National Taiwan University Social Responsibility and Sustainability Report

CONTENT

WORDS FROM THE PRESIDENT

Against the backdrop of a challenging and rapidly evolving 21st century, it is increasingly evident that the value of knowledge lies not only in advancing academic frontiers, but also in addressing the major issues facing humanity—a mission NTU takes seriously. As Taiwan's premier institution of higher education, NTU remains steadfast in its pursuit of truth, academic freedom, and public welfare.

We are committed to fulfilling our role as a national think tank and a cradle of global citizenship. We are dedicated to cultivating talent with interdisciplinary acumen, a strong sense of civic responsibility, and an entrenched engagement with the pressing issues of our time. Our graduates are encouraged to be actively involved in shaping public discourses and contribute meaningfully to societal needs.

Over the years, our commitment to sustainable development has fast become a defining element of our institutional identity. In addition to consistently refining our low-carbon transition efforts and participating in the Ministry of Education's University Social Responsibility (USR) initiative, we have this year launched the Resilient Campus Initiative—a forward-looking initiative to strengthen our preparedness for emerging challenges and to ensure a safe, inclusive environment for all members of our academic community.

NTU students, ever at the forefront of change, are partnering with communities and international organizations to advance the United Nations Sustainable Development Goals (UNSDGs). Their advocacy for environmental initiatives—ranging from reusable lunch boxes to on-campus composting bins—demonstrates their conviction and readiness to spearhead a new generation.

Further, NTU continues to collaborate with alumni and industry partners to promote youth innovation. Through academic research, lectures, and themed competitions, we are working together to develop solutions for a sustainable future. I am proud to share that these collective efforts were recognized by the 2024 National Sustainable Development Award—a milestone that underscores NTU's expanding stature across the landscape of higher education.

As we navigate the uncertainties of this new era, it is my genuine hope that the NTU community continues exemplifying the spirit of making the impossible possible, and staying true to our core mission of contributing to universal values. Together, we will, in pursuit of excellence, continue to push forward with both idealism and pragmatism, and to create lasting, positive change not only for Taiwan but also for the entire world.

Wen-Chang Chen

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01

SUSTAINABILITY ACHIEVEMENTS

2024 THE Impact Rankings

TOP 10

THE IMPACT RANKINGS

#55 in the world

#7

2 ZERO HUNGER

End hunger, achieve food security and improved nutrition and promote sustainable agriculture.

#8

3 GOOD HEALTH AND WELL-BEING

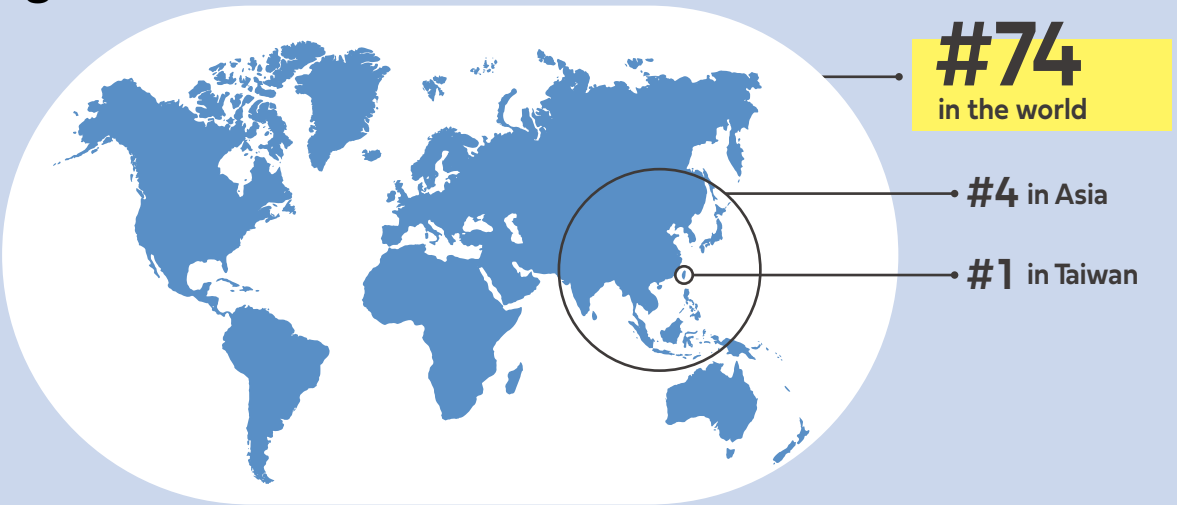
Ensure healthy lives and promote well-being for all at all ages.

#9

9 INDUSTRY, INNOVATION AND INFRASTRUCTURE

Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation.

QS World University Rankings Sustainability 2025



QS WORLD UNIVERSITY RANKINGS

Sustainability 2025

National Sustainable Development Awards

With the mission of "Building Campus Sustainability and Expanding Social Influence," NTU is actively responding to pressing global challenges such as climate change and sustainable development. In 2024, NTU was honored with the Executive Yuan's National Sustainable Development Award[1]—a recognition that not only affirms NTU's achievements in sustainability but also highlights its leadership and influence among higher education institutions.

Note 1 : Organized by the National Council for Sustainable Development under the Executive Yuan, the National Sustainable Development Award honors outstanding organizations contributing to Taiwan's 18 Sustainable Development Goals and the 2050 net-zero emissions target. The award also evaluates sustainable governance, including green procurement, circular economy, disaster prevention education, inclusive and accessible service environments, gender equality, digital transformation, and digital inclusion. In 2024, a total of six educational institutions—including one elementary school and five universities—received this prestigious recognition.

NTU Wins the 2024 National Sustainable Development Award (December 2024).

2024 CommonWealth Magazine University Citizen Survey

天下雜誌 CommonWealth Magazine

#1

in the "Public University Group"

Dr. Shih-Torng Ding, Executive Vice President of NTU, represents the University at the "2024 CommonWealth Excellence in USR" Award Ceremony (September 2024).

2024 Net Zero Tech International Contest

To actively advance the global 2050 net-zero transition goal and inspire students to engage in the research and development of net-zero technologies, NTU and the TECO Technology Foundation once again co-organized the "2024 Net Zero Tech International Contest." The event received strong support from government agencies and 11 corporate partners[1], and featured a dual-track format comprising a "Main Contest" and an "International Contest." With a total prize pool of NT$6.5 million, the event attracted 240 teams and 998 students and faculty members from 17 countries/regions all over the world. The enthusiastic participation successfully positioned Taiwan as a vital hub for global exchanges in net-zero technologies, talent cultivation, and green industry development.

The 2024 Net Zero Tech International Contest was held at the NTU Sports Center, with 40 outstanding teams advancing to the finals.

Note 1 : List of sponsors (in alphabetical order): Chen-Yung Foundation; CPC Corporation; Fubon Financial Holding Co., Ltd.; HOTAI Motor Co., Ltd.; Hua Nan Commercial Bank Ltd.; Nan Pao Resins Chemical Co., Ltd.; NTU Advanced Research Center of Green Materials Science and Technology; NTU Industry & Academia Development Association; Pau Jar Charity Foundation; Shiny Chemical Industrial Co., Ltd.; and TECO Electric & Machinery Co., Ltd.

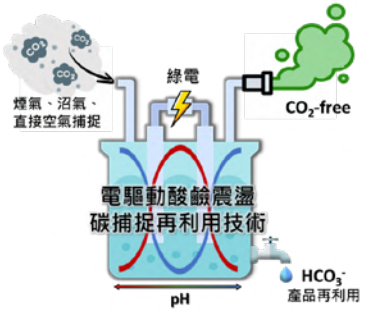
Award-Winning Projects from NTU

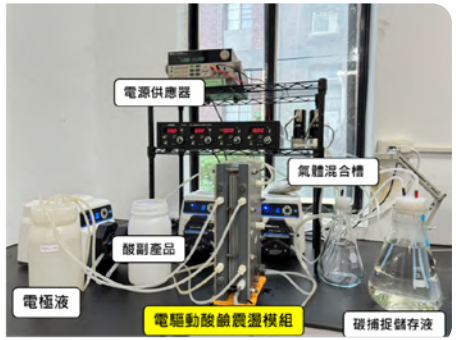
Taiwan-Main Contest

Electrochemical pH-Swing Processes for Carbon Capture and Utilization to Achieve Net-Zero Goals

To reduce CO_2 emissions from agricultural process and products, the Green Technology Lab, led by Associate Professor Shu-Yuan Pan from the Department of Bioenvironmental Systems Engineering, developed a technique on the principle of low-voltage-driven water dissociation reactions. The technique captures CO_2 from ambient air, industrial chimney emissions, or biogas and converts it into carbonate products (such as ammonium carbonate fertilizers and nutrient solutions for algae growth). This process not only achieves CO_2 capture and reuse, but also contribute to a bio-based, green and circular economy.

For instance, in the case of biogas, the team employs electrochemical pH-swing processes to capture CO_2 produced during anaerobic fermentation. This process removes CO_2 and traces contaminants like hydrogen sulfide, increasing methane concentration and improving the overall efficiency of biogas-based power generation. The captured carbon is further transformed into high-value products such as biocarbon and bioethanol, thereby creating additional value streams and creating diverse value with a product ecosystem.





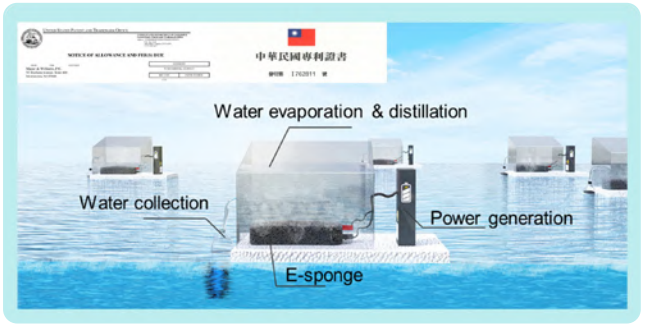
Conceptual diagram and laboratory setup of the Electrochemical pH-Swing Processes for Carbon Capture and Utilization.

Taiwan-Main Contest

Green Materials for Energy Innovation: "E-Sponge Tech" Enables Simultaneous Clean Energy and Water Generation

The global water shortage issue has become increasingly severe. Meanwhile, electricity is the driving force of modern society, and power shortages could have significant impacts on both the economy and daily life. In light of these challenges, developing innovative solutions that can simultaneously address water scarcity and energy deficits has become an urgent priority for governments and key stakeholders in the private sector. To achieve this dual goal, the research team led by Professor Kuo-Lun Tung from the Department of Chemical Engineering drew inspiration from the natural filtration mechanisms of the mangrove plant Avicennia marina (water pen) to develop an integrated desalination and power generation system that is both sustainable and cost-effective.

Inspired by the water pen's root structure, the team developed a novel sponge material, known as E-sponge tech, out of sponge material derived from low-cost discarded polarizer. This innovative material enables efficient seawater desalination while simultaneously generating electricity through the principle of photothermal conversion and ion concentration difference. The process thus represents a win-win solution, delivering economic, environmental, and social benefits all at the same time.

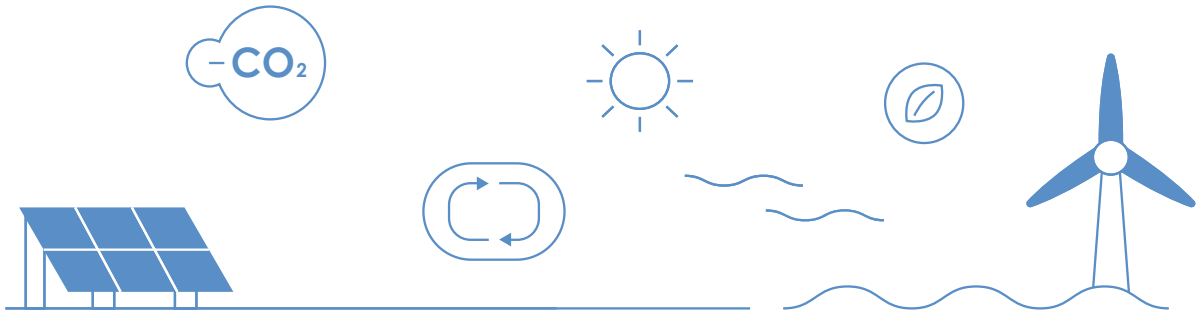


Through solar energy and ambient heat, E-sponge tech integrates water evaporation, distillation, and electricity generation, offering a self-sustaining solution for clean water production.

Taiwan-Main Contest Team

The Green Technology Laboratory, led by Prof. Shu-Yuan Pan, received the Chen-Yung Foundation Sustainability Award.

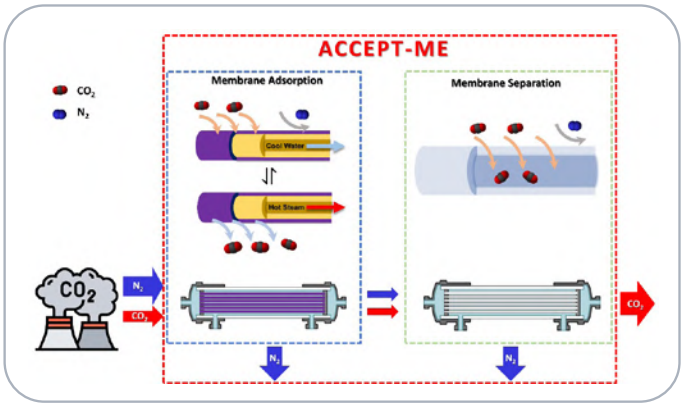
The team, led by Prof. Kuo-Lun Tung, received the Hotai Green Energy Award.



International Contest

Advanced Carbon Capture and Elimination Process Technology using Membrane Engineering

To mitigate the impact of greenhouse gases on climate change, Professor Dun-Yen Kang's research group in the Department of Chemical Engineering at NTU has integrated two emerging technologies (membrane adsorption and membrane separation) to efficiently capture carbon dioxide from flue gas for subsequent utilization. In this process, membrane adsorption first enriches CO_2 from its initially low concentration, after which a membrane-separation module further purifies the stream, enabling high-purity CO_2 to be obtained with minimal energy. Compared with conventional amine absorption, this approach requires no large volumes of chemical solvents and significantly reduces energy consumption. Thanks to their modular design, the membrane units are compact, space-saving, and can be rapidly scaled or deployed on-site according to user needs. We hope this technology will become a cost-effective, environmentally friendly cornerstone on the path to net-zero emissions by 2050.

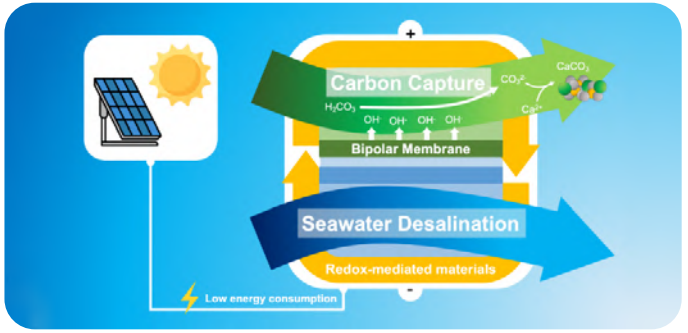


Schematic of the Membrane Integration Process.

Next-Generation Redox-Mediated Bipolar Membrane Electrodialysis: Simultaneous Seawater Desalination and Carbon Capture

Due to severe climate change, continuous population growth, and rapid industrial development, freshwater scarcity has emerged as a critical global issue. Hence, seawater desalination has been positioned as a critical strategy by governments worldwide in water resource management.

Reverse osmosis is currently the primary method for seawater desalination; however, the process requires high energy consumption and leads to large carbon emissions. To address this challenge, the research team led by Professor Chia-Hung Hou from the Graduate Institute of Environmental Engineering developed a five-channel redox-mediated bipolar membrane electrodialysis (BMED) system, leveraging the dual capability of the bipolar membrane to generate both acid and base. This allows for the capture of carbon in an alkaline environment and its precipitation as high-value calcium carbonate. Additionally, the integration of redox flow battery materials seeks to achieve efficient carbon capture and low-energy seawater desalination. Result showed that the system can capture a carbon equivalent of 26.4 mg/L. Simultaneously, the system's energy consumption is measured at 0.95 kWh/m³, underscoring its potential to provide new sources of freshwater while achieving the dual objectives of efficient carbon capture and low-energy desalination.



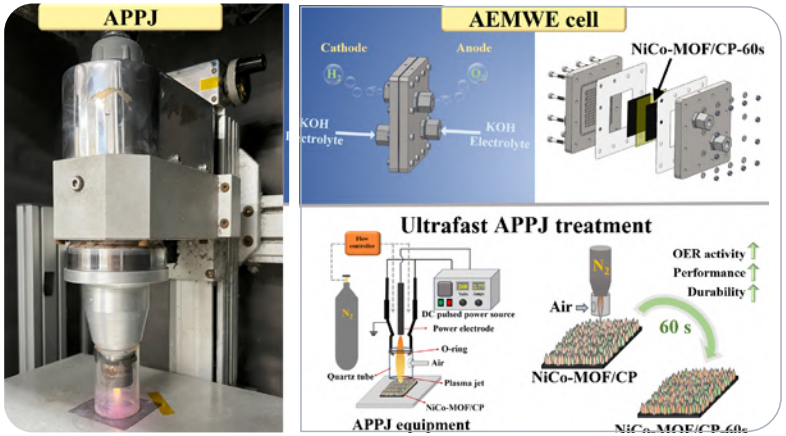
Schematic of the redox-mediated bipolar membrane electrodialysis (BMED) system designed for both seawater desalination and carbon capture.

