國立臺灣大學
National Taiwan University

2020 NTU

Social Responsibility and Sustainability Report

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Data Sources

SDGs' research output revealed in this report are derived from Clarivate's InCites database and based on keywords developed by Elsevier.

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From the President

It is time for universities to make "pioneering the future" part of their responsibilities based on the spirits of initiative, progress, and self-awareness.

The pandemic COVID-19 spread all over the world last year, and it hasn't subsided yet. From a macro perspective, the pandemic has changed the political and economic development in every country. From a micro perspective, this highly contagious and deadly disease has changed the interpersonal networks, from the forms of academic exchanges at home and abroad to the way through which students access quality education. What remains unchanged is that NTU will continue to fulfill its responsibility to society.

Last year, NTU released the first University Social Responsibility and Sustainability Report (USR Report). This year, the second NTU USR Report will present the results of NTU's commitments to society in the previous year.

This year, the USR Report is divided into three parts. Part One, titled "Achievements in Prevention and Control of COVID-19," summarizes the measures taken by and contributions of NTU in addressing COVID-19. Part Two, "Sustainability Governance at NTU," lays out NTU's visions and strategies for sustainable practices. Part Three is titled "Highlights of Social Impact," which showcases the qualitative results of NTU's efforts in working towards the 17 Sustainable Development Goals (SDGs) announced by the United Nations in 2015.

In fact, all three parts of the report focus on identifying and reaching the UN SDGs. The 17 SDGs are aimed at three major directions: economic growth, social progress, and environmental protection. Firstly, NTU's efforts in preventing and controlling COVID-19 on- and off-campus are no different than its efforts in promoting social progress, of which the purpose is "to ensure good health and well-being for all". Secondly, NTU Sustainability Plan includes projects that involve designing a carbon neutrality path and analyzing how foreign universities address issues surrounding water, food, energy, air, transportation, waste, and construction. The objective is, of course, to promote environmental protection. By horizontally enabling cross-disciplinary and cross-agency collaborations and vertically connecting the industry with useful human resources and technology, NTU successfully propelled diversified industry-university cooperation, shortened the distance between the university and society, and facilitated economic growth. An upgrade of the NTU SDGs website and establishment of the SDGs database mentioned in Part Two "Sustainability Governance at NTU" as well as NTU's achievements in Part Three "Highlights of Social Impact" are all directly linked to the 17 SDGs, and this shows that NTU is not missing out on the opportunity of establishing global partnerships. To sum up, this report is a reflection of how NTU has kept up with the world with its social, environmental, and economic achievements.

As NTU works towards being great and better, it continues to base its action on sustainability and altruism, takes the initiative where it is needed, and demonstrates the spirit of social awakening as a university. The world is at a time of change and universities must stand shoulder to shoulder with our society to face the formidable challenges together. Not only does this report outline NTU's future directions, but it also serves as an important index for tracking societal progress.

2021.05.04

President Chung-Ming Kuan

Part One

Achievements in Prevention and Control of COVID-19

COVID-19: A War We Fight as One

In the face of the worst pandemic in a century, NTU stepped up to the plate and fought alongside the people of Taiwan. Some of our faculty members have come forward to the front line and helped the government with policy making by offering their expertise. Others have participated actively in antibody testing and vaccine development. To protect the health of our teachers and students, the campus instantly took control measures, and a distance learning platform was available for overseas students who had not been able to return to Taiwan. Collectively, we at NTU have spared no effort and played our part as a responsible member of society.

The Best Think Tank: CDC's Advisory Panel of Experts

In 2003, Taiwan was hit by the outbreak of Severe Acute Respiratory Syndrome (SARS). We learned from the experience, so when an unidentified pneumonia broke out in Wuhan, China in early January 2020, Taiwan Centers for Disease Control (CDC) promptly appointed Professor Shan-Chwen Chang, Executive Vice President of NTU, to assist in setting up an advisory panel made of experts. Many of the panelists are professors from NTU's College of Medicine and College of Public Health, including Yee-Chun Chen, Li-Min Huang, Ping-Ing Lee, Sui-Yuan Chang, Daniel Fu-Chang Tsai, and Chi-Tai Fang. Participation of the advisory panel enabled the Central Epidemic Control Center (CECC) to instantly develop precise and science-based prevention strategies. Together with the devotion of healthcare providers island-wide and self-discipline of the general public, Taiwan has impressed the world with the successful containment of the spread of COVID-19.

Protector of NTU Campus: NTU Epidemic Prevention No. 1:

The campus control measures include "campus footprint" and body temperature screening at entrances into buildings on campus. With more than 70,000 people coming in and out of NTU campus every day, it would have been time-consuming and increased the risk of infection for body temperatures to be taken manually at every entrance. The solution was "NTU Epidemic Prevention No. 1," a control device that identified the person by their ID card, took body temperature, and sent the data wirelessly to the cloud database and access control system. Alerts were sent when anomalies were detected. With cost lower than thermal imaging, "NTU Epidemic Prevention No. 1" significantly reduced the cost of epidemic prevention and campus management. NTU also offered the blueprint of "NTU Epidemic Prevention No. 1" free of charge to public facilities, and several of them have built their own devices, including Taipei Children's Amusement Park and Hsinchu Motor Vehicle Office. "NTU Epidemic Prevention No. 1" was first developed by Dr. Jen-Sen Liu, a technical specialist at NTU's Department of Electrical Engineering (NTUEE). The device was then upgraded and set up by other NTU institutes and a team of NTUEE students. It is indeed a synergetic result of collaboration between institutes, professors, and students.

Prof. Shan-Chwen Chang, Executive Vice President of NTU and convener of CECC's expert advisory panel

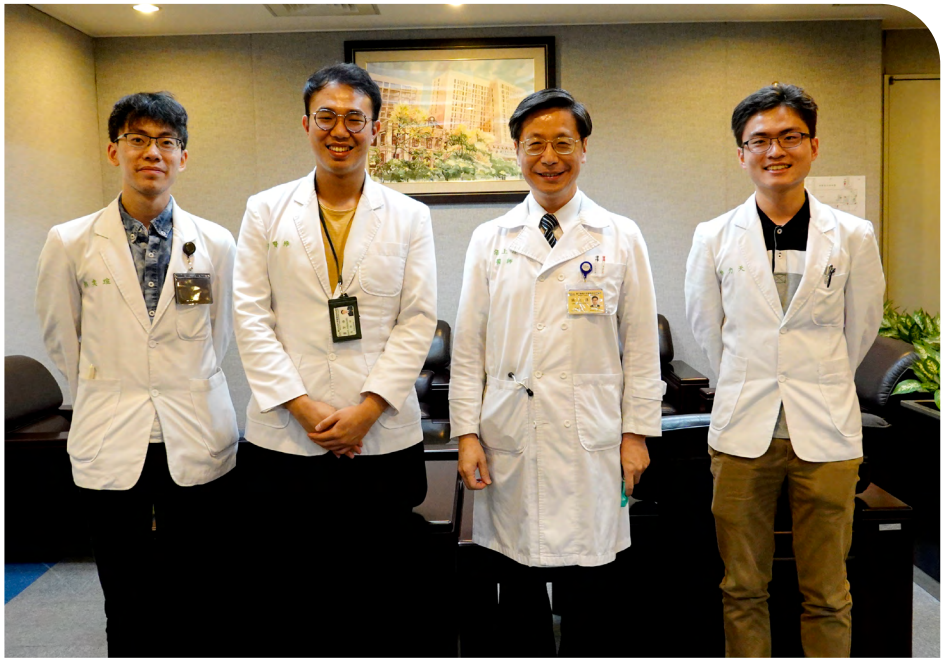
NTU Students Play Their Part

While Taiwan's fight against COVID-19 has been a success story worldwide, international public health organizations found it difficult to learn from the Taiwan experience, because the CDC website did not provide sufficient information in English. With the approval from the Executive Yuan, NTU's medical students association and public health students association both recruited student volunteers to translate CDC's Interim Guidelines for Clinical Management of COVID-19 into English. They also created Fight COVID Taiwan, an English website with topical columns and answers to questions frequently asked by foreign press. The translations were reviewed by medicine and public health professors to ensure their reliability. Despite pressure from the academic work and internship, NTU students spent time translating gratuitously out of love for humanity. Their hard work and enthusiasm were praised by British MP Jeremy Hunt's office and professors of University of Indonesia. Their act of selflessness was the best campaign of international publicity for Taiwan.

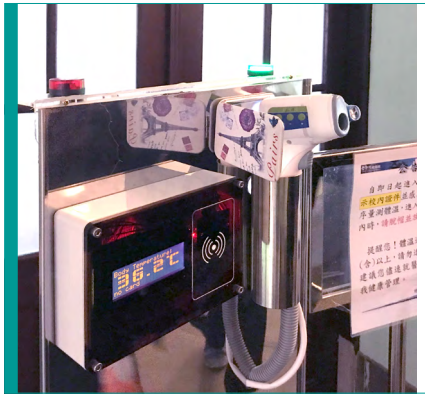
NTU Research Center for Epidemic Prevention Science

In November 2020, NTU Research Center for Epidemic Prevention Science held "Insights About COVID-19 Prevention" Conference. Topics included vaccines, research of new drugs, testing technology, and infection control. Experts from academia, research institutes, and the industry were invited to speak and share ideas with each other. They also discussed COVID-19's impact on the way people work and the trends of employment. Development Center for Biotechnology, BioMed Commercialization Center (Drug Division), and corporations such as Medigen Vaccine Biologics, PlexBio, Taigen, Level Biotechnology, and Genelabs Life Science talked about collaboration between the industry and academia. As the battle against COVID-19 continues, NTU will carry on integrating its academic and research capabilities, so as to influence and change the society in a positive way.

In areas concerning COVID-19 prevention and research,
in 2020 NTU was granted 8 government projects, participated in
20 industry-academia collaboration projects, and licensed **17** technologies
that covered rapid screening, vaccine development, and drugs.



Fight COVID Taiwan team and Prof. Shan-Chwen Chang



Thanks to donations from NTUEE alumni, **17** devices were donated to National Central Library, Taipei Public Library, Mingchuan Elementary School, among other public facilities.

COVID-19 Special Visiting Student Program helped **404** Taiwanese students whose education abroad was interrupted by the pandemic to continue their education at NTU.

NTU COVID-19 Special Visiting Student Program

The outbreak of COVID-19 forced universities around the globe to close their campuses, making it impossible for many Taiwanese students to study abroad. As the pandemic was well-controlled in Taiwan, foreign universities asked if their sister universities in Taiwan could help enroll their students as a way to protect their right to education. In academic year 2020, NTU launched COVID-19 Special Visiting Student Program, which enabled students who had begun or were about to study overseas to take courses at NTU as visiting students, and the credits would be recognized by the original universities. The program received an enthusiastic response. 90% of the students in the program were from NTU's sister universities, including University of Toronto, University of Ottawa, University of California, University of Washington, University of Minnesota, New York University, University of Illinois at Urbana-Champaign, University of Wisconsin–Madison, University of Southern California, Purdue University, Oxford University, The University of Edinburgh, The University of Manchester, SOAS University of London, King's College University of London, Universiteit van Amsterdam, Universiteit Utrecht, The University of Sydney, The University of Queensland, Kyushu University, and Sophia University, among other prestigious universities in the world.

Helping Students Find the Way Back to Taiwan

In accordance with the guidelines and regulations of the Ministry of Education (MOE) and the CECC, and based on the premise of "prevention first" and "protection of right to education," NTU has followed the implementation procedures and relevant measures to assist foreign students to return Taiwan to continue their studies. In 2020, 855 students applied to enter Taiwan (305 overseas Chinese, 350 mainland Chinese, and 200 international students). They stayed in 10 quarantine hotels. From airport pickups, hotel check-ins, epidemic prevention pamphlets and quarantine bags, and quarantine telephone calls, to helping the students move to dormitories, contacts from advisors, and assistance from Student Counseling Center, it was made possible by joint efforts of relevant agencies. In order to relieve the financial burden on overseas students, NTU offered a special epidemic subsidy program for overseas

Chinese students. The "New Overseas Student Support Program" subsidized 59 overseas Chinese students, with a total subsidy of NT$1,062,000. The "Quarantine Support Program for Underprivileged Overseas Chinese Students and International Students" subsidized 139 students, with a total subsidy of NT$1,042,500.

COVID-19 Anxiety Relief

To help the students through the difficult times of the pandemic, the Student Counseling Center's website has included a "COVID-19 Anxiety Relief" page, where students will find resources to help them through the tough times of COVID-19, such as how to cope with the delayed academic year, information anxiety, and "mental" fever. Hopefully, they will be able to take care of their physical and mental health in the face of COVID-19.

