chain game model results indicate that supportive policy and cross-chain collaboration can improve sustainability outcomes, contingent on firms' cost structures and market conditions. A 2025 *Resources, Conservation and Recycling* study, *Waste photovoltaic wafers-derived SiC-based photocatalysts for pharmaceutical wastewater purification: S-scheme, waste utilization, and life cycle assessment*, explores the conversion of waste photovoltaic wafers into silicon-carbide-based photocatalysts for pharmaceutical wastewater treatment. Materials testing and life cycle assessment highlight the potential for high-value waste recovery and efficient pollutant degradation under experimental conditions. These studies illustrate complementary management and technological pathways to circular production systems.

SDG 13 (Climate Action)

MUST recorded 184 SDG 13-aligned publications in 2024–2025, focusing on low-carbon materials, carbon capture technology, climate risk assessment and emissions

mitigation. A 2025 *Nature Communications* article, *Nature-inspired hierarchical building materials with low CO_2 emission and superior performance, presents the development of low-carbon cement-based materials inspired by natural hierarchical structures*, reporting enhanced strength and toughness relative to material density alongside reduced estimated carbon emissions. A 2024 *Nature Communications* study, *Redox-tunable isoindigos for electrochemically mediated carbon capture*, explores redox-tunable organic molecules as a route to high-performance electrochemical carbon capture. Molecular design modifications enhance CO_2 binding affinity and material stability under oxygen-containing conditions. Together, these studies advance both low-carbon construction materials and molecular-scale carbon dioxide capture technologies, providing a scientific foundation for scalable low-carbon solutions.

SDG 14 (Life Below Water)

SDG 14 generated 84 publications in 2024–2025, addressing marine pollution, marine organism health, coastal zone management and ecological risk assessment. A 2024 *Environmental Science & Technology* article, *Pharmaceutical Residues in Edible Oysters along the Coasts of the East and South China Seas and Associated Health Risks to Humans and Wildlife*, surveys pharmaceutical residues in edible oysters from China's eastern and southern coasts and assesses associated risks to human health and wildlife. The work links emerging marine contaminant monitoring to food safety and ecological health protection. A 2025 *Renewable and Sustainable Energy Reviews* study, *Large-scale seaweed cultivation as a nature solution for carbon-negative economy and restorative environmental stewardship: Lessons from China*, discusses how large-scale seaweed cultivation can support marine ecosystem restoration, carbon sequestration and sustainable blue economy development. Collectively, these publications address both marine environmental risk management and more sustainable stewardship of marine resources.

SDG 15 (Life on Land)

SDG 15 research covers biodiversity conservation, ecosystem management, corporate environmental responsibility and human-nature interactions, with 53 publications recorded in 2024–2025. A 2024 *Journal of Environmental Management* article, *The inclusion of biodiversity into Environmental, Social, and Governance (ESG) framework: A strategic integration of ecocentric extinction accounting*, examines how biodiversity loss and species extinction risk can be more effectively integrated into corporate ESG assessment. It proposes

integrating ecocentric perspectives and extinction accounting into corporate sustainability governance frameworks. A 2025 study in *Journal of Hospitality and Tourism Management, Sustainable development in wetland tourism: The impacts of gratitude to nature and connectedness to nature on environmentally responsible behavior*, investigates how wetland tourism experiences and feelings of gratitude and connection to nature shape tourists' environmentally responsible behaviour. The findings suggest that ecological conservation depends not only on institutional and technological solutions, but also on public understanding and behavioural change.

SDG 16 (Peace, Justice and Strong Institutions)

SDG 16 accounts for 50 related publications in 2024–2025, with themes including governance quality, business ethics, legal institutions and public policy. A 2025 J*ournal of Business Ethics* article, *Judicial Waves, Ethical Shifts: Bankruptcy Courts and Corporate ESG Performance*, uses the phased rollout of specialised bankruptcy courts in China as a quasi-natural experiment. It finds that improved creditor protection and enhanced access to bank finance are associated with better corporate ESG performance, demonstrating how judicial institutions can shape corporate sustainability behaviour. A 2025 study in *Sustainable Development, Organized Crimes, Cultural Heritage, and Sustainable Tourism: A Configurational Analysis*, examines links between organised crime, cultural heritage looting, community well-being and sustainable tourism. Through configurational analysis, it explores the combined roles of governance capacity, community engagement and institutional arrangements. Both papers connect effective institutional development with social responsibility and sustainable development outcomes.

Overall, MUST's 2024–2025 SDG-aligned publications span medicine, engineering, environmental science, economics, management, and the humanities and social sciences. Health, clean energy and industrial innovation research are particularly well represented in high-impact journals, while research in education, equity, ecology and governance further enriches and diversifies the University's research portfolio. Publications in leading titles including *Nature Communications*, *Nature Water* and *PNAS*, alongside field-leading journals such as *British Journal of Management*, *Energy*, *Sustainability and Society*, *Resources*, *Conservation and Recycling* and *Journal of Business Ethics*, illustrate the breadth and depth of MUST's research contribution. Collectively, this body of work advances theoretical inquiry, technological innovation and empirical analysis to address pressing real-world sustainability challenges.