International Contest

Low-Cost Energy-Efficient Atmospheric-Pressure Plasma Jet Processed NiCo-Metalorganic Framework Electrocatalyst in Anion Exchange Membrane Water Electrolysis Module

As global demand for renewable energy continues to rise, the imbalance between energy supply and demand is becoming increasingly pronounced. In response to such issue, the intercollegiate research team, led by Professor Jian-Zhang Chen from the Institute of Applied Mechanics, Professor I-Chun Cheng from the Graduate Institute of Photonics and Optoelectronics, and Professor Meng-Jiy Wang from the Department of Chemical Engineering at NTUST, developed a technology which uses the atmospheric-pressure plasma jet (APPJ) process to enhance the hydrogen production performance of water electrolysis catalysts with an anion exchange membrane water electrolysis (AEMWE) module.

The AEMWE technology used in this study, compared to traditional mature water electrolysis technologies, allows the usage of Earth-abundant transition metals instead of scarce precious metals. At the same time, the APPJ technology takes advantage of its ability to rapidly anneal without the need for vacuum conditions, replacing the time-consuming and energy-intensive catalyst material post-processing procedures. By using this low-cost, energy-efficient, and ultra-fast plasma material process, the durability and performance of the catalyst are enhanced, thereby reducing the energy consumption and cost required for hydrogen production through water electrolysis.



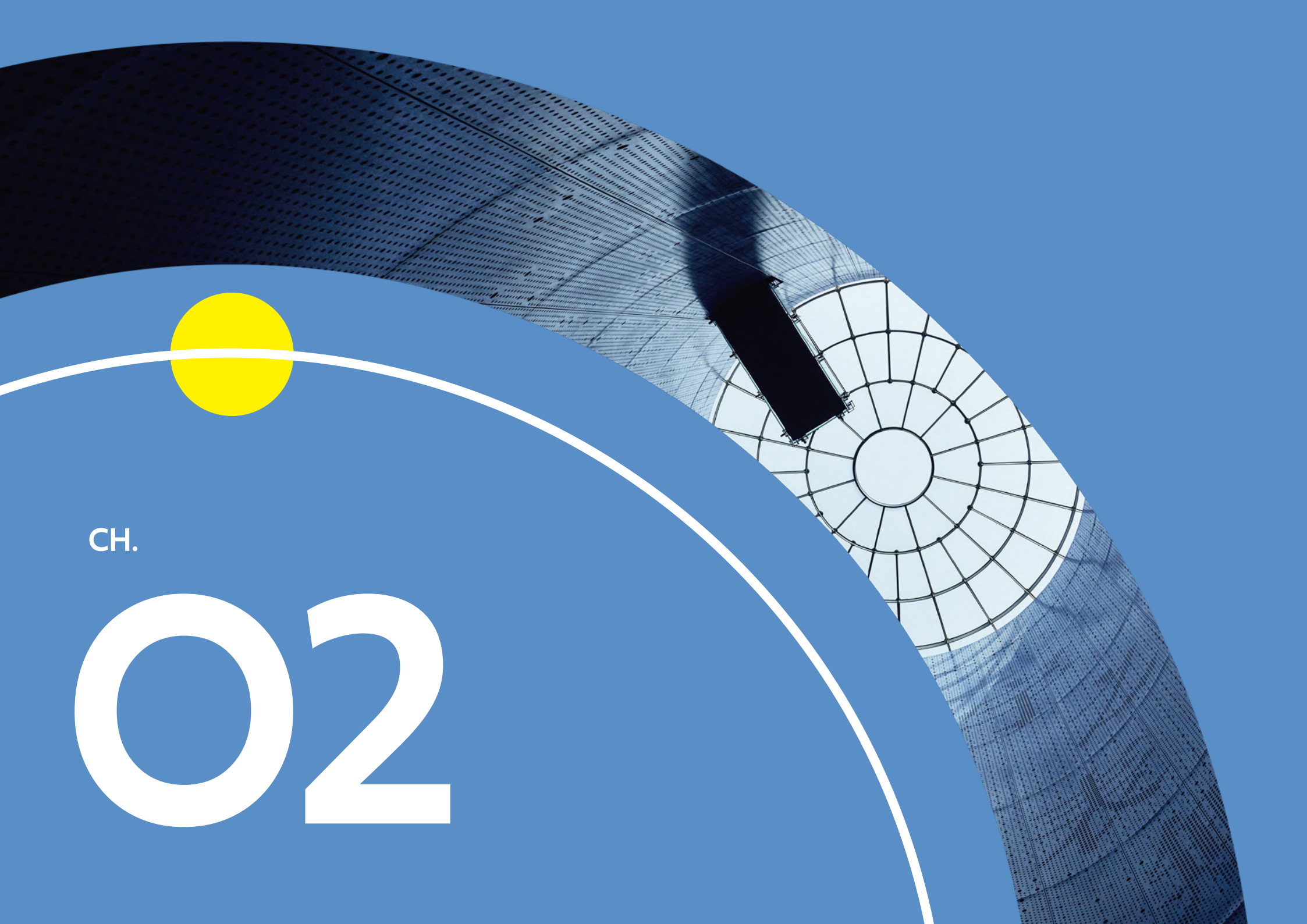
Applying the APPJ process to water electrolysis catalysts to improve the efficiency of anion exchange membrane water electrolysis (AEMWE).

International Contest Team

The team, led by Prof. Dun-Yen Kang, received the Taiwan Smart Energy Award.

The team, led by Prof. Jian-Zhang Chen, Prof. I-Chun Cheng and Prof. Meng-Jiy Wang, received the Advanced Net Zero Carbon Emission Technology Award.

The team, led by Prof. Chia-Hung Hou received the Advanced Green Energy Award.



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SUSTAINABLE GOVERNANCE

Internal Greenhouse Gas (GHG) Inventory

NTU obtained its first GHG verification statement under ISO 14064-1:2006 as early as 2011. Ten years later, NTU conducted its 2020 GHG inventory based on the updated ISO 14064-1:2018 standard and passed external verification by the British Standards Institution (BSI), becoming the first educational institution in Taiwan to adopt the 2018 ISO standard for campus-wide GHG inventory. The results from the 2020 inventory have been designated as the baseline for NTU's carbon neutrality goal, and NTU has since continued to perform annual internal inventories and progress tracking.

The 2024 NTU Campus-Wide GHG Emissions Inventory covered Category 1 (direct GHG emissions) and Category 2 (indirect emissions from imported energy) emissions. Sources of the former include fuel consumption (by research vessels, official vehicles, boilers, emergency generators, and agricultural machinery), natural gas, liquefied petroleum gas (LPG), refrigerant leakage, septic tank, and animal husbandry. Category 2 accounts for indirect emissions from purchased electricity.

Compared to the baseline year (2020), NTU's total GHG emissions in 2024 decreased by 6.73%. This reduction was mainly attributed to a 5.58% decrease in the national electricity emission factor and a 3% reduction in NTU's total electricity consumption. As over 90% of NTU's GHG emissions originate from electricity use, NTU will continue to improving energy efficiency, implementing energy-saving measures, reducing unnecessary energy waste, and speeding up the replacement of low efficiency equipment, steadily progressing toward its carbon neutrality goal.

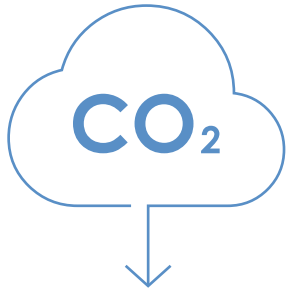
2024 GHG Emissions Inventory Summary[1]

Unit: tCO2e

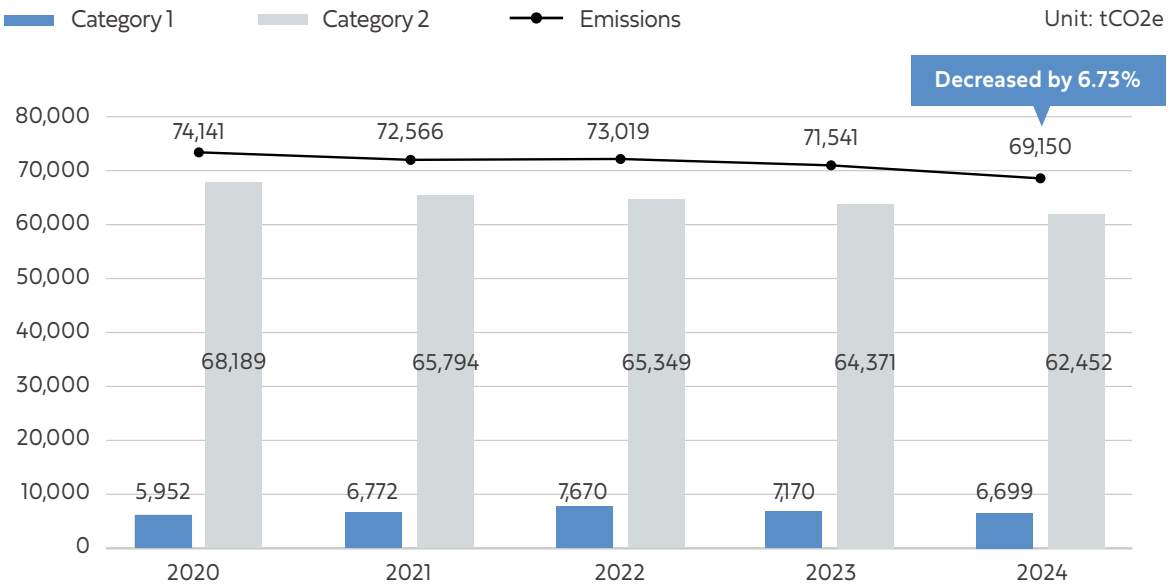
Emission Category	Definition (ISO 14064-1 : 2018)	Emissions
Category 1	Direct GHG emissions	6,699
Category 2	Indirect GHG emissions from imported energy	62,452
Total Emissions		69,150[2]

Note 1 : The inventory scope covers NTU's Main Campus, Shuiyuan Campus, College of Medicine Campus, Zhubei Campus, Yunlin Campus, Veterinary Hospital, Experimental Farm, Highland Experimental Farm, and Experimental Forest.

Note 2 : Total emissions are rounded to the nearest integer.



Annual GHG Emissions Inventory Results (2020-2024)



Campus Electricity and Water Resource Usage[1]

Electricity Consumption and Energy Usage Intensity (EUI[2]) in the Last Three Years

Year	2022	2023	2024
Electricity Consumption (kWh)	144,444,656	144,347,273	144,587,463
EUI (kWh/m²)	104.78	104.33	104.49

Water Consumption in the Last Three Years

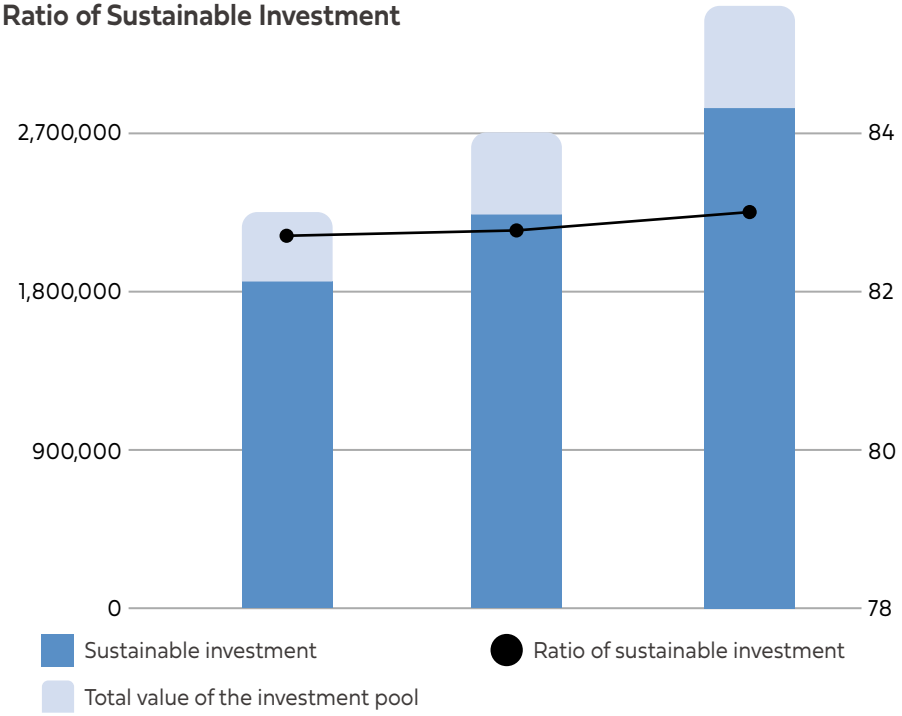
Year	2022	2023	2024
Water Consumption (tons)	1,404,095	1,420,887	1,532,485

Note 1 : Statistics from NTU's Main Campus, Shuiyuan Campus, College of Medicine Campus, Old College of Social Science Campus, Zhubei Campus.

Note 2: Covering a total floor area of 1,378,500 m^2 in 2022, 1,383,562 m^2 in 2023, and 1,383,710 m^2 in 2024.

Endowment Management and Sustainable Investment

Ratio of Sustainable Investment



Unit: NT$ Thousands

Year	2022	2023	2024
Sustainable investment[3]	2,251,124	2,700,014	3,425,952
Total value of the investment pool[4]	1,859,503	2,235,074	2,845,380
Ratio of sustainable investment	82.6%	82.8%	83.1%

Note 3: Investment in equities and funds only.

Note 4: Including investment in corporations and mutual funds with benchmark sustainability performance.

Resilient Campus Initiative: NTU Advances Disaster Preparedness and Governance

Building a resilient campus is one of NTU's key strategies for fulfilling its social responsibility, aimed at providing a safe and sustainable environment for learning and research. It also serves as a crucial governance response to the growing risks posed by extreme weather, earthquakes, and public emergencies. To strengthen the University's overall disaster preparedness, NTU has launched a multi-year Resilient Campus Initiative, actively enhancing campus-wide capacity for disaster response and risk reduction.

In November 2024, NTU held a Disaster Relief Volunteer Training Program, inviting expert instructors to enhance disaster awareness and emergency response capabilities among faculty, staff, and students. The program will continue in the coming years, with plans to expand its scale. To further deepen administrative leaders' understanding of disaster management, NTU also hosted a special session during its Administrative Meeting on December 31, 2024, featuring a keynote speech by Dr. Wei-Sen Li, Secretary-General of the National Science and Technology Center for Disaster Reduction (NCDR). Titled "Campus Disaster Preparedness from an Operational Continuity Perspective," the talk shared international and domestic best practices in campus risk management in a bid to build the capacity of NTU's disaster response coordinators and administrative leaders in managing campus risks.

Disaster preparedness training : instructor introducing community-level disaster prevention and response efforts (November 2024).

The instructor-led first aid training (November 2024).

Keynote speech on campus disaster risk governance for NTU administrative leadership (December 2024).

Campus Tree Inventory Project: Preserving NTU's Natural Green Landscape

The lush greenery of the NTU campus not only provides a pleasant and relaxing environment for students, faculty, and the public, but also represents a valuable green asset for NTU. In 2012, the Office of General Affairs conducted a campus-wide tree inventory and launched the "Language of NTU Trees" website, making tree data publicly accessible. However, over the past decade, many of the campus trees have changed—some were removed or died, while others were added or replaced through natural succession or planting. As trees are important carbon sinks, updating the tree inventory allows for a better understanding of the changes in tree growth and carbon storage over time, thereby contributing to key sustainability indicators and reflecting NTU's commitment to university social responsibility.

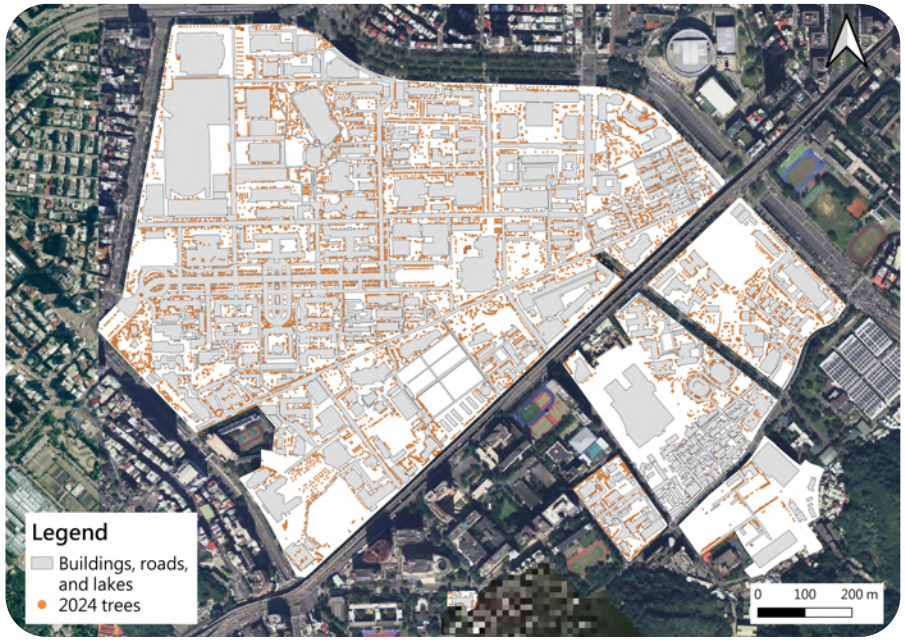
As such, in 2024, NTU commissioned Associate Professor Chih-Hsin Cheng from the NTU School of Forestry and Resource Conservation to lead the Campus Tree Inventory Project. In conjunction with a Ministry of Education Teaching Practice Research Program, students participated in field-based learning activities such as species identification, basic measurement techniques, and carbon storage sampling. The project is also aligned with international standards, enabling students to become familiar with carbon sink accounting and reporting frameworks established by the Food and Agriculture Organization (FAO) and the Intergovernmental Panel on Climate Change (IPCC).

