

7 AFFORDABLE AND CLEAN ENERGY



Affordable and Clean Energy

Ensure access to affordable, reliable, sustainable and modern energy for all.



Sedikit-sedikit, lama-lama Jadi Bukit

SDG 7, which aims to ensure access to affordable, reliable, sustainable, and modern energy for all, is well reflected in the classical Malay peribahasa “*Sedikit-sedikit, lama-lama jadi bukit*” (small efforts, over time, make great changes). This proverb highlights how consistent and steady actions can lead to meaningful, long-term impact. At UM, this principle is demonstrated through a range of sustainable energy initiatives—such as installing solar panels, promoting energy-saving practices on campus, integrating energy efficiency in building designs, and encouraging student-led innovation in green technology.

These actions, though often incremental, collectively contribute to reducing the university’s carbon footprint and fostering a culture of energy responsibility. By embracing steady progress towards clean energy, UM plays a vital role in advancing global efforts to build a sustainable and energy-secure future. Through persistence and collaboration, the university continues to demonstrate that every small step forward strengthens the foundation for a cleaner and more resilient tomorrow.

Upgrading Campus Buildings for Energy Efficiency

Universiti Malaya has long recognised that improving the efficiency of its physical infrastructure is fundamental to achieving a sustainable campus. In 2024, this commitment was strengthened through the implementation of the Net Zero Blueprint 2030, which emphasises structured plans to retrofit existing facilities with modern, energy-efficient systems. Buildings across the campus were evaluated using the Building Energy Index (BEI) and Power Usage Effectiveness (PUE) indicators, providing quantifiable measures of progress.

These upgrades extend beyond hardware improvements; they are supported by systematic monitoring processes and targeted interventions in high-consumption areas such as laboratories, lecture halls, tutorial rooms, offices, and residential colleges. By embedding energy efficiency standards into capital planning and refurbishment projects, UM is ensuring that every new investment reinforces its long-term sustainability goals. These actions reflect the aspirations of SDG 7.2 — to increase the share of renewable energy and energy efficiency in infrastructure development — ensuring that UM's built environment aligns with global sustainability benchmarks.

UM has also planned the installation of solar panels on the rooftops of selected buildings on the main campus. This initiative will provide financial benefits through reduced electricity bills and potential income from selling excess power back to the grid, while also reducing the University's carbon footprint and promoting energy independence. The installation of solar photovoltaic systems will be carried out through the Solar Energy Purchasing under the Self-Consumption (SELCO) programme or the Net Energy Metering for Government Ministries and Entities (NEM GoME) scheme. The request for proposals and evaluation process were completed in 2023, and the approval process is currently ongoing. The total installed capacity is expected to reach around 13 MWp, capable of supplying approximately 20% of the University's current electricity demand.



Energy Efficiency Planning and Governance

In 2024, Universiti Malaya strengthened institutional governance in energy management by formalising a dedicated Energy Management Committee, supported by a full-time Energy Manager. This body was tasked with coordinating and monitoring energy performance across faculties and departments, ensuring that sustainability is not approached in isolation but integrated into daily operations.

The committee introduced a comprehensive Energy Efficiency Plan encompassing energy audits, energy performance contracting, and targeted retrofits. For instance, lighting systems and air-conditioners in selected buildings were replaced with high-efficiency alternatives, while air-conditioning systems were optimised to reduce energy consumption. Through these structured measures, UM has embedded sustainability into its operational framework.

These efforts align with SDG 7.3 — to double the rate of improvement in energy efficiency — and reflect the University's transition from ad hoc sustainability actions to a systematic governance framework, where accountability, measurable targets, and periodic reporting drive continuous progress.



Identifying and Reducing Energy Wastage

Another highlight of 2024 was the implementation of a multi-year energy audit programme, made possible through a grant from the Sustainable Energy Development Authority (SEDA) Malaysia. The audits systematically reviewed energy consumption patterns across buildings, identifying hotspots of inefficiency.

The findings have already informed early interventions such as installing motion-sensor lighting, replacing current lighting with energy efficient lighting, optimizing Heating, Ventilation, and Air Conditioning (HVAC) scheduling, and recommending improved insulation in selected spaces. We anticipate that these corrective measures will result in significant long-term electricity cost savings and a reduction in carbon intensity.

Conducted over a five- to seven-year cycle, these audits ensure continuous improvement and foster a culture of evidence-based energy management. This initiative directly contributes to SDG 7.3: ensuring energy is used more efficiently and sustainably, while also serving as a model for other Malaysian universities and institutions.



