



Sustainability Summary 2021-24

INTRODUCTION

Sunway University is committed to becoming a planetary health and sustainability-driven institution through data-driven climate action, reduction of greenhouse gas emissions, and responsible operational practices. This commitment is driven by the urgent need to address climate change and the desire to contribute to a healthier planet. Our journey began with tracking Scope 1 and 2 emissions, which allowed us to develop a strategic roadmap toward achieving net-zero emissions, aligning with both national and international sustainability goals. This document provides a snapshot of our progress from 2021 to early 2024, highlighting our emissions performance, key action plans, and future initiatives.

OUR VISION, GOALS AND ROADMAP

Our sustainability vision is to cultivate a data-informed and operationally responsible university community dedicated to reducing emissions, increasing stakeholder awareness of climate objectives, and fostering innovation for a more sustainable future. We are dedicated to continuous improvement and innovation in sustainability practices. We aligned our initiatives with the United Nations Sustainable Development Goals (SDGs).



EMISSIONS OVERVIEW

Emission Categories	2019	2020*	2021*	2022*	2023	2024
Scope 1						
Direct emissions from company vehicles (tCO ₂ e)	11.4	3.7	1.5	5.6	11.1	15.8
Scope 2**						
Purchased electricity for own use (tCO ₂ e)	5,817.9	4,603.7	3,258.2	4,763.6	5,310.1	5,587.4
Total Scope 1 and 2 (tCO₂e)**	5,829.3	4,607.4	3,258.2	4,763.6	5,321.2	5,046.9
Total space (sqm)	59,200	59,200	64,000	64,000	64,000	64,000
Total emission per area (tCO ₂ e/sqm)	0.11	0.085	0.061	0.083	0.092	0.087
Emission factor (kgCO ₂ e/kWh)	0.753	0.821	0.757	0.774	0.774	0.740

* Since 2020 - 2022 were impacted by the COVID-19 pandemic, tracking during these years may not provide an accurate reflection of typical conditions or progress.

** Scope 2 subtracted renewable energy owned and generated by the University.



POTENTIAL OFFSETS

PLANTED FOREST INITIATIVE

As part of Sunway University's integrated sustainability strategy under the Sunway City Kuala Lumpur (SCKL) vision, the university has transformed its urban campus into a **green and living laboratory**. One of its flagship environmental initiatives is the establishment of **planted forest areas**, created through deliberate greening and landscape restoration efforts that support both biodiversity and climate resilience.

Covering more than **15.39 hectares**, these planted forests are not only aesthetically valuable but also function as **long-term natural carbon sinks**. The trees and forest ecosystems are now maturing into biodiverse, self-sustaining habitats that actively **sequester carbon dioxide**, contributing an estimated **92.34 tCO₂e per year** in natural offsets. These spaces also serve as platforms for **student learning, research, and community engagement** in sustainable practices.

This initiative reflects Sunway University's leadership in advancing the United Nations Sustainable Development Goals (SDGs), particularly SDG 13 (Climate Action) and SDG 15 (Life on Land). By aligning ecological restoration with climate action, the university is demonstrating how nature-based solutions can be an integral part of achieving its **net zero emissions target**.

NET ZERO CARBON EMISSION TARGET AND PROGRESS

Year	Targeted Net Emission (tCO2e)	Actual Emission** (tCO2e)	Total Offset*** (tCO2e)	Total Net Carbon Emission (tCO2e)
2019	Base year	6,298.8	575	5,723.8
2020*	5,727	5,022.1	483	4,539.1
2021*	5,139	3,924.6	772	3,152.6
2022*	4,551	5,342.2	665	4,677.2
2023	3,963	5,870.6	642	5,228.6
2024	3,375	5,603.2	649	4,954.6
2025	2,787	To be determined		
2026	2,199			
2027	1,611			
2028	1,023			
2029	435			
2030	0			

* Since 2020 - 2022 were impacted by the COVID-19 pandemic, tracking during these years may not provide an accurate reflection of typical conditions or progress.