Through the collective effort of faculty and students, the 2024 tree inventory identified a total of 10,515 trees on the main campus. All updated data has been integrated into the Language of NTU Trees website, enabling both the general public and donors from the "NTU Tree Care Project" to track the health and growth of individual trees. In addition, compared to the 2012 tree inventory, the total number of trees on campus has decreased by 2,316, but the remaining trees have shown notable growth: the average diameter at breast height (DBH) increased by 7.4 cm, and average tree height increased by 2.7 meters. Based on measurements analyzed using the i-Tree Eco[1] tool, NTU's trees were estimated to have stored 5,521.8 metric tons of carbon in 2024, representing a net increase of 1,250.3 metric tons since 2012. This translates to an average annual carbon sequestration of approximately 104.2 metric tons. Notably, NTU is among the few universities to calculate campus tree carbon sequestration using field-based measurements, rather than relying solely on model-based estimations via i-Tree Eco.

This tree inventory not only enhances tree management on campus but also cultivates students' practical skills in forest carbon assessment and strengthens environmental literacy—laying a solid foundation for Taiwan's next generation net-zero talent.

Note 1 : i-Tree Eco is an urban forest ecosystem analysis tool developed by the U.S. Forest Service. It can be used to estimate the environmental benefits of trees, including carbon sequestration and air pollution removal.

Visual comparison of tree growth between 2012 (left) and 2024 (right), using a Madagascar almond (Terminalia mantaly) tree in front of the Sports Center Plaza as an example. Both the diameter at breast height (DBH) and tree height increased significantly.



Tree distribution map of NTU's main campus (2024).

Growth and Carbon Storage Changes of NTU Campus Trees (2012-2024)

	Number of Trees (no.)	Avg. DBH (cm)	Avg. Height (m)	Carbon Storage (tons)
2012	12,831	24.2	7.6	4,271.5
2024	10,515	30.6	10.1	5,521.8
Trees Retained	8,604	+ 7.4[2]	+ 2.7	2,111.7
Trees Lost	- 4,227	20.6	6.5	- 1,201.3
Trees Newly Planted	1,911	17.5	6.8	339.9
Net Change	- 2,316	+ 6.4	+ 2.5	+ 1,250.3

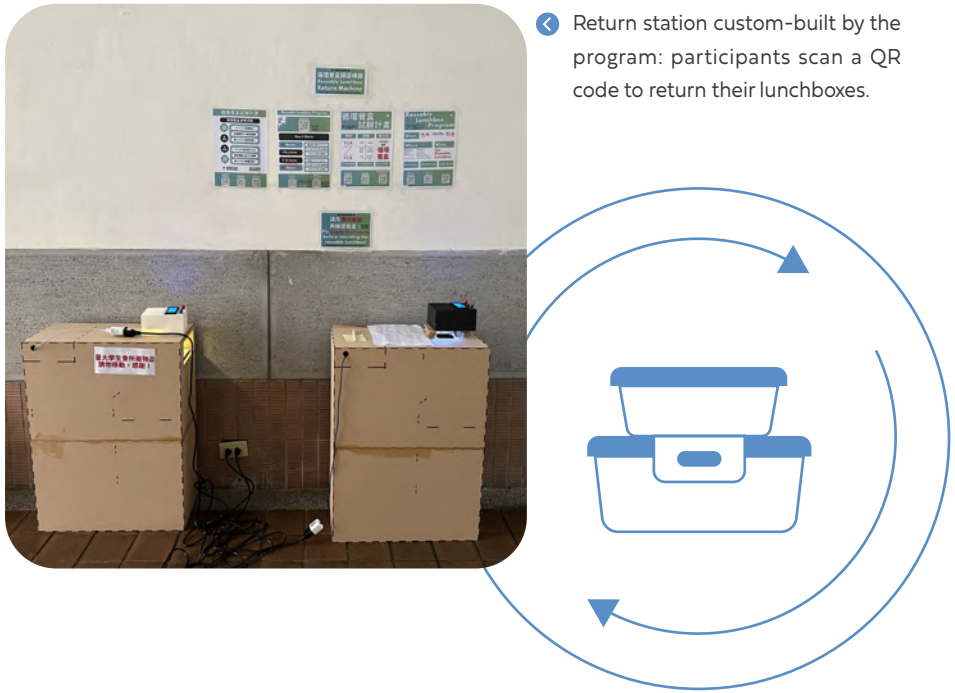
Note 2: The "+/–" symbols represent changes in tree growth indicators from 2012 to 2024.

Sustainable Lunchboxes: A Student-Led Initiative for Reducing Campus Plastics

To raise awareness of plastic and waste reduction and to cut down on the use of single-use lunch containers on campus, the NTU Student Association Sustainability Group partnered with the NTU Climate Action Club to launch the week-long NTU Reusable Lunchbox Pilot Program in November 2024. Entirely student-initiated and financially supported by the NTU-YLL Project, the program was implemented in collaboration with NTU's campus cooperative restaurants.

Participants could borrow reusable lunchboxes by completing mobile registration and received a NT$5 discount on bentos with each use. After meals, containers were returned by scanning a QR code at a self-service return station. All used containers were collected daily, professionally cleaned, and returned for reuse—bringing the concept of reusable foodware to life and demonstrating sustainability in action.

The pilot received strong support and positive feedback. A total of 252 reusable lunchbox meals were sold, preventing an equal number of disposable containers from entering the waste stream. Moreover, the return rate reached an impressive 95%. A follow-up survey showed that 84.7% of respondents (n = 155) supported reducing single-use foodware on campus. Moving forward, student organizers will continue engaging with NTU administration to explore ways for NTU to adopt and lead reusable lunchbox initiatives—setting a model for sustainable campus practices.



Return station custom-built by the program: participants scan a QR code to return their lunchboxes.

Promotion poster for the Reusable Lunchbox Pilot Program.

The Sustainable Lunchboxes Pilot Program sold 252 lunchboxes.

From Food Waste to Urban Fertile Soil: NTU Roots & Shoots Club Promotes Community Composting

Since its founding in 2008, the NTU Roots & Shoots Club has been dedicated to environmental and sustainability advocacy. The club engages in environmental education in ways that are accessible, relatable, and engaging, and takes concrete action to protect the planet. Since April 2023, the club has been setting up composting stations on campus to collect food and kitchen waste from club members and student cafeterias, in a bid to process organic waste locally and enhance resource circulation.

To sustain and expand their efforts, the club launched a service-learning course in 2024 to recruit students and residents from nearby neighborhoods to take part in the collection and composting of organic waste, as well as the recording relevant data. These hands-on activities have helped integrate composting more deeply into the NTU community.

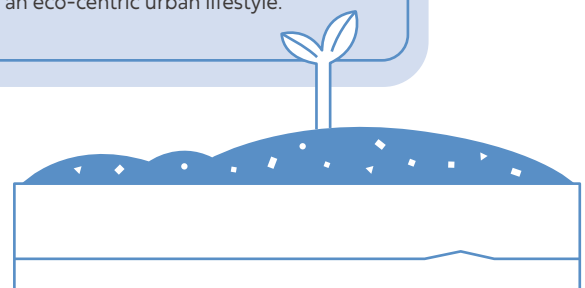
As of January 2025, the club's Urban Fertile Soil Project has seen the creation of composting sites next to the NTU Women 9th Dorm cafeteria and in Guzhuang Village of Taipei City's Da'an District. To date, more than 1.5 metric tons of food waste have been collected, with 20 volunteers participating in site maintenance. Through collaboration with local communities and grassroots organizations, the Roots & Shoots Club has not only pioneered a model for urban organic waste management, but also created platforms for community dialogue and youth engagement—allowing the concepts of circularity and ecology to take root and flourish in the city.

The NTU Roots & Shoots Club hosts a community compost workshop in Guzhuang Village, Da'an District, Taipei City, and sets up a composting station in a public space.

On-campus composting site next to the NTU Women 9th Dorm.

Urban Fertile Soil Project Overview

The project aims to transform household food waste into compost within communities, thereby enriching soil, promoting urban agriculture, and creating carbon sink benefits. By applying nature's principles of circularity and regeneration, it seeks to build community-based models for managing organic waste in urban areas and contribute to an eco-centric urban lifestyle.



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03

SOCIAL IMPACT

1 NO POVERTY

The Transformation of East Asian Welfare States in the Post Covid-19 Era: Challenges, Opportunities, and Futures

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In March 2024, NTU's Global Asia Research Center (GARC), Taiwan Social Resilience Research Center (TSRRC), and Graduate Institute of National Development co-organized an international conference, inviting 24 scholars from Hong Kong, Japan, South Korea, the United Kingdom, and Taiwan to present a total of 22 papers. Their research explored how East Asian welfare states are responding to the highly uncertain and challenging geopolitics and global economy as well as rapidly aging populations. The conference also aimed to clarify how different countries transformed their welfare systems, focusing on the core values of social justice within these welfare systems. The event attracted approximately 80 participants, attending either in person or via live stream.

The conference opened with an insightful keynote speech by Professor Ka-Ho Mok, Vice-President of Lingnan University. He discussed community-based post-Covid integrated care and health strategies for older adults in Hong Kong, emphasizing the need for adaptable welfare states in East Asia to effectively address the evolving health and long-term care demands of the elderly through comprehensive social welfare systems. He also highlighted the importance of collaborative models involving government, individuals, families, industries, NGOs, and society at large in shaping elderly care.

The conference was organized around two key themes: "East Asia" and "Pension." A comparative study involving participants from Taiwan and other East Asian countries found that individuals experiencing financial hardship due to uncontrollable external factors, such as the Covid-19 pandemic, were generally perceived as more deserving of social security support. The study also revealed that perceptions of social welfare eligibility varied by gender and nationality. Through in-depth academic dialogue, the conference provided valuable insights into the evolving landscape of social welfare policy in East Asia. These exchanges are expected to inform future policy development across the region to more effectively address both current and emerging social challenges.

Scholars shared welfare policies from different East Asian countries at the conference.

NTUTH: Raising Awareness of Poverty Issues on Campus

Eradicating poverty is a key SDG and an important concern at NTU. The NTU Treat for the Homeless (NTUTH) addresses this issue through a variety of activities, including "street actions" in which participants distribute meals and engage in conversations with unhoused individuals, alongside lectures, panel discussions, and interviews. These experiences provide participants with valuable insights into the lived realities and structural causes of homelessness.

Beyond its regular programming, NTUTH also plays a key role in advocacy and awareness-raising by holding annual exhibitions on campus that present issues of poverty and social exclusion in accessible ways, encouraging broader participation in its "street actions" initiative. In 2024, approximately 50 students participated regularly, collectively distributing nearly 1,000 meals to those in need. Through these sustained and hands-on efforts, NTUTH seeks to foster social dialogue, increase public awareness of poverty-related issues, and ultimately contribute to a more inclusive and socially responsible community.

NTUTH organized a homelessness-themed exhibition on campus in 2024.

Students waiting for admission outside the Taitung Art and Culture Center.

Empowering Youth Through Music and Imagination

On December 20, 2024, the NTU EMBA Student Association organized the "Seeds of Music: The Power of Diversity" concert at the Taitung Art and Culture Center. The event welcomed 600 children from Bausun Junior High School, Pei Nan Junior High School, and Dong Hai Elementary School to enjoy an afternoon filled with enriching music.

Curated around themes of "sincerity, love, longing, mystery, passion, and dance," the concert guided young audiences through music's emotions and storytelling. Spanning cultures and eras, the performances touched every heart, while interactive and heartfelt sharing sessions between musical pieces created a memorable experience for both students and teachers, many of whom expressed hope for the concert's continuation. One meaningful reflection came from Pei Nan Junior High baseball players: "For us boys on the team, this experience offered a refreshing contrast to the competitive pressures of the games, allowed us to immerse ourselves in the overwhelming power of music."

This heartwarming initiative was made possible through the generous support of NTU EMBA alumni, whose sponsorship brought the concert to children in the Taitung region. Filled with warmth, the event offered an unforgettable artistic experience that left a lasting impression on its young audience.

Special thanks to the following companies and alumni for their generous support:
Mr. Ruei-Bin Chen, CEO of the Chen Bo-Feng Educational Foundation; Dr. Pang-Yen Chang, Founder of the Come In Well-Being Clinic; Mr. Matthew Wang, Founder of Matthew's Choice Inc.; Dr. Chieh-Yang Hsieh, Founder of Neogence; and Ms. Lynn Lee, Taiwan Regional General Manager of the French skincare company NAOS.

The NTU plant health team conducted diagnostic training and field practice directly in the farmland.

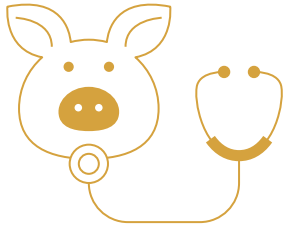
2 ZERO HUNGER

NTU's Targeted Support Enhances Agricultural Development and Sustainability in Yunlin

2 8 12

A team of plant and animal health experts from various departments within the NTU College of Bioresources and Agriculture has been collaborating with the Yunlin County Government to enhance the production and safety of agricultural products by providing professional services directly to the frontline of agricultural sector. Notably, the Plant Teaching Hospital has played a pivotal role by partnering with local agricultural units and establishing plant health diagnostic service stations in 20 townships across Yunlin County. These stations serve as real-time consultation platforms, offering pre-scheduled and on-site diagnostic services, to provide farmers with expert guidance and timely solutions for issues related to plant health. In 2024, the team extended their services to approximately 111 hectares of farmland. By integrating data from the Ministry of Agriculture with the Social Return on Investment (SROI) methodology, the Plant Teaching Hospital brought about an estimated increase of approximately 12.59 million NTD in production value, reflecting the team's significant contribution to strengthening the local agricultural economy and improving farmers' livelihoods.

Similarly, the veterinary team has been actively engaged with livestock farms in Yunlin, implementing a wide range of professional services and outreach activities throughout 2024. These efforts included the organization of five seminars, two specialized workshops, six mobile veterinary clinics, and 38 livestock dissection sessions, as well as the provision of routine livestock veterinary care thrice per month. The team also provided a 50% subsidy for on-site diagnostic testing services for local agribusinesses and completed a total of 8,836 such cases involving serological testing, molecular biology analyses, and pathological examinations of livestock. These efforts comprehensively strengthened pig breeding capacity and played a vital role in ensuring food safety.



The NTU plant health team fostered a strong partnership with Yunlin's agricultural and livestock sectors through industry-academia collaboration.

In addition, NTU's diagnostic center for animal diseases in Yunlin offers free consultations to partnering farms on precision diagnosis/treatment, biosecurity measures, and immunization program planning. In collaboration with the Yunlin County Animal Disease Control Center, the NTU team also assists local youth farmers in working with the only regional slaughter facility that complies with HACCP (Hazard Analysis and Critical Control Points) standards in a bid to actively promote the adoption of local cold-chain slaughtering technologies. These measures not only reduce transportation costs and GHG emissions, but also enhance the safety and quality of pork processing. By addressing supply chain instability, which often leads to food shortages and price fluctuations, the NTU team has contributed substantially to breaking the cycle of vulnerability in food production. Collectively, these efforts support the development of a more resilient and sustainable agricultural ecosystem in the Yunlin region.

Using Reclaimed Water for Rice Irrigation: A Sustainable Approach to Food Security

2 6 12

Climate change has intensified water shortages, posing a significant threat to agricultural irrigation, particularly for rice cultivation, and ultimately jeopardizing Taiwan's food security. In response, the NTU College of Public Health and the Food Safety Center have partnered with the Agricultural Engineering Research Center to explore the use of reclaimed water—treated wastewater—for rice irrigation. Through comprehensive, long-term analysis, the research team aims to assess the impact of reclaimed water on rice health and food safety, evaluating its potential for large-scale implementation in Taiwan.

Over a two-year trial, reclaimed water was successfully used to irrigate four crop cycles, providing a stable and consistent water supply. The research examined two rice varieties, both of which outperformed those grown with traditional irrigation in terms of yield and economic value. Furthermore, evidence suggests that rice irrigated with reclaimed water exhibited greater resilience to environmental stressors. Importantly, pollutant concentrations in the reclaimed water-irrigated rice did not exceed those found in conventionally irrigated crops.

By combining long-term observations with in-depth experimental analysis, the team's findings will serve as a crucial reference for shaping Taiwan's agricultural water policies. This research provides concrete solutions for water resource management under climate adaptation strategies, supporting the sustainable development of Taiwan's agriculture and food security.

For more details, please refer to the *2024-2025 Public Health Annual Report*.

Rice irrigated with reclaimed water achieved higher yield and economic value compared to traditional water sources.