4.6 Sustainability Research in Practice: Knowledge Exchange and Application

MUST strives to bridge sustainability research with real societal needs through academic exchange, interdisciplinary technology development, research translation and international collaboration. In the 2024/25 academic year, focused activities addressed priority areas including emerging pollutants, clean energy, medical technology, urban resilience and marine ecology. The following cases illustrate diverse pathways for the sharing, co-development and real-world application of research knowledge.

Case 1: Tackling Emerging Pollutants – Academician Wu Fengchang on Priority Environmental Research Needs (SDGs 3, 6, and 12)

On 6 November 2024, MUST hosted a Distinguished Scientist Lecture entitled *Major Scientific and Technological Needs in Emerging Pollutant Control*, delivered by Academician Wu Fengchang, Member of the Chinese Academy of Engineering and a leading authority on environmental standards and pollution prevention and control. Academician Wu examined core scientific questions and technical challenges in emerging pollutant governance, covering pollutant classification, potential ecological and human health hazards, environmental risk assessment, treatment technologies and forward-looking research priorities (Figure 29).

Academician Wu emphasised that effective emerging pollutant management requires a full-chain approach spanning pollutant source identification, exposure assessment, risk evaluation and pollution abatement. Conventional environmental management frameworks alone are insufficient to address these complex challenges; instead, progress depends on the integrated advancement of fundamental scientific research, advanced treatment technologies and engineering implementation. He stressed the importance of life cycle risk management, and outlined key research priorities relating to environmental standard setting, pollution control technology development and industrial green transition. Faculty and students also engaged in in-depth discussion on incorporating emerging pollutant considerations into corporate environmental impact assessment and potential improvements to regulatory governance frameworks.

The lecture highlighted the critical intersections between scientific research, public policy and industrial technology innovation. Emerging pollutants can impact ecosystem integrity and public health via water and other environmental media, meaning their effective governance demands cross-disciplinary collaboration across environmental science, analytical

chemistry, environmental engineering and risk management. The event provided a high-level platform for interdisciplinary dialogue, and directly aligns with SDG 6 (Clean Water and Sanitation), SDG 12 (Responsible Consumption and Production) and SDG 3 (Good Health and Well-being).



Figure 29. Academician Wu Fengchang Delivering Distinguished Scientist Lecture on Emerging Pollutant Control

Case 2: Advancing Novel Solar Energy Technologies – Academician Li Yongfang on Organic Photovoltaic Innovation (SDGs 7, 9, and 13)

On 22 January 2025, MUST hosted a Distinguished Scientist Lecture delivered by Academician Li Yongfang, Member of the Chinese Academy of Sciences and a leading polymer chemist. Entitled *Hard Work Pays Off: Reflections on My Scientific Career and Innovation in Organic Photovoltaic Research*, the lecture traced Academician Li's decades-long research journey and outlined the evolution of organic photovoltaic materials, linking fundamental scientific methodology, materials science research and real-world clean energy technology translation (Figure 30).

Academician Li provided a systematic overview of major solar cell categories and their practical applications, and charted the technological progression of photovoltaic materials — from fullerene acceptors and narrow-bandgap small-molecule acceptors to low-cost polymeric photovoltaic materials and emerging macromolecular acceptors. Drawing on his own

landmark research, he examined the intrinsic relationships between molecular design, photoelectric conversion efficiency and manufacturing cost. He emphasised that well-defined scientific questions and sustained, rigorous inquiry form the bedrock of transformative technological innovation. During the Q&A session, participants explored frontier topics including wearable energy devices, next-generation photovoltaic application scenarios and the development potential of perovskite materials.

Advancing next-generation solar cell technologies requires coordinated breakthroughs across conversion efficiency, operational stability, manufacturing scalability and real-world application suitability. Organic photovoltaics integrate polymer chemistry, materials science and energy engineering, opening up alternative pathways for diversified renewable energy deployment. The lecture deepened attendees' understanding of the latest global solar energy research advances, and inspired early-career researchers to identify frontier research questions at the intersection of materials innovation and real-world energy transition needs. It directly supports progress towards SDG 7 (Affordable and Clean Energy), SDG 9 (Industry, Innovation and Infrastructure) and SDG 13 (Climate Action).



Figure 30. Academician Li Yongfang Delivering Distinguished Scientist Lecture on Organic Photovoltaic Research

Case 3: Med-Engineering Integration for Health Technology Innovation – First Research Outcomes from the MUST LIU's Innovation and Technology Centre (SDGs 3, 4, and 9)

On 27 February 2025, MUST LIU's Innovation and Technology Centre unveiled three

landmark projects integrating medicine, engineering and artificial intelligence: a traditional Chinese medicine (TCM) robot powered by a diagnostic large language model, ceramic-stabilised quantum dot technology for infectious disease detection, and an interdisciplinary education programme combining AI and life sciences. The event was attended by Academician Zhong Nanshan, Member of the Chinese Academy of Engineering and MUST Distinguished Professor; Xie Yongqiang, President of the Macao Science and Technology Development Fund; and invited guests from the healthcare, research and industrial sectors. Discussions centred on research translation and the practical deployment of med-engineering collaborative innovations (Figure 31).