The "COVID-19 Anxiety Relief" page has **3,973** views.

Dr. Taiyin Yang, recipient of NTU's 15th Distinguished Alumnus Award

NTU Alumnus Taiyin Yang Leads Research on Remdesivir

In 2020, as COVID-19 spread rapidly around the world and tensions mounted, reports that patients had been treated effectively with Remdesivir immediately drew international attention. Originally a drug used for the treatment of Ebola virus infections, Remdesivir was developed by Taiyin Yang, an NTU alumnus who graduated from the Chemistry Department in 1974. Now the drug is being used to treat COVID-19. Dr. Yang is Executive Vice President of Pharmaceutical Development and Manufacturing of Gilead Science. After graduating from NTU, she received her PhD in organic chemistry from the University of South California. In 2020, Dr. Yang was invited to speak at NTU's commencement ceremony. She is also one of the recipients of NTU's 15th Distinguished Alumnus Award in the social service category. Her contribution has been widely recognized around the globe.

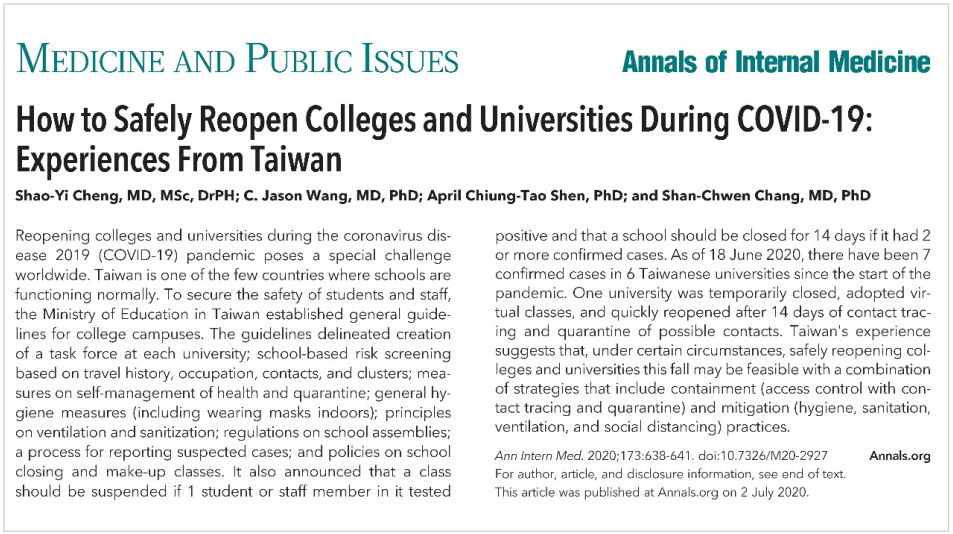
Professor Sui-Yuan Chang, Department of Laboratory Medicine

Virus Isolation Paves Way for Vaccine Development

When COVID-19 broke out in late January 2020, the world was yet to realize how threatening the virus could be. Professor Sui-Yuan Chang had already led her research team to work on this new virus. Besides teaching at NTU's Department of Laboratory Sciences and Medical Biotechnology, Professor Chang is also the deputy director of Department of Laboratory Medicine at NTU Hospital. She and her team sacrificed their Chinese New Year holidays in early 2020, and in only three days, they successfully isolated the first strain of Taiwan's variant of COVID-19, making Taiwan the fourth country in the world to isolate the virus. Information of the virus strain made it possible to understand the pathogenicity of the virus and hasten the development of drugs, vaccines, and reagents for testing. Professor Chang and her team's achievement has laid a solid research foundation for epidemic prevention in Taiwan.

NTU Experience Published in Prestigious Medical Journal

An article detailing Taiwan's experience in countering the spread of COVID-19 was published in the Annals of Internal Medicine, a prestigious international medical journal. It was co-authored by Associate Professor Shao-Yi Cheng (NTU Health Center Director), Professor Shan-Chwen Chang (NTU Executive Vice President), Professor April Chiung-Tao Shen (NTU Vice President for Student Affairs), and Associate Professor C. Jason Wang (Stanford University School of Medicine). The article was published online in July, at which time there was intense debate in the U.S. regarding whether to allow students to return to campus for the fall semester, and it was cited and discussed by a number of major international news outlets. Time magazine, for example, cited the article and lauded Taiwan's response to the pandemic. The article has also inspired a large number of tweets with over a million followers. The article mentions how NTU reacted swiftly by setting up a response task force and announcing epidemic prevention measures, campus safety measures, and regulations on home quarantine for international students. "NTU Epidemic Prevention No. 1," a screening device, was deployed to control access into buildings on campus. Together with strategies designed by NTU Health Center, the prevention system has proven extremely effective, making Taiwan and NTU a success story in the battle against COVID-19 worldwide.



MEDICINE AND PUBLIC ISSUES

Annals of Internal Medicine

How to Safely Reopen Colleges and Universities During COVID-19: Experiences From Taiwan

Shao-Yi Cheng, MD, MSc, DrPH; C. Jason Wang, MD, PhD; April Chiung-Tao Shen, PhD; and Shan-Chwen Chang, MD, PhD

Reopening colleges and universities during the coronavirus disease 2019 (COVID-19) pandemic poses a special challenge worldwide. Taiwan is one of the few countries where schools are functioning normally. To secure the safety of students and staff, the Ministry of Education in Taiwan established general guidelines for college campuses. The guidelines delineated creation of a task force at each university; school-based risk screening based on travel history, occupation, contacts, and clusters; measures on self-management of health and quarantine; general hygiene measures (including wearing masks indoors); principles on ventilation and sanitization; regulations on school assemblies; a process for reporting suspected cases; and policies on school closing and make-up classes. It also announced that a class should be suspended if 1 student or staff member in it tested positive and that a school should be closed for 14 days if it had 2 or more confirmed cases. As of 18 June 2020, there have been 7 confirmed cases in 6 Taiwanese universities since the start of the pandemic. One university was temporarily closed, adopted virtual classes, and quickly reopened after 14 days of contact tracing and quarantine of possible contacts. Taiwan's experience suggests that, under certain circumstances, safely reopening colleges and universities this fall may be feasible with a combination of strategies that include containment (access control with contact tracing and quarantine) and mitigation (hygiene, sanitation, ventilation, and social distancing) practices.

Ann Intern Med. 2020;173:638-641. doi:10.7326/M20-2927 Annals.org

For author, article, and disclosure information, see end of text.

This article was published at Annals.org on 2 July 2020.

NTU's COVID-19 response experience published in Annals of Internal Medicine

Prevent Virus Spread: NTU Can Help!

University campuses are an open environment with large flows of people and frequent human-to-human contact. Without effective crowd control in the early stage of the outbreak, the risk of cluster infection would have been much higher. Professor Tzai-Hung Wen of the Department of Geography and his research team incorporated information of the pandemic into maps and simulated how the flows of people and inter-human contact would affect the spread of COVID-19 from the perspectives of geography and spatial-temporal distribution. They also analyzed the way the pandemic might spread should cluster infections emerge. Predictive research and practical prevention measures have shown the significant effects of crowd control, automated body temperature screening, and footprint tracking on NTU campus.

Shaping A New Policy on COVID-19

As Taiwan is moving into the post-COVID-19 era, the government, industry, and academia must put themselves in each other's shoes and come up with new strategies. In late July 2020, NTU's College of Social Sciences held "Shaping A New Policy on COVID-19" conference where government officials, academics, and think-tank experts were invited to discuss economic trends and growth prospects, financial situations and relief packages, international politics and social change, economic analysis and research, healthcare system reform, and economic rescue and revitalization strategies. Some of them presented the results of their work at the conference. There were more than 300 participants, and many viewers watched the live broadcast online. It was indeed the most significant COVID-19 prevention conference since the outbreak.

139 COVID-19 studies published in 2020, accounting for **19.8**% of academic publication nationwide.

Study at Ease Measures

To allow students who were unable to enter Taiwan or had their enrollment deferred due to COVID-19 to study at ease, exceptions were made for their course selection, registration and tuition payment, course-taking, course leaves, and housing. Measures included reducing tuition fees, offering rent relief, integrating the three-member universities of the NTU System to offer synchronous or asynchronous online courses, adjusting course content and grading, extending the term of study for students unable to enter Taiwan, discounting any pandemic-induced suspension from the maximum permissible period of suspension, and remission of accommodation fees for students who were not able to return to the dormitories. These measures ensured continuous learning and protected students' right to education.

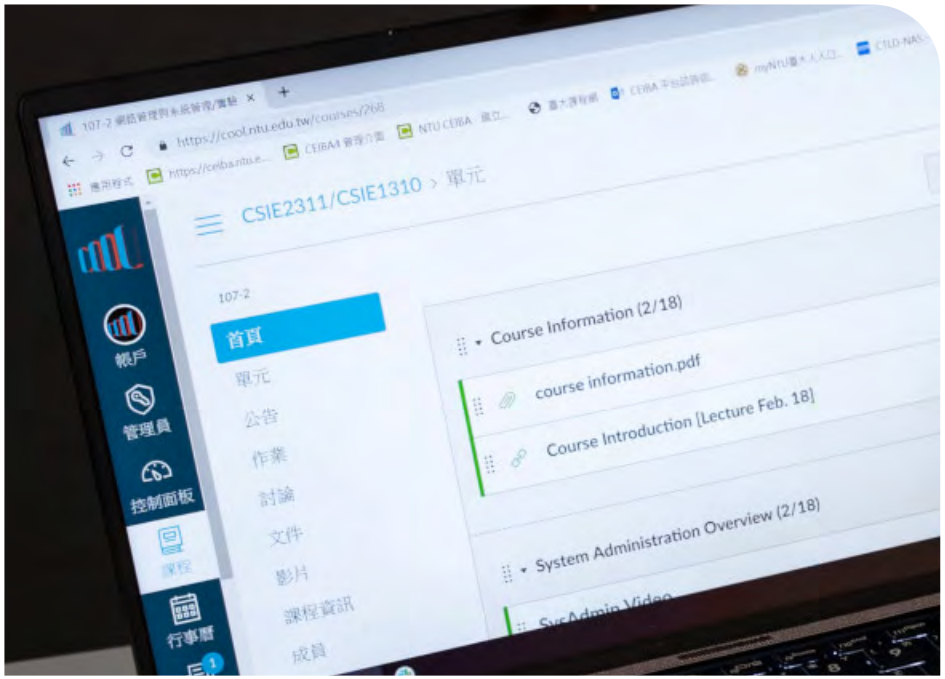
Digitalized Teaching

Considering the potential impact of complete course digitalization might have on both the teachers and students, courses with more than 100 students were the first to go online as a tow-pronged approach. On the one hand, the university would have more time to optimize the hardware, software, and supporting measures, so that teachers could gradually adopt the knowledge and technology of online teaching. On the other hand, with large classes given online, smaller classes were able to use bigger classrooms where students were seated farther apart, ensuring social distancing. In the meantime, digital teaching services were put in place to explain various ways of distance teaching. To reduce the pressure of class preparation on teachers, it also provided tools needed for digital teaching, orientation videos, equipment for lease, IPR-related issues for online courses. Technology advice was available both online and in person.

In the first half of 2020, more than **1,200** teachers and more than **24,000** students benefited from the support of NTU COOL.

Hardware, Software, and Supporting Measures

In the time of the pandemic, NTU has held digital teaching seminars and workshops, such as "Teaching in Front of a Camera" and "Voice Expressions," to encourage teachers to engage in digital teaching. For teaching assistants, the university provided "Digital Teaching Treasure Box" and "Digital TA Training Course." Both were online courses aimed to help TAs quickly acquire digital teaching skills and be familiarized with NTU COOL, the university's digital teaching platform. To provide a stable and smooth platform for distance teaching and online examinations, NTU continues to upgrade storage, system performance, and video conversion efficiency. In peak hours, the platform can accommodate more than 1,000 viewers to watch videos at the same time. NTU's success in teaching during the pandemic has been recognized by overseas academic circles. Tohoku University in Japan, for example, has invited NTU to write and share its success story.



COVID-19 Chronicle

Jan. 21

First confirmed case imported from Wuhan to Taiwan.

Jan. 24

Pandemic prevention and control measures were imposed at dormitories.

Jan. 29

Announcement of campus-wide prevention measures.

Jan. 30

NTU prevention response team was set up.

Jan. 31

NTU COVID-19 contact group was created to share the latest prevention information.