"Food and Nutrition" Workshop: Promoting the Value of Locally Grown Produce

On October 23, 2024, NTU's Agricultural Exhibition Hall hosted the "Food and Nutrition" Workshop, featuring Mr. Che-Yu Lee, Secretary General of the Taiwan Nutrition and Health Association, as the speaker. The workshop explored the journey of food ingredients from farm to table, emphasizing the importance of locally grown produce. Special focus was given to the nutritional value of soybeans and their derived products. Through this session, participants gained a deeper appreciation for the vital connection between agriculture and healthy eating.

During the workshop, Mr. Lee highlighted the significance of ingredient origin for human health, noting that understanding the cultivation and production processes empowers individuals to make healthier, more sustainable dietary choices. He also introduced the benefits of locally grown soybeans and provided an overview of Taiwan's current soybean cultivation. Mr. Lee emphasized that supporting local agriculture not only ensures access to fresh and safe ingredients, but also reduces dependence on imported agricultural products, stimulates the local economy, and lowers the environmental impact of long-distance transportation.

In summary, the workshop enhanced participants' understanding of nutrition and healthy dietary practices, while promoting domestically produced food ingredients. By raising awareness of the relationship between health, sustainability, and local agriculture, the event inspired participants to practice healthy, sustainable dining in everyday life.

The "Food and Nutrition" Workshop. (October, 2024)

3 GOOD HEALTH AND WELL-BEING

NTU's Blood Donation Campaign: Continuing a Legacy, Supporting Medical Sustainability

Blood donation has been a long-standing tradition at NTU since 1975. For many years, the University's iconic bloodmobile, affectionately known as "NTU No. 1," was stationed just outside the main campus, becoming a familiar sight and a shared memory for generations of students and faculty members who contributed to this life-saving cause. However, following sidewalk renovations in 2016, the bloodmobile was decommissioned, and subsequent blood donation activities on campus became irregular, organized only occasionally by charitable societies and volunteering entities. This led to a decline in the stability and frequency of blood donations amidst an increasing demand for blood due to Taiwan's rapidly aging population. In 2022, the number of donors aged 17 to 20 fell below 100,000 posing significant challenges to maintaining reliable blood banks domestically. It is projected that a national blood shortage may occur by 2030, which will affect the effective operation of the local healthcare system.

To support the sustainable development of Taiwan's healthcare, NTU partnered with the Taipei Blood Center of the Taiwan Blood Services Foundation to launch the Campus Blood Donation Campaign in October 2023. The initiative introduced a monthly on-campus visit by an electric bloodmobile, designed to provide a convenient and eco-friendly environment for students, faculty, and staff members alike to donate blood. The electric bloodmobile features updated equipment, operates without exhaust emissions or noise pollution, and promotes both environmental sustainability and public participation, which encourages even more people to jump on the blood donation bandwagon.

The campaign has met with enthusiastic support since its initiation. Approximately 30% of donors at each blood donation event are first-time participants, reflecting the campaign's success in engaging the university community. From its launch through the end of 2024, a total of 24 blood donation events have been held, resulting in over 1,400 individuals donor and the collection of more than 1,700 bags of blood. Through this program, the University has not only contributed to stabilizing the national blood supply but has also fostered civic responsibility and participation among the wider NTU community while increasing awareness of social contribution as part of the university's core values.

From October 2023 to the end of 2024

More than 1,400 blood donations have been made,

With a total of over 1,700 bags of blood collected.

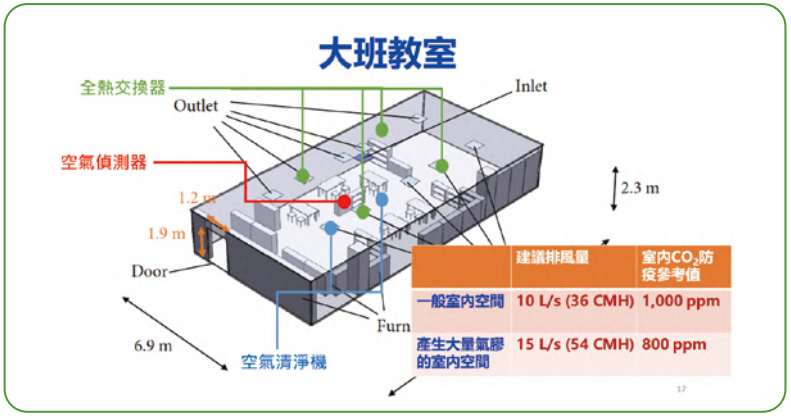
NTU faculty and students actively participate in the blood donation campaign, supported by the on-campus electric bloodmobile.

A Study on Indoor Air Quality and Student Health: Mitigating Airborne Transmission Risks in Schools

During the fall and winter seasons, it is common to observe increased coughing among students in kindergartens, elementary schools, and junior high schools, with respiratory illnesses frequently spreading between teachers and students and subsequently affecting their families. In recent years, particularly during waves of COVID-19 outbreaks, cluster infections in schools have raised serious public health concerns and drawn significant attention from parents and society at large.

To combat these issues, Professor Ta-Chen Su's research team from the National Taiwan University Hospital (NTUH) Department of Environmental and Occupational Medicine and the NTU College of Public Health has been investigating indoor air quality in educational settings since 2018. In 2021, the team conducted continuous air quality monitoring in kindergartens across Taipei City, employing epidemiological modeling to evaluate the risk of airborne COVID-19 transmission.

The study revealed that carbon dioxide concentrations in enclosed kindergarten classrooms rose sharply during class hours, correlating with a heightened risk of infectious disease transmission. Based on such findings, the team recommended that the government revise the standards for allowable carbon dioxide levels in classrooms and prioritize improvements to ventilation and exhaust systems across campuses. In addition, the installation of air purifiers equipped with HEPA filters is advised for ill-ventilated classrooms. The integration of IoT-system sensors was also proposed to enable real-time air quality monitoring and to facilitate dynamic adjustments to classroom occupancy and usage times. This research was published in November 2024 in *Indoor Air*, a leading international journal, and has received wide recognition from the global scientific community.



Simulated configuration of a kindergarten classroom ventilation and exhaust system.

Oysters, Chicken Farms, and Popsicles: The Public Health Service Team in Changhua

Established in 1965, the NTU Public Health Service Team initially aimed to address rural medical resource shortages. As Taiwan's healthcare resources became more accessible, the team transitioned from a "Medical Service Team" to a "Public Health Service Team," integrating field research with community service.

In 2024, the team selected Fangyuan Township, Changhua County, based on local school demographics, accommodations, and environmental concerns. Their mission focused on assessing the poultry industry's impact on residents, studying elderly lifestyles after retirement, and providing health education to elementary school students beyond their regular curriculum.

The Health Education Group led a five-day camp at Xinbao Elementary School, engaging 49 students in interactive lessons to promote health awareness. The Community Health Group assessed living conditions, conducted frailty prevention programs, and studied the local egg and oyster industries' economic impact at Wanggong Community. Meanwhile, the Environmental Investigation Group analyzed air samples for pollutants and surveyed residents on their perceptions of air quality.

Though a one-week service trip couldn't create immediate change, engaging with residents provided invaluable insights. Through fieldwork and interaction, team members deepened their understanding of public health and strengthened their commitment to community service.

For more details, please refer to the *2024-2025 Public Health Annual Report*.

The Environmental Investigation group is conducting a sample collection in the chicken farm.

The Community Health group conducted education in the development association through activities.

The NTU x TPOD Higher Education International Forum and Poster Exhibition. (October, 2024)

4 QUALITY EDUCATION

Future University Forum Tour: Inspiring Dialogue on Higher Education Innovation across Taiwan

4 17

Officially launched in 2019, the Future NTU Initiative is committed to laying a strong foundation for the transformation of higher education by focusing on curriculum reforms, interdisciplinary collaboration, and digital innovation in education. In 2023, NTU hosted three Future University Forums, inviting experts and scholars from Singapore, the United States, and Taiwan. A total of 26 universities participated in the symposiums, underscoring the growing interest in the initiative within the wider education community.

To further encourage dialogue on the future of higher education in Taiwan, NTU collaborated with the Taiwan Professional and Organizational Development Network in Higher Education (TPOD) to launch the "Future University Forum: Around Taiwan" series in 2024, working with partner institutions nationwide to host four forums focused on key themes such as interdisciplinary teaching, learner-centered approaches, student self-directed learning motivation, and flexible academic structures to support talent cultivation. The forums attracted over 500 in-person participants and nearly 600 online viewers. They were held at the National Chung Hsing University, National Kaohsiung University of Science and Technology, and Taipei Medical University among others, and concluded at NTU in October that year with the NTU x TPOD Higher Education International Forum and Poster Exhibition. Centered around the theme *What's Next: Future-focused University,* the event welcomed higher education experts from Japan, South Korea, and Singapore to engage in meaningful dialogue. Additionally, 15 universities from across Taiwan were also invited to showcase their achievements in higher education innovation through a poster exhibition, celebrating the creativity and vitality of the country's higher education landscape.

To further promote the Future University vision, NTU has published seven NTU Models Handbooks, covering key topics such as academic specialization programs, academic advising, undergraduate honors programs, future classrooms, and international study groups. By integrating theory and practice, NTU aims to advance the internationalization of higher education in Taiwan and expand its global influence.

Experts from Japan, South Korea, Singapore, and Taiwan gather at NTU to discuss the future of higher education.

Interdisciplinary Internships x Industry-Academia Mentorship: Nurturing Talent for the Future

The NTU Career Center launched the Interdisciplinary Internship–Mentorship Program to provide students with professional guidance and internship opportunities in all fields, aligned with industry trends in sustainability, smart technologies, and innovation. Partnering with 71 companies in 2024, the program attracted over 1,000 applicants, with 306 students ultimately selected for the program.

To better gear students up for their internships, the Career Center also offered preparatory courses such as "Get Ready for Your Career" and "Building Future Leader," along with workshops and one-on-one career consultations. A total of 389 management-level industry professionals were invited to serve as mentors, guiding more than 3,500 students in navigating core competencies like workplace communication, marketing, interdisciplinary collaboration, and leadership. Students who completed the courses and workshops received priority for internship recommendation.

Besides providing professional guidance to interns, partner companies also organized various training programs such as workshops on sustainability, design thinking, and curation. Upon completion of the internship, companies evaluated interns based on performance, with over 84% of participating students receiving A+ ratings. At the program's sharing session, students expressed that their internship experience had given them a deeper understanding of their career goals and they encouraged their peers to participate in the program as well. Through strong academia-industry collaboration and mentorship, students were able to develop essential workplace skills systematically during their academic journey, laying a firm foundation for their future careers.

Partner company hosts ESG workshop exclusively for NTU interns, sharing trends in sustainable development.

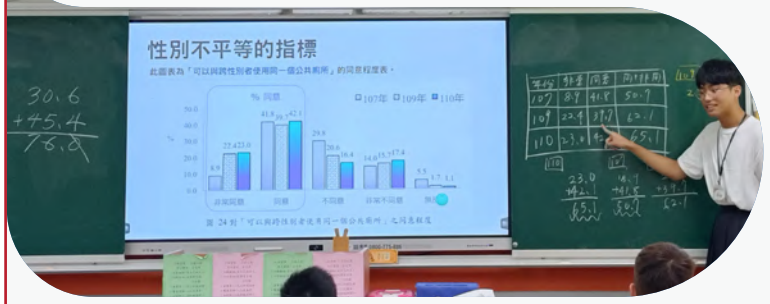
Innovative Teaching x Trans-Disciplinary Perspectives: The All Gender Restroom Project

Kevin Li, a student in NTU's Trans-disciplinary Bachelor Program, is passionate about education and equality, and strives to turn that passion into action. Inspired by his experience serving rural communities through the Schweitzer Service Program[1], Li developed a lesson plan blending innovation with practical application for an action-based course titled "The All Gender Restroom Project."

Li's lesson plan is centered on the theme of all gender restrooms and employs a project-based learning (PBL) approach that guides students in exploring legal frameworks and cultural perspectives surrounding gender issues. It integrates mathematical concepts such as line symmetry and statistics with design thinking and aesthetics, the result of which is a trans-disciplinary civic engagement course.

Li's course diverges from traditional learning models by enabling students to engage playfully with real-world problems. Through Li's course, students develop action plans by thinking out of the box and apply theoretical knowledge in practical contexts, thereby deepening their understanding of real-world social issues. The course exemplifies the integration of educational innovation and social responsibility, and has been widely praised by students. It was also awarded First Prize in the student category of the NTU Super Lesson Plan Competition in the 2024-25 Academic Year.

The All Gender Restroom Project employs a PBL approach to integrate social issues with mathematical concepts.



Note 1：The Schweitzer Service Program is an annual three-week summer program jointly organized by the NTU Teacher Education Program and junior high schools in rural Taiwan. As part of this program, pre-service teachers conduct a three-week course each summer, designing and delivering original lesson plans to participating junior high school students.

5 GENDER EQUALITY

NTU Student Group Moonteacha Champions Menstrual Equity

4 5 10

Menstruation has long been overlooked and stigmatized in today's society. To combat this reality, a group of NTU students passionate about menstrual equity established the educational group Moonteacha in 2022 to raise public awareness and understanding of menstrual care through a series of diverse and creative initiatives.

Moonteacha launched its "Dear Mooniary" platform as a safe space for individuals to share their experiences online and as a way to increase the visibility of menstrual discourse. The group also designed the board game "Share Your Period," which aims to encourage dialogue and understanding of menstrual concerns by drawing on players' personal experiences. Additionally, Moonteacha held an exhibition at the Bopiliao Historic Block, drawing attention from all walks of life and further advancing public discussion of menstrual knowledge.

As a result, Moonteacha has gained wide recognition for their efforts, receiving the Outstanding Action Award from the Ministry of Education's Youth Development Administration as part of the 2022 Global Youth Action Program. In 2024, the group was also honored with the NTU Student Social Contribution Special Award in recognition of their contribution to society. Moreover, they were also granted public funding to visit Japan and exchange ideas with local advocate groups. Back home, the Moonteacha team continues to share their work with Taiwanese high schools, universities, and international groups, sowing the seeds of menstrual equity wherever they go, and driving real changes in gender equity advocacy.

Moonteacha's six-day exhibition at Bopiliao Historic Block sparks menstrual discussions among visitors of all ages and genders.

Moonteacha receives the 2022 Global Youth Action Program Outstanding Action Award from the Ministry of Education's Youth Development Administration.

Bridging Academia and Civil Society through Publishing: Gender Advocacy at NTU's Women's and Gender Research Program

Affectionately known as the Women's and Gender Research Program, the Women and Gender Division at the NTU Center for Population and Gender Studies is helmed by faculty members from various departments who specialize in gender-related research. A champion of gender equity, the Division is committed to advancing academic development in women's and gender issues, promoting gender education and policies, nurturing future researchers, as well as raising gender awareness among the public.

One of the Division's longest-standing initiatives is the publication of the biannual *Journal of Women's and Gender Studies* to promote and enhance gender research in the Sinophone world. The journal features original scholarly work across disciplines and emphasizes dialogue between theory and local lived experiences, laying the foundation to an inclusive academic network that embraces diversity. To boost the visibility of gender issues in the digital age, the Division also transformed its nearly 40-year-old printed periodical, *Forum in Women's and Gender Studies*, into a podcast of the same name. Hosted by researchers, the podcast invites guests from the civic sector, academia, and the media among others to explore gender perspectives on current affairs such as capital punishment, labor rights in nursing, and LGBTQ+ elder care.

In addition, the Division has long promoted its Women's and Gender Studies Program, which offers structured courses on a wide range of related topics. It regularly organizes or co-hosts on-campus lectures and forums on subjects such as female criminality, nursing labor and health resilience, as well as international marriages and social integration. Members of the Division are also actively involved in social reform, engaging with issues such as the autonomy and name reclamation of indigenous communities, transitional justice, as well as the transformation of production systems. By combining academic rigor with public engagement, the Division continues to strive for gender equity through the creation and dissemination of knowledge.

Cover of Issue 55 of the *Journal of Women's and Gender Studies*.

Fostering Dialogue on Scientific Careers and Gender Equity: Interdisciplinary Scholars Unite to Build an Inclusive Academic Environment

Gender inequality remains prevalent across society, and women, particularly in academia, continue to be underrepresented in many natural science disciplines. To promote a more gender-inclusive academic environment, the NTU Science Promotion and Engagement Center co-hosted the Scientific Careers and Gender Equity Seminar under the guidance of the National Science and Technology Council. The event was helmed by four distinguished female scientists: Dr. Li-Hwai Lin (Institute of Astronomy and Astrophysics, Academia Sinica), Associate Professor Chiao-Chen Chen (Department of Chemistry, National Cheng Kung University), Professor May-Ru Chen (Department of Applied Mathematics, National Sun Yat-sen University), and Professor Ya-Hsuan Liou (Department of Geosciences, NTU).

The seminar adopted a multi-faceted approach in its exploration of gender equity, examining legal reforms, scientific evidence, and life experiences that shed light on the challenges that women face family life, academic workplaces, and other situations. Associate Professor Yen-Ting Hwang from the NTU Department of Atmospheric Sciences shared her personal experience, offering valuable insights into how she balances career and family through strategic use of resources and support systems. Through similar exchange of stories and in-depth dialogue, the seminar fostered solidarity and mutual encouragement among the participating women, all of whom are remarkable scientists in their own right. Besides promoting inclusivity and career equity in the scientific community, the seminar also aimed to inspire more women to pursue careers in scientific research, nurture outstanding talents, and ultimately strengthen the country's scientific competitiveness.