The TCM diagnostic robot was developed by the team of Professor Hon Chi Tin from the Faculty of Innovation Engineering. It integrates robotic systems with a domain-specific large language model to enable integrated TCM syndrome differentiation and herbal beverage preparation. According to the University, the team has developed three generations of robot prototypes, filed more than 20 related patents, and formulated a range of food-medicine homologous formulations, with the core technology now entering mass production and on-site deployment. The project demonstrates the potential of AI-enabled TCM innovation to enhance the accessibility and convenience of primary health services.

A second project, led by Professor Li Liang from the Macao Institute of Materials Science and Engineering, applies high-temperature solid-state synthesis and ceramic encapsulation technology to enhance the resistance of quantum dot materials to light, moisture, oxygen and pH fluctuations. The team has developed a combined test strip for influenza A, influenza B and COVID-19, paired with a handheld fluorescence reader, demonstrating strong application potential for point-of-care rapid testing. Complementing the two technology projects, the AI and Life Sciences Education Programme integrates AI programming, robotics and life science learning through project-based activities, providing young learners with hands-on exposure to frontier interdisciplinary technologies.

A cooperation agreement for the TCM AI robot project was also signed during the event, linking university researchers with healthcare and industry partners to advance clinical validation and application development. Collectively, the three projects mark tangible progress from exploratory research towards demonstrable, deployable technologies. They align primarily with SDG 3 (Good Health and Well-being) and SDG 9 (Industry, Innovation and Infrastructure), while the educational component also advances progress towards SDG 4 (Quality Education).



Figure 31. Med-Engineering Research Showcase and TCM AI Robot Unveiling Event

Case 4: Research-Backed Urban Resilience Enhancement – MUST Co-hosts the 2025 Macao Urban Planning Seminar(SDGs 9, 11, and 13)

On 17 May 2025, the 2025 Macao Urban Planning Seminar was convened at MUST. Organised by the Macao Urban Planning Society and supported by the Faculty of Humanities and Arts, the seminar centred on urban resilience building and disaster prevention technology innovation. More than 100 attendees from government departments, professional bodies, universities and research institutions across mainland China, Hong Kong and Macao exchanged insights on natural disaster risk mitigation, intelligent disaster prevention systems and long-term urban adaptation strategies in response to climate change (Figure 32).

Professor Shi Peijun of Beijing Normal University presented key findings from China's national natural disaster risk survey, and analysed potential sea-level rise risks facing Macao. Experts from the Guangzhou Urban Planning & Design Survey Research Institute introduced the application of intelligent technologies and spatial information systems in disaster prevention and urban governance. Leung Wing-mo, Former Assistant Director of the Hong Kong Observatory, delivered a keynote on building future-ready cities under climate change and explored evidence-based adaptation pathways. A dedicated roundtable session enabled comparative discussion of planning frameworks, infrastructure resilience and emergency management practices across the region.

As a high-density coastal city, Macao faces pronounced climate-related risks including sea-level rise, extreme weather events and urban pluvial flooding. Addressing these challenges requires coordinated research across urban planning, environmental science,

geographic information systems and civil engineering. At the seminar, MUST showcased its research advances in coastal flood protection, sustainable building design and urban regeneration, demonstrating how its interdisciplinary teaching and research outputs directly address local urban sustainability needs.

The seminar advances progress towards SDG 11 (Sustainable Cities and Communities), SDG 13 (Climate Action) and SDG 9 (Industry, Innovation and Infrastructure), particularly by fostering cross-sector knowledge exchange between academic researchers, government authorities and industry practitioners.



Figure 32. Attendees at the 2025 Macao Urban Planning Seminar

Case 5: International Marine Environmental Research Collaboration – MUST Researcher Joins Brazil's Emerging Pollutants Research Network (SDGs 6, 13, 14, and 17)

MUST remains actively engaged in international research networks dedicated to addressing transboundary environmental challenges. On 14 August 2025, the University announced that Assistant Professor Marta Filipa Simões, from the State Key Laboratory of Lunar and Planetary Sciences, had joined the core research team of a newly funded project under Brazil's National Institutes of Science and Technology (INCT 2024) programme.

Entitled CEMAR, the initiative is a national research institute project focused on the identification, quantification, dispersal patterns, environmental risk assessment and mitigation of emerging pollutants in marine and coastal environments. It brings together researchers

from Brazil, Portugal, Macao and other regions to co-develop standardised monitoring protocols and risk assessment frameworks (Figure 33).

CEMAR's research scope covers the detection and quantification of emerging contaminants, their transport pathways across environmental media, ecological risk evaluation and targeted pollution mitigation strategies. Its work draws on integrated expertise in environmental chemistry, microbiology and marine ecology. Specialising in extremophile microorganisms and astrobiology, Assistant Professor Simões brings a distinctive analytical perspective to the marine environmental research agenda. This collaboration creates new opportunities to investigate how pollutants alter microbial community structures and ecosystem functioning across diverse environmental conditions.

Marine pollution is inherently transboundary; understanding contaminant transport dynamics and long-term ecological impacts requires cross-disciplinary and cross-regional collaboration. Participation in CEMAR enables MUST researchers to exchange methodological expertise with international peers and explore new frontier research questions. The project directly aligns with SDG 14 (Life Below Water) and SDG 17 (Partnerships for the Goals), and contributes to environmental risk objectives under SDG 6 and SDG 13, reflecting the University's long-standing commitment to global scientific cooperation.