Feb. 03

The new semester was postponed for two weeks to prevent cluster infections.

Feb. 05

Study at Ease measures were in place for students from HK, Macau, and China who could not enter Taiwan.

Feb. 06

The first NTU COVID-19 meeting was held to explain prevention strategies.

Feb. 14

Announcement of new schedule for final exams and corresponding measures for teachers.

Feb. 17

Solutions to digitalized teaching were announced to assist professors with class preparation.

Feb. 26

Online course-selection platform was set up for students who could not enter Taiwan, including students from HK, Macau, China, and other regions.

Mar. 02

Access control and body temperature screening in every building on campus.

Apr. 08

Teachers and students were required to wear face masks in classrooms and laboratories.

Apr. 06

Courses with more than 100 students were moved online.

Mar. 30

Access control at every entrance/exit of the main campus.

Mar. 23

Events of more than 100 people were suspended.

Mar. 14-15

The opening of NTU Azalea Festival-Department Expo was held online.

Mar. 09

Financial rescue plan 1.0 for businesses under contract with NTU: 50% rent cut for businesses on campus; 25% rent cut for businesses off campus.

Apr. 14

Financial rescue plan 2.0 for businesses under contract with NTU: 70% rent cut for businesses on campus; 50% rent cut for businesses off campus.

Apr. 27

Courses with more than 60 students were moved online.

May. 16

As the pandemic was well under control in Taiwan, access control at the main campus was loosened.

May. 25

COVID-19 Special Visiting Student Program was in place to help Taiwanese students who were meant to study abroad to continue their studies in NTU.

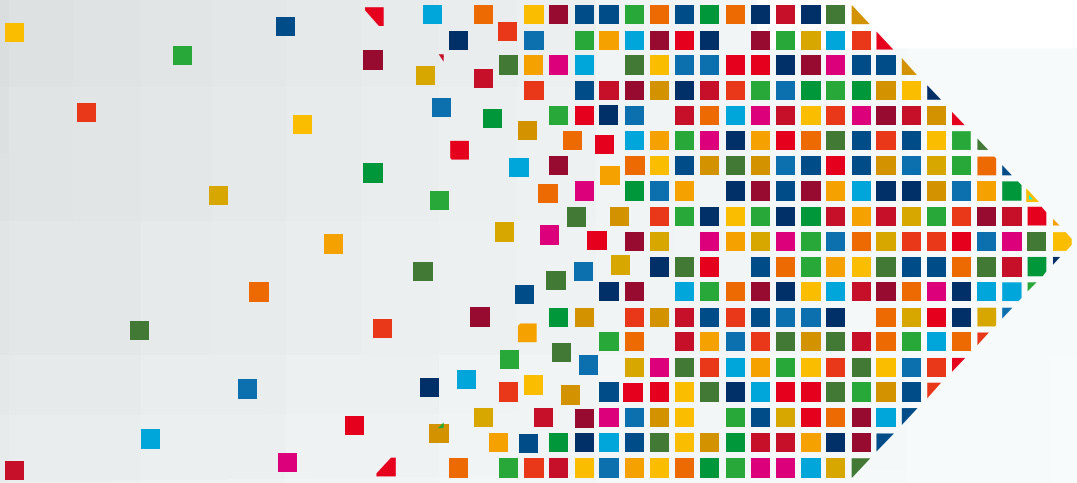
Jun. 06

Commencement ceremony was downsized and broadcast live. The campus procession was canceled.

Dec. 01

"Fall-Winter COVID-19 Prevention Program" was launched in accordance with the government policy.

Part Two



Sustainability Governance at NTU

Driving a Sustainable Future through Practices

Besides being a place for the speculation of human values, research and development, innovation, and dissemination of knowledge, universities also play a key role in serving, transforming, and influencing the society. With its outstanding faculty and students and abundant social resources, and as a top international university, NTU takes part actively in public welfare activities and seeks to take more social responsibility. The university will lead the way in the never-ending journey of social responsibility and exert a positive and long-term influence on the society and the world.

Former NTU President Ssu-Nien Fu once told the faculty and students that we must "dedicate the University to the Spiritus Universalis." With his encouragement in mind, NTU's vision of sustainability for its 100th anniversary in 2028 will be "Driving a Sustainable Future through Practices," which uses the UN Sustainable Development Goals (SDGs) as the framework of implementation and incorporates university governance. In addition, NTU has integrated curriculum, research, and technology and worked with the industry, government, and academia in order to address the environmental, economic, and social challenges arising from climate change.

In 2020, NTU published its very first Social Responsibility and Sustainability Report, and declared that it would set targets according to SBTi to become 50% carbon neutral by 2028 and 100% carbon neutral by 2048 in response to Paris Agreement's appeal. To create a carbon neutrality path and relevant strategies, the university has launched NTU Sustainability Plan, which includes six major projects and systematic campus action plans that will help NTU shoulder its responsibility as a higher education institution and move towards sustainable development.

Carbon Neutrality

NTU aspires to become an example of carbon neutrality for higher education institutions in Taiwan by understanding and following international standards of carbon investigation, management, and neutrality, summarizing successful measures taken by universities around the world, and customizing actions suitable for Taiwan.

Action Plans of Sustainable Governance

NTU will identify what it needs to improvement in governance, establish deliverable goals, and make sustainable governance plans by analyzing the success stories of foreign universities in managing water resources, food, energy, air quality, transportation, waste, and campus buildings.

International USR Alliance

NTU will organize workshops with partner universities from Taiwan and abroad to exchange ideas in the practices of sustainable governance and the promotion of university social responsibility. NTU's carbon neutrality initiatives and carbon reduction path are two key projects for discussion, which may encourage other higher education institutions to examine their own emissions and establish long-term reduction targets. Together, higher education institutions can share and achieve the vision of social responsibility.

Social Responsibility

Through a top-down approach, NTU will effectively use its scale and resources to maximize its value and synergy of cross-disciplinary and cross-agency cooperation, where the industry's demand for talent and technology is satisfied. Collaboration between the academia and the industry are enhanced in order to shorten the distance between the university and the society.

NTU SDGs Database

To better understand the interconnection between research, education, service, and SDGs and NTU's strengths, the university has reviewed the courses and research projects and promoted the management of SDGs tags in response to the needs of sustainable governance. The results will be updated on the NTU SDGs Website on a regular basis.

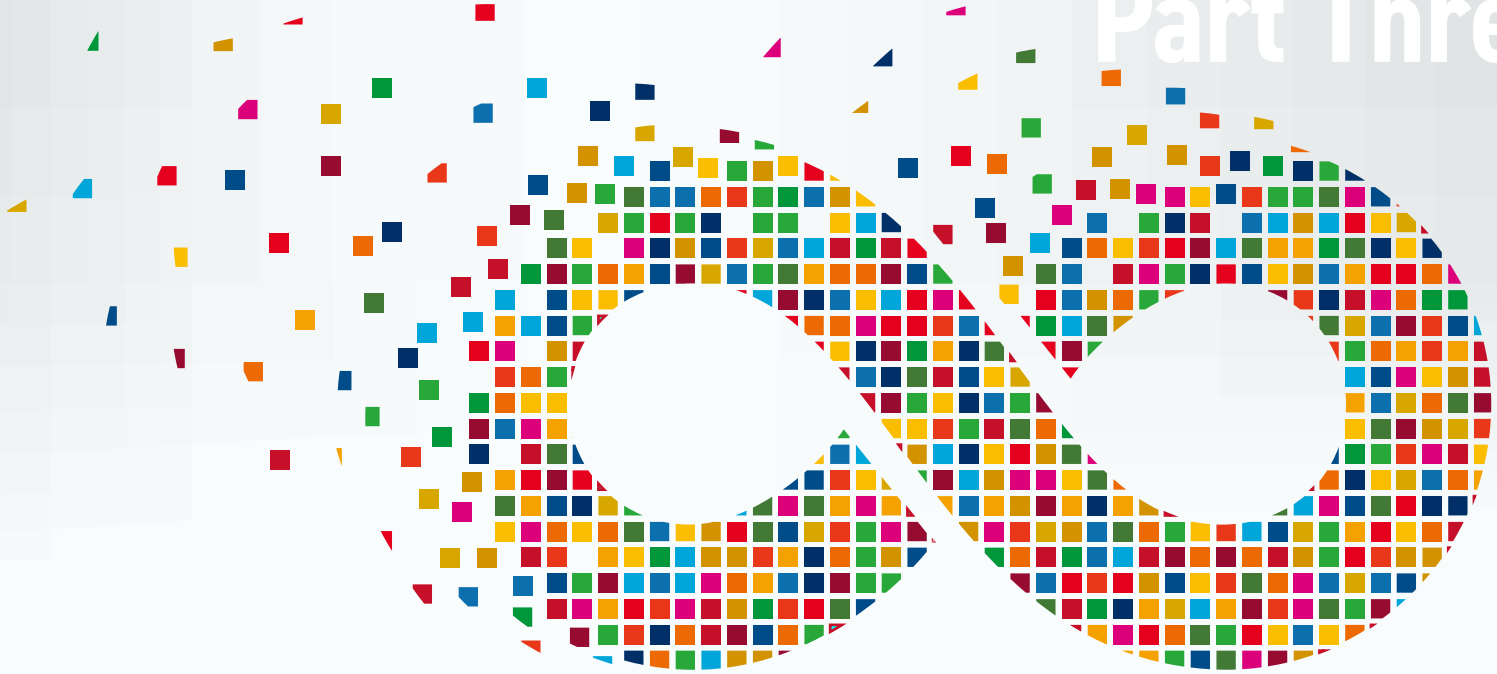
NTU SDGs Website

The NTU SDGs website offers information and query service of NTU's work towards SDGs, including its efforts in integrating research, education, human resources, and social services. The progress and results of NTU Sustainability Plan can also be found on the website for those interested in NTU's work in sustainable governance, including the NTU faculty, staff, students, and the public.

Highlights of Social Impact

Our Social Influence

NTU is largest and oldest institution of higher education in Taiwan. With diversified disciplines and cross-disciplinary synergy, NTU has actively responded to the appeal of the United Nations' Sustainable Development Goals (SDGs). This chapter consists of NTU's achievements in various fields in 2020. We will continue devoting ourselves to a sustainable future in the spirit of the university's motto, "Integrity, Diligence, Fidelity, and Compassion."



Part Three

1 NO POVERTY

NO POVERTY

More Opportunities, Better Future

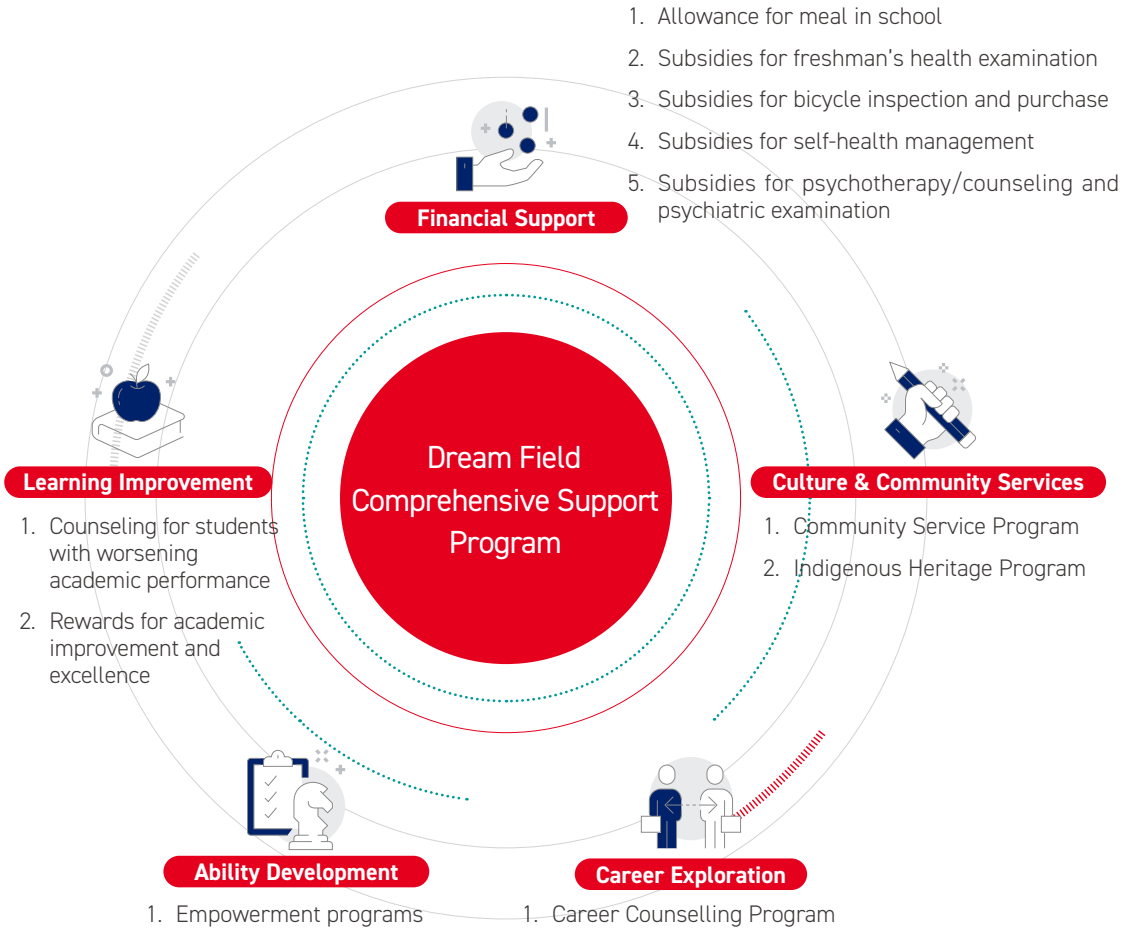
To play its part as an institution of higher education in promoting the overall public welfare, NTU provides "Dream Field Comprehensive Support Program" (formerly known as "NTU Total Care Program for Disadvantaged Students" until 2021), "Hope Scholarship", and living stipends for financially/culturally disadvantaged students to ease the burden on their shoulders and enhance equality of opportunity.