Local Community Outreach for Energy Efficiency

Universiti Malaya (UM) actively engages the local community in understanding and adopting energy-efficient and clean energy practices through outreach, innovation, and collaborative learning. UMPEDAC, led by Dr. Tan Chia Kwang, carried out a field study in Selangau, Sarawak, working directly with remote longhouse communities to assess energy consumption and living conditions. This initiative not only aimed to identify low-carbon electrification models but also served as a hands-on outreach effort, promoting energy-efficient practices and raising awareness of sustainable energy solutions among local residents. The “*Solar Untuk Sekolah*” programme, led by students from the Faculty of Science in collaboration with the Low-Dimensional Materials Research Centre, introduced secondary school students to solar energy through creative model-building using recycled materials. This hands-on initiative not only cultivated awareness of renewable energy but also reflected UM’s broader efforts to extend sustainability education beyond campus. Alongside this, UM strengthens community learning through seminars and research showcases by centres such as the Centre for Energy Sciences, NANOCAT, and UMPEDAC, which feature accessible discussions on smart power flow controllers, photocatalytic coatings for energy efficiency, and nanomaterials for clean energy systems. These activities collectively promote scientific literacy, encourage responsible energy use, and connect the public with the latest advances in sustainable technology.



Complementing these outreach and educational efforts, UM continues to demonstrate applied innovation in energy management through research and knowledge sharing. The solar-powered smart monitoring device, developed at the Faculty of Engineering, exemplifies this commitment—using AI and IoT technologies to optimise electricity usage and reduce energy waste on campus. Its deployment and demonstration across the UM community provide a practical example of how smart systems can enhance energy efficiency. Meanwhile, the International Conference on Sustainable Energy, Infrastructure and Environment 2024 (ICSEIE2024) gathered national and international experts to explore pathways for accelerating the global energy transition. Together, these initiatives deepen local understanding of clean energy, foster sustainable practices, and strengthen Malaysia’s pursuit of a low-carbon future.

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Bringing Sustainable Energy to Rural Communities in Sarawak

In 2024, Dr. Tan Chia Kwang from the Universiti Malaya Power Energy Dedicated Advanced Centre (UMPEDAC) led a field study on rural electrification for longhouse communities in Selangau, Sibü, Sarawak. Conducted from 8 to 10 October, the research assessed living conditions, transport access, and energy use in Rh Rony and Rh Himly. Through on-site surveys and data collection, the study identified viable low-carbon electrification models and conducted a lifestyle life-cycle analysis (LCA) for rural households. In collaboration with a student from Ritsumeikan University, Japan, this initiative reflects UM's commitment to combining scientific research with local community outreach to enhance energy efficiency and sustainable living.

The outcomes of this study are expected to inform policy recommendations for rural energy access, particularly in areas where conventional grid connection remains economically or geographically challenging. Insights gained from this project will support the development of hybrid renewable energy systems and community-scale microgrids, promoting energy-efficient practices at the local level. Furthermore, the findings will serve as an academic reference for interdisciplinary research on sustainable electrification, helping to shape future UMPEDAC initiatives and national dialogues on equitable energy transition and infrastructure development for rural Malaysia.

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Above: Survey interview with Mr. Nyindang, a senior resident of Rh Rony in Selangau, Sibü, Sarawak (top left). The dilapidated condition of the longhouse at Rh Rony (top right) highlights the need for improved infrastructure and sustainable electrification. Dr. Tan Chia Kwang (UMPEDAC) is pictured in front of Rh Rony during the field visit. “Rh” stands for “Rumah,” meaning house; here it refers to a “Rumah Panjang” or longhouse

Below: Survey interview with residents of Rh Himly in Selangau, Sibü, Sarawak (bottom left). An exchange student from Ritsumeikan University, Japan, joined the team to support cross-cultural learning and data collection on rural electrification. The main mode of transport in the village is the perahu panjang (bottom right)



Solar Untuk Sekolah: Empowering Students with Clean Energy Innovation

The “Solar Untuk Sekolah” programme, organised by students from the Faculty of Science, Universiti Malaya, in collaboration with the Low-Dimensional Materials Research Centre (LDMRC), aimed to engage Form Three students in designing school infrastructure models powered by solar cells using recycled materials. This three-day solar model design competition was held on 30 April, 7 May, and 14 May 2024. Participants were guided to creatively construct school infrastructure models incorporating recycled materials and solar panels. The programme included a briefing on the National Energy Transition Roadmap (NETR), a workshop to assist participants in building solar models, and an evaluation day where innovative designs such as solar sirens and solar vans were showcased. This initiative not only enhanced students’ creativity and technical skills but also raised awareness about sustainable energy and the importance of reducing reliance on fossil fuels among young learners.

By fostering understanding and appreciation of clean energy technologies, the programme supports the United Nations’ Sustainable Development Goals, particularly SDG 7 (Affordable and Clean Energy) and SDG 13 (Climate Action). It empowers the community with knowledge of solar energy applications, encouraging local participation in environmental sustainability efforts. Additionally, the programme benefits LDMRC by sparking interest among students in pursuing advanced studies in sustainable energy research. For the student organisers, it provided invaluable experience in research, event management, communication, and leadership, ultimately deepening their commitment to sustainable development and community engagement.

Below: UM students from the Faculty of Science, together with UM researchers, during the “Solar Untuk Sekolah” programme briefing and hands-on workshop for school children and teachers



Global Intellectual Discourse on Energy and Sustainability

Beyond campus operations, UM has demonstrated leadership in international sustainability dialogues. The Global Intellectual Discourse 2024 (The Malaya Dialogue), hosted at Dewan Tunku Canselor in January, convened policymakers, diplomats, academics, and industry leaders to deliberate on the future of energy and global cooperation. The dialogue examined the prospects for power and sustainability, with ambassadors from the United States, India, and Australia emphasising the interconnectedness of energy, peace, and security.