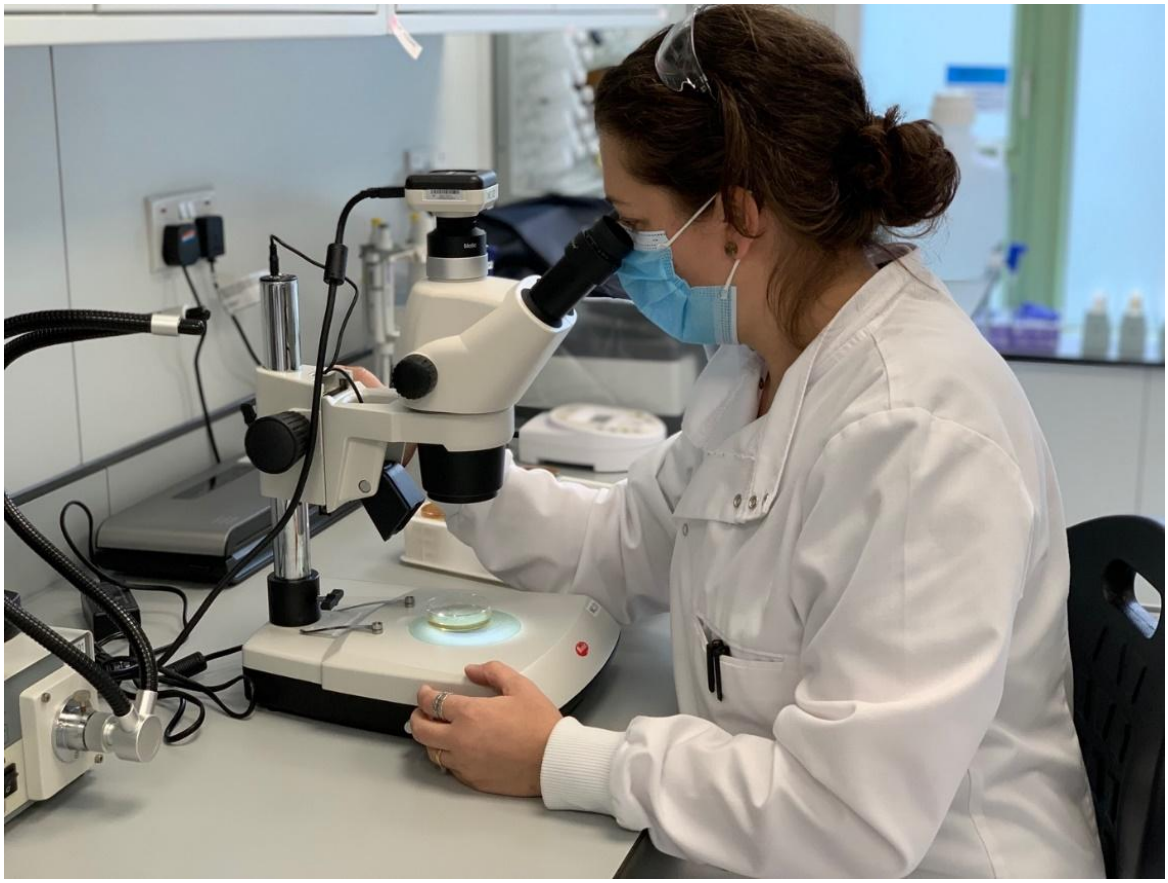


Figure 33. Assistant Professor Marta Filipa Simões Conducting Research on Laboratory Platform

Overall, MUST's sustainability research practices in the 2024/25 academic year integrate four core pathways: high-level academic exchange, interdisciplinary technology development, research translation and international collaborative partnership. Distinguished lectures on emerging pollutants and photovoltaic technology expand campus access to global frontier research insights. MUST LIU's Innovation and Technology Centre showcases the real-world application potential of med-engineering integrated technologies, while the urban planning seminar bridges academic expertise with local disaster resilience needs. Participation in the international marine pollution research network further extends the University's global collaborative footprint.

These activities complement the University's publication outputs by building structured knowledge exchange channels, advancing actionable technical solutions and strengthening multi-stakeholder partnerships — all of which are critical enablers for addressing complex, interconnected sustainability challenges.

5. Campus Sustainability Culture and Community Engagement

MUST embeds sustainability principles into campus culture and day-to-day operations, with a holistic focus on staff and student well-being, environmental literacy education and community service outreach. Campus catering services prioritise food safety, nutritional quality and balanced diets, while dedicated counselling and personal development programmes support mental health across the university community. Landscaped green spaces and recreational facilities promote rest and well-being, with resource-efficient ecological greening enhancing the overall campus living environment.

Student-led volunteering, elderly and youth support programmes, charitable fundraising drives and environmental campaigns such as the annual Lights Out for One Hour initiative extend the University ' s social responsibility mission beyond campus boundaries. These collective efforts contribute directly to SDG 3 (Good Health and Well-being), SDG 10 (Reduced Inequalities), SDG 17 (Partnerships for the Goals) and a range of other sustainable development objectives.