NTU's "Dream Field Comprehensive Support Program" rewards improvement for excellent study performance in place of part-time jobs. The program offers more than 30 counseling and financial support mechanisms. "Hope Stipends" rewards qualified students with NT$40,000 or NT$80,000 every year to relieve their financial burden so that they can focus more on their studies, academic development, and academic performance. Beginning school year 2019, "Hope Scholarship" is another way to support students financially. First-year students from financially-disadvantaged families or families in hardship are eligible to apply for "Hope Scholarship," which provides a first-school-year scholarship of NT$100,000 or NT$60,000. Students rank in the top 30% of the class are eligible for a renewal.

NTU's support for financially/culturally disadvantaged students has been widely recognized that in September 2020, the university was invited to share its support mechanisms, results, and sustainability plans with other universities in Taiwan. At the end of 2020, NTU was awarded along with 9 other universities by the Ministry of Education for their excellence in fulfilling responsibilities as higher education institutions.

In 2020, **191** students were granted "Hope Scholarship," and **355** were subsidized by "Hope Stipends."

Dream Field Comprehensive Support Program



In2020, 54.6% of financially disadvantaged students were supported by NTU's "Dream Field Comprehensive Support Program."

SDG1

86 studies published between 2016 and 2020,

accounting for 16.4% of academic publication nationwide.

Alumni Donate to Study Abroad Scholarship

To create opportunities of studying abroad for disadvantaged students, NTU provides "Voyage of Aspirations Scholarship" to encourage more students to explore the world outside of Taiwan. Hopefully, their knowledge about the world will be extended, their global mobility will be improved, and their experiences will influence fellow NTU students and the society of Taiwan in a positive manner. The "Voyage of Aspirations Scholarship" expects the alumni to make regular, fixed-amount donations for the yearly exchange program to survive. With NTU President Kuan's fund-raising efforts and the alumni's support, the first "Voyage of Aspirations Scholarship" was open for application in October 2019 and supported 76 students to study in 22 countries in academic year 2020, including the USA, Germany, and Japan.

ZERO HUNGER

The students tried beers made with various adjuncts

Meal Allowance for Students in Need

"Allowance for meal in school" aims to reduce the financial burden on disadvantaged students, so that their academic performance would not be influenced by more part-time work. Students from low-income and middle-low income households or from families in hardship or in emergent need can apply for a monthly meal allowance of NT$4,000 for a duration of 4 months every semester. To avoid labeling and increase the willingness of application, the allowance will be sent into a digital wallet with which e-payments can be made in restaurants and stores on campus.

Craft Beer That Helps Local Small Farms

As one of the cross-domain experiments led by D-School, Engaged Urban is a course that combines design thinking and social practices. By field visits, hands-on practice, and case studies, students are guided to explore the challenges faced by social development in Taiwan. In 2020, Engaged Urban worked with the local beer brand Alechemist in an enterprise called "Crisis and Redesign." Together, they explored the social-land-economy connection behind the beermaking industry. Alechemist was created by the alumni of NTU's College of Bioresources and Agriculture. They use a higher proportion of locally grown grains in their craft beer so that the flavors of local materials can be enjoyed by more people, and the predicament faced by Taiwan's agriculture can be solved. The course combined sociology, urban study, and food and agriculture education. The students explored the production and marketing system, culture and local tradition, local design and innovation behind the making of craft beer. They also explored the ways to make the beer industry more localized and sustainable by learning about the impact of climate change on the industry's supply chain and retail prices.

There were **2,011** "allowance for meal in school" recipients in 2020, with a total allowance amount of **NT$8.04** million.

Plants displayed at Ethnobotany, Food and Farming Education Center of the Experimental Forest

SDG2

111 studies published between 2016 and 2020, accounting for 24.6% of academic publication nationwide.

Ethnobotany, Food and Farming Education Center

NTU's Ethnobotany, Food and Farming Education Center of the Experimental Forest is located in Hsinyi, Nantou County. It is the first exhibition venue for food and agriculture education in Taiwan. The Center features a selection of 36 species of plants that are closely related to the lives of indigenous peoples in Taiwan, showing the spirit and significance of the peoples' connection with nature. Instead of the oft-seen handicraft-making experience or exhibition of tools, the Center introduces the richness of Taiwan's indigenous culture by showing specimens of plants, how they use the plants for food and tools, and their development of calendars, myths, and rituals. Plants are not only collected as exhibits, but their printed images are also displayed as part of scientific research.

Intelligent Breeding of Lacewings to Control Pests

Biological control is the use of living organisms to control pests on farms. With less use of pesticides, it is environmentally-friendly pest control. To prevent the potential impact on local ecology by alien species of organisms, native species are used as natural enemies to reduce the number of pests. In cooperation with Miaoli District Agricultural Research and Extension Station, Professor Joe-Air Jiang of NTU's Department of Biomechatronics Engineering has spent 4 years developing an intelligent production system for Mallada basalis (lacewing). In October 2020, the research results were announced in Miaoli District Agricultural Research and Extension Station. Lacewing larvae prey on aphids, mealybugs, mites, among other smaller pests, and are particularly effective in controlling pests on strawberry plants, papaya plants, and tee trees. However, lacewing breeding depends on manual work, and high density of population may lead to loss caused by self-predation. Professor Jiang and his team developed breeding technologies, such as egg extraction solution and feeding container. Combined with automatic modules and intelligent monitoring, the manpower and space needed have significantly decreased and quality identification has become more consistent. This is indeed a groundbreaking achievement in biological control in Taiwan.

Collaborative Intelligent Vehicle That Saves Labor

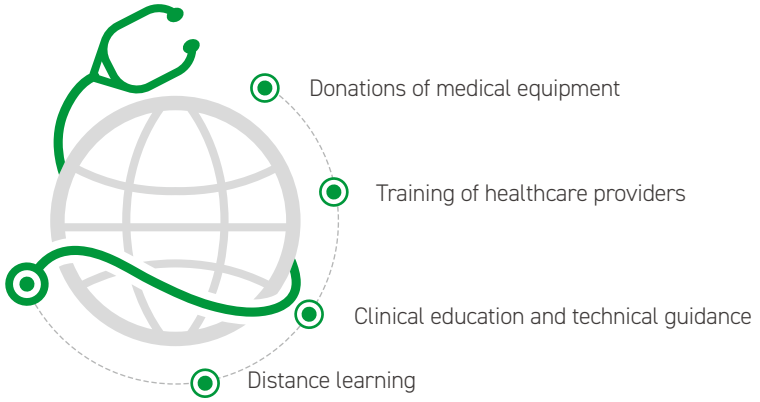
To address the shortage of agricultural labor in Taiwan, Professor Ping-Lang Yen of NTU's Department of Biomechatronics Engineering and his team developed a collaborative intelligent vehicle that reduces manpower needed for harvesting special crops. Taking tea-harvesting, for example, is now mostly assisted by machines. Besides the riding-type tea plucking machine, which is suitable for gentle slopes, hand-held tea plucking machines are commonly used in Taiwan. The intelligent vehicle developed by the research team is more convenient and labor-saving in that it requires only one operator and can be used in various terrains. It can readily replace the riding-type machine, which requires two operators. The intelligent vehicle moves according to the pace of the operator and detects the surroundings at the same time to avoid hurting the crops. At the end of the aisle, the vehicle can stop automatically or turn according to the instructions input by the operator, making it suitable for various farmlands. As the vehicle carries most of the machine weight, relieving the burden on the operator. The collaborative intelligent vehicle saves labor, reduces production costs, and moves agriculture one step closer to intelligent development.

3 GOOD HEALTH AND WELL-BEING

GOOD HEALTH AND WELL-BEING

Global Medical Excellence Award

As a national medical center, NTU hospital is the leader of medical development in Taiwan and shoulders the responsibility of helping Taiwan's medical community meet the international standards. NTU Hospital began following the government's medical diplomacy policies as early as 1964. Its efforts have not only improved the quality of health care in countries that are friendly with Taiwan, but also strengthened the diplomatic ties. In 2005, NTUH International Medical Service Center was established. In addition to providing international healthcare services, the Center also engages in international collaboration with countries such as Vietnam, Indonesia, Mongolia, and Guatemala. Collaboration programs include donations of medical equipment, training of healthcare providers, clinical education and technical guidance, and distance learning. The Center successfully helped Viet Duc Hospital carry out Vietnam's first liver transplant from a living donor and the hospital's first human heart transplant. The Center also guided Viet Duc Hospital in completing lung transplant operations. In its cooperation with Mongolia, the Center helped the Mongolian national health center for women and children with the country's first IVF treatments with multiple successful results. NTUH International Medical Service Center has played an important role in the communication of every exchange program to ensure the programs proceed smoothly. In September 2020, the Center's highly recognized achievements made it one of the recipients of the 5th Global Medical Excellence Award organized by Taiwan Global Healthcare Association



ASPPH Harrison C. Spencer Award for Outstanding Community Service

NTU's College of Public Health has been devoted to public health in Changhua and Matsu Counties for many years with measures such as community health check-ups, environmental health, and healthcare services. It has also helped with the training of local public health professionals and created a successful model where the academia shares resources with the communities. The College was recognized by the 2020 ASPPH Harrison C. Spencer Award for Outstanding Community Service, an award that acknowledges colleges or programs for making significant long-term contributions to public health. NTU's College of Public Health is the first and only awardee from a country other than the United States.

ASPPH representatives, the NTU College of Public Health team, and Changhua governmental officials

SDG3

6,486 studies published between 2016 and 2020,

accounting for 21.5% of academic publication nationwide.

The Student Counseling Center carried out a physical and psychological adjustment survey on first-year students in 2020.

3,990 undergraduate freshmen

and 548 first-year graduate students responded to the survey.

Mental Health Safety Net for NTU Students

As issues around students' mental health have drawn more attention in recent years, NTU provides adequate resources to create a safety net for students that need help. The Student Counseling Center has more than 40 full-time and part-time clinical psychologists, counseling psychologists, and social workers who are able to provide individual counseling, group counseling, and services that will improve mental health. NTU Health Center has psychiatrists from NTU Hospital. Together with Taiwan Lifeline International, the university has put in place the "NTU Lifeline," which provides 24-our online consultation for the faculty and students as a way to overcome the shortage of on-campus counselors.