The event also featured YB Senator Tengku Datuk Seri Utama Zafrul Tengku Abdul Aziz, Minister of International Trade and Industry, who addressed climate change and energy insecurity in the context of international trade and Malaysia's leadership role in the Global South.

A Global Science and Energy Roundtable followed, with experts from the World Nuclear Association, Tenaga Nasional Berhad, and Malakoff Corp Berhad. The discussion highlighted the critical role of science-driven solutions and industry partnerships in accelerating the global energy transition.



Above: The Malaya Dialogue; Session 2: The Future of Power in the 21st Century: East-West Divide and the Roles of Energy, Economic, and Security Leadership in Peace, Sustainability, and Conflict Guardrails

Below: The Malaya Dialogue; Session 3: Global Science and Energy Roundtable 2024



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The Top 2% Research Scientists Lecture Series, held in January, featured Prof. Kamal Sharma (GLA University, India) and UM's Assoc. Prof. Dr. Nurhidayatullaili Binti Muhd JULKAPLI. Their lectures focused on battery recycling for electric vehicles and nanohybrid photocatalysts for pollutant mitigation—two fields that directly contribute to cleaner, more sustainable energy technologies.

In addition, a seminar on The Chemistry of Reactive Carbon Compounds was presented by Prof. Dr. Ong Tiow-Gan of Academia Sinica, Taiwan, and another seminar on Solution-Processed Functional Metal Oxide Thin Films for Energy Applications was delivered by Prof. Dr. Jiban Podder, FRSC, FBAS, of Bangladesh University of Engineering and Technology, Dhaka, Bangladesh. These seminars further strengthened NANOCAT's engagement with cutting-edge research in catalysis, materials chemistry, and functional energy materials.

These engagements reinforce UM's reputation as a regional leader in energy research and innovation while also fostering international collaboration.



Right: Event posters by NANOCAT, open to the public free of charge

Solar-Powered Smart Monitoring: Optimising Energy Use at UM

In terms of innovation, Professor Dr. Hazlee Azil Illias from the Department of Electrical Engineering, Universiti Malaya, and his collaborator, Mr. Nasiru Yahaya Ahmed, have developed a solar-powered smart monitoring device under the UM EcoCampus Living Labs Research Grant 2023/2024. This device uses a combination of artificial intelligence (AI), the Internet of Things (IoT), image processing technologies, and renewable energy technology to optimise electricity usage based on the real-time occupancy of selected lecture halls at the Faculty of Engineering.



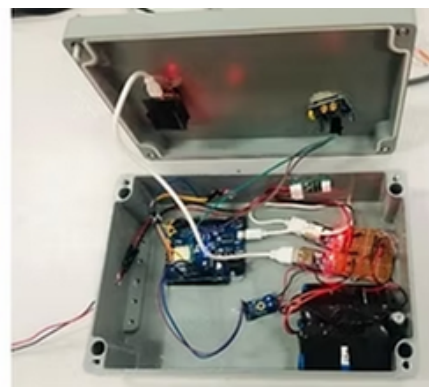
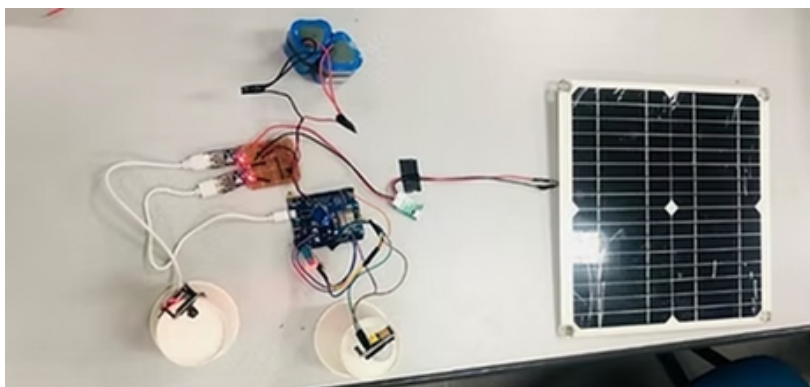
The smart monitoring device works by continuously tracking both room temperature and occupancy. Temperature sensors detect whether the air conditioning is running—if the temperature is below 25°C, it indicates that the air conditioning is likely on. The device then activates motion sensors to determine if anyone is present in the room. If no movement is detected after a preset time, the system automatically alerts the building manager via a Telegram message that the air conditioner should be turned off. This automated process ensures that energy is only used when necessary, reducing energy consumption by at least 40% in the monitored lecture rooms.



The system has also been shared with the UM community, allowing students and staff to benefit from this smart energy management technology and promoting sustainable energy practices across the campus.

Above: Briefing on the solar-powered smart monitoring system for occupancy and energy use in a lecture room to the UM community

Below: The developed prototype



Seminar on Photocatalytic Innovation for Energy Efficiency

A research seminar on energy efficiency was organised by the Centre for Energy Sciences, Faculty of Engineering, UM, on 14 February 2024. The seminar, titled “*Effective Photocatalytic Technology for Improving Environmental and Energy Performance of Submerged Water Surfaces and Systems*,” was delivered by Professor Dr. Dennis Y. C. Leung from the Department of Mechanical Engineering, University of Hong Kong.