** Total scope 1 and 2, excluding the renewable energy generated by the university.

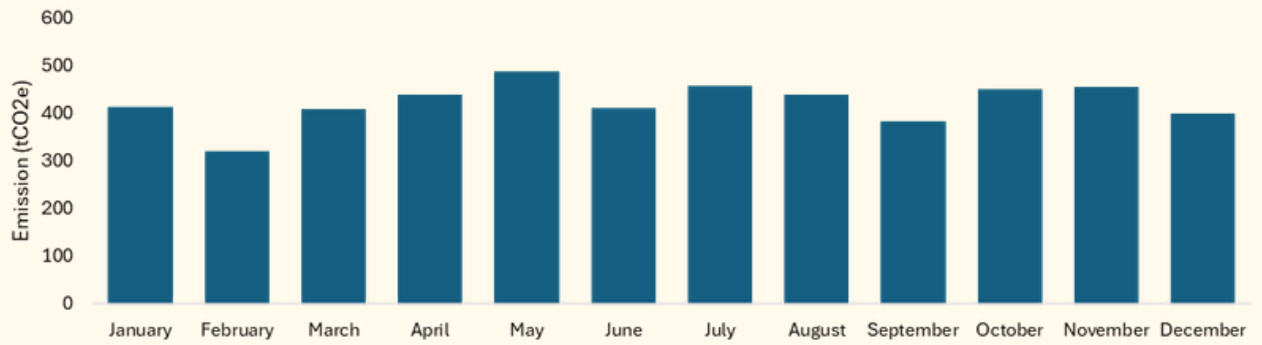
*** This includes university-managed planted forests, research outputs and outcomes, as well as renewable energy systems owned and operated by the university.

NET ZERO ACTION PLAN AND PROGRESS

Initiative	Target	Current Status (2024)
Transition to renewable electricity	20% by 2030	9.5%
Green building upgrades	A Net Zero Building completed by 2025	80% completed
Waste reduction & circular economy	40% reduction by 2030	20%

Environmental Sustainability Policy

2024 Monthly Scope 2 Net Carbon Emissions (tCO₂e)



SUNWAY UNIVERSITY SUSTAINABILITY ACTIONS

2024 Update – Continuity and Scaling

Sunway University continues to strengthen its commitment to greenhouse gas (GHG) reduction through the ongoing implementation and scaling of existing sustainability initiatives introduced in previous years. In 2024, the University focused on enhancing the efficiency, integration, and impact of these initiatives, ensuring sustained progress towards its net-zero carbon ambition and alignment with SDG 7 (Affordable and Clean Energy).

1. CARBON REDUCTION AND EMISSION REDUCTION PROCESS

Sunway University has embarked on a comprehensive carbon management initiative aimed at reducing carbon emissions. A central component of this initiative is the installation of solar panels and battery storage systems on campus.



Building on the solar photovoltaic (PV) and battery storage systems established in earlier years, Sunway University continued to optimise and expand the performance of its renewable energy infrastructure in 2024.

Key developments include:

- **Optimisation of Existing Solar Systems:** Improved energy yield through better system integration and monitoring, ensuring more efficient utilisation of renewable energy generated on campus.
- **Enhanced Energy Storage Utilisation:** Strengthening the use of battery systems to manage peak demand and improve energy resilience.
- **Integration with Broader Campus Energy Systems:** Renewable energy systems are increasingly coordinated with campus-wide infrastructure to maximise efficiency and reduce reliance on grid-based electricity.

These efforts reinforce the University's ongoing transition towards cleaner energy sources while ensuring that previously implemented systems continue to deliver higher impact over time.



[Carbon Reduction and Emission Reduction Process](#)

2. ENERGY REDUCTION PLAN AND ENERGY WASTE IDENTIFICATION (STRENGTHENED IMPLEMENTATION)

The University's energy reduction plan remained a central component of its sustainability strategy, with 2024 focusing on deepening implementation and improving precision in energy management.



Enhancements include:

- **Advanced Monitoring and Data-Driven Optimisation:** Adoption of more refined tracking mechanisms to better identify inefficiencies in lighting, HVAC systems, and equipment usage.
- **Strengthened Building Energy Management Practices:** More systematic control of energy consumption across campus facilities through improved automation and scheduling.
- **Continuous Equipment Upgrades:** Ongoing replacement of older systems with more energy-efficient alternatives to reduce overall consumption.
- **Expanded Awareness and Behavioural Campaigns:** Reinforcement of energy-saving practices across the university community, fostering a culture of shared responsibility in reducing energy use.

Through these continuous improvements, the University has enhanced its ability to reduce energy intensity while maintaining operational effectiveness.



[Energy Reduction Plan and Energy Waste Identification](#)

3. ASSISTANCE TO LOW-CARBON INNOVATION (EXPANDED IMPACT AND APPLICATION)

The CO₂ Capture and Utilisation Research Centre (CCDCU), established as part of the University's earlier sustainability initiatives, continued to expand its role in 2024 as a key platform for low-carbon innovation and applied research.