Graceful Aging through Advance Directives Planning

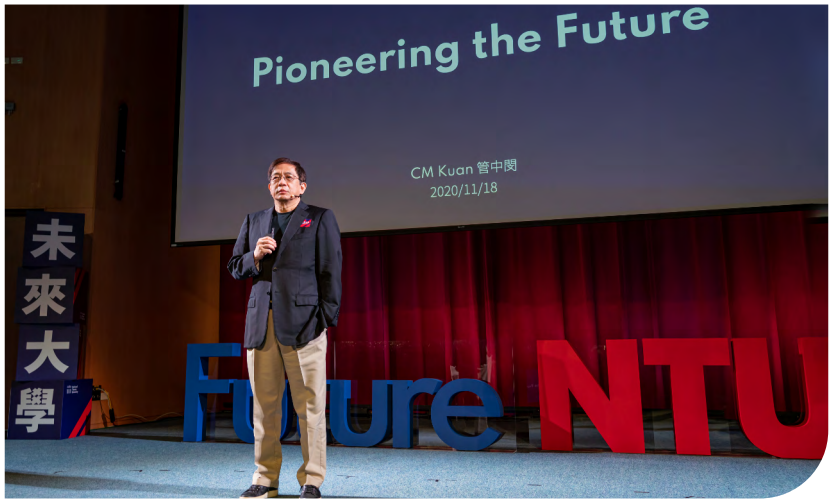
As Taiwan is becoming an aging society, and "the last mile" of senior care services has attracted public attention. "Graceful Aging through Advance Directives Planning" (GAADP) is a collaborative project initiated by NTU's Department of Social Work, Institute of Health Policy and Management, and the Bei-Hu Branch of NTU Hospital. This interdisciplinary and interprofessional project aims to integrate advance care and long-term care and to develop a more equal, local, and innovative service network. Based in Wanhua District of Taipei City, the project introduces the concept of "graceful aging" to the community through lectures, well-being courses and workshops. The project manager, professor Peishan Yang of the Department of Social Work, explains that GAADP wants to empower the people with information on the choices they have when faced with scenarios related to dying and death. Hopefully, people will be better prepared in advance with resources from healthcare providers, social workers, and the community. When one's time comes, they will be able to take it calmly with the four principles: "love, gratitude, apology, and farewell."

4 QUALITY EDUCATION

QUALITY EDUCATION

The Future NTU

The modern university is designed to reflect the spirit of industrial revolution, where each academic discipline is devoted to its own line of research and pursues pure knowledge. However, with rapid changes in technology and society, universities as such find it difficult to meet the needs of emerging industries for cross-disciplinary human resources. In the face of a rapidly-changing world, institutions of higher education must be transformed to meet new challenges. Since he took office, NTU President Chung-Ming Kuan has been actively developing "The Future NTU" plan. Since 2019, more than 100 workshops have taken place, where more than 1,500 faculty members, students, staff, alumni, and people from the industry brainstormed about what "The Future NTU" may look like. The discussions focused on the weaknesses of the institution, with the expectation of building an open university centered on learners. In the Future NTU Talks held in November 2020, the "Future NTU White Paper" was made public to explain NTU's ideas and vision about higher education in the future, including a "non-discipline specific degree" program that will break the barriers between academic disciplines and loosen the restrictions of the education system. Students will explore and experience on their own. The decision of what to learn will be made by students themselves to help them find their aspirations and fulfill their potentials; hopefully in the process they will discover the meaning of learning and the purpose of life, while they head into the future.



President Chung-Ming Kuan announced the concept of "Future NTU" at Future NTU Talks

NTU International Degree Programs

To enhance its capacity of internationalization, NTU set up International College, which offers cross-disciplinary, cross-college, all-English master's programs based on NTU's academic advantages. These programs incorporate major global issues with the goal of cultivating international talent with humanism and professionalism. In 2020, the first international master's program, "Master Program in Global Agriculture Technology and Genomic Science (Global ATGS)," was launched. This program focuses on smart agricultural engineering and genome science and technology, and students will have the opportunity to intern at international research organizations, such as International Rice Research Institute and World Vegetable Center. In response to the impact of COVID-19, the courses have been moved online to ensure the students' learning go uninterrupted. As Taiwan has successfully contained the spread of the pandemic, international students in Taiwan can safely go to physical classes. In 2021, NTU's International College launched the second international master's program, "Master's Program in Biodiversity." More programs are expected to come, including "Master's Program in Intelligent Medicine and Healthcare," "Master's Program in East Asian Development and Sinophone Studies," and "Master's Program in Environmental Planning and Disaster Prevention."

NTU Tutor Team

Education is meant to be a stepping stone for disadvantaged students to move up the socioeconomic ladder and to promote social equality. However, unequal distribution of resources has made social mobility more difficult than before. Caring for education of children from disadvantaged families and children in remote villages, a group of NTU students established "NTU Tutor Team" in 2019. "NTU Tutor Team" helps senior high school students who are financially-disadvantaged or from remote villages. The tutor team is made of NTU students and alumni from all colleges, and they provide free tutoring services, such as reviewing the lessons, explain exam questions, and counseling. In collaboration with NTU's College of Social Sciences, the tutor team offer free study space for students before General Scholastic Ability Test and Advanced Subjects Test. They also provide mental counseling for students whose families face sudden difficulties. Due to the pandemic, in the first half of 2020 their services were offered online. With better containment of the spread of COVID-19 in Taiwan, the tutoring services have been offered both virtually and physically since June 2020. "NTU Tutor Team" hopes its high-quality and free resources of learning can lend the students in need a helping hand, bridge the educational resource gap caused by financial differences, and realize equal distribution of educational resources.

Learning Corner of Southeast Asian Languages and Cultures

Collectively organized by professor Peishan Yang of the Department of Social Work, Koo Chen-Fu Memorial Library, and Office of International Affairs, the "Learning Corner of Southeast Asian Languages and Cultures" introduces the languages and cultures of Southeast Asian countries. Since 2019, it has chosen one country each semester and so far, it has introduced the languages and cultures of Vietnam, Indonesia, and Thailand. The activities are popular among students of NTU and other universities as well as the general public. Activities include weekly lectures by scholars and experts, language classes, music and dances, multicultural campus discussions, Southeast Asian history and culture, guided tour of Southeast Asian communities in Taipei, visits of independent Southeast Asian bookstores. Koo Chen-Fu Memorial Library organizes themed book fairs in conjunction with the activities. The Learning Corner aims to cultivate the students' intercultural literacy, provide opportunities for international exchanges, and create a campus that is friendly to all cultures.

SDG4

8 studies published between 2016 and 2020, accounting for 5.3% of academic publication nationwide.

Learning Corner participants learns court dance from Java, Indonesia

5 GENDER EQUALITY

GENDER EQUALITY

Center for Population and Gender Studies

One of the goals of the Center for Population and Gender Studies is to enhance gender research, gender education, and information sharing. In 2020, the Center's researchers participated in several committees that promoted gender equality in Taiwan, advised and supervised the revision of "Gender Equality Policy Guidelines" and implementation measures of the Guidelines, and was entrusted by the Ministry of Education with the "Plan of Compiling a New White Paper on Gender Equity Education." To promote women and gender studies, the Center's Women and Gender Division regularly publishes a journal in Chinese called the *Journal of Women's and Gender Studies*, which is listed in Taiwan Humanities Citation Index (THCI) and Taiwan Social Sciences Citation Index (TSSCI). The Forum in Women's and Gender Studies is another journal published by the Women and Gender Division and issue 113 is entitled "COVID-19 and Gender Perspectives." The Women and Gender Division is made of NTU professors with expertise in sociology, history, geography, psychology, literature, archeology, law, and sports. They examine gender-related issues from multiple perspectives and organize forums, such as "Artificial Reproduction in Taiwan: Within the Framework of Gender Equality" and "Gender Dilemma: Indigenous Autonomy and Equality." They also discuss multiple gender issues, promote gender equality, and empower women by involving themselves with non-profit organizations that advocate gender equality, such as Taipei Women's Rescue Foundation, Awakening Foundation, and Birth Reform Alliance.

Gender Equality in Decision Making Mechanism

"Gender equality" is a global issue. Participation in public affairs and the power to make public decisions do not just involves the rights to govern, but also determines the allocation of public resources and the opportunity to achieve self-value. To realize the democratic spirit of gender equality in decision-making, NTU refers to the experience of international legislation and the Gender Equality Policy Guidelines and upholds the principle that "participants of either gender shall account for more than one third of the total participants" in NTU's meetings, including Teacher Evaluation Committee, Staff Selection Committee, Teacher Grievances Committee, and Staff Grievances Committee. This principle takes policy and practice of gender equality into account and helps protect the rights of disadvantaged genders in a grievance review procedure. The goal is to ensure gender equality and minimize casual stereotyping and prejudice that are common in the workplace.

Gender Neutral Restroom and Dormitory

Chapter 7 of the "Framework of NTU Campus Planning" is entitled "Friendly Campus" and provides the principles of building gender-neutral restrooms and a barrier-free campus. For the promotion of gender-neutral restrooms, NTU has published "Handbook for All Gender Restroom." Currently, NTU has gender-neutral restrooms in 15 buildings on campus. 11 more buildings will have such restrooms over the next three years. In addition, NTU is planning to build a student dormitory where 3% of the beds (about 90 beds) will be gender-neutral. The building is expected to be completed in 2025.

NTU has **726** full-time female faculty, accounting for 32.5% full-time faculty.

SDG5

21 studies published between 2016 and 2020, accounting for **17.9**% of academic publication nationwide.

Gender Friendliness Course

To make the campus gender-friendly, NTU's Orientation Camp has opened a "gender friendliness course" in recent years. Taught by NTU professors, the course introduces gender diversity and the development of gender equality. New students will be able to learn about gender issues in various scenarios on campus and are expected to respect people of different genders.

Professor Chia-Ling Wu of the Department of Sociology explains Gender Equity Education Act at Orientation Camp

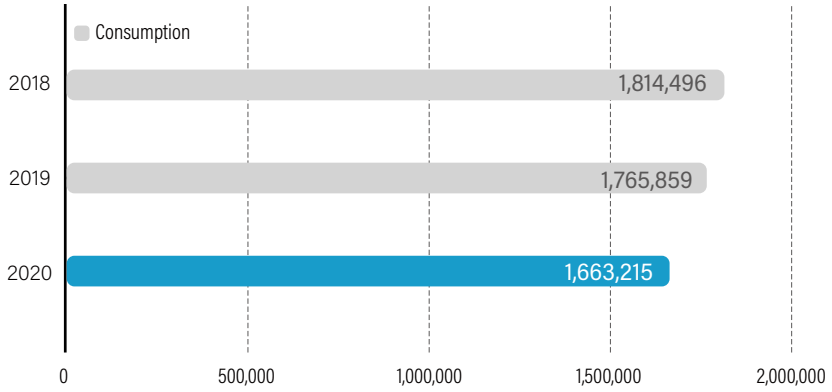
6 CLEAN WATER AND SANITATION

CLEAN WATER AND SANITATION

NTU Works with International Researchers on Water Management

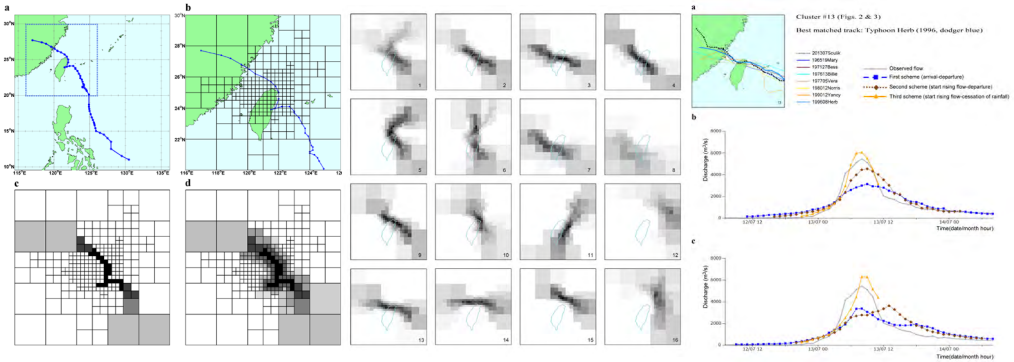
Water plays a critical role in the ecosystems where nature and humans coexist. The "United in Science 2020" report points out that water is the key to climate change adaptation, and that terrestrial water takes the greatest impact of hydrological and climate changes around the world. Groundwater trends over the next 100 years will depend on the changes of water cycle under global warming. Professor Min-Hui Lo of NTU's Department of Atmospheric Sciences and research teams from Europe, Asia, and North America have tried to discover light at the end of the tunnel. Their study "Divergent effects of climate change on future groundwater availability in key mid-latitude aquifers" was published in Nature Communications in July 2020. The study indicated that previous groundwater assessment had utilized regional hydrological models, but the researchers used a fully-coupled climate model, including the land, atmosphere, ice, and ocean components, to investigate GWS and water cycle changes over seven critical aquifers. They found that if the effect of pumping is not considered, groundwater depletion in the central U.S.A. and the Middle East is expected accelerate, showing that redistribution of water resources may become more challenging for water management in the future.