During the seminar, a newly developed nano-sized photocatalytic coating that effectively controls the growth of microorganisms on yacht hulls and seawater gates was introduced. By utilising these materials, the need for frequent removal of deposited microorganisms is minimised, thereby reducing maintenance costs and improving energy efficiency.



Above: Research Seminar — *Effective Photocatalytic Technology for Improving Environmental and Energy Performance of Submerged Water Surfaces and Systems*

Seminar on Smart Power Flow Controllers

The Faculty of Engineering, UM, in collaboration with the Institute of Electrical and Electronics Engineers (IEEE) Power and Energy Society Malaysia Chapter, hosted a Seminar on Smart Power Flow Controllers on 18 April 2024 at the Faculty of Engineering, UM. The seminar was delivered by Dr. Kalyan K. Sen from Sen Engineering Solutions Inc., India.

During the seminar, Dr. Kalyan highlighted how smart power flow controllers can maximise power transfer, minimise energy losses, avoid congestion by rerouting power, and stabilise the power grid. This initiative directly advances SDG 7.1: ensuring access to sustainable and modern energy technologies.



Right: Event poster for the Seminar on Smart Power Flow Controllers (top) and photo of participants attending the seminar (bottom)

Seminar on Advanced Sliding Mode Control

The UM Power Energy Dedicated Advanced Centre (UMPEDAC) organised a hybrid seminar entitled “Advanced Sliding Mode Control for Electrical Machines and Drive Systems” on 23 August 2024. The seminar was presented by Dr. Abdul Khaliq Junejo, an Assistant Professor at Quaid-e-Awam University of Engineering, Science and Technology (UEST), Nawabshah, Sindh, Pakistan, and a Postdoctoral Fellow at Huazhong University of Science and Technology, China.



Right: Event poster for the Seminar on Advanced Sliding Mode Control

International Conference on Sustainable Energy, Infrastructure and Environment 2024 (ICSEIE2024)

The International Conference on Sustainable Energy, Infrastructure and Environment 2024 (ICSEIE2024) was co-organised by the UM Power Energy Dedicated Advanced Centre (UMPEDAC), Universiti Tenaga Nasional, and other local institutions from 14 to 15 October 2024 at Le Méridien Putrajaya, Malaysia. The conference theme was “Embracing Sustainability: Accelerating Energy Transition for a Greener Tomorrow.”

The conference focused primarily on green energy technologies such as solar, wind, and bioenergy harvesting technologies, hydrogen and nuclear energy, environmental sustainability, as well as energy efficiency and management. It brought together leaders and experts in sustainability, energy, infrastructure, and environmental protection to share knowledge, forge collaborations, and inspire collective action.



Right: Call for papers for the conference (top) and a photo from the main forum (bottom). Photo credit: Universiti Tenaga Nasional (UNITEN)

International Workshop on Renewable Energy for Carbon Neutrality

The School of Energy Management at Shri Mata Vaishno Devi University (SMVDU), Katra, in collaboration with the UM Power Energy Dedicated Advanced Centre (UMPEDAC), Universiti Malaya, conducted a one-day International Workshop on Renewable Energy for Carbon Neutrality on 12 December 2024. The event brought together leading academics, researchers, and professionals from around the world to explore innovative renewable energy strategies and solutions aimed at achieving global climate goals and addressing the challenges of carbon neutrality. The workshop's keynote address was delivered by Prof. Jeyraj Selvaraj, Executive Director of UMPEDAC, Universiti Malaya, on the topic "Carbon Neutrality through Solar Energy-Based Systems." Prof. Selvaraj presented pioneering research on solar energy technologies, including photovoltaic systems and solar thermal solutions, and highlighted their crucial role in reducing carbon emissions and advancing sustainable energy transitions.



Above: Participants at the International Workshop on Renewable Energy for Carbon Neutrality

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Showcasing Self-Cleaning Solar Panel Coating at Global Intellectual Discourse 2024

On 22 January 2024, UMPEDAC participated in the exhibition of its product, the Self-Cleaning Coating for solar panels, at the Global Intellectual Discourse (*Wacana Pemikir Global*) 2024, organised by Universiti Malaya. The event was inaugurated by the Prime Minister of Malaysia, Yang Amat Berhormat Dato' Seri Anwar Ibrahim. Following the officiation, the Prime Minister visited the exhibition booths featuring research by Universiti Malaya's scholars. The Self-Cleaning Coating for solar panels was demonstrated to him by Dr Vengadaesvaran and Dr Amirul Syafiq.



Right: The UMPEDAC team with their Self-Cleaning Coating for solar panels

Energy Efficiency Services for Industry

Universiti Malaya (UM) continues to extend its expertise beyond campus boundaries to support local industries in advancing energy efficiency and clean energy innovation. Through research collaborations, technology transfer, and specialised consultancy, UM delivers practical solutions that improve energy performance and sustainability in industrial operations. These initiatives reflect the University's commitment to translating research into impactful applications that benefit both national development and the environment.