- **Innovating for Net Zero: CO₂ Capture and Utilisation Research Centre**

As part of its comprehensive strategy to achieve net-zero emissions, Sunway University has established a dedicated Research Centre for CO₂ Capture and Utilisation (CCDCU) within the School of Engineering and Technology. This center is focused on developing advanced carbon capture technologies that enable the efficient removal of CO₂ from industrial and ambient sources and continued to expand its role in 2024 as a key platform for low-carbon innovation and applied research.

Progress in 2024 includes:

- **Further Development of Carbon Capture Technologies:** Advancing research on efficient CO₂ capture methods with greater applicability to industrial and urban contexts.
- **Expanded Exploration of CO₂ Utilisation Pathways:** Continued work on converting captured carbon into useful products, supporting a circular carbon economy.
- **Stronger Industry and Research Collaboration:** Deepening partnerships to translate research into real-world applications, enhancing the impact of low-carbon technologies.
- **Increased Student and Research Engagement:** Providing more opportunities for interdisciplinary learning and research participation in sustainability-focused projects.

These developments demonstrate the University's commitment to scaling existing research initiatives to contribute more meaningfully to global decarbonisation efforts.



[Research Centre for Carbon Dioxide Capture and Utilisation](#)

4. POLICY DEVELOPMENT FOR CLEAN ENERGY TECHNOLOGY


Sunway University is actively engaged in developing and implementing policies that promote the adoption of clean energy technologies. These include establishing comprehensive frameworks for renewable energy integration and driving sustainable energy transitions throughout the university ecosystem.

Sunway University continued to refine and strengthen its policy frameworks in 2024 to support the adoption of clean energy technologies and sustainable practices.

Key progress includes:

- **Enhanced Integration of Sustainability into Institutional Policies:** Embedding clean energy considerations into campus planning, operations, and procurement processes.
- **Strengthening Implementation Mechanisms:** Ensuring that sustainability policies are effectively translated into operational practices across the University.
- **Alignment Across Academic, Operational, and Research Functions:** Greater coordination to ensure that sustainability principles are consistently applied throughout the institution.

These efforts ensure that sustainability is institutionalised and continuously reinforced, supporting long-term carbon reduction goals.

 [Sunway University Sustainability Policy](#)



NEWLY LAUNCHED SUSTAINABILITY INITIATIVES

2024–2030 Roadmap

In 2024, Sunway University initiated a new phase of its sustainability journey through the launch of a strategic five-year decarbonisation roadmap, designed to accelerate progress towards its net-zero carbon ambition by 2030. Building on its existing sustainability foundations, these initiatives adopt a systems-level, whole-life carbon approach, integrating infrastructure, digital innovation, research, and governance within Sunway City as a living laboratory.

A key flagship initiative under this roadmap is the development of a net-zero carbon academic building, which is designed to go beyond conventional definitions of net-zero. The building will operate with a net negative carbon emission profile on an annual basis, while achieving full net-zero status within approximately 18–19 years.



Figure 1: Conceptual illustration of Sunway University's flagship net-zero carbon academic building, designed as a next-generation sustainable facility integrating low-carbon materials, energy-efficient systems, and renewable energy infrastructure. The building will serve as a living laboratory for sustainability, supporting education, research, and real-world implementation of climate solutions

Importantly, this target incorporates a whole-life carbon framework, accounting not only for operational emissions but also embodied carbon from construction (estimated at 429 tCO₂e). This distinguishes the project from typical net-zero buildings that focus primarily on operational performance, positioning it as a leading model for comprehensive lifecycle decarbonisation in higher education infrastructure.

The projected carbon trajectory demonstrates a steady cumulative offset over time, driven by renewable energy generation and high-efficiency building systems, ultimately achieving net-zero and transitioning into net-negative performance (Figure 2).

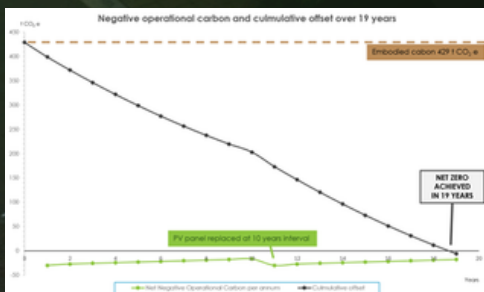


Figure 2: Projected lifecycle carbon performance of the flagship net-zero building, illustrating cumulative carbon offset against embodied carbon over a 19-year period. The model shows how operational carbon savings, supported by renewable energy systems such as solar PV (with periodic replacement cycles), progressively offset initial construction emissions, achieving net-zero before transitioning into net-negative carbon performance.