Water Consumption 2018-2020 Unit: Metric ton



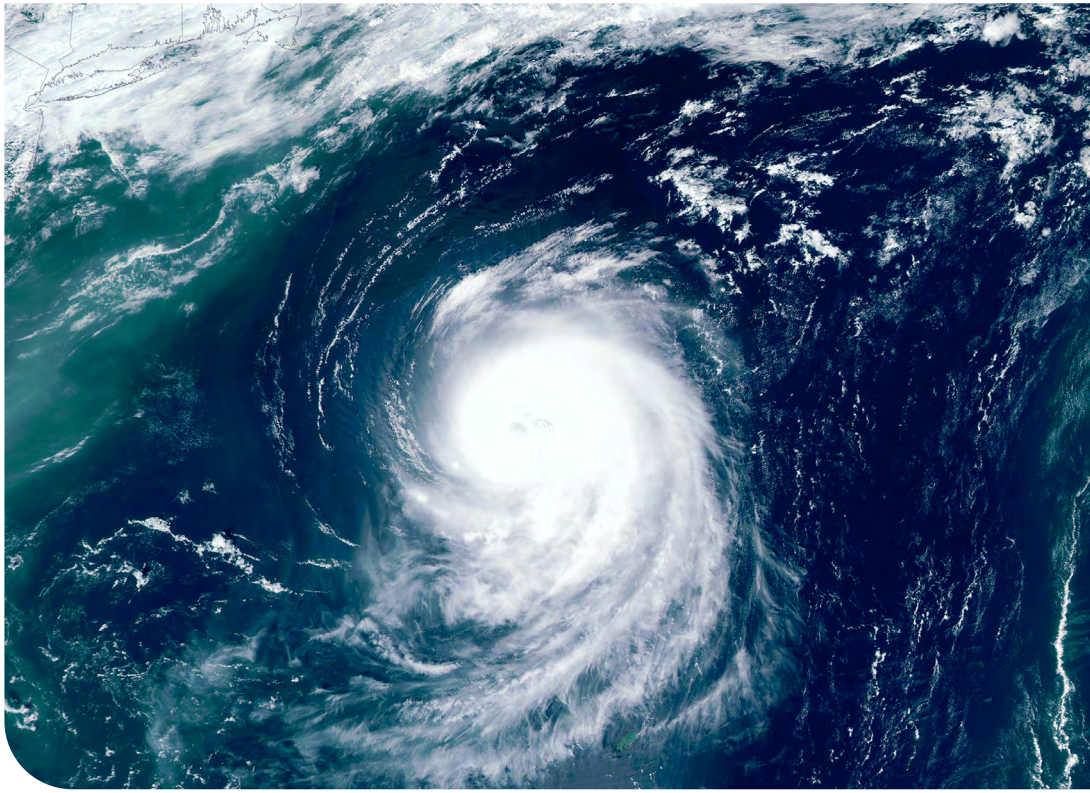
Accurate Typhoon and Flood Forecasts with AI Technology

Typhoons are both a major source of water supply and a challenge of water management for Taiwan. Peak discharge of floods caused by torrential rains will influence the strategies a reservoir might take. Previously, flood patterns caused by typhoons was forecasted only hours in advance, limiting the time for responsive measures. Professor Fi-John Chang of NTU's Department of Bioenvironmental Systems Engineering worked with researchers from Tamkang University, Water Resources Agency, and the University of Illinois at Urbana-Champaign. They used machine learning technology to predict flood patterns two days in advance. Their model can update the flood forecast synchronously with the actual rainfall to enhance accuracy. Due to the lack of reliable rainfall forecast in the past, prediction of hydrological conditions could only depend on actual rainfall, and it was difficult to make long-term predictions. With data of 97 typhoons between 1965 and 2015, the research team was able to acquire more accurate day-to-day predictions using AI technology. This technology enables them to make effective judgment and issue early warnings before typhoons arrive. Accurate predictions will help the government deploy and execute effective measures, protecting people's lives and properties.



Solving Water Shortage with Advanced Treatment Technology

In the face of climate change and uneven distribution of water resources, it is urgent to improve water supply and water efficiency. Wastewater/effluent treatment and reuse are not affected by rainfall, so its potential has received more attention in recent years. Professor Chia-Hung Hou of NTU's Graduate Institute of Environmental Engineering has led his team to work on a new, energy-efficient water treatment technology, called capacitive deionization (CDI). CDI is an electro-sorption method using a combination of a sorption media and an electrical field to separate ions and charged particles as a way to remove salts and charged pollutants. CDI can be used for desalination, water softening, industrial wastewater recycling, and removal of trace pollutants (e.g. arsenic in groundwater). As an environmentally friendly technology, CDI has been widely recognized as a highly advanced renewable water technology. When commercialized, it can be applied to the wastewater discharge from semiconductor and chemical plants in Taiwan and abroad to redress the imbalance of water resources and to ensure sustainable utilization of water resources.



SDG6

165 studies published between 2016 and 2020,

accounting for 26.7% of academic publication nationwide.

7 AFFORDABLE AND CLEAN ENERGY

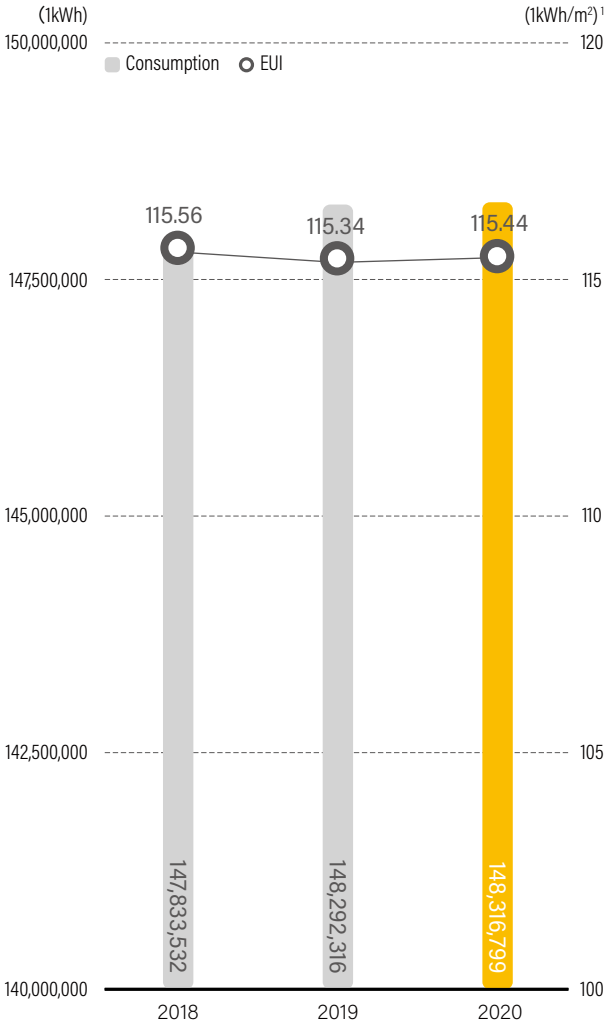
AFFORDABLE AND CLEAN ENERGY

"Taiwan-Netherlands Offshore Wind Energy Talent Education Summit," co-organized by NTU, NITO, and MIRDC.

Offshore Wind Energy Talent Education

Taiwan is planning for its offshore wind power capacity to reach 5.7 gigawatt (GW) by 2025, which will create a demand for 20,000 professional jobs. With an eye on the prospects of offshore wind power and the development of professional manpower, NTU has taken the responsibility of training future teachers since 2020 by offering Offshore Wind Energy Program and such courses as Maritime Engineering of Offshore Wind Power, Corrosion and Corrosion Protection, and Principles of Underwater Sound. NTU's offshore wind power research began in 2010. Since 2018, the university has visited manufacturers, wind energy research centers, and training institutions in Denmark, the Netherlands, and Germany, such as MHI Vestas, TU Delft, EnBW. Together with its overseas partners, NTU has organized many conferences, training programs, and recruitment activities in Taiwan. NTU signed an MOU with Copenhagen Infrastructure Partners (CIP) and Technical University of Denmark (DTU) for collaborative on-the-job training and master's degree programs; CIP has also promised to offer scholarships for students that go to DTU. On March 2, 2020, NTU co-organized "Taiwan-Netherlands Offshore Wind Energy Talent Education Summit" as part of its contribution to the future of Taiwan's offshore wind energy.

Power Consumption 2018-2020



Note 1: NTU floor space in 2018: 1,279,312 m^2; in 2019: 1,285,656 m^2; in 2020: 1,284,750 m^2.

Successful Test of Marine Current Power Generation

As a renewable energy, marine current power has been assessed to show great potential. With the steady and powerful Kuroshio Current flowing by, the geological and chemical and ecological conditions along the east coast of Taiwan are considered to be suitable for the development of marine current power. Entrusted by National Academy of Marine Research, NTU's Ship and Ocean Technology Research Center is in charge of the development plan of Kuroshio Current Power Plant. The Center is devoted to the design, research, and analysis of an integrated system and the development of key technologies of ocean current energy harvesting. In October 2020, the research team completed the test of a 1:5 scale free-floating winged generator off the coast of Tainan, verifying the performance of an ocean current power generator made entirely with technology developed in Taiwan. The system has reached the stage of integration of components. The goal is for Taiwan and its energy industry to become technologically self-reliant in ocean current energy harvesting.

Dealer of Green Energy That Accelerate Energy Transformation

Mr. Watt is a star-up company founded by four NTU alumni graduating from different departments. They met at NTU Creativity and Entrepreneurship Program, which opened up an opportunity for their lives. With the global trends of sustainability comes a higher demand for green power. Mr. Watt takes advantage of the trends as an intermediate dealer of green electricity by purchasing green electricity from renewable energy manufacturers and selling it to businesses that need green electricity. Certified by National Renewable Energy Certification Center, Mr. Watt is the first of its kind in Taiwan's energy market. For example, Greenharvest, one of Mr. Watt's suppliers, has two solar power plants. They sell green power to Mr. Watt, which then resells its "green power certificate" to L'Oréal Paris Taiwan's office in Taipei 101, making Taipei 101 the first business building to use green electricity in Taiwan. Mr. Watt hopes that by purchasing products from green business or by directly buying green power, the general public will become part of the green energy market in the future and contribute to energy transformation.

SDG7

620 studies published between 2016 and 2020, accounting for **15.1**% of academic publication nationwide.

Taiwan's First Commercial Offshore Windfarm Wind Speed Study

There are several potential windfarm sites along the west coast of Taiwan. Located in the Chunan Town of Miaoli County, Formosa 1 is the first commercial offshore windfarm in Taiwan. Professor Ke-Sheng Cheng of NTU's Department of Bioenvironmental Systems Engineering analyzed the data from May 2017 to April 2018 to determine the wind speed characteristics near Formosa 1. He concluded that the winds come mainly from the northeast monsoon in winter and from the southwest monsoon in summer, and that the highest wind speed occurs in winter afternoon. However, wind speeds near Formosa 1 vary greatly. The study points out that further analysis of factors such as land-sea breeze, ocean temperature, and air temperature might improve the understanding of offshore wind energy harvesting.

8 DECENT WORK AND ECONOMIC GROWTH

DECENT WORK AND ECONOMIC GROWTH

Financial Rescue Plan for Businesses Under Contract with NTU

When the COVID-19 pandemic broke out, businesses on campus were immediately faced with a grave crisis. NTU launched the first financial rescue plan that businesses running in historical sites or buildings could extend the lease by two months. They could apply for rescue measures and rent reduction. When business continued to deteriorate, NTU offered another relief package for April and May. For off-campus businesses under contract with NTU, rent in March was cut by 25%, and rent in April and May was cut by 50%. Due dates could be extended, and rent would be exempted if business was suspended. For on-campus businesses, rent in March was cut by 50%, and rent in April and May was reduced by 70%. From March to June, NTU's rescue plan and the MOE's rent subsidies helped 105 businesses. In addition, NTU has reached out to food delivery platforms and asked them to consider the possibility of collaboration. The number of on-campus lunchbox stalls was increased in order to help the businesses weather through the pandemic.

Talent Education for Post-Pandemic Economy

The COVID-19 pandemic has impacted global economy, which in turn changed business models and talent development. To bridge the gap between college education and the future changes of workplace, NTU held "Post Pandemic: Talent Education and Development Conference" on June 18, 2020. The conference had participants from 40 Taiwanese and foreign companies. They shared their recruitment plans, HR demands, and expectations for future employees. Through conversations and exchange of ideas, NTU and the participating businesses mapped out collaboration programs of talent education in the future. The goal is to help cultivate valuable human resources for the industry.