The Scientific Careers and Gender Equity Seminar unites scholars from diverse disciplines and backgrounds, empowering the female scientific community through shared experience and dialogue.

6 CLEAN WATER AND SANITATION

Transforming Water for a Sustainable Future: Water Reuse, Resource Recovery, and Technology Innovation

In response to the growing urgency of climate change and the global push toward net-zero emissions, NTU has actively fostered collaboration among academic, governmental, and industrial sectors to develop energy- and carbon-efficient water treatment and reuse technologies. With innovation at its core, our research continues to address the pressing challenges surrounding water resource management. In 2024, Professor Chia-Hung Hou from the NTU Graduate Institute of Environmental Engineering led a project supported by the National Land Management Agency of the Ministry of the Interior, demonstrating a pilot-scale water reclamation system using membrane capacitive deionization (MCDI) technology at the Keya Water Resources Recycling Center in Hsinchu. This system was able to continuously treat secondary effluent from domestic wastewater with a daily output of 21.1m³ while maintaining an ion removal efficiency exceeding 80%, desalination energy consumption of 0.2–0.3 kWh/m³, and a water recovery rate of 77%, reflecting its ability to provide a stable supply of high-quality reclaimed water. Its potential for energy efficiency was further highlighted in an environmental impact assessment, which estimated that the system produced only approximately 2.82 kg CO_2-equivalent of GHG emissions per cubic meter of water produced, significantly less than traditional water reclamation technologies. These findings were published internationally in the prestigious journals *Desalination* in 2024.

Reclamation at the Keya Water Resources Recycling Center (left and center), and for fluoride-containing semiconductor wastewater treatment and resource recovery (right).

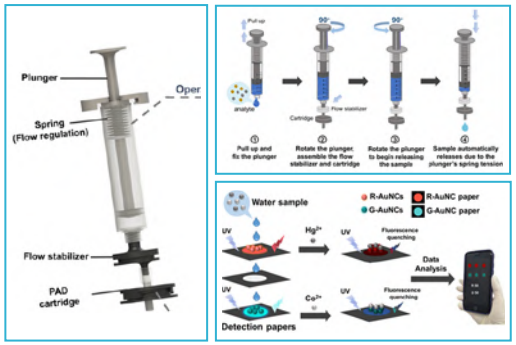
To further expand the scope of MCDI applications, Professor Hou's team also introduced the MCDI technology to wastewater treatment in the semiconductor industry, a sector that has garnered significant attention following the rapid development of Taiwan's high-tech industries. In the case of fluoride-containing semiconductor wastewater, while promising progress has been made in recycling high-concentration fluoride wastewater into cryolite, low-concentration streams remain difficult to treat and are typically handled through chemical dosing (e.g., $CaCl_2$) with limited recovery potential. However, Professor Hou's research, a 2024 industry-academia collaboration project funded by the National Science and Technology Council (NSTC), has sparked new hope. In this project, the MCDI system successfully concentrated fluoride ions from low-concentration wastewater, thereby expanding its suitability for cryolite regeneration. The initiative demonstrated a viable path toward greater resource recovery and was honored with the 2024 NSTC Industry-Academia Cooperation Projects High Distinction Award.

Enhancing Water Quality Monitoring: Portable Devices for Efficient On-Site Testing

Rapid industrialization and economic growth have led to increasingly severe environmental pollution, with heavy metals emerging as one of the most pressing concerns. These toxic substances tend to accumulate in living organisms and pose significant threats to human health, as prolonged exposure to heavy metal pollution may alter genetic material and adversely affect the central nervous system, metabolism, and organ functions.

Existing heavy metal detection methods rely heavily on expensive precision instruments with complex procedures that are time-consuming and unsuitable for use in remote or under-resourced areas. Considering this challenge, Professor Chien-Fu Chen from the NTU Institute of Applied Mechanics led a team in leveraging 3D printing to modify commercial syringes, successfully developing a portable semi-automatic environmental monitoring device suitable for users of all ages to carry out on-site detection of waterborne pollutants.

Instead of traditional electric power, Prof. Chen's modified device uses a spring-loaded mechanism installed in the plunger, coupled with a precisely engineered polydimethylsiloxane (PDMS) membrane that serves as a flow stabilizer to regulate fluid flow rate and volume. The team also enhanced the sensitivity of the built-in paper-based analytical device (PAD), significantly improving its detection of mercury and cobalt ions. It is empirically proven that the device is not susceptible to interference by other metal ions and background substances, and can complete heavy metal detection in 20 minutes. Further, its detection limits are well below those of the regulatory restrictions on drinking water by the US Environmental Protection Agency and the European Union. All things considered, this portable and easy-to-use device is well-suited for widespread use in water quality surveillance and environmental monitoring in resource-constrained regions, playing a key role in reducing the public's risk of exposure to heavy metal pollution.



Visual representation and operating procedures of the portable semi-automatic heavy metal detection device.

More than Just a Tea Field: A Case Study on Water Conservation and Climate Adaptation in Pinglin Tea Plantations

Located in the upstream catchment area of the Taipei Water Source District, New Taipei's Pinglin is not only home to vital water resources but is also a key player in northern Taiwan's tea cultivation scene. As the threat of climate change continues to loom, balancing water conservation with sustainable development has become a shared concern among tea farmers and local authorities alike.

Rising to the occasion are Professor Jehn-Yih Jhuang and Dr. Siang-Heng Wang of the NTU Department of Geography and the International Degree Program in Climate Change and Sustainable Development, who have conducted long-term microclimate observations in two adjacent tea plantations in Pinglin, each of which employs a distinct management strategy. Their 2024 research reveals that tea farm practices and management strategies have significant impact on water balance, energy patterns, and microclimate conditions in the tea fields.

Significantly, the study found that ecologically sustainable management strategies adopted by tea farmers help improve water utilization and enhance moisture retention in the hilly terrains where tea is often cultivated. These research findings also indicate that stable microclimates with smaller diurnal temperature variations help foster healthier growing conditions for tea plants, increasing the plantation's resilience to climate change. The research not only provides critical scientific data for improving watershed management and implementing climate-resilient agriculture, but also offers Taiwan new sustainable strategies for agricultural production and water resources management in the face of climate change.

Monitoring instruments installed in the Pinglin tea plantations.

The research team collecting and analyzing data from instruments installed in the tea plantations.

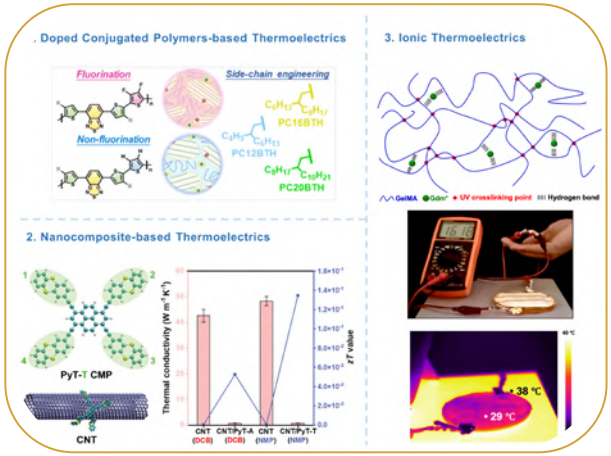
7 AFFORDABLE AND CLEAN ENERGY

Can't Turn Down the 'Heat': Organic Thermoelectric Materials Spark New Hope in Waste Heat Recovery

Countries around the world are committed to developing green energy in a global effort to reach net-zero carbon emissions by 2050 and combat the escalating challenges of climate change. As a key player in the global high-tech industry, Taiwan is no exception. However, domestic electricity demand continues to rise, and the industrial sector now accounts for over half of the nation's total energy consumption. Of particular concern is low-grade waste heat, which represents more than 50% of all industrial heat waste. If harnessed effectively, this untapped energy source could generate significant electricity while reducing carbon emissions.

Amidst these developments, thermoelectric materials have garnered increasing attention in recent years for their ability to convert waste heat into usable electrical energy, hence contributing to energy renewal. At the forefront of this research is Professor Cheng-Liang Liu's team from the NTU Department of Materials Science and Engineering. The team is dedicated to developing high-performance organic thermoelectric materials that can maintain high electrical conductivity while minimizing thermal conductivity and heat dissipation (by lowering their heat transfer coefficient), thus increasing the efficiency of thermoelectric conversion.

Prof. Liu's research aims to leverage the human body-ambient temperature difference to provide a stable electrical source for wearable biosensors, Internet of Things (IoT) applications. By adopting advanced



Research on Organic Thermoelectric Materials and Wearable Power Generation Devices.

doping techniques and drawing on organic materials' low toxicity, optimal ductility and malleability, and ease of processing, the team has overcome the challenge of low electrical conductivity in organic conjugated polymers. Their innovations span three major thermoelectric materials systems: organic conjugated polymers, organic/inorganic thermoelectric nanocomposites, and quasi-solid-state thermogalvanic cells. These materials have been successfully applied to environments requiring a stable temperature differential, for instance in wearable power generation devices and in the recovery of waste heat in small household appliances. These innovative technologies not only contribute to the effective recovery of waste heat but also offer new energy solutions for wearable components, hence advancing the development of new energy sources and a low-carbon future.

Taiwan's Path to Net-Zero: What are Our Green Energy Options?

The transition to green energy has become a global priority as electricity demand rises, compounded by challenges such as carbon emissions and nuclear waste. To enhance public awareness and promote accessible science education, the NTU Center for the Advancement of Science Education launched an eight-part lecture series in spring 2024 titled "Taiwan's Path to Net-Zero: What are Our Green Energy Options?" Designed to make foundational science both engaging and relevant, the series invited leading domestic energy experts to share insights on emerging energy trends and how Taiwan, a global leader in semiconductors and technology, can pursue renewable energy while balancing economic growth and national energy needs.

The lectures addressed topics such as safety concerns over small modular nuclear reactors, prompting reflections on the opportunities and risks of new nuclear technologies. Two sessions delved into the pivotal role of energy storage systems in battery applications and the conversion of solar energy into green electricity and fuels. Other lectures, including those on offshore wind, Kuroshio current power, and ocean thermal energy conversion, highlighted Taiwan's potential in clean energy development. The series also explored advanced technologies like hydrogen-powered materials and examined global energy trends, offering a comprehensive roadmap for the future of energy.

Each session attracted over 100 participants, reflecting the public's growing interest in sustainability. In response to broaden the initiative's impact, the lectures were recorded and made available online, enabling wider engagement with Taiwan's renewable energy and sustainable development goals.

Audience members engage in an extended discussion on wind energy with Ørsted Taiwan Project Development Director Chuan-Sheng Kao (June 2024).

Energy Transition for the Future: Insights from Global Policies to Local Strategies

As countries worldwide advance toward net-zero, energy transition has become a shared challenge for both governments and industries. For energy-import-reliant Taiwan, this transition is not only necessary but urgent. In 2024, the government introduced the Energy Transition 2.0 initiative to ensure a stable energy supply while promoting renewable sources. To examine Taiwan's strategies and progress, the NTU Graduate Institute of Public Affairs (GIPA) joined forces with the Industrial Technology Research Institute (ITRI)'s Do Energy team to host an academic symposium titled "Energy Transition for the Future—Insights from Global Policies to Local Strategies."

The symposium began with a local case study on Syin-Lu Social Welfare Foundation's Green Sheltered Workshop, followed by a comparative analysis of net-zero policies in Taiwan, Japan, and South Korea. GIPA Director Hong-Wung Wang also led a discussion on Taiwan's current progress and potential challenges in energy transition. Finally, the symposium closed with a round-table, featuring experts including ITRI Do Energy Team Leader Dr. Ming-Lung Hung, Taiwan Green Energy for Charity Association Founder Hui-Ping Chen, as well as GIPA professors Way Sun and Tze-Luen Lin. The panel discussed the broader implications of Taiwan's net-zero transition and evaluated the effectiveness of current policy measures.

Over 70 participants, including experts, NTU faculty and students, and members of the public, engaged in discussions and proposed strategic recommendations, highlighting the importance of shaping a sustainable path forward.

"Energy Transition for the Future—Insights from Global Policies to Local Strategies" symposium (September 2024).

2024 Appreciation Banquet for NTU International Mentorship Program, with over 200 mentors and students in attendance (September 2024).

8 DECENT WORK AND ECONOMIC GROWTH

NTU Develops AI Robotic Dogs to Help Address Labor Shortages

A research team under the leadership of Professor Chung-Hsien Kuo of the Department of Mechanical Engineering at NTU is dedicated to the development of AI-powered robotic dogs, known as the NTU DogBot. The project has already achieved promising preliminary results and has garnered attention from various domestic media outlets. Launched in 2022, the NTU DogBot project began with a first-generation prototype built with 3D printing technology. Measuring 42 cm in length and weighing 4 kg, the first-generation DogBot served as a proof of concept for gait control, autonomous localization, and navigation. Building on this foundation, Prof. Kuo secured funding support from the National Science and Technology Council. In February 2024, the team developed the second-generation model, "Oliver," followed by the third-generation model, "Dustin," in May of the same year.

The AI robotic dog integrates multiple advanced technologies—including mechanical design, control systems, gait generation, autonomous navigation, and AI algorithms—making it a highly interdisciplinary research initiative filled with technical challenges. "Oliver" measures 54 cm in length and weighs 16 kg. It is designed for home use and features motion-guided learning and AI vision, allowing it to interact with users through voice and facial expression recognition. "Dustin," on the other hand, is 93 cm long and weighs 40 kg. It is tailored for industrial applications such as facility inspection and item delivery. Equipped with various sensors for sound, vision, temperature, and gas detection, it can report real-time operational updates via integration with LINE Bot, enhancing safety and convenience in industrial environments.

NTU Department of Mechanical Engineering is actively advancing AI robotic dog development with the goal of mitigating labor shortages in Taiwan's industrial sector. Industries such as chemical manufacturing, construction, railway maintenance, food service, and logistics are currently facing critical labor shortages. These sectors are closely tied to our daily life and are in urgent need of smart solutions. With the launching of the NTU DogBot, businesses can access cost-effective robotic solutions that are locally customized. By partnering with domestic system integrators, these AI robotic dogs can be rapidly deployed with robust support for maintenance and upgrades, ultimately enhancing overall industrial competitiveness.

NTU DogBots, Oliver and Dustin.

Click here to watch the NTU DogBot video.

NTU International Mentorship Program: Expanding Students' Global Career Horizons

4 8 17

The NTU International Mentorship Program offers students valuable opportunities to intern at international enterprises, NGOs, and research institutions. By bridging academic knowledge with hands-on experience, the program aims to enhance students' cross-cultural communication and problem-solving skills, thereby strengthening their competitiveness in the global job market. Special emphasis is placed on emerging industries and sustainable development, including areas such as green economy and social enterprises, aiming to nurture future talent and promote inclusive economic growth.

Beyond professional internships, the program is committed to fostering knowledge exchange and cultural understanding. Participating students not only develop practical skills but also engage with global trends and sustainability issues, helping expand NTU's international reach. In 2024, the program successfully matched 180 students with 91 host organizations from different parts of the world. Recognized for its outstanding impact, the NTU International Mentorship Program received international acclaim by winning the 2024 PIEoneer Awards presented by The PIE News, a leading global education media platform. Evaluated by a panel of nearly 60 international experts, the program was honored with both Employability International Impact Award and the prestigious PIEoneer of the Year Award. Among nearly 600 attendees from higher education institutions, private enterprises, NGOs, and government, NTU stood out for its exceptional contributions to international education and global career development.

At the International Mentorship Appreciation Tea Reception, NTU awarded "Honorary Mentor" plaques to acknowledge long-term supporters fo the program.

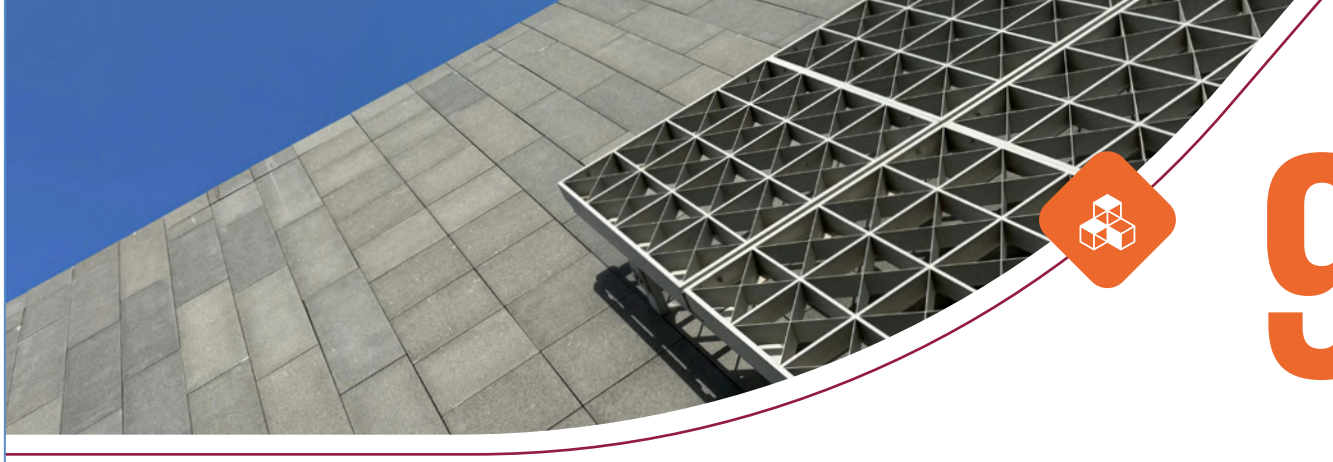
Annual Migration Workshop: New Perspectives on Global Migration Issues

On June 7, 2024, the Global Asia Research Center (GARC) at NTU co-hosted the Annual Migration Workshop with the Seoul National University Asia Center (SNUAC). The event brought together 180 participants and featured scholars from Taiwan, South Korea, and Japan. The workshop explored key issues surrounding migration, labor, and cultural transformation, structured around four major themes: labor markets, migration flows, cultural identity, and social inclusion. In sessions on labor and migration, scholars analyzed the impact of globalization on labor markets, such as gendered migration patterns in the AI industry. Comparative discussions also examined the differing historical backgrounds and challenges of migrant labor in Taiwan and Germany.