A key milestone in 2024 was the memorandum of agreement between UM's Nanotechnology & Catalysis Research Centre (NANOCAT) and Smart EnerG Pte Ltd to develop a functionalised titanium dioxide (TiO₂) nanocoating for photovoltaic panels, improving efficiency and reducing maintenance costs. UM also partnered with Guoann Dot Com Bhd to advance smart energy and carbon-neutral technologies. Alongside innovations like the Cross-Axis Wind Turbine (CAWT) and the Master of Renewable Energy programme, these initiatives strengthen industry capacity for cleaner, more efficient energy solutions.

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Cross-Axis Wind Turbine Innovation

UM's impact in 2024 extended beyond its campus through direct services to local industry. A standout achievement was the innovation of the Cross-Axis Wind Turbine (CAWT) by Professor Ir. Dr. Chong Wen Tong from the Department of Mechanical Engineering, Faculty of Engineering, UM, developed to harness Malaysia's low wind speeds more effectively. Unlike traditional designs, the CAWT integrates vertical and horizontal axis technologies to capture wind energy from both the horizontal and vertical directions of oncoming winds, offering higher energy efficiency, improved reliability, and easier maintenance. Currently in prototype testing, UM is collaborating with industry partners, including PETRONAS, for potential commercialisation. This innovation underscores UM's commitment to advancing industrial energy efficiency through practical, research-driven solutions.



Above: Prototype of Universiti Malaya's Cross-Axis Wind Turbine (CAWT), designed for efficient energy capture in Malaysia's low-wind environment (top), and the Prime Minister's visit to the booth featuring the CAWT at an exhibition in UM (bottom)

Below: Researchers with the CAWT during wind tunnel testing at CPP



MoA on Carbon Neutral Research and Smart Renewable Energy Collaboration

In January 2024, a Memorandum of Agreement (MoA) was signed between UM, Guoann Dot Com Bhd, and several parties from China for a RM14 billion R&D investment in carbon-neutral research and smart renewable energy initiatives. The MoA aims to establish a joint research and development centre for carbon neutrality, deepening technical and knowledge exchange in clean energy between Malaysia and China, while injecting green intelligence into the Belt and Road projects. Through this collaboration, UM aims to transform into a smart campus focused on research and innovation to address carbon challenges.



Above: MoA signing ceremony between UM, Guoann Dot Com Bhd, and several parties from China

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Master of Renewable Energy Programme

The Master of Renewable Energy Programme, offered by the UM Power Energy Dedicated Advanced Centre (UMPEDAC), was launched in 2016 and continues until today. It provides specialised postgraduate education in renewable energy technologies and management, tailored for professionals seeking to deepen their expertise in sustainable energy practices and contribute to building a skilled workforce capable of driving energy efficiency across various sectors.

The programme emphasises practical learning through industry-relevant technical field trips and exposure to the latest technologies and best practices, ensuring that students are prepared to meet the evolving demands of the renewable energy sector.

Below: Briefing deck for the Master of Renewable Energy Programme



Enhancing Solar Efficiency through UM-Smart EnerG Collaboration

On 29 April 2024, Universiti Malaya (UM), through the Nanotechnology & Catalysis Research Centre (NANOCAT), extended its research expertise to support the local renewable energy industry in improving solar power efficiency and reducing maintenance costs. This collaboration demonstrates UM's direct contribution to advancing clean energy technologies within Malaysia's industrial sector.

A memorandum of agreement (MoA) was signed between NANOCAT and Smart EnerG Pte Ltd to evaluate and enhance the performance of photovoltaic (PV) panels using a functionalised titanium dioxide (TiO₂) nanocoating. The project focuses on improving power generation efficiency while reducing the need for frequent cleaning, thereby lowering operational costs and environmental impact. By leveraging UM's research capabilities in nanomaterials and catalysis, the partnership provides industry-level solutions that strengthen Malaysia's solar energy infrastructure.

This collaboration aligns closely with the objectives of the National Energy Transition Roadmap (NETR), which promotes the deployment of renewable energy technologies and the growth of the local solar manufacturing ecosystem. Beyond joint research, UM also offered technical consultation and performance assessments, ensuring that the developed coating technology meets both industrial standards and energy efficiency benchmarks.

Through such industry partnerships, UM continues to provide tangible energy efficiency services—ranging from applied research to technical evaluation—that directly support Malaysia's transition towards a low-carbon economy. The initiative underscores UM's role as a leading university in fostering innovation and delivering sustainable energy solutions for industrial application.



Above: Group photo of Smart EnerG Pte Ltd representatives with Professor Mohd Rafie Johan, Director of the Nanotechnology & Catalysis Research Centre (NANOCAT), and Associate Professor Lai Chin Wei, Principal Investigator

Policy Development and Advocacy for Clean Energy

Universiti Malaya (UM) has contributed to the development of clean energy and energy-efficient technology policies through research, collaboration, and strategic planning at multiple levels. At the local level, the UM Net Zero Blueprint 2030, drafted in 2024, outlines a pathway for achieving a carbon-neutral campus by 2030 and net zero by 2050. Developed through a workshop involving UM experts and external partners, including the Sustainable Energy Development Authority (SEDA) Malaysia, the blueprint sets out frameworks for renewable energy deployment, green electricity adoption, and operational efficiencies across six core sectors. By combining research findings with operational insights, the blueprint provides evidence that can inform policy and practical decision-making in energy and sustainability.