◀ NTU Executive Vice President Chiapei Chou spoke at "Post Pandemic: Talent Education and Development Conference."

NTU Entrepreneurship Center

NTU Entrepreneurship Center is dedicated to creating an ecosystem of innovation, which provides accelerator and incubator programs, as well as diversified counseling resources for teams at different stages and of different scales. The Center also helps startups with certification of their products and technology and actively introduces industry resources. In addition to hands-on experience sharing and advice about business strategies, the Center also matches start-up companies with businesses as an intermediary, so that they will continue to grow. On Demo Day at the end of 2020, 20 teams were invited to present their products or services. One of them was Home Heart (Homexin), an innovative co-hiring care service that is based on machine learning and data analysis. It's an intermediary platform certified by Ministry of Health and Welfare. TriBake and GoodToGo were two other teams. They both won subsidies from the Fourth National Youth Public Welfare Project. TriBake is a social enterprise that sells bakery products, offers free training for social welfare groups, and helps the disadvantaged find stable employment. GoodToGo is a system that recovers and reuses food containers. It has received support from the Environmental Protection Administration and they jointly promote environmentally friendly delivery services in order to reduce the consumption of disposable containers.

NTU Entrepreneurship Center has so far raised a total funding of more than **NT$3.1** billion.

NTU Entrepreneurship Center and American seed accelerator Techstars co-organized "Take Off Summit by Techstars x TEC"

SDG8

93 studies published between 2016 and 2020, accounting for **11.3**% of academic publication nationwide.

ntuMoodle: NTU e-Learning Platform

To help NTU's staff and faculty become familiar with online procedures, NTU launched an online learning and certifying platform, called ntuMoodle, to replace traditional training courses. There are demonstration videos and question banks on ntuMoodle that will familiarize new recruits with the online systems as soon as possible. ntuMoodle is connected with the university's campus information system, which are accessible only to staff that have passed training; the goal is to minimize grievances and human errors and improve the satisfaction of administrative quality.

9 INDUSTRY, INNOVATION AND INFRASTRUCTURE

INDUSTRY, INNOVATION AND INFRASTRUCTURE

NTU Participated in BIO Asia-Taiwan 2020

NTU's 12 academic units and 16 technical teams worked together in setting up the NTU Hall at BIO Asia-Taiwan 2020. They demonstrated NTU's research strength and its potential to work with the biotechnology, medical, and agricultural industries at the event. BIO Asia-Taiwan International Conference and Exhibition is the largest biomedical event in Taiwan, where the biotech community exchange ideas and information. BIO Asia-Taiwan 2020 was the first physical event in the biotechnology field that took place in the world after the COVID-19 breakout in 2020. The NTU Hall presented the university's research and cooperative achievements in areas such as biotechnology, medicine and pharmaceutics, medical materials, and agriculture. During the event from July 22 to 26, experts from Taiwan and abroad were invited to speak; the NTU Hall organized presentations and panel discussions, covering topics about COVID-19 control and prevention, pharmaceutics and medical materials, and intelligent medical care. The NTU Hall provided "industry-academia cooperation consultation service" at BIO Asia-Taiwan 2020, where they explained the process of patent technology transfer, industry-academia collaboration, and incubator services; the goal was to enhance collaboration and promote NTU's research achievements and strength.

The NTU Hall presented more than 30 results of collaborative R&D at BIO Asia-Taiwan 2020.

Winning FutureTech Award at Taiwan Innotech Expo

At Taiwan Innotech Expo 2020, Ministry of Science and Technology invited government agencies to set up the Future Technology Pavilion at Exhibition Hall 1 of Taipei World Trade Center. Among the 122 exhibited technologies, NTU participated in 21 of them. Of the 21 technologies, NTU directed the research of 18 technologies and co-directed 3 technologies. 12 research projects directed by NTU received FutureTech Breakthrough Award, while other projects were recognized by Best Popular Award and Best Technology Transfer Award. Exhibition themes include AI & AIoT, electronics & optoelectronics, and new materials. Special exhibitions included the International Area, Precision Health Ecosystem, and Featured Areas Research Centers. The three-day event attracted 50,000 visitors. NTU exhibited its outstanding R&D strength in healthcare, electronics, materials, and programming, such as intelligent control of membrane fouling in water treatment, wound-specific hemostatic materials, and training robotic arms with small amounts of samples. These technologies would improve productivity, precision, and application. They will not only open new doors for future technologies, but also become a major driving force for the industry.

SDG9

31 studies published between 2016 and 2020, accounting for 7.5% of academic publication nationwide.

In 2020, NTU was granted 79 patents and transferred 175 patents, which accumulated an intellectual property income of NT$234,553,159.

NTU-KU Held Joint Symposium on Digital Health

NTU and Kyoto University has been cooperating closely since 2005 on a long-term, friendly basis. Despite the pandemic, the two universities signed a sister-university MOU in December 2020 and organized the fifth joint symposium whose theme was "AI & Smart Medicine for Digital Health." The symposium had online and offline lectures and demonstrations of research results. Keynote speakers were professor Chien-Hua Huang, director of NTU Hospital's Emergency Medicine and professor Kuroda Tomohiro from Kyoto University. Professor Huang talked about using medical data to predict sudden cardiac arrest, while Professor Kuroda shared information about healthcare system. Following the keynote speeches were six featured talks given by NTU and KU scholars on clinical care and diagnostic technology. The symposium also invited six experts from the academia and industry to share achievements on digital health technology. In addition, the physical symposium invited NTU's Global Industry Platform of NTU System, T4 GIP, and NTU's Industry Liaison partners to demonstrate their research results in the poster session. Through a series of speeches and exhibitions on digital healthcare, the symposium offered an opportunity to explore the latest trends and applications of intelligent healthcare and deepen exchanges and cooperation between the two universities.

NTU Scholars Recognized in Disruptive Innovation

The Ministry of Science and Technology launched a "disruptive innovation" contest, where more than 100 research papers in the past three years that had major academic significance in Taiwan were reviewed. In 2020, 11 papers received the award given by the Ministry of Science and Technology, four of which were from NTU. Professor Hao Ming Chen of NTU's Chemistry Department participated in the study that explored the feasibility of converting CO2 to CO with FE3+ ions as metal catalyst, a potential alternative to gold-based nanomaterials. Professor Yung-Ming Jeng of NTU's Graduate Institute of Pathology and his team established that there is a link between sugar metabolism and KRAS mutations, which may induce pancreas cancer. Professor Haojia Ren of NTU's Department of Geosciences observed coral samples from Dongsha Atoll and found the first evidence of anthropogenic nitrogen emissions affecting the pelagic environment. Professor Mu-Chun Wu of NTU's Department of Anthropology used geographical information system (GIS) to study the abandoned settlement sites of two Paiwan tribes and demonstrated an alternative anthropological investigation other than cultural relics and customs. The winning papers include the fields of science and humanities and they have shown the diversity and creativity in academic research beyond rigorous deduction.

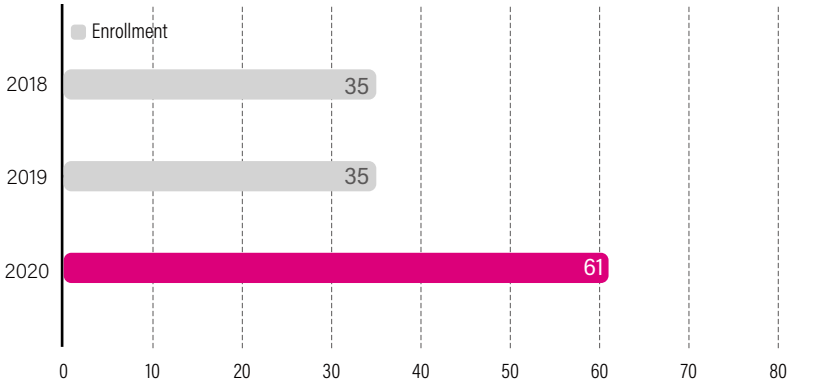
10 REDUCED INEQUALITIES

REDUCED INEQUALITIES

NTU without Border

In order to help the disadvantaged and create "more hopes", NTU has launched the "Hope Admission Program" for financially and culturally disadvantaged students. The program includes "early admission without GSAT—Hope Group" and "individual application—Hope Group". "Early admission without GSAT—Hope Group" is an independent admission route that considers more than just academic performance; high schools can recommend students who are altruistic, service-oriented, caring for others, and optimistic. The number of students admitted has increased from 10 in academic year 2015 to 50 in academic year 2020. "Individual application—Hope Group" is a new admission route implemented since academic year 2020. Beginning in academic year 2021, high school students living in MOE-approved remote areas and "non-mountain and non-urban" areas are also eligible to apply, in addition to students from low-income families, mid-low-income families, families in hardship, and indigenous families. "NTU without Border" is aimed at reaching out to remote areas and providing more admission routes for disadvantaged students.

Number of students enrolled via "Hope Admission Program"



152 students used "Hope Program" counseling service in 2020.

Hope Program Helps Students Adapt to College Life

Students from disadvantaged families may need more support in learning and in building up confidence. NTU has put in place the "Hope Program" for students enrolled via "Hope Admission Program." The "hope students" are organized into small groups with instructors and teaching assistants to offer support in learning and campus life. There is customized individual counseling as well as group tutoring that will help them with studies and bolster their confidence. The counseling results have shown that "Hope Program" is effective in helping the "hope students" adapt to campus life and pursue knowledge and self-discovery confidently in the face of peer competition and rigorous evaluation of academic performance. Sometimes students may not perform as well as expected or may suffer physically or mentally, but they can always turn to counseling resources and seek support from the counseling staff.

Center for Indigenous Studies

NTU's Center for Indigenous Studies aspires to promote interdisciplinary dialogue on issues about indigenous peoples in Taiwan from different viewpoints. Hopefully, these discussions will deepen our understanding of indigenous issues, combine academic research with practical actions, promote a multicultural society advocated by the civil society, provide a platform where indigenous peoples can converse with the society, enable indigenous peoples to exercise their inherent rights, and gradually achieve social and cultural sustainability. The Center has organized several projects with "Return" as the theme with a stress on "hands-on experience" and "community connection." The "Return" projects include "Cross-disciplinary Austronesian Studies," "Local Creation," and "History of Life." "Cross-disciplinary Austronesian Studies" invites scholars from different fields to give speeches and has applied for MOST grants to send graduate students overseas for further investigation, so as to increase cross-community interaction, recognize multiple identities, understand cultural borrowing, and generate creative discourse. "Local Creation" includes such activities as three-dimensional mapping, craft classes, and ethnic plant workshops. The students learn about indigenous life in the past, build indigenous houses, and weave fabrics in the traditional way. These activities intend to create connections between the students and the indigenous tribes. "History of Life" invites the students to write about their growing up, so that they can ask themselves about how their "culture" internalizes or evolves from the perspectives of upbringing, interpersonal interaction, and personal temperament. Most of the activities are participated by non-indigenous students as well, so they are in fact an opportunity for cross-cultural interaction, allowing the participants to explore the means and meaning of "Return."

Students learn to build a Seediq house.

SDG10

46 studies published between 2016 and 2020, accounting for 16.6% of academic publication nationwide.

In 2020, 1,405 students participated in NTU social service groups, and a total of 2,959 people received help from the social service groups.

SUSTAINABLE CITIES AND COMMUNITIES

Art Settlement Planning: Preserving Jing-Nong Tai's Residence

Professor Jing-Nong Tai began teaching at NTU in 1946. He was chair of NTU's Department of Chinese Literature from 1948 to 1968, during which time he helped the department establish its academic ethos and administrative structure. In addition to his major contribution to education, Professor Tai also had a profound influence on the academic research of humanities in Taiwan and the spirit of freedom on NTU campus. On June 12, 2020, Professor Tai's residence on Wenzhou Street was declared a historic monument by Taipei City's Department of Cultural Affairs after NTU and people who cared about the matter had stated the cultural significance of the building. Since the announcement, NTU's taskforce had met 14 times to gather ideas, reach a consensus, and propose a restoration plan. The proposal was reviewed by a committee at the university level and by Taipei City's Department of Cultural Affairs. Finally, on February 26, 2021, the proposal was approved by Taipei City's Cultural Assets Reviewing Committee. The building will maintain its original layout and structure to honor the memory of Professor Tai and be restored as "Jing-Nong Tai Culture Center." Professor Tai's study "Long Po's Small Room" will be renovated and used by NTU's faculty and students as a venue for lectures on humanities and culture.