Under the theme of migration flows, topics included transnational marriage, education, and language adaptation. Scholars employed literature reviews, content analysis, and interviews to explore how changes in globalized education are reshaping the roles and expectations of South Korean parents. Discussions on culture and identity focused on multicultural urban contexts, the Iranian diaspora, and identity strategies among Taiwan's second-generation immigrant youth. These studies revealed a complex landscape of ethnic coexistence, political spectrum variation, and identity negotiation across communities.

The final theme, social inclusion, addressed public attitudes toward immigrants. Research suggested perceived abstract threats have a greater influence on public sentiment than actual economic or social conditions. In Taiwan, for instance, migration policy remains development-oriented, with the protection of migrants' rights often contingent upon their perceived economic contributions. The workshop's lively and in-depth discussions highlighted the diversity and complexity of migration issues in Asia. The event provided valuable insights for shaping future labor migration policies and fostering more inclusive and equitable societies across the region.

NTU Global Asia Research Center co-hosted the Annual Migration Workshop with Seoul National University Asia Center (June 2024).



9 INDUSTRY, INNOVATION AND INFRASTRUCTURE

New RCS Structural System: Enhancing Safety, Efficiency and Sustainability for Buildings

The New RCS project, led by Professor Yu-Chen Ou of the Department of Civil Engineering, has revolutionized the construction of high-rise buildings with its innovative Composite Moment Frame System (RCS). By merging reinforced concrete (RC) columns with steel (S) beams, the system significantly enhances structural safety while also improving construction efficiency and cost-effectiveness. Jointly supported by the National Science and Technology Council (NSTC) of Taiwan and Ruentex Engineering & Construction Co., Ltd (Ruentex), the project has benefited from Ruentex's valuable practical experience as one of Taiwan's leading construction firms.

The project aimed to develop new RCS joints that could leverage high-strength concrete and reinforcement for improved structural efficiency. Additionally, the project focused on designing versatile beam-column joints capable of accommodating various configurations, including eccentric framing and different column cross-sections, making the beam-column joints more adaptable for real-world constructions. The New RCS joints are not only structurally solid, but also suitable for the faster and more controlled precast construction system. The project researchers conducted large-scale testing at the National Centre for Research on Earthquake Engineering (NCREE) to simulate the behavior of the joints under earthquake loads. The experimental results provided valuable information for developing design guidelines. Prof. Ou's team has published a comprehensive design manual for designing a wide variety of RCS joints, along with various academic articles in top-rated structural engineering journals.

Following successful testing and design approval by the Taiwan National Land Management Agency, Ruentex constructed a 27-story office building in Taipei using the New RCS system. At present, this new technology is being utilized in the construction of five more high-rise buildings.

The project's success has led to a second phase aimed at integrating eco-friendly "green concrete" and advanced modeling techniques. A venture between Taiwan and the Czech Republic (NSTC-TACR project) has paved the way for more efficient, sustainable, and earthquake-resistant building designs for the near future. This innovative method will not only improve structural performance but also promote the development of sustainable infrastructure for future urban development.

Large-scale experiments at the National Center for Research on Earthquake Engineering.

A 27-story New RCS building in Nangang, Taipei, nearing completion.

NTU Partners with TSMC and Germany to Advance Global Semiconductor Talent Cultivation

On March 6, 2024, NTU held the opening ceremony for the Semiconductor Talent Incubation Program Taiwan, marking the official launch of a collaborative initiative between NTU, Taiwan Semiconductor Manufacturing Company (TSMC), and the government of Saxony, Germany. Thirty students from six countries and three German universities undertook a semester-long academic program at NTU, followed by internships at TSMC's Central Taiwan Science Park facilities.

Opening Ceremony of the Semiconductor Talent Incubation Program Taiwan (March 2024).

The courses in this program were delivered by eight NTU faculty members from departments including Electrical Engineering, Mechanical Engineering, Computer Science & Information Engineering, and Information Management. A total of eight semiconductor-related courses were offered to strengthen international students' academic and technical competencies. In addition, NTU's Office of International Affairs organized career development workshops, Mandarin language classes, and cultural immersion activities to help students better understand Taiwan's culture and workplace environment. In response to the global shortage of semiconductor professionals, NTU has been actively expanding its efforts to cultivate international talent in this critical field. These efforts include the launch of an International Bachelor's Program in Semiconductor Technology and IC design courses. The current initiative is set to expand its enrollment in future years, and NTU will continue deepening its collaboration with TSMC and German partners to establish a long-term platform for scientific and talent exchange. Through this trilateral partnership, NTU aims to develop a sustainable model of cross-border academia-industry-government cooperation, further enhancing Taiwan's competitiveness in the global semiconductor industry.

From Learning to Practice: NASA Program Cultivates Talent in Information Management

At NTU's Department of Computer Science and Information Engineering (CSIE), a unique undergraduate course, nicknamed NASA, has been cultivating future information management professionals since 2012. The name NASA stands for Network Administration and System Administration, and represents not only the course title, but also the student team led by Professors Hsin-Mu Tsai, Hsu-Chun Hsiao, and Shang-Tse Chen. The team is responsible for maintaining the department's IT infrastructure and services.

The NASA program is divided into three stages. In the first stage, students learn the fundamentals of computer networks and system administration, covering topics such as IP address configuration, storage systems, virtualization technologies, and information security. Students are expected to commit 15-20 hours per week to self-study and hands-on practice, with their skills evaluated through lab-based assessments. Around 30 students advance to the second stage for in-depth training and system implementation tasks. The third stage emphasizes large-scale projects under faculty supervision.

Since 2012, the NASA program has trained over 600 professionals. In 2024, under the leadership of Profs. Hsin-Mu Tsai and Shang-En Huang, the NASA team traveled to Seremban, Malaysia, to co-organize the National Secondary School Programming Contest, in collaboration with the NTU Alumni Association in Malaysia. They set up servers, network infrastructure, monitoring systems, handled data backup, and stress-tested competition laptops—ensuring smooth operation for 60 teams and 180 participants. The program integrates academic training with practice, fostering innovation and talent development in information and computing.

NASA team members traveled to Malaysia to help organize the National Secondary School Programming Contest (September 2024).

The project team conducted community consultation with the Fakong indigenous community to identify local health needs and perspectives through an indigenous-led process.

10 REDUCED INEQUALITIES

Advancing Equity Through Culture: A Vision for Indigenous Health Justice

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To address long-standing inequalities in indigenous health, the NTU College of Public Health has launched the USR project "Culture-Health" supported by the Ministry of Education. The initiative collaborates with indigenous communities such as Fakong, Tafalong, Ciamengan, and Kiwit to co-create culturally safe healthcare environments from campuses, institutions to the whole society. Grounded in the principles of the Indigenous Peoples Health Act, the project explores indigenous-led health promotion strategies that affirm both indigenous agency and knowledge.

In 2024, the project team developed two courses centered on culture and health, and partnered with local indigenous communities to design short-term field internships aimed at encouraging students to explore the impact of culture on health. What is more, the team is also committed to integrating indigenous health perspectives into other courses and is actively promoting the establishment of the "Culture and Health" Specialization Program in NTU. To advance dialogue on the issue, the team also held two workshops and six public lecture series, drawing approximately 350 participants. Such events are crucial in cultivating cultural competency among NTU students, faculty, and healthcare professionals, contributing to a more inclusive society.

Driven by the goal of building a consultation model rooted in indigenous agency, the team co-hosted three community consultations that resembled actual indigenous practices. The meetings sought to understand local health needs, and were participated by 60 people from various indigenous communities. Additional outreach efforts included two press conferences as well as the publication of six academic conference papers and a practical guide titled *Overturning Inequalities: A Handbook on Indigenous Peoples Health Act*, which aims to enhance both the visibility and practical application of the Act, reflecting NTU's commitment to advancing indigenous health equity.

Workshop on the Promotion of Culturally Safe Indigenous Health.

NTU Children and Family Research Center : Building Youth Resilience through the PILOT Program

Since its founding, the NTU Children and Family Research Center—established in collaboration with CTBC Charity Foundation—has been dedicated to the research and advocacy on child and adolescent welfare. Findings from the Center's 2014 nation-wide longitudinal study on children's social experiences revealed that up to 71% of students had experienced school bullying. The study also showed that children and youth who suffered from bullying or domestic violence were more likely to exhibit signs of depression, anxiety, and anger—factors that may contribute to Internet or substance addiction. To help address these issues, the Center developed the Positive Interpersonal & Life Orientation Training (PILOT) program in collaboration with experts and school educators.

Tailored to Taiwan's educational context, the PILOT curriculum aims to strengthen children's emotional, social, and adversity intelligences (EQ, SQ, and AQ). It includes modules on emotional regulation, communication, decision-making, and conflict resolution. By integrating the program into standard school curricula, students are better equipped to build greater self-awareness, engage in more positive social interactions, and develop greater resilience in everyday life. Since its launch in 2019, the program has been adopted by 255 institutions across 20 counties and cities, benefiting more than 20,000 students. Research shows participants demonstrated higher well-being, improved conflict resolution skills, and stronger psychological resilience, along with reduced tendencies toward addiction and depression.

The Center is also committed to promoting the PILOT program in rural areas of Taiwan to support students with limited resources. In 2024, the program stood out among 157 teams to win the Gold Award for "Quality Education (SDG 4)" at the Asia-Pacific Sustainability Action Awards. This marked NTU's first win in the Award's university category and affirmed NTU's growing contribution to reducing inequalities in education.

The NTU Children and Family Research Center developed the locally tailored PILOT Program to build emotional and social resilience in children.

NTU EMBA Alumni Bring Free Medical Services to Taoyuan

NTU EMBA Alumni Foundation partnered with Taoyuan Jingfu Temple to host a large-scale voluntary medical service event (April 2024).

Continuing its commitment to social service, the NTU EMBA Alumni Foundation joined forces with Taoyuan Jingfu Temple to host its largest-ever voluntary medical service event on April 25, 2024, as part of the annual Kaizhang Shengwang Cultural Festival. The medical team comprised 16 EMBA-trained doctors and numerous NTU alumni volunteers, offering free healthcare consultations in a range of specializations, including orthopedics, dentistry, traditional Chinese medicine, ENT, and dermatology among others, ensuring timely and professional care to residents.

From the efficient patient registration and medical consultation to the collaborative logistic of supplies, the event was a testament to NTU EMBA alumni's concerted efforts in enhancing community welfare. Former Foundation Chairman Chi-Ming Chien noted that beyond delivering quality healthcare, the voluntary medical team also embodied the alumni's enduring dedication to public service. Looking ahead, the Foundation will expand its reach, bringing medical care to all communities across Taiwan.

The NTU Myanmar Kyar-pan Music and Dance Troupe performs at the 2024 Multicultural Festival in New Taipei City.

11 SUSTAINABLE CITIES AND COMMUNITIES

Promoting Sustainability of Burmese Migrant Culture Through Music and Dance Education

4 10 11

Associate Professor Tasaw Hsin-Chun Lu of the NTU Graduate Institute of Musicology has pioneered a new model for Burmese music and dance education by integrating the cultural resources of Taiwan's Burmese communities into NTU's music and dance curriculum. Through partnerships with local organizations and government institutions, Prof. Lu has fostered deeper connections between academic education and migrant cultural heritage while helping to preserve and sustain musical and dance traditions that are on the brink of extinction.

Since 2017, Prof. Lu has offered courses in Burmese music and dance and founded the NTU Myanmar Kyar-pan Music and Dance Troupe. Collaborating with the Myanmar Chinese Association in New Taipei City and the Taoyuan Yunnan Folk Dance Association, the team has launched community-building initiatives such as the publication of periodicals, as well as the organization of intergenerational music and dance lessons, community guide training workshops, and cultural festivals and performances. Through ongoing initiatives, these efforts have strengthened cultural exchange and understanding across ethnic groups, while also empowering and uniting the Burmese migrant community in Taiwan.

In addition, Prof. Lu has spearheaded various intercultural performances and capacity-building projects to broaden public appreciation of traditional Burmese performing arts. These endeavors are especially meaningful considering the 2021 military coup in Myanmar, after which Taiwan welcomed a growing number of

The team conducts community guide training workshops as part of a community-building initiative in Taoyuan.

Burmese classical dance workshop.

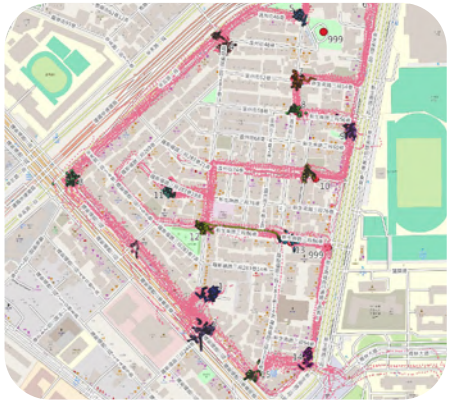
Myanmar nationals seeking refuge, including second-generation Burmese Chinese as well as students of Sino-Burmese descent or belonging to other ethnic minority groups such as the Bamar, Jingpo, Kachin, and Karen communities. Participation in Prof. Lu's courses and projects has provided these individuals with emotional support, a sense of belonging, and an avenue to rebuild cultural identity and pride.

Professor Lu's music and dance curriculum not only takes NTU students beyond the classroom and into the community, offering them a cross-cultural experience and hands-on learning, but also enhances public understanding of Myanmar's rich cultural heritage, paving the way for potential tourism and economic opportunities for the local music and dance enthusiast.

University x Community: Mapping Local Comfort Through Mobile Environmental Monitoring

In 2024, the NTU SC+ Project Team launched the Mobile Sensing Comfort Mapping Project in Taipei City's Daxue Village to help local communities respond to environmental challenges posed by climate change. The team developed a lightweight mobile sensing device that measures temperature, humidity, PM2.5, light intensity, wind speed, and noise levels. By collecting community-specific environmental data through these roving detectors, the team produces high-resolution "comfort maps" that identify areas of poor air quality and excessive noise, providing scientific evidence to inform future environmental and urban improvements in these communities.

The project draws on the interdisciplinary expertise of students from the Department of Geography, the Department of Mechanical Engineering, the International Degree Program in Climate Change and Sustainable Development, and the Department of Information Management. Through a combination of classroom learning and fieldwork data collection, project members transform academic theory into action, putting into practice the spirit of cross-disciplinary collaboration. To encourage community participation, the team also hosted a workshop on community comfort, inviting Daxue Village residents to review collected environmental data and discuss feasible strategies for urban enhancement, such as reconfiguring green spaces to improve airflow and formulating noise reduction measures for problem areas.



Comfort map of Daxue Village, created using data collected by the SC+NTU Project Team's mobile sensing devices.

This project not only showcases the innovative application of mobile sensors in urban environmental governance but also strengthens collaboration between the University and local communities. Looking ahead, the team plans to expand its microclimate sensing model to other urban neighborhoods while refining its technology and implementation to continue contributing to local climate action and community resilience.

Witnessing the Transformation of Fishing Villages: Field Research Bridges Past, Present, and Future

The Yunlin Offshore Industrial Park is a major regional development initiative introduced in the 1990s, known for the conception and operation of the No.6 Naphtha Cracker Complex located in Mailiao Township. However, endeavors in other areas of the region have been met with less success, hindered by significant talent outflow and stagnant development. One such area is Bozailiao of Sihu Township, once the largest coastal fishing port in Yunlin during the 1980s and a key node in maritime transportation between Taiwan and the Penghu Islands. Since the mid-1990s, severe siltation has led to the rapid decline of the region and consequently its fishing industry, epitomizing the inevitable fate of coastal villages in Central Taiwan—marginalized by industrialization and neoliberal policy shifts.

Since the fall semester of 2023, the NTU Department of Anthropology has been conducting field research in Bozailiao as part of its "Field Methods of Cultural Anthropology (with Practices)" course. Over two consecutive years, students have carried out group-based independent research projects on a broad range of topics, including sustainable development, renewable energy, port revitalization, flood management, religious beliefs, inherited traditional craftsmanship, rural education, elder care, and immigration issues. From a comprehensive standpoint, the course offers a multifaceted understanding of marginalized Han Chinese fishing villages with a focus on local perspectives.

To strengthen community engagement, students have presented their research findings at local sharing sessions and published them in a collection of essays. These efforts foster in young scholars a greater awareness of issues in contemporary rural development, sparking meaningful dialogue between northern and southern Taiwan, rural and urban regions, as well as academic and grassroots communities.

Students host a local sharing session at Jian-Yang Elementary School in Bozailiao, Sihu Township, Yunlin County (June 2024).