5.1 Staff Well-being and Professional Development

MUST prioritises the health, well-being and career advancement of all employees. Comprehensive staff welfare provisions, robust workplace protections and targeted professional training programmes underpin a stable, inclusive and supportive working environment. Eligible full-time staff and their spouses are covered by medical insurance schemes, with additional occupational injury insurance and preferential consultation rates available at MUST Hospital. Paid leave entitlements – including annual leave, sick leave, maternity leave, paternity leave and compassionate leave – support employees in balancing work responsibilities with personal and family commitments. Eligible staff may also apply for on-campus faculty accommodation, while provident fund arrangements, on-site recreational facilities and other employee benefits provide further holistic support. These measures safeguard staff well-being and support the retention and stability of academic, research and administrative teams.

The University supports the continuing professional development of both academic and administrative staff through tailored resources aligned with different role requirements. Academic leave schemes enable teaching and research staff to attend international

conferences, undertake visiting academic exchanges and pursue collaborative research projects. Eligible employees may also apply for tuition fee subsidies for University degree programmes. Regular seminars, skills-based training and management workshops help staff strengthen professional expertise, communication competencies, team collaboration, organisational management and problem-solving capabilities. These development opportunities align individual career growth with the University ' s long-term strategic development goals.

In the 2024/25 academic year, the University delivered a series of targeted professional development activities. On 18 – 19 July 2025, it hosted a two-day Advanced Management Training Programme for senior leaders from all faculties, research institutes and administrative departments. The programme covered core themes including management leadership, team governance, organisational culture, strategic planning and implementation. Participants also undertook a field visit to Huawei to study industry best practices in research and innovation, talent development and organisational management. Group discussions and team presentations fostered cross-departmental knowledge exchange, integrating management theory with real-world enterprise practice (Figure 34).



Figure 34. Vice President Tong Ka Lok with Advanced Management Training Programme Participants

MUST also places strong emphasis on occupational safety and health. On 17 July 2025, the University held a dedicated workplace safety and health seminar, inviting representatives

from the Labour Affairs Bureau of the Macao SAR Government to explain regulatory requirements and on-site precautionary measures. The session strengthened employees ' workplace safety awareness and self-protection competencies, supporting a safer, healthier working environment (Figure 35).



Figure 35. Representative from the Macao Labour Affairs Bureau Delivering Occupational Safety Seminar

To enhance internal workplace communication, MUST hosted a Conflict Management and Resolution Strategies workshop on 28 June 2025. Facilitated by Dr Lee Chan Wing, a practitioner with over 20 years of experience in journalism and media communication, the workshop introduced practical communication frameworks and conflict management methodologies. Drawing on the CDEF communication model and the 3R conflict management framework, the session explored common sources of workplace disagreement and constructive response strategies. The initiative addresses day-to-day interpersonal and collaborative challenges faced by staff, and provides practical tools to improve cross-departmental communication and foster positive workplace relationships (Figure 36)



Figure 36. Conflict Management and Resolution Strategies Staff Workshop

Through comprehensive welfare provisions, structured professional development, occupational safety education and communication skills training, MUST supports the health, well-being and career progression of all employees. These measures contribute to a safe, supportive and inclusive workplace, and align with SDG 3 (Good Health and Well-being), SDG 4 (Quality Education) and SDG 8 (Decent Work and Economic Growth).

5.2 Student Well-being and Holistic Development

MUST supports students' academic, personal and social development through integrated services including psychological counselling, health education, sports programmes and career guidance. The Student Affairs Office provides free, confidential psychological counselling and support for all foundation, undergraduate and postgraduate students, addressing concerns including academic stress, emotional distress, interpersonal relationship challenges and career uncertainty. Lectures, workshops and campus-wide activities promote healthy lifestyles, self-awareness and balanced development alongside academic study.

From 14 to 16 April 2025, the Psychological Counselling and Guidance Unit of the Student Affairs Office organised the 17th Psychological Culture Festival. Grounded in positive psychology, the festival delivered interactive workshops on mindful living, interpersonal relationships, exercise and mood regulation, and procrastination management – all highly relevant to student daily life. Student mental health ambassadors also promoted mental health literacy through interactive exhibition booths. *A Kind Words to Myself*

campaign invited students and staff to share supportive messages, normalising psychological care within everyday campus conversation. Collectively, the activities fostered self-awareness, emotional regulation and mutual support across the university community (Figure 37).



Figure 37. 17th Psychological Culture Festival Campus Activities

MUST also supports students in exploring academic and career pathways. On 26 March 2025, the Psychological Counselling and Guidance Unit hosted a *Career Positioning Map* workshop led by an in-house university counsellor. Through group guidance, personal reflection and peer discussion, participants reflected on their lived experiences, identified core personal values and explored potential future career trajectories. The activity links psychological support with career identity formation and development planning, helping students approach educational and employment decisions with greater self-understanding (Figure 38).



Figure 38. Student Career Planning and Development Workshop

Sporting events promote physical fitness, mental resilience and team collaboration. On 16 March 2025, as part of the University's 25th anniversary celebrations, the finals and award ceremony of the 10th MUST Sports Meet took place at the Building I football and athletics field. The three-day event included men's and women's track events, team relays and recreational team competitions, with 221 athletes competing and 33 prizes awarded. Students demonstrated athletic excellence and team spirit, while staff participation encouraged interaction across the wider campus community (Figure 39).



