NANYANG TECHNOLOGICAL UNIVERSITY (NTU)

Walking the Talk as a Sustainable Campus

Nanyang Technological University, Singapore (NTU) is one of the top universities in Asia and ranks within the top 50 globally. As a living testbed for tomorrow's technologies and a model of sustainability, NTU aims to become carbon neutral by 2035. Despite accommodating over 42,000 students and employees on its 200-hectare campus, NTU has successfully reduced carbon emissions and waste by 30% since 2011. The university has received multiple accolades for its sustainability efforts and ranks among the world's top 50 universities in the 2024 QS World University Sustainability Rankings.

SUSTAINABILITY STARTS ON CAMPUS

Over the years, NTU has developed its expertise in sustainability through extensive efforts in education, research, and innovation. As a leading research-intensive university, NTU recognises the need to address global threats to sustainability and other grand challenges facing the world. In 2021, the University launched its 15-year Sustainability Manifesto, grounded in the belief that sustainability efforts must begin on campus, and that the University must exemplify its commitment to sustainability in practice.

The NTU campus is a model of sustainability, with 100% of its eligible buildings certified BCA Green Mark Platinum, the highest green building rating from Singapore's Building and Construction Authority (BCA). NTU also boasts eight Zero-Energy buildings on campus, the highest number among organisations in Singapore.

Furthermore, NTU is home to two of the largest Mass Engineered Timber buildings in Asia, with the latest addition, Gaia, launched in 2023. This innovative construction technology has allowed the University to minimise the buildings' environmental impact, including embodied and operational carbon levels.

NTU has also installed over 25,000 photovoltaic (PV) solar panels on the roofs of campus buildings to offset the University's electricity consumption with green energy. This is one of the largest PV installations by a single entity in Singapore, accounting for about 1.5% of the total PV capacity in the country. NTU's PV farm generates approximately 11.7 million kWh of electricity annually, enough to power more than 2,870 four-room HDB flats for a year.

SUSTAINABLE PRACTICES AND ENERGY CONSERVATION AT NTU

NTU actively manages and reduces carbon emissions from campus operations through various measures. One significant initiative is the implementation of more Passive Displacement Ventilation (PDV) systems for energy-efficient space cooling. Unlike traditional systems, PDV relies on natural convection for air circulation, saving NTU about 2.4 million kWh of electrical energy annually, equivalent to powering over 580 four-room HDB flats for a year.

For water conservation, NTU introduced plug load controllers that cut off the power supply to water dispensers after operating hours, preventing unnecessary energy use in maintaining hot or cool water. This initiative saves an estimated 469,970 kWh of energy annually, enough to power over 110 four-room HDB flats for a year. Additionally, more than 1,100 urinals were treated with probiotic pellets, reducing water used for flushing and saving about 68,427.77 m^3 of water annually.

NTU also installed automatic systems to close the sashes of approximately 1,000 fume hoods in various labs when not in use, eliminating energy wastage. This measure saves 3.4 million kWh of electrical energy annually, sufficient to power over 850 four-room HDB flats for a year.

COLLABORATIVE EFFORTS LEADING TO EMERGING TECHNOLOGIES

Investment in sustainability-related research and development is crucial as it creates a broader impact for Singapore and beyond. NTU achieves this through collaborations

with key industry players, leading to the implementation of emerging technologies that promote environmental sustainability. Some notable initiatives from NTU include:

- NTU researchers from the Energy Research Institute (ERI@N) using metal-eating microbes to recycle lithium-ion batteries.
- NTU exploring a hybrid energy generation system, in collaboration with NUS and Keppel Infrastructure, that utilises wind, solar, and tidal energy.
- NTU advancing sustainable lithium battery technologies in collaboration with Livent Corporation.
- NTU establishing a joint research institute with Indonesia to co-develop research and academic programmes focussing on climate change and sustainable development.
- NTU improving solar recycling in partnership with Maxeon Solar Technologies.

SUSTAINABILITY IN THE CURRICULUM

As an Institute of Higher Learning, NTU is dedicated to fostering greater awareness and commitment to environmental sustainability through education. This is demonstrated by the University's integration of sustainability principles into its curriculum across various disciplines, equipping students with the knowledge and skills to address global sustainability challenges effectively.

To date, NTU offers more than 200 sustainability-related courses for students of all levels and backgrounds, as well as working professionals. Sustainability is also available as a second major for all single-major programmes across four colleges. Additionally, an interdisciplinary PhD programme in AI and Sustainability aims to produce a new generation of scientists with expertise in Artificial Intelligence to tackle critical environmental challenges. This programme is the latest among the University's degree offerings in its Business, Computing & Data Science, Engineering, Humanities, Arts & Social Sciences, Medicine, Science, and Graduate colleges.

ENGAGING ACTIVITIES IN SUSTAINABILITY AND ENVIRONMENTAL STEWARDSHIP

NTU organises a variety of programmes and activities covering a wide range of sustainability and environmental stewardship topics. For example, the University's annual student-led Green for Good event galvanises the NTU community into collective action to cultivate environmentally friendly practices. NTU's Sustainability Month attracted more than 15,000 participants and over 70 partners and featured "NTreeU," a tree-planting initiative supporting the National Parks Board's OneMillionTrees movement. Through these initiatives, the university community is empowered to collectively contribute to environmental protection.

NTU'S CONTRIBUTIONS TO ADVANCING CLEAN ENERGY IN SINGAPORE

NTU's Sustainability Manifesto and its related initiatives align with the Singapore Green Plan 2030, which champions sustainable development. For instance, recent research from NTU uncovered a significant geothermal resource in Singapore, which could provide a consistent source of clean energy alongside solar power. In resource-limited Singapore, such discoveries are crucial for national-level decarbonisation efforts.

To help Singapore develop smarter, more resilient energy grids, the Renewable Energy Integration Demonstrator-Singapore testbed, led by ERI@N, explores the compatibility of various renewable sources with energy storage systems such as batteries and hydrogen fuel cells. Data from this testbed will be used to advance the development of more intelligent and robust energy grids in Singapore. NTU's work and efforts support ongoing national initiatives to develop new sustainability solutions, creating a greater impact for Singapore and the region in the long run.

NANYANG TECHNOLOGICAL UNIVERSITY SINGAPORE

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