12 RESPONSIBLE CONSUMPTION AND PRODUCTION

The Third Corporate Climate-Related Financial Disclosure Survey: Addressing Challenges in Taiwan's Delayed Net-Zero Transition

The Risk Society and Policy Research Center (RSPRC) at NTU has been closely monitoring Taiwan's net-zero transition and industrial climate risks. In 2024, the Center published the Third Corporate Climate-Related Financial Disclosure Survey Report. The report was released at an industry-academia collaboration event, where distinguished guests—including Vice President Bi-Khim Hsiao and Fubon Group Chairman Ming-Chung Tsai—were invited to attend and deliver remarks. The survey results were subsequently made available to the public via the Center's official website and were distributed to stakeholders for their reference.

Targeting companies with an annual revenue exceeding NT$100 million, this year's survey adopted stratified proportional random sampling and analyzed responses from 901 companies, and examined corporate motivations, perceived benefits, and concrete actions based on the reporting framework developed by the Task Force on Climate-related Financial Disclosures (TCFD), as well as the corporates' practices in net-zero and sustainability transitions. Compared with the previous two surveys, the percentage of Taiwanese companies adopting the TCFD framework rose from 8.7% in 2022 to 14.4% in 2024. However, the proportion of companies investing in renewable energy only rose modestly from 27.3% in 2023 to 32.7% in 2024. Notably, 80.7% of respondents reported being unaware of the government's proposed carbon pricing policies, highlighting a significant gap in policy awareness.

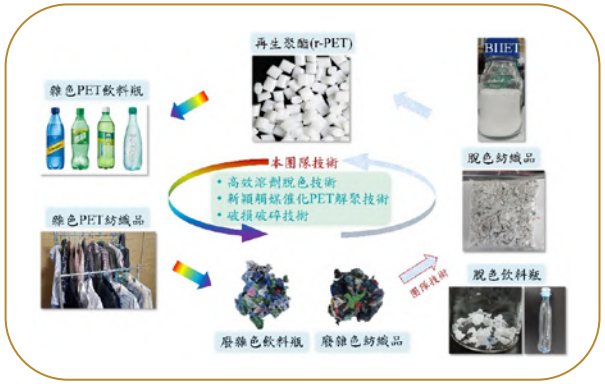
The survey findings indicate that Taiwan's transition governance remains stagnant, due to delayed policy implementation and weak momentum in renewable energy development. The postponement of carbon pricing mechanisms has exacerbated business uncertainty, hindering competitive strategy formation. In the report, the Center recommends that the government establish a robust inter-ministerial body to drive the net-zero transition more effectively. Meanwhile, businesses are urged to seize opportunities by linking executive compensation to ESG performance and investing in ESG talent development. Also, the financial sector should actively support the transition by offering climate finance products, preferential financing terms, and incentives for climate-related disclosure and low-carbon innovation. In addition, advancing emissions reduction, enhancing climate adaptation, and ensuring a just financial transition remain essential priorities for a more sustainable future.

NTU Risk Society and Policy Research Center released the results of its TCFD survey at the 2024 Fubon Sustainable Future Forum, attracting over 500 guests from government, industry, academia, and civil society (June 2024).

Novel Process Technologies to Enhance the Recycling Value of Colored Waste PET

In recent years, increasingly stringent regulations and brand requirements regarding the recycled PET (r-PET) content in polyethylene terephthalate (PET) products have driven a global surge in demand for r-PET. However, the traditional r-PET production model, which primarily relies on transparent, colorless PET beverage bottles as raw materials, is no longer sufficient to meet the million-ton scale supply gap. In contrast, the use of colored waste PET materials—recycled from discarded beverage bottles and textiles—offers a more stable and cost-effective raw material source. Yet, due to the presence of dyes, r-PET produced from these materials typically has a lower market value.

To address this challenge, a research team led by Professor Chia-Wen Wu from the Department of Chemical Engineering has developed three innovative, patented sub-technologies: high-efficiency solvent-based decolorization, novel catalytic PET depolymerization, and enhanced fracture processing, which can help transform colored PET bottles and textiles into high-quality decolorized PET materials and bis(2-hydroxyethyl) terephthalate (BHET) monomers, which are essential feedstocks for r-PET production. The team's innovations not only significantly improve the efficiency of decolorization and depolymerization processes but also address key industry challenges in Taiwan, such as the lack of patent protection and outdated dye removal technologies. By advancing these capabilities, the research enhances the international competitiveness of Taiwan's r-PET industry and substantially increases the recycling value of waste PET resources.



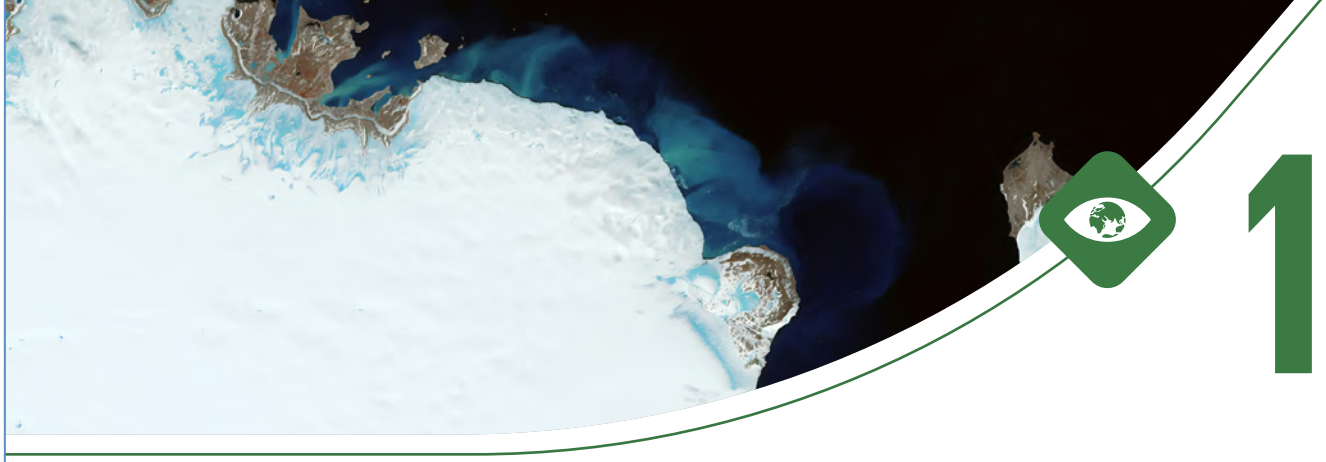
Schematic diagram illustrating the circular economy process for producing r-PET from colored waste PET materials using the three sub-technologies.

Nudging Toward Net-Zero Living: NTU's Graduate Institute of Public Affairs Explores New Strategies for Behavioral Transformation

To achieve Taiwan's 2050 net-zero emissions goal, changes in individual behavior and everyday lifestyles are essential. Supported by the Climate Change Administration at Ministry of Environment, Professor Yu-Ying Kuo and Professor Way Sun from the Graduate Institute of Public Affairs launched a project titled "Promoting and Analyzing Nudge Theory for Net-Zero Lifestyle Transition Policies," which aims to explore how nudge theory can be used to guide public behavior and decision-making.

The research team focused on encouraging alternatives to single-use plastic cups. Through interviews with student groups promoting circular cups at NTU, the team examined students' attitudes, behaviors, and the challenges they faced in adopting such initiatives. In addition, the team held three information sessions in Taipei and Taoyuan, engaging the general public, university communities, businesses, and non-profit organizations. These sessions introduced key actions under Taiwan's net-zero policy and Green Lifestyle initiatives, while also sharing strategies and design methods based on nudge theory. Through these efforts, the team hopes to foster behavior change and jointly advance the transition to a green lifestyle.

The team hosted an information session at the University of Taipei Library, where participants shared their thoughts on net-zero policies and nudge theory (August 2024).



13 CLIMATE ACTION

Climate Warnings from Historical Sites: NTU-Led International Team Deciphers an Ancient City and Its Links to Climate Change

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As global warming drives continual sea level rise, island nations are facing unprecedented survival challenges. Located on the eastern coast of Pohnpei Island in Micronesia, the ancient city of Nan Madol, often referred to as the "Venice of the Pacific," comprises over 100 artificial islands built from basalt columns and coral structures. Once the capital of the Saudeleur Dynasty, Nan Madol was eventually abandoned following the dynasty's collapse. Despite more than two centuries of research, the precise construction timeline and causes behind the dynasty's fall remain unresolved, and the potential role of climate change remains under debate.

To investigate these mysteries, Professor Chuan-Chou Shen from the Department of Geosciences at NTU led an international research team involving 23 institutions from the United States, Australia, and various countries in Asia. The team analyzed the age of corals used in the site's construction to reconstruct its building history. The findings revealed that Nan Madol was built in two major phases between the 10th and 15th centuries. The first phase marked the dynasty's rise, while the second phase coincided with geological subsidence, rising sea levels, and severe wave impacts associated with La Niña-like conditions. The gradual sinking of the land, combined with frequent seawater incursions, made the maintenance of structures increasingly difficult. This, in turn, led to growing public discontent, ultimately contributing to the fall of the dynasty and the abandonment of the city.

The research was published in October 2024 in the international journals *PNAS Nexus* and *Science*. The study provides valuable empirical evidence for archaeology and geoscience, offering new insights into the complex interplay between climate change and human societies. It also serves as an important reference for current and future island communities confronting climate-related risks.

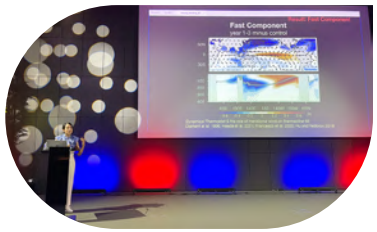
Professor Chuan-Chou Shen (foreground) and archaeologist Professor Felicia Beardsley from the University of La Verne, USA (background) collecting coral samples from the outer wall of the tomb complex at Nan Madol.

Impact of Urban Air Pollution on the Tropical Pacific and Global Climate

The eastern equatorial Pacific is the birthplace of the El Niño phenomenon and plays a critical role in regulating global temperatures and extreme weather events. Accurately predicting sea surface temperatures (SSTs) in this region has been a key challenge for climate scientists. Over the past 40 years, despite the clear trend of global warming, SSTs in the eastern Pacific have paradoxically declined, posing a major scientific mystery. Previous studies suggested that aerosols emitted from power plants and industrial zones, while harmful to human health, can reflect sunlight and induce surface cooling. However, with increasingly stringent air pollution regulations worldwide, aerosol emissions have decreased significantly since the 1980s. Yet, the cooling trend of the eastern Pacific continues, leaving its underlying cause unclear.

To address this issue, Associate Professor Yen-Ting Hwang from the Department of Atmospheric Sciences at NTU led an international research team and published findings in *PNAS* in January 2024. The study revealed that the impact of aerosols on SSTs in the equatorial Pacific may have peaked recently, and that the strongest effects occurred decades after aerosol emissions had begun to decline. This result was surprising, given aerosols have a very short atmospheric lifetime, yet their climatic effects appear only decades after emissions are reduced.

The study explains this delayed response through two separate time scales of the climate system's reaction to aerosol-induced radiative cooling: First, following aerosol reductions, atmospheric circulation adjusts rapidly, altering tropical trade winds and leading to cooling in the southeastern and central equatorial Pacific. Second, the long-accumulated cooling effect from historical aerosol emissions has been absorbed into the ocean since the Industrial Revolution, slowly intensifying the oceanic meridional overturning circulation and cooling the subsurface waters of the equatorial Pacific. These two mechanisms combined to cause a peak in surface and subsurface cooling in the eastern equatorial Pacific between 2020 and 2030. To conclude, this research provides a new perspective on tropical Pacific climate variability and highlights that the protective cooling buffer previously provided by aerosols is fading, posing additional challenges for managing global warming risks.



Associate Professor Yen-Ting Hwang presenting the research findings at an international conference.

Students conducting on-site disaster observations in Japan's Tohoku region.

Taiwan-Japan Joint Field Study: Special Topics and Overseas Fieldwork for Natural Hazards

Natural disasters have long been a central concern in geography, and remain one of the most critical global environmental challenges today. To deepen students' understanding of disasters, the Department of Geography at NTU launched the course "Special Topics and Overseas Fieldwork for Natural Hazards" in June 2024. Led by Associate Professor Ray Y. Chuang, 12 students traveled to the Tohoku region of Japan for a field study in collaboration with Professors Yasufumi Iryu and Jun Muto and their students from the International Research Institute of Disaster Science (IRIDeS) at Tohoku University.

The first half of the course focused on the areas affected by the 2011 Great East Japan Earthquake and tsunami, with on-site observations along the coasts of Miyagi and Iwate Prefectures to assess post-disaster recovery, the effectiveness of reconstruction policies, and community rebuilding efforts. Particular attention was given to the preservation and revitalization of disaster heritage sites, which have become important tools for promoting local economic recovery and disaster education. In the second half of the course, students explored the inland areas of the Tohoku region, observing other types of natural hazards as well as issues related to geothermal energy and mineral resources. Through fieldwork and exchanges between the faculty members and students from both Taiwan and Japan, participants not only deepened their understanding of disaster mechanisms and risk reduction strategies, but also gained valuable insights into local reflections on disasters in Tohoku, broadening their international perspectives and research outlook.

14 LIFE BELOW WATER

NTU's "New Ocean Researcher 1" Completes Its First International Voyage

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In 2024, the domestically-built research vessel New Ocean Researcher 1, managed by the Institute of Oceanography at NTU, successfully completed its maiden international voyage to Palau. The 24-day expedition covered a distance of 2,500 nautical miles and achieved multiple oceanic and atmospheric observation missions, marking a new milestone for Taiwan's domestically-constructed research vessels. The New Ocean Researcher 1 serves the missions of advancing marine scientific research, and providing education and training, with a core focus on integrated atmospheric and oceanographic observations. Equipped with a meteorological tower at the bow, the vessel is capable of collecting weather data in real time during voyages and transmitting it via satellite communication to the Taiwanese Central Weather Administration, effectively extending the reach of land-based weather monitoring networks.

This voyage was led by Distinguished Professor Sen Jan and Professor Yiing-Jang Yang. The research team included faculty members, students, research assistants, and technicians from six universities and seven academic departments, including NTU, National Central University, National Cheng Kung University, National Sun Yat-sen University, National Taiwan Normal University, and National Taiwan Ocean University. The team conducted interdisciplinary joint investigations, including observations of the Kuroshio Current, the North Equatorial Current, and mesoscale ocean eddies, as well as the launch of radiosondes to collect data on air quality, rainfall, and cloud structures. In addition, the expedition also successfully carried out mesoscale oceanographic and atmospheric observations, reaching up to 15,000 meters above and 1,000 meters below the sea surface.

"New Ocean Researcher 1" successfully overcame challenges of endurance and supply capacity to complete its historic first international voyage.

The New Ocean Researcher 1 completed a sea surface mission, collecting data from as high as 15,000 meters above to 1,000 meters below the sea surface.

The observational data collected during this voyage are expected to contribute to improving large-scale ocean forecasting models and enable deeper research into the physical mechanisms of energy transfer between seabed seismic activity and tsunamis. These results will also support future projections of global warming trends and the distribution and variability of oceanic blue carbon, laying a solid foundation for building a comprehensive ocean data repository for Taiwan and strengthening the nation's marine scientific research capacity.

Analyzing 21 Years of Fisheries Data: Impacts of Climate Change on Marine Resources

Climate change, along with other anthropogenic factors, is reshaping the landscape of global marine fisheries. With advances in technology, fishing vessel route tracking and catch management have become increasingly digitalized and real-time, building a rich database that underpins modern fisheries science. Integrating fisheries data with atmospheric and oceanographic conditions provides critical insights into how climate change and human activities affect marine resources and helps develop adaptation strategies. Building on the foundation of data-driven analysis, Associate Professor Chia-Yin Ko from the Institute of Fisheries Science, Professor Emeritus Tai-Sheng Chiu from the Department of Life Science, and Dr. Wan-Ling Tseng from the NTU Ocean Center formed a research team that has long collaborated with Taiwan's Fisheries Agency of the Ministry of Agriculture and the Overseas Fisheries Development Council. Together, they established a comprehensive database on the Argentine shortfin squid (Illex argentinus), a key species in Taiwan's distant-water fisheries.

Using fishing log data reported by fishermen, the team conducted spatiotemporal analyses of squid catch patterns, providing critical scientific evidence for fisheries ecology, economic development, seafood security, and marine conservation. The study analyzed 21 years of squid catch data (1998–2018), using catch per unit effort (CPUE) as an index of squid abundance and linking it with large-scale regional oceanographic conditions. Findings showed that lower sea surface temperatures in January and February and stronger eddy kinetic energy (EKE) from March to May were associated with higher squid abundance. However, increases in sea surface temperature driven by global warming may offset these positive effects, highlighting the significant influence of atmosphere-ocean interactions on fisheries resources.

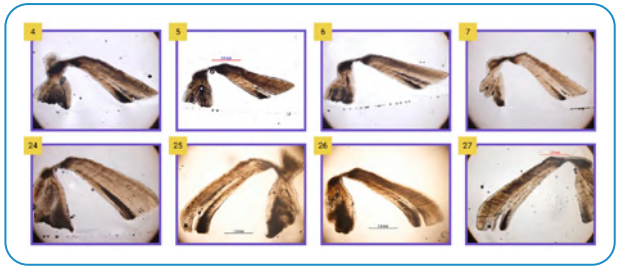
This research was published in the journal *Environmental Research* in 2024. Moving forward, the team aims to further refine large-scale biogeographic analysis methods and develop seasonal forecast systems to help fishermen anticipate changes in springtime squid abundance, opening new possibilities for fisheries prediction and sustainable resource management.