Figure 39. 10th MUST Annual Sports Meet

MUST also participates in the Macao SAR Government's Healthy Campus initiative. On 26 February 2025, Vice President Kwong Ying-wa led a delegation of over 20 students and staff to the official launch ceremony, co-organised by the Education and Youth Development Bureau and the Health Bureau. The initiative promotes healthy eating, physical activity, health screening, mental health and vaccination under the Healthy Macao Blueprint. On-site health information booths and interactive exercise sessions helped students understand key health indicators such as blood pressure and blood glucose, and encouraged adoption of healthier daily habits (Figure 40).



Figure 40. MUST Delegation at Healthy Campus Initiative Launch Ceremony

On 7 May 2025, the Residence and Life Experience Unit of the Student Affairs Office co-hosted a health lecture with Macao Union Hospital, entitled *Takeaway Food, Milk Tea and the Challenge of Balanced Nutrition*. Delivered by Dr Fu Jin, clinical nutrition consultant at Peking Union Medical College Hospital Macao Medical Centre, the session addressed common dietary patterns, widespread nutritional misconceptions and the health risks associated with unbalanced diets. Using takeaway meals and milk tea as relatable everyday examples, the lecture equipped residential students with evidence-based knowledge to make informed dietary choices and strengthen their daily health management skills (Figure 41).



Figure 41. Health Lecture: Takeaway Food, Milk Tea and Balanced Nutrition

Through integrated counselling services, health education, sports programmes and career development support, MUST embeds student well-being into everyday campus life. The initiatives address immediate physical and mental health needs while building long-term self-awareness, life skills and developmental capacity, contributing directly to SDG 3 (Good Health and Well-being) and SDG 4 (Quality Education).

5.3 Campus Safety and Inclusive Campus Environment

MUST is committed to fostering a safe, equitable and respectful learning environment for students from diverse geographical and cultural backgrounds. Residence hall management protocols, safety education, first-aid training and crime prevention initiatives strengthen risk awareness and appropriate emergency response capabilities. The Student Affairs Office provides regular residence safety and hygiene guidance to help students understand communal living expectations. Student organisations and interactive campus activities also promote understanding of diverse group needs and cultivate a culture of mutual respect and inclusive participation.

On 8 May 2025, the Residence and Life Experience Unit invited the Macao Fire Services Bureau to deliver a Basic First Aid Training Course for residential hall staff and student

residence team leaders. Combining theoretical instruction with hands-on practice, the session covered emergency call protocols, initial accident response, cardiopulmonary resuscitation (CPR), bleeding control and bandaging, and automated external defibrillator (AED) operation. Simulated practical drills allowed participants to practice standardised emergency response procedures and reinforced the importance of timely, effective assistance (Figure 42).



Figure 42. Basic First Aid Training for Residence Hall Staff and Students

On 13 March 2025, the Student Affairs Office and the Macao Judiciary Police jointly hosted an Anti-Fraud Campaign Vehicle event on campus. Over 300 students participated in interactive booths and educational games introducing common scam tactics and preventive measures. Officers from the Juvenile Concerns Group and Anti-Fraud Coordination Centre shared practical guidance on digital safety and fraud risk identification. The activity forms part of the Macao SAR Government's campus anti-fraud education programme, and equips students with the skills to recognise and respond to financial fraud risks (Figure 43).



Figure 43. Campus Anti-Fraud Campaign Vehicle Event

To advance campus inclusion, the Social Service Team of the Student Affairs Office organised the *Twenty-Five Years Together: Friendship, Service and Shared Achievement* fair on 14 March 2025, marking MUST's 25th anniversary and the team's 11th anniversary. Held in Hall N101, the event centred on inclusion and sustainability, and brought together the student union, faculty student associations and other campus clubs. Twenty-three interactive booths and stage performances attracted over 600 participants. Braille writing activities and tactile simulation challenges fostered understanding of the lived experiences of people with visual impairments, while moss terrarium workshops promoted ecological awareness and resource conservation. The initiative demonstrates how student-led activities can cultivate empathy, inclusive participation and mutual respect across the campus community (Figure 44).



Figure 44. Campus Inclusion and Sustainability Fair

These initiatives demonstrate how MUST integrates emergency preparedness, fraud prevention and inclusive participation into everyday campus life. Professional training, law enforcement collaboration and student-led activities strengthen safety awareness, personal responsibility and respect for diversity. The initiatives align with SDG 3 (Good Health and Well-being), SDG 10 (Reduced Inequalities) and SDG 16 (Peace, Justice and Strong Institutions).

5.4 Community Engagement and Public Service

MUST encourages students and staff to apply their disciplinary expertise through community engagement and volunteer service. Faculties, the Student Affairs Office and student volunteer groups organise a wide range of activities supporting elderly care, community health and educational philanthropy. Medical and Chinese medicine outreach draws on the University's core disciplinary strengths, allowing students to practice under faculty supervision while delivering basic health education and care to local communities. Charitable activities also raise awareness of educational equity, social inclusion and environmental protection.

On 20 October 2024, the Faculty of Medicine and the Asian Medical Students' Association (AMSA) Macao organised a community visit to the Asilo de Felicidade Residential Home. Under the supervision of Associate Professors Daniel Baptista-Hon and Aby Charles, 13 medical students across all five year levels conducted basic health checks for approximately 30 elderly residents, nearly half of whom are wheelchair users. Checks included pulse measurement, scleral and conjunctival examination, lymph node palpation, and cardiac and respiratory auscultation. The visit enabled students to apply clinical knowledge in a real community setting, engage with elderly residents and deepen their understanding of medical communication and professional responsibility (Figure 45).