Carbon Reduction and Emission Reduction Process
Energy Reduction Plan and Energy Waste Identification

1. INTEGRATED LOW-CARBON CAMPUS ECOSYSTEM

As part of its long-term decarbonisation strategy, the University has launched the development of an integrated low-carbon campus ecosystem, moving beyond individual renewable projects towards a fully coordinated energy system.



Key initiatives include:

- **Solar Microgrid Expansion Programme:** Scaling up existing solar photovoltaic (PV) systems into a campus-wide microgrid integrated with battery storage to optimise energy generation, storage, and usage.
- **District Cooling Integration Initiative:** Systematic integration with Sunway City's district cooling infrastructure to significantly reduce cooling-related energy demand and emissions.
- **Low-Carbon Infrastructure Transition Plan:** Adoption of green construction materials (e.g., low-carbon concrete, heat-insulating coatings) and passive design strategies across new and existing buildings.
- **Flagship Net-Zero Carbon Building Project:** Development of a next-generation academic facility designed to operate at net-zero carbon, serving as a model for future campus expansion.

This initiative is expected to deliver substantial reductions in Scope 2 emissions while transforming the campus into a demonstrative model of sustainable urban infrastructure.

2. SMART ENERGY AND DIGITAL OPTIMISATION PROGRAMME

To enhance operational efficiency, the University has launched a Smart Energy Management Programme, leveraging digital technologies to optimise energy use across campus.



Key components include:

- **AI-Enabled Energy Management Platform:** Deployment of a centralised digital dashboard for real-time monitoring, predictive analytics, and optimisation of energy consumption.
- **Advanced Building Energy Management Systems (BEMS):** Integration of intelligent automation systems to regulate lighting, HVAC, and equipment usage based on occupancy and demand patterns.
- **Continuous Energy Audit Framework:** Establishment of a structured system for identifying inefficiencies and implementing targeted energy-saving interventions.
- **Behavioural Transformation Campaigns:** Expansion of university-wide initiatives to promote energy-conscious practices among staff and students.

This programme strengthens the University's ability to achieve sustained reductions in energy intensity while improving overall operational performance.

3. LOW-CARBON INNOVATION AND LIVING LAB EXPANSION

To enhance operational efficiency, the University has launched a Smart Energy Management Programme, leveraging digital technologies to optimise energy use across campus.



Sunway University has launched an expanded Low-Carbon Innovation Programme to scale its contribution to climate solutions through research, industry collaboration, and real-world application.

Central to this initiative is the enhancement of the CO₂ Capture and Utilisation Research Centre (CCDCU), which will:

- Advance next-generation carbon capture technologies for industrial and urban applications
- Develop circular carbon solutions, converting CO₂ into value-added products such as fuels and materials
- Strengthen interdisciplinary and industry-linked research to accelerate technology deployment

In parallel, the University is expanding its Sunway City Living Lab platform to enable:

- Real-world testing of sustainable energy systems and smart infrastructure
- Deployment of circular economy solutions, including waste-to-resource innovations
- Integration of research outcomes into operational and community-level applications

This initiative extends the University's impact beyond campus boundaries, contributing to broader emissions reduction and urban sustainability transformation.

4. CLEAN ENERGY POLICY AND INSTITUTIONAL TRANSFORMATION FRAMEWORK

To support long-term sustainability outcomes, Sunway University has launched a strengthened institutional governance and policy framework for clean energy transition.



Key elements include:

- **University-Wide Sustainability Integration Framework:** Aligning academic programmes, research priorities, campus operations, and infrastructure planning under a unified sustainability strategy.
- **Sustainable Procurement and Development Policy:** Embedding low-carbon criteria into procurement, construction, and operational decision-making processes.
- **S.U.S.T.A.I.N. Education Integration:** Scaling the University's sustainability education framework to ensure all graduates are equipped with competencies in sustainable development and climate action.
- **Strategic Partnership Model:** Expanding collaborations with industry, government, and international organisations to co-develop and implement clean energy solutions.

This framework institutionalises sustainability as a core component of the University's long-term strategy, ensuring continuity, accountability, and measurable progress.

FORWARD OUTLOOK (2024–2030)

These newly launched initiatives mark a strategic shift towards a holistic, integrated decarbonisation model, positioning Sunway University as a regional leader in sustainable campus development and climate action. Over the next five years, the University will focus on scaling these initiatives, enhancing measurable impact, and contributing to both institutional and societal carbon reduction goals.