Applying Artificial Intelligence to Fisheries Conservation: Estimating Fish Age Using Deep Learning

The Pacific bluefin tuna (*Thunnus orientalis*) has experienced significant population declines over the past 25 years due to environmental degradation. In Taiwan, the seasonal catch of mature Pacific bluefin tuna hit a historic low in 2012, representing a 93% decline compared to 1999. However, following the implementation of a series of stringent management measures, the biomass of Pacific bluefin tuna has gradually begun to recover in recent years.

To better monitor the dynamics of the Pacific bluefin tuna population, an interdisciplinary research team, comprising Associate Professor Yi-Jay Chang and Prof. Jen-Chieh Shiao from the Institute of Oceanography, and Prof. Yan-Fu Kuo and graduate student Tsung-Hsiang Ma from the Department of Biomechatronics Engineering at NTU, developed an AI-based deep learning system to automatically estimate the age of Pacific bluefin tuna using otolith images. This system significantly improves the efficiency of analyzing fish growth rates, maturity ages, life spans, and age structures.

The model employs convolutional neural network (CNN) techniques to perform automated age estimation based on otolith cross-section images. To enhance the model's accuracy in estimations, the team also incorporated supplementary training data such as otolith weight, body weight, and body length. This real-time model enables rapid estimation of fish age composition, marking a major advancement in applying machine learning to fisheries science. This system not only accelerates monitoring of the age structure and population dynamics of Pacific bluefin tuna, but also enables more effective assessments of the impacts on marine resources by fishing, offering an innovative technological solution for sustainable fisheries management and marine conservation. The research results were published in *Fisheries Research* in 2024 .



Cross-section images of Pacific bluefin tuna otoliths at different ages(estimated ages indicated in the upper left corner).

15 LIFE ON LAND

Rehabilitation Research on Yellow-Margined Box Turtle Enhances Rewilding Efficiency and Population Sustainability

The yellow-margined box turtle (*Cuora flavomarginata*), indigenous to Taiwan and listed as a Category 1 protected species (i.e., endangered), has faced increasing threats in recent years, including habitat loss and illegal poaching. In response, authorities have initiated translocation and restoration programs. However, two critical challenges remain. First, the status of both wild and restored populations is unclear due to the lack of effective monitoring benchmarks; second, conservation efforts have focused primarily on adult turtles, leaving significant gaps in understanding the ecological habits and adaptability of hatchlings.

To address these issues, Assistant Professor Jhan-Wei Lin and his research team from the Department of Life Science at NTU conducted a mark-recapture study to accurately estimate population parameters such as survival and migration rates within rehabilitated turtle groups. The findings showed a generally stable population, with males exhibiting greater mobility and more likely to disperse beyond restoration sites, while females tended to remain within original habitats. The team also monitored the post-release behavior of 23 hatchlings, revealing their strong adaptability and preference for habitats with lower crown closure (i.e., lightly shaded) edges of broadleaf forests, a key insight for future habitat management.

This study marks Taiwan's first detailed monitoring of yellow-margined box turtle populations and systematic tracking of wild-released hatchlings. It provides a scientific basis for assessing the effectiveness of restoration efforts and the viability of including hatchlings. The former provides a benchmark for evaluating translocation outcomes, enhancing the accuracy of population management. The latter confirms that small-bodied individuals, such as hatchlings, are highly adaptable in the wild and can be included in future restoration programs, reducing pressure on rearing facilities and improving population age structure. Together, these findings strengthen conservation planning and action strategies, increasing the species' chances of sustainable survival.

The research team conducting tracking work in the wild.

Documenting the morphological features of a marked yellow-margined box turtle.

Promoting Sustainable Forestry: NTU Experimental Forest Collaborates with Local Partners

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In order to promote nature education and foster community collaboration, the NTU Experimental Forest has implemented the "community forestry plan" to integrate sustainable forestry practices into local community development. The program encompasses three core areas: natural resource surveys (including biodiversity assessments, long-term ecological monitoring, and local personnel training), forest conservation (such as reforestation, wildfire prevention, forest protection, flood control, and training efforts), and forest-based recreation (covering eco-tourism planning as well as habitat creation and maintenance). On the macro level, the program also contributes to holistic community development, the advancement of eco-tourism, and cooperative forest stewardship. Grounded in the principles of nature conservation and sustainable forest management, the initiative partners with communities on forest patrols and incident reporting, sharing responsibilities in operations, development, and maintenance. In addition, training programs are also organized to cultivate docents for guided tours. These efforts contribute to building local capacity and foster enduring partnerships.

In 2024, the NTU Experimental Forest supported a total of eight community forestry proposals. Among them, the Tongpuze Creek Environmental and Ecotourism Protection Association from Nantou County provides eco-tour guide training, environmental education programs, and strengthens resource survey capabilities. Meanwhile, the Kalibuan Community Development Association channels its efforts to protect the natural resources of indigenous communities through forest patrols, maintenance of environmental facilities, and the prevention of poaching, illegal logging, and environmental degradation.

Through this initiative, the NTU Experimental Forest helps communities establish development visions and goals, empowering them to build distinctive strengths in natural resource surveys, forest conservation, and forest recreation. These efforts not only enhance community cohesion and autonomy, but also foster partnerships with the Experimental Forest to advance environmental sustainability.

The NTU Experimental Forest collaborated with the Kalibuan Community Development Association in Sinyi Township, Nantou County, to carry out forest patrol.

Beneath the Surface: NTU's Soil Museum Showcases Earth's Hidden Riches

Researchers from INRAE (France's National Research Institute for Agriculture, Food, and Environment) and Taiwan Agricultural Research Institute visit the Soil Museum.

Soil forms the foundation of life on Earth, and its formation is influenced by factors such as parent material, climate, vegetation, topography, and time. Among the 12 primary orders of soil taxonomy, 11 are found in Taiwan (with Gelisols—dark, organic-rich soils underlain by permafrost—being the only exception). To help the public appreciate the diversity and significance of the ground beneath their feet, the Department of Agricultural Chemistry at NTU has established Taiwan's one and only university-based Soil Museum.

Since 2020, the museum has offered both educational and interactive tours to individuals and groups of all ages and backgrounds. Through exhibits featuring soil samples, teaching materials, and photographs, the museum is committed to fostering a deeper understanding of soil's essential role in everyday life, from plant growth and agriculture to sports fields, climate change, and food safety. The museum also integrates interdisciplinary knowledge from soil and environmental science, plant physiology and chemistry, microbiology and biotechnology, and bio-resource utilization, to further enrich public understanding of soil science.

To date, the museum has welcomed more than 800 visitors, including teachers, students, parents, NGOs, farming groups, environmental advocates, artists, and scholars from home and abroad. Through its outreach, the museum continues to promote "soil literacy" across diverse communities and raise public awareness about soil and environmental sustainability.

16 PEACE, JUSTICE AND STRONG INSTITUTIONS

Tracking Democracy and Governance in Asia: Insights from the Asian Barometer Survey (ABS)

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The Hu Fu Center for East Asia Democratic Studies at NTU's College of Social Sciences has long been dedicated to tracking democratic development in Asia and is one of the most important institutions for studying global trends in democratic transition and decline. The Center brings together a team of domestic and international scholars with experience in cross-national surveys, and serves as the global headquarters of the Asian Barometer Survey (ABS). Under a standardized survey design and integrated research framework, the Center has long focused on political culture, regime change, and democratization in Asia. Drawing on a cross-national research network and accumulated empirical data, the ABS has become an important foundation for understanding shifts in confidence in democracy, institutional resilience, and governance challenges across Asian countries.

The sixth wave of the ABS (2021–2024) spans 13 countries and includes data from over 16,000 respondents, offering a solid empirical foundation for evaluating institutional trust, governance quality, and regional cooperation. By assessing public perceptions of corruption, political trust, and democratic legitimacy, the ABS provides a robust evaluation of the current governance performance across countries. It evaluates public trust in core institutions—including the electoral system, judiciary, law enforcement, and political parties—to identify governance shortcomings and guide potential reforms.

The ABS team meets to finalize details regarding the survey (October 2024).

At the same time, the ABS also examines levels of political participation, civil liberties, and support for democratic values, and assesses the effectiveness of each country's political system in upholding peace and justice. The survey data not only supports cross-national collaboration and data-driven policymaking, but also serves as a valuable tool for comparison and knowledge exchange across Asia. It contributes to strengthening institutions, advancing sustainability, and deepening regional cooperation.

2024 Just Transition Survey Highlights Urgent Climate and Equity Challenges in Taiwan

As the impact of climate change intensifies, the global push towards net-zero transition is gaining momentum. However, while social transformation is essential, it may inadvertently marginalize disadvantaged populations. Therefore, ensuring a just transition—one that leaves no one behind—is imperative. To achieve this goal, the Risk Society and Policy Research Center (RSPRC) at NTU has conducted three consecutive years of surveys on "just transitions". In 2024, the survey focused on the support and adaptation needs of youth, workers, and vulnerable groups. The findings were presented at a press conference, where experts from various sectors were invited to discuss the results. The event also drew significant media attention, helping raise awareness and spark broader societal discussion on the issues of climate change and a just transition.

According to survey results, 86.5% of participants believe that Taiwan has "severe" income inequality, and 80.9% of respondents are "worried" about global warming. Yet, with regard to policy communication, it was found that 62.1% of participants lack a strong understanding of the government's carbon reduction policies, and most people (64.6%) believe that the carbon reduction pressure placed on industries by the government will be transferred to employees.

In addition, some respondents (45.5%) believe that the policymaking process regarding net-zero emissions lacks a tripartite mechanism that involves the government, employers, and employees, while 59.8% believe that existing carbon reduction policies fail to properly consider public opinion. These results indicate that the public is generally concerned about the impacts of climate change and carbon reduction policies, and expects the government to allocate greater resources and attention to such issues. In response, the research team proposed three key recommendations: 1) to promote fairer distribution of social resources; 2) to strengthen policy communication among the government, business, and labor sectors; and 3) to establish a climate social fund (for just transition) as soon as possible in line with the COP29 resolution, to ensure that everyone is considered and protected throughout the transition process.

Press conference for the release of the 2024 Just Transition in Taiwan Survey (December 2024).

2024 Spring Forum Highlights Forensic Interviewing in Child Protection: From Casework to Policy Reform

On April 23, 2024, the NTU Children and Family Research Center, sponsored by the CTBC Charity Foundation, and the Taiwan Social Resilience Research Center (TSRRC) co-hosted the Spring Forum, focusing on forensic interviewing in child protection cases. Assistant Professor Ching-Yu Soar Huang, formerly of Keele University's School of Psychology (UK), shared insights on the development and practice of forensic interviewing in the UK and Taiwan. Judge Ming-Hui Cheng of the Yilan District Court and Prosecutor Shu-Tzu Hung of the Taiwan High Prosecutors Office also participated as panelists, offering legal perspectives on the issue. The session was moderated by Dr. Hsiao-Lin Hwa—Professor at NTU's Graduate Institute of Forensic Medicine and Attending Physician at NTU Hospital's Department of Obstetrics & Gynecology, and attracted 134 participants both in person and online.

Since 2012, the NTU Children and Family Research Center has promoted the Investigative Interview Protocol published by the U.S. National Institute of Child Health and Human Development (NICHD), assisting social workers, police officers, and prosecutors in Taiwan in improving child victim interviewing techniques to enhance testimony credibility and conviction rates. During the forum, Prof. Huang noted that trainees in Taiwan showed a significant improvement in recognizing direct and open-ended questions, demonstrating the training's effectiveness. Judge Cheng emphasized the importance of child testimony in sexual assault cases and advocated for streamlined procedures and simplified questioning to reduce the risk of miscarriages of justice. Prosecutor Hung outlined challenges professionals may face during investigations and proposed expanding the scope of cases eligible for expert support, along with establishing ethical guidelines and a licensing system to facilitate better collaboration.

Looking ahead, the NTU Children and Family Research Center will continue to promoting reforms in judicial inquiry and advocate for legislative amendments to strengthen personnel capacity and emergency protocols, thereby reinforcing the foundation of child protection practices.

17 PARTNERSHIPS FOR THE GOALS

Strengthening Emergency Care in Somaliland: NTUH Yunlin Branch Launches Medical Training Programs

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National Taiwan University Hospital (NTUH) Yunlin Branch, in collaboration with the International Cooperation and Development Fund (TaiwanICDF), has launched the "Public Health Emergency Response System Enhancement Project in Somaliland" to strengthen emergency preparedness and response capabilities in the capital of Somaliland and its surrounding regions. The project is dedicated to enhancing both pre-hospital and in-hospital emergency care access for local populations during accidents and health crises, while simultaneously building the capacity of healthcare professionals to respond to large-scale disasters and public health emergencies.

In December 2024, the first Advanced Cardiac Life Support (ACLS) and Prehospital Emergency Care (PEC) training courses were held in Somaliland. These courses were led by locally trained seed instructors—four physicians and four nurses—who had previously completed training at NTUH Yunlin Branch. With the support of Taiwan's professional trainers and donated equipment, the seed instructors developed course materials and utilized brand-new training devices and medical simulators to deliver a robust, hands-on curriculum to 36 local healthcare workers.

After completing the training, trainees reported significant improvements in their clinical competencies, noting that the program enabled realistic simulations of emergency scenarios and enhanced the professional capacity of local medical teams. Dr. Wen-Chu Chiang, Vice Superintendent of NTUH Yunlin Branch, emphasized that the cornerstone of this initiative and training program lies in the model of "local professionals training local professionals," which reflects the philosophy of "Taiwanese wisdom, Somaliland solutions." Specifically, by embedding Taiwanese-originated, locally-taught emergency care models within the Somaliland community, the seed instructor system fosters not only local ownership of sustainable medical practices but also a resilient foundation for Somaliland's emergency medical system.

The seed instructor leading a Prehospital Emergency Care (PEC) training course.

Technology-Enhanced Epidemic Prevention Efforts to Strengthen Tuberculosis Surveillance in Namibia

Tuberculosis (TB) remains one of the world's most significant infectious diseases, particularly in low- and middle-income countries. Professor Hsien-Ho Lin, Director of the Institute of Epidemiology and Preventive Medicine at NTU's College of Public Health, has collaborated with the University of Namibia, the Namibian Ministry of Health & Social Services, and Harvard Medical School to implement a comprehensive TB prevention and treatment program in Namibia. The initiative seeks to reduce TB transmission and alleviate its economic repercussions through proactive screening efforts aimed at identifying multidrug-resistant TB (MDR-TB) in community hotspots, healthcare facilities, and patients' homes. These efforts are intended to enable early detection, interrupt transmission chains, and enhance treatment outcomes.

In addition to medical intervention, the program also addresses TB's economic impact on affected families. Household surveys are conducted to evaluate whether proactive screening strategies can help reduce the likelihood of catastrophic healthcare expenditures. Recognizing the logistical challenges posed by limited transportation infrastructure, the Acer Foundation contributed 300 tablet devices equipped with communication capabilities to support data collection and real-time monitoring of disease transmission. By integrating professional expertise with digital technology, the project advances global health governance by leveraging Taiwan's experience, exemplifying our strong commitment to promoting health equity in line with the UN SDGs.

The Acer Foundation supports NTU's TB prevention initiative in Namibia with advanced technological devices.

Implementation of NTU's International Altruistic Service for International Diplomacy

International internships and service learning constitute a key component of NTU's commitment to fostering students' global perspectives and cross-cultural competence. Through NTU student clubs like the World Volunteer Society (NTUWVS) and Service-Learning in Northern Thailand (NTUSLINT), we uphold the principle of "diplomacy for all people." Over the past 17 years, these clubs have traveled to Mumbai, Ladakh, Nepal, and Northern Thailand, forging long-term bonds with local schools and communities, and offering services to over 5,000 individuals. Notably, the Global Volunteer Network (GVN) connects Taiwan's volunteer organizations with those abroad, encouraging youth to engage with international NGOs and NPOs, deepening students' global engagement and raising NTU's international visibility.

In summer 2023, NTUWVS embarked on a 15-day trip to Vinayak Shiksha Niketan School in Nepal. Before the trip, the team collaborated with government and civic bodies on volunteer training and devised an eight-week lesson plan on Mandarin, culture, and science to foster global citizenship among local students. Beyond that, NTUWVS members immersed themselves in the local culture, fostering trust, friendship, and cooperation with local organizations and overseas Chinese communities.

The NTUSLINT introduced classes on learning and practicing knotting.

The NTUWVS equips students with fundamental programming concepts by manipulating logic blocks.

Similarly, NTUSLINT has visited dozens of Chinese schools in villages such as Nong Bua, Mae Sai, Pha Dang, and Phayapai. In winter 2024, the team visited Nong Bua, where they spent time with local elders and conducting a 20-day immersive program for students from kindergarten to high school at Zhongxing and FuHwa Schools. The curriculum featured engaging lessons on Scout knotting, bamboo catapults, digital literacy, and animal product processing. Through service, NTU students connect with the world, transcend language and cultural boundaries, and collaborate with international partners to foster impactful global change.

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