Figure 45. Faculty of Medicine Students on Community Visit to Asilo de Felicidade Residential Home

On 5 April 2025, the Faculty of Chinese Medicine and the Social Service Team visited the Women's General Association Lok I Day Care Centre for the Elderly. Led by Assistant Professors Yu Lili and Liang Qiuyu, 25 students delivered tuina therapy demonstrations, distributed wellness herbal teas and provided health education for over 40 elderly participants. MUST alumnus and registered Chinese medicine practitioner Tam Ka Wai also gave a talk on seasonal health care, dietary regulation, exercise and acupressure, and answered questions from participants. Students gained first-hand insight into elderly care needs and delivered targeted wellness activities. The Faculty has organised regular elderly outreach visits since 2013, providing sustained opportunities to link professional education with community care (Figure 46).



Figure 46. Faculty of Chinese Medicine Community Health Outreach for Elderly Residents

In late February 2025, the Social Service Team organised a two-day charity sale in the ground-floor lobbies of Buildings N and B in support of the 2025 China Oasis Education Assistance Campaign. Students sold custom keychains, fridge magnets, handmade crafts and herbal sachets, raising a total of MOP 3,613. All proceeds were donated to the Chinese Educators' Association of Macau to support the initiative, which funds educational

opportunities for children in remote mainland Chinese regions and supports local desertification prevention projects. The campaign gave students hands-on experience in charitable fundraising, volunteer service and critical reflection on the links between educational equity and environmental challenges (Figure 47).



Figure 47. Social Service Team Fundraising for the China Oasis Education Assistance Campaign 2025

MUST's community activities combine professional expertise with student volunteering. Medical and Chinese medicine outreach supports local older residents, while educational fundraising extends concern to disadvantaged communities. These efforts reflect SDG 3 (Good Health and Well-being), SDG 4 (Quality Education), SDG 10 (Reduced Inequalities), and SDG 17 (Partnerships for the Goals), linking education with public service.

5.5 Green and Low-Carbon Initiatives

MUST encourages students and staff to practice sustainable living through environmental education, resource conservation campaigns and ecological protection activities. The University participates in environmental initiatives led by the Macao SAR Government and supports student clubs and volunteer groups in organising practical on- and off-campus events. These activities promote everyday low-carbon choices, waste reduction and nature conservation, while partnerships with government agencies and peer universities

extend environmental engagement beyond campus boundaries.

On 23–24 April 2025, the Social Service Team held World Earth Day activities entitled Promoting Green Living, Protecting Our Planet Together in Buildings N and B. Integrating Earth Hour themes, the event promoted low-carbon lifestyles through interactive games, eco-craft activities and environmental knowledge quizzes. Students created dried-flower bookmarks and participated in a green plant giveaway challenge. Online quizzes and promotional materials covered key topics including energy conservation, waste sorting and circular resource reuse, with several hundred students and staff taking part. All surplus materials were collected and responsibly stored after the event, embodying resource conservation principles throughout the planning and delivery process (Figure 48).



Figure 48. World Earth Day Campaign: Promoting Green Living, Protecting Our Planet Together

MUST also encourages students to participate directly in on-the-ground ecological conservation. On 16 March 2025, the Macao Municipal Affairs Bureau organised the 44th Macao Green Week coastal mangrove planting activity at the Taipa waterfront recreational area cycling path. Four student representatives from MUST's Social Service Team joined peers from the University of Macau, Macao Polytechnic University and the University of Saint Joseph to support coastal habitat conservation.

Prior to planting, Municipal Affairs Bureau staff explained the ecological functions of mangroves – including mudflat stabilisation, water quality improvement and habitat

provision – and introduced mangrove seedling growth characteristics, correct planting techniques and on-site safety precautions. Students then worked collaboratively in the coastal mudflats to plant seedlings under staff guidance.

The activity deepened participants' understanding of mangrove ecological value and the long-term commitment required for coastal ecosystem conservation. MUST has participated in annual tree-planting initiatives since 2016, providing students with sustained opportunities to translate environmental awareness into tangible practical action (Figure 49).



Figure 49. MUST Students Participating in 44th Macao Green Week Coastal Mangrove Planting

Through energy-saving initiatives, environmental education and hands-on conservation activities, MUST fosters greener lifestyles both on campus and in the wider community. World Environment Day activities drive collective participation in energy conservation; World Earth Day events deliver student-led learning on responsible resource use; and mangrove planting provides direct, immersive experience of ecosystem protection. These initiatives align with SDG 11 (Sustainable Cities and Communities), SDG 12 (Responsible Consumption and Production), SDG 13 (Climate Action) and SDG 15 (Life on Land).

6. Future Outlook and Strategic Priorities

Throughout the 2024/25 academic year, MUST has advanced sustainable development across campus operations, education, research and community engagement, building a holistic approach underpinned by robust institutional governance and active participation from students and staff. Greenhouse gas emissions accounting, clean energy deployment, interdisciplinary curricula, SDG-aligned research and community outreach initiatives have established a solid foundation of practical experience. Moving forward, MUST will prioritise continuity, targeted resource allocation and measurable outcomes, embedding sustainability more deeply into day-to-day management, teaching, research and public service.