At the regional and national levels, UM has participated in initiatives that support policy development more broadly. The university co-authored ASEAN Policy Brief No. 13 (2024) on private-sector climate investment and helped establish the ASEAN Universities Climate Change Network to encourage research collaboration and knowledge sharing among universities. At the national level, UM contributes to Malaysia's hydrogen economy through research, partnerships, and engagement with the Hydrogen Economy and Technology Roadmap. Internationally, UM participated in forums such as The Malaya Dialogue and COP29, sharing research-based perspectives that can inform policy discussions. These activities illustrate UM's ongoing role in supporting evidence-informed approaches to clean energy and energy-efficient technology policy development.

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Local Level: UM Net Zero Blueprint 2030

In 2024, UM reached a strategic milestone with the drafting of the UM Net Zero Blueprint 2030, which establishes a roadmap for achieving a carbon-neutral campus by 2030 and ultimately net zero by 2050. Although still in draft form as of early 2025, the blueprint received in-principle endorsement from the Universiti Management Committee (JKPU) on 11 December 2024, demonstrating strong institutional commitment.

The blueprint was developed through the UM Net Zero Campus Strategic Workshop, held on 14–15 August 2024 and hosted by UM Eco Campus under the Sustainable Development Centre (UMSDC). The workshop convened experts and taskforce members from UM and external partners, including representatives from the Sustainable Energy Development Authority (SEDA) Malaysia. Participants reviewed the previous Eco-Campus Blueprint (2016) and designed a robust strategic framework to support UM's net zero ambitions, ensuring alignment with national clean energy objectives.

Grounded in the UM Master Plan 2050 and informed by the Sustainable Development Solutions Network's Net Zero on Campus guide—adapted for UM's context—the blueprint outlines six core sectors: Energy, Mobility, Facilities, Waste Minimisation & Recycling, Value Chain, and Beyond Campus Operations. These sectors are further divided into 17 thematic focus areas, supported by 57 actionable plans to ensure systematic, measurable progress.

Within the Energy sector, the blueprint places particular emphasis on:

- Renewable Energy Installation Framework: Establishing a comprehensive framework to evaluate and recommend the installation of renewable energy systems across campus facilities, including solar panels and wind turbines.
- Green Electricity Tariff (GET): Continuing the adoption of TNB's Green Electricity Tariff to support the transition to sustainable energy sources and reduce reliance on fossil fuels.

By integrating academic research, operational data, and stakeholder engagement, UM's blueprint provides actionable insights that can inform and support government policy development in clean energy and energy-efficient technologies.



Above: UM Net Zero Blueprint 2030 document

Right: Two-day workshop with experts from various sectors to prepare the blueprint



Regional Level: Contribution to ASEAN Policy Brief on Climate Investment

In the same year, UM contributed to policy development through its participation in the ASEAN Socio-Cultural Community (ASCC) Research and Development Platform on Climate Change. The resulting policy document, Policy Brief No. 13 (2024), titled “Facilitating Private Sector Climate Investment Decision-Making: Leveraging on Data and Regulation in ASEAN”, was co-authored by Associate Professor Dr. V. G. R. Chandran Govindaraju from UM and Mr. S. Sarpaneswaran from C&G Analytica, Malaysia.

The policy brief analyses the regional policy environment influencing private-sector investment in renewable and low-carbon initiatives. It highlights barriers related to data transparency, cross-border regulation, and financing mechanisms, and proposes policy solutions to enhance regulatory coherence, improve data governance, and promote sustainable investment across the ASEAN energy landscape.

Through this contribution, UM provided expert insights into innovation systems, energy policy, and industrial efficiency, strengthening evidence-based policymaking at the ASEAN level. The brief forms part of the ASCC’s official publication series, supporting the ASEAN Strategy on Climate Change and Energy and the ASEAN Plan of Action for Energy Cooperation (APAEC) 2021–2025. This initiative reinforces UM’s role as a regional knowledge partner and policy contributor in advancing clean energy and climate-resilient development across Southeast Asia.



Above: Policy Brief No. 13 (2024), titled “Facilitating Private Sector Climate Investment Decision-Making: Leveraging on Data and Regulation in ASEAN” including the executive summary and policy recommendations



Right: A photo of Prof. Dr. V. G. R. Chandran A/L Govindaraju, Department of Political Science, Public Administration and Development Studies, Faculty of Business and Economics, Universiti Malaysia

Regional Level: Establishing the ASEAN Universities Climate Change Network

In 2024, Universiti Malaya (UM) strengthened its regional presence in climate policy and governance through the establishment of the ASEAN Universities Climate Change Network (AUN-CCN). The initiative was formalised on 2 September 2024 with the signing of a Memorandum of Understanding (MoU) between the NUS Centre for International Law (CIL) and UM, represented by the Climate Change Advisory Committee (CCAC). The ceremony, held during the regional conference “*Post-GST and the Road to 2025*”, was officiated by Prof. Ir. Dr. Kaharudin Dimiyati, UM’s Deputy Vice-Chancellor (Research and Innovation), and witnessed by Dr. Helena Varkkey, Chair of the CCAC, alongside representatives from NUS including Mr. George Loh, Associate Vice-President (Strategic Partnership), and Dr. Nilufer Oral, Director of CIL.