Energy Management and Emissions Reduction

In energy management and emissions control, MUST will refine its approach to identifying and addressing major emission sources. Purchased electricity accounted for approximately 75.8% of total greenhouse gas emissions in 2024/25, with Buildings N (University Library), P (Student Residence Hall) and O (Academic Building) representing the largest consumption points. The University will conduct targeted analysis of energy use in these high-consumption buildings, examining functional requirements, operating hours and occupancy patterns to optimise air-conditioning scheduling, lighting controls and equipment efficiency. More systematic building-level and time-specific consumption data will support performance benchmarking and the evaluation of efficiency upgrade measures. For energy-intensive older equipment, maintenance and renewal plans will balance capital costs with long-term energy savings. MUST will also strengthen inspection and maintenance records for refrigerant systems and review emissions from wastewater treatment operations to identify practical improvement opportunities.

Clean Energy and Circular Resource Management

For clean energy and waste recycling, the University will improve performance monitoring of existing facilities. On-campus solar photovoltaic systems and established recycling schemes for plastic bottles, waste paper, used batteries, end-of-life equipment and office consumables form the baseline for this work. Future photovoltaic management will track real-time electricity generation, equipment condition and long-term efficiency trends, comparing measured output against baseline estimates. Waste management improvements will

focus on optimising the accessibility and usability of collection points, clarifying sorting guidance and differentiating items suitable for reuse, recycling or specialist hazardous waste treatment. Discarded computers, laboratory equipment and furniture will be assessed for repair, redistribution or reuse where safety and operational requirements permit.

Education for Sustainable Development

MUST will further deepen the integration of sustainability into professional and practical education. Existing curricula cover core themes including new energy materials, environmental impact assessment, corporate social responsibility, cultural heritage and public health. The AI-MUST general education course launched in 2025 provides an additional platform for interdisciplinary technology applications. The University will encourage teaching staff to embed real-world sustainability challenges into coursework assignments, research projects and final-year dissertations. Engineering and design students will explore urban environmental challenges, building efficiency and local habitat conservation; business and hospitality students will work on green supply chains, food resource management and responsible operations; and information technology students will investigate AI applications in environmental monitoring, urban governance and public service delivery.

Research Translation and Interdisciplinary Collaboration

In research and application, MUST will build on its established strengths in medicine, clean energy, industrial innovation, resource recycling and environmental governance. In the 2024–2025 calendar period, Scopus recorded 2,901 MUST publications aligned with the SDGs, with a growing share addressing multiple goals simultaneously. Alongside continuing to grow the volume and quality of research outputs, the University will place greater emphasis on real-world relevance and practical impact. In medical technology, priorities include further performance testing and use-case validation for AI-assisted diagnosis, rapid testing technologies and novel biomedical materials. In energy and environmental research, teams will be encouraged to address priority regional challenges including emerging pollutant monitoring, low-carbon building development and resource recovery in Macao and the Greater Bay Area. Interdisciplinary collaboration and partnerships with government agencies, healthcare providers and industry partners will support technical validation, demonstration projects and knowledge transfer where feasible.

Campus Well-being and Community Service

MUST will continue to enhance staff well-being, student support and community service, with a stronger focus on programme continuity and outcome measurement. Activities in the reporting year included staff management training, the Psychological Culture Festival, health education lectures, campus safety campaigns and volunteer service programmes. Future student mental health and career guidance programmes will incorporate anonymous feedback mechanisms to identify evolving needs at different stages of study. Staff training will be refined in response to role-specific requirements and participant feedback, with particular focus on workplace safety, management competencies and communication skills. In community engagement, the University will sustain long-term cooperation between the Faculties of Medicine and Chinese Medicine, student volunteers and elderly service organisations, exploring integrated models combining health education, regular visits and structured volunteer preparation.

Data Governance and Performance Measurement

Robust data management and performance assessment will underpin all these efforts. MUST already systematically reports greenhouse gas emissions, electricity consumption, solar power generation, recycling volumes, sustainability-related courses and research outputs. The University will clarify data ownership, reporting periods, collection methodologies and update schedules to improve year-on-year comparability. Campus management indicators will include total emissions, per capita emissions, building-level electricity consumption and recycling volumes. Education reporting will cover relevant course numbers, student participation rates and interdisciplinary activity outcomes. Research monitoring will consider collaborative projects and knowledge transfer alongside publication metrics, while activity reports will record participation levels and participant feedback. Clear distinctions will be maintained between calendar-year research data and academic-year campus activity data. Consistent, standardised record-keeping will support evidence-based progress evaluation and targeted resource allocation.

Looking ahead, MUST will prioritise the quality, continuity and effectiveness of all sustainability initiatives. Targeted management of energy-intensive buildings, enhanced circular resource reuse, interdisciplinary sustainability education, applied research translation and sustained community engagement will all build on the University's existing strong foundations. By aligning its disciplinary strengths with Macao's development needs, and

deepening collaboration across internal departments and with government, industry and community partners, MUST aims to embed sustainability as an enduring, core element of campus operations, education, research and public service.



United Nations Sustainable Development Goals (SDGs)