The Network aims to build a collaborative academic platform across ASEAN to advance research and policy innovation in climate change law, governance, and sustainable development. It also seeks to serve as a regional knowledge hub, supporting interdisciplinary studies, sharing institutional expertise, and fostering capacity building among ASEAN universities. This partnership underscores UM’s commitment to advancing regional dialogue and policy-relevant research in line with ASEAN’s collective climate ambitions. During the launch, Prof. Dimiyati emphasised the importance of cross-border academic collaboration, while Dr. Varkkey contributed to a closing panel on “The International Climate Change Regime – 2030 and Beyond”, further reinforcing UM’s policy engagement in the ASEAN context.

Below: MoU signing ceremony for the ASEAN Universities Climate Change Network (AUN-CCN). Photo credit: NUS Centre for International Law (CIL)



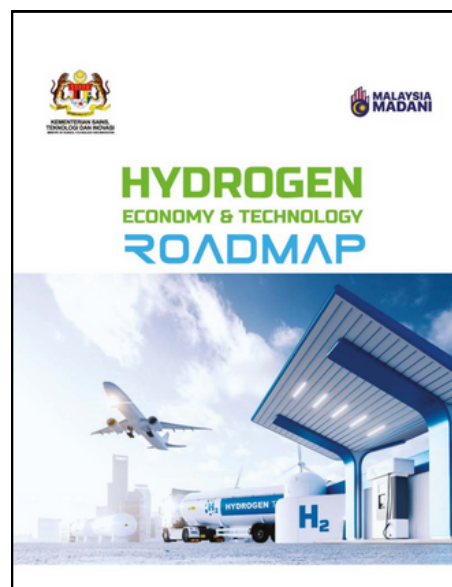
National Level: Universiti Malaya's Involvement in Malaysia's Hydrogen Economy and Clean Energy Development

Universiti Malaya (UM) has emerged as a key contributor to Malaysia's clean energy transition, particularly in advancing hydrogen technology. The university's research efforts and strategic collaborations directly support national objectives to develop a sustainable hydrogen economy and achieve net-zero emissions by 2050.

The Hydrogen Economy and Technology Roadmap (HETR), launched by Malaysia's Ministry of Science, Technology, and Innovation (MOSTI) in October 2023, outlines the nation's strategic approach to developing a hydrogen economy. The roadmap aims to position Malaysia as a leading hydrogen economy in the ASEAN region by 2050. It identifies several challenges in developing a hydrogen economy, including high production costs, transportation and storage issues, and the need for a clear regulatory framework. UM's contributions are acknowledged in the HETR, reflecting the university's active involvement in hydrogen research. According to the roadmap, UM has published 171 research papers on hydrogen technologies, underscoring its role in driving innovation and addressing the technical and practical challenges of a hydrogen-based energy system.

In May 2024, UM formalised a Memorandum of Agreement with TNB Fuel Sdn Bhd (TNBF) and Energise Sdn Bhd to accelerate the development of hydrogen-fuel applications. The collaboration focuses on creating efficient and scalable hydrogen solutions aligned with Malaysia's National Energy Transition Roadmap. The signing ceremony was attended by Associate Professor Ts. Dr. Aznul Qalid Md Sabri, Chair of the Cluster Industry, Innovation & Sustainable Sciences at UM, and Professor Ir. Dr. Hazlie Mokhlis, representing UM's Centre of Innovation & Enterprise (UMCIE). Energise Sdn Bhd was represented by its Managing Director, Tuan Syed Faisal Algadrie.

Through this partnership, UM plays a central role in translating research into practical applications, facilitating the commercialisation of hydrogen technologies, and supporting policy-aligned innovation in the energy sector.



Above: The front cover of the Hydrogen Economy and Technology Roadmap (HETR)

Below: UM formalised a Memorandum of Agreement with TNB Fuel Sdn Bhd (TNBF) and Energise Sdn Bhd.



Global Level: The Malaya Dialogue

In early 2024, Universiti Malaya (UM) hosted The Malaya Dialogue (Global Science and Energy Roundtable), an international forum that convened diplomats, policymakers, and global energy experts to deliberate on technology transitions and sustainable-energy cooperation. The Dialogue provided a forum for research, policy and industry participants to exchange perspectives on sustainable-energy transitions and international cooperation. By convening diplomats, policymakers and technical experts, UM furthered its role in connecting academic enquiry with policy-oriented discussion.



Above: Special Address via video conference by Dr. Sama Bilbao y León, Director General of the World Nuclear Association, during The Malaya Dialogue – Session 3: Global Science and Energy Roundtable 2024

Global Level: UM's Participation in COP29 and International Policy Dialogues

In November 2024, Universiti Malaya (UM) participated as part of Malaysia's official delegation to the 29th Conference of the Parties (COP29) in Baku, Azerbaijan. The UM delegation contributed actively to the Malaysia Pavilion and associated policy forums, where its researchers shared evidence-based insights on clean-energy transition, climate finance, and energy-efficient technologies. Through these engagements, UM strengthened the linkage between academic research and international policy dialogue, supporting Malaysia's stance on renewable energy deployment and sustainable technology pathways. By taking part in global deliberations on climate action, UM's involvement at COP29 served as a tangible mechanism through which the university informed and supported governments in clean-energy policy development — translating research expertise into real-world policy relevance.



Above: Professor Dr. Surinderpal Kaur from the Faculty of Languages and Linguistics and Associate Professor Dr. Zeeda Fatimah Mohamad from UMSDC and the Faculty of Science representing Universiti Malaya at the COP29 Malaysia Pavilion: Opening Plenary Session

Empowering Low-Carbon Start-ups

In 2024, Universiti Malaya (UM) continued to provide strong institutional support for start-ups advancing a low-carbon economy through dedicated accelerator programmes and strategic partnerships. Led by the UM Centre of Innovation and Enterprise (UMCIE) and UM Innovations Sdn. Bhd. (UMI), these initiatives offer targeted assistance to deep-tech and sustainability-driven start-ups through mentorship, business development training, venture-building support, and alternative financing channels.

By fostering innovations in renewable energy, clean technology, and sustainable production, UM plays a pivotal role in nurturing entrepreneurial talent and translating research into market-ready solutions that contribute to Malaysia's carbon-neutral and green growth agenda.

UM Deep Tech (UMDT) Accelerator Programme

Universiti Malaya (UM) continued to advance low-carbon innovation through the UM Deep Tech (UMDT) Accelerator Programme, managed by the UM Centre of Innovation and Enterprise (UMCIE). The six-month programme provides targeted assistance to research-based start-ups, including those developing green and low-carbon technologies, by supporting their journey from laboratory research to market readiness. UMDT offers structured mentorship, business development training, and access to funding opportunities through strategic partnerships with industry and venture capital networks. The programme specifically identifies Green Technology as one of its priority domains, encouraging innovations that reduce carbon emissions, improve energy efficiency, and promote sustainable production.

Participating start-ups in 2024 under UMDT advanced solutions such as renewable energy systems, waste-to-fuel conversion, and clean technology applications, demonstrating UM's commitment to fostering a low-carbon economy. Through this accelerator initiative, UM not only nurtures entrepreneurial talent among researchers and students but also strengthens Malaysia's innovation ecosystem in line with national sustainability and carbon-neutral goals.

Below: The Nanotechnology and Catalysis Research Centre (NANOCAT) and other members of the third cohort of the UMDT Programme attending the UM Deep Tech Start-up Accelerator Mini Exhibition in November 2024. NANOCAT aims to commercialise its research innovations through the establishment of a start-up company



UM Innovations Forges Strategic Partnerships to Boost University Start-Ups

In 2024, Universiti Malaya (UM), through its wholly owned subsidiary UM Innovations Sdn. Bhd. (UMI), strengthened its support for start-ups driving a low-carbon and innovation-led economy by establishing strategic partnerships with Origgin Ventures Sdn. Bhd. and Pitch Platforms Sdn. Bhd. (pitchIN). These collaborations aim to accelerate the commercialisation of UM's research innovations and empower emerging ventures in clean and sustainable technologies.

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Under this initiative, Origgin will invest in selected deep-tech spin-off companies under UMI's programme, providing seed capital and venture-building support to advance prototypes into minimum viable products (MVPs). The partnership also connects start-ups to Origgin's international network, positioning them for future growth and funding opportunities.

Meanwhile, pitchIN, Malaysia's leading equity crowdfunding (ECF) platform, will collaborate with UMI to facilitate public and alumni investments into UM's Start-Up and Spin-Off (SUSO) companies. A dedicated microsite will be developed for UMI spin-offs to host ECF campaigns, expanding funding access for start-ups founded by UM students, alumni, and faculty.

Among the early beneficiaries is Xcess Pressure Sdn. Bhd., a UM spin-off led by Dr. Iswadi Jauhari, which developed the Super Butterfly Hydropower System—a clean-energy innovation that captures excess water pressure in pipelines to generate electricity. The system has been successfully piloted with Air Selangor and Pengurusan Aset Air Berhad, contributing directly to Malaysia's sustainable energy goals.

Complementing these efforts, the pitchIN Academy Fundraising Accelerator Programme equips UM-affiliated start-ups with entrepreneurial and fundraising skills. Together, these partnerships underscore UM's commitment to nurturing a dynamic innovation ecosystem that supports national aspirations for a low-carbon and sustainable economy.



Above: Representatives from Origgin Ventures Sdn. Bhd. and Pitch Platforms Sdn. Bhd. (pitchIN), together with UM Innovations Sdn. Bhd. (UMI), during the formalisation of the strategic partnership