New Residence Halls for Faculty & Staff

To attract outstanding international scholars and improve the quality of research and education, NTU put forward the "Mortgage Plan of Building Faculty & Staff Residence Halls," where 14 underused pieces of land will be used to construct 240 residences for NTU faculty and staff. Construction on the first six sites are expected to begin in the second half of 2021 and to finish between 2023 and 2024, which will provide 68 residences. In addition, beginning in 2019, the university has extended the accommodation for new teachers from three years to four years, benefiting 98 new professors. Beginning in July 2020, new teachers can stay in NTU accommodation for up to five years. Hopefully, the incentive will attract more teachers to return to Taiwan and play a part in higher education in Taiwan.

◀ NTU President Chung-Ming Kuan visited Professor Jing-Nong Tai's former residence.

As of 2020, there are 6 green buildings in NTU.

Sustainable Green Dormitories

To provide sufficient, safe, and affordable accommodation for the students, NTU plans to build new dormitories with 3,750 beds in total by 2025. The dormitory buildings will be sustainable green buildings that have longer life cycle and less long-term cost, reflecting the value of a sustainable ecosystem. The new dorms will use non-toxic, environmentally friendly building materials with sufficient ventilation and natural lighting that are good to health. There will be well-designed escape routes and emergency facilities to ensure safety of the students. The new dorms will be a gender-neutral space where the various needs of the residents will be addressed, so that the residents can interact in harmony.

Hospice & Long-term Care of Animals

Animals, like humans, also face the problems of aging. In 2019, NTU Veterinary Hospital established the Section of Rehabilitation and Integrative Medicine to provide elderly care for animals. Services include long-term care, daycare, and integrated physical therapy of Chinese and western medicine that is suitable for postoperative recovery, paralysis, or mental degradation. Companion animals are popular in Taiwan, and the problems of animal aging and the needs of long-term care are foreseeable. NTU Veterinary Hospital is the first animal hospice care training and education center in Taiwan. Beginning in 2020, the hospital has worked with Taipei City Animal Protection Office to provide training and profession certification. The training is open to animal care professionals and the public, so that private animal hospitals will be better at diagnosis and treatment and animal keepers will be equipped with professional knowledge. The training system enables proper use of medical resources and promotes the concept of responsibility in animal keeping, so that companion animals can receive proper care when they grow old.

A YouBike2.0 station on NTU campus.

Public Transport on Campus

NTU campus provides several forms of public transport that will meet the needs of motor vehicles and bicycles both on and off campus. there are motor vehicle charging stations, battery exchange stations, 24-hour self-service car and scooter rental, carsharing service, and bicycle-sharing service. Users can easily switch from one form of transport to another as they move in and out of campus. These measures ensure an efficient use of space and energy and provide an environment that reduces transportation footprint.

SDG11

262 studies published between 2016 and 2020,

accounting for 21.6% of academic publication nationwide.

12 RESPONSIBLE CONSUMPTION AND PRODUCTION

RESPONSIBLE CONSUMPTION AND PRODUCTION

Coffee Grounds in Organic Farming: Waste Reduction & Nutrition Boost

Professor Iou-Zen Chen of NTU's Department of Horticulture and Landscape Architecture and Nespresso undertook an industry-university collaboration project, where scientific data on the application of coffee grounds in organic farming were collected and analyzed. Coffee grounds have been used in plant cultivation and there are relevant studies abroad. Taiwan has the experience of using the entire tea plant in farming, and now coffee grounds have become a new research subject. The forms of application were differentiated and the experiments applied coffee grounds to the growing process of several vegetables, including bok choy, sweet potato leaves, and lettuce. After comparing the results, the researchers found that coffee grounds were effective when used in soil mixture, pesticide agents, and compost. They were shown to help increase yield, reduce area affected by pests, and boost nutritional value. Coffee grounds have multiple uses in daily life. When used in agriculture, they are helpful in the development of organic farming and in reducing environmental burden.

First Black Pig Biogas Power Plant in Taiwan

Professor Chu-Yang Chou of NTU's Department of Biomechatronics Engineering has cooperated with Taoyuan City's Department of Environmental Protection and local pig farmers to experiment on biogas power production. In September 2020, the black pig biogas power plant in Taoyuan began operation. Pig farm biogas power production has been a common practice among white hog farms in Taiwan for many years; white hogs account for 90% of the pork market in Taiwan. Taoyuan Black Pigs are a native species in Taiwan. The black pig biogas plant in Taoyuan is the first biogas power plant using biogas from black pigs and the first biogas power plant in northern Taiwan. Methane in the biogas can be used for power generation, solid pig waste can be used as fertilizer, while the waste water can be purified and used for irrigation. Together, these approaches will minimize pig farms' impact on the environment. The research team also tried mixing pig waste with such agricultural waste as rice stalks and vegetable leaves for anaerobic digestion to find out a ratio that would effectively produce methane and treat more waste water. The collaborative pig farm has about 5,000 pigs, and the biogas power plant produces 1,200 kWh of electricity per day. The biogas power plant reduces carbon emissions by 3,700 metric tons per year, eliminates sewage odors that used to annoy both the farmers and neighbors, and lessens farmers' dependence on chemical fertilizers. These factors make traditional pig farming and domestic hog species more commercially competitive.

uCup Helps Cut Down Use of Plastics

People in Taiwan enjoy handmade drinks. A group of NTU students are taking a different approach to reduce the use of single-use disposable cups as a way to put their ideals of environment protection into practice. Established by several NTU students, the uCup platform offers "reusable cup rental service." Consumers can rent reusable cups provided by uCup when they purchase drinks and return the cups at retailers under contract with uCup. This new and convenient service has effectively reduced the consumption of plastics. In the first semester of academic year 2019, uCup worked with eight on-campus retailers and created a daily use of 150 reusable cups, which significantly reduced the amount of and raised the awareness of environmental protection on campus. The results were reported by several press media, a first among domestic universities. In 2020, uCup began working with handmade drink retailers near the campus. Consumers using reusable cups can collect reward points in exchange for prizes or exclusive discounts. uCup also participated in the TiC100 Social Enterprise Competition to move towards their dreams through practical actions.

In 2020, uCup's collaboration with NTU's student clubs and academic departments cut down the consumption of single-use cups by 1,200.

SDG12

143 studies published between 2016 and 2020, accounting for 13.6% of academic publication nationwide.

uCup's reusable rental cups

13 CLIMATE ACTION

CLIMATE ACTION

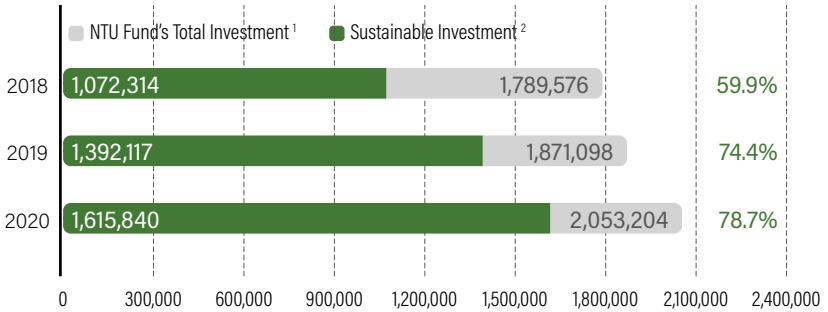
NTU's Commitment to Carbon Neutrality and Social Responsibility

At the release conference of NTU Social Responsibility and Sustainability Report in June 2020, NTU announced its carbon reduction goal: 50% carbon neutrality by 2028 and 100% carbon neutrality by 2048. This announcement is in line with the Paris Agreement, the latest climate agreement of the United Nations. Signatories can establish their own emission reduction schedule. A number of multinational corporations and higher education institutions around the world have followed suit and proposed their own carbon neutrality goals. NTU is honored to be one of them. Following the goals set by SBTi, NTU would put forth the reduction measures within 24 months of the announcement so as to show its commitment to the society.

Disinvestment from High-Pollution and High-Emission Industries

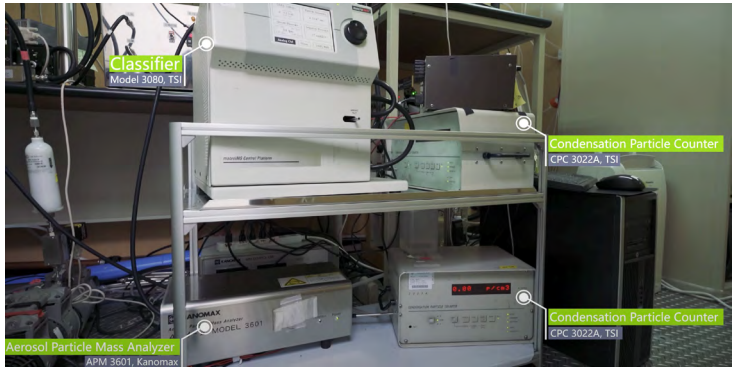
One of the actions a higher education institution can take to proactively address climate change issues is to withdraw the university fund's investment in high-pollution and high-emission industries. During the election, President Chung-Ming Kuan, who was then a candidate, expressed his support for the NTU fund to stop investing in high-pollution and high-emission industries in the candidate forum. In less than two years since

Sustainable Investment 2018-2020 Unit: NT$1,000



Note 1: Inclusive of investment in stocks and funds.

Note 2: Inclusive of investment in enterprises meeting sustainable performance benchmarks and in sustainable funds.



President Kuan took office, the NTU fund has withdrawn all of its investment in high-pollution and high-emission industries (in December 2020), making NTU the first university in Asia to have completed such disinvestment. Beginning in September 2019, the disinvestment took 15 months with support from student groups and NTU's Office of Financial Affairs. In the future, NTU will continue to promote sustainable investment and is committed to investing in funds and businesses with sustainable performance. As of 2020, sustainable investment accounted for 78.7% of total investment.

IMPACT: Comprehensive Air Quality Monitoring

Aerosol (suspended particulates) is an air quality indicator commonly used in weather broadcasts and can be used to assess daily activity planning. Associate Professor Ta-Chih Hsiao of NTU's Graduate Institute of Environmental Engineering has set up a mobile monitoring station in a container called IMPACT (Integrated Measurements of Pollution and Aerosol Composition & Transformation), which can measure the mass concentrations of PM2.5 and PM1.0. It can also monitor general air pollution factors and the characteristics and spatiotemporal variations of aerosols. The design of IMPACT is derived from NASA's mobile monitoring station, and it is equipped with tools to analyze the physical and chemical properties of aerosols, particle size distribution, and lung-deposited surface area concentrations, which shows the level of aerosol deposition in the lungs. Using a technology developed in the laboratory, the data collected by IMPACT have higher temporal resolution and show more subtle changes than data obtained from traditional filters. This will help us understand how aerosols are transmitted in the air, their dynamic changes, as well as their potential toxicity. The monitoring results will facilitate the planning of air pollution reduction and improve the quality of life and health of the population in the long run.

International Degree Program in Climate Change and Sustainable Development

In response to the need for interdisciplinary talent in climate change and sustainable development, NTU's College of Science launched the International Degree Program in Climate Change and Sustainable Development in 2016. With 25 full-time professors from six colleges and 13 departments, the program integrates teaching and research resources from geoscience, life science, and social science. Students are led to explore the environment and human system through hands-on projects and social practice. They are also encouraged to overcome the biases arising from specialized division of labor. The ultimate goal is to develop the students' ability to integrate international and local experiences, make the best use of knowledge in science and humanities, and solve complex and multi-dimensional problems either on their own or with teammates.

NTUSA Promotes Dialogue on Sustainability

The Sustainability Team of National Taiwan University Student Association (NTUSA) has paid close attention to environmental issues. To increase environment awareness in NTU's faculty and students, NTUSA's Sustainability Team and Office of Financial Affairs organized a seminar called "Responsible Investment and Sustainable Development of the Financial Sector" on October 21, 2020. The keynote speaker was Sophia Cheng, Chief Investment Officer of Cathay Financial Holdings. In her speech, she talked about the global trends of sustainable and responsible investment as well as climate change. She also explained climate-related actions that businesses in Taiwan might take, using Cathay Financial Holdings' measures as an example and sharing her observations and suggestions. Dr. Chung-pei Pien from NTU's Risk Society and Policy Research Center was also invited to speak at the seminar. He explained the relationship between climate change and the financial sector and proposed green capital flow solutions. He also talked about research of green capital flow and made policy suggestions from the Center's perspective. The seminar was a refreshing and rewarding experience that helped the participants further understand the close relationship between the financial sector and sustainable development.

SDG13

448 studies published between 2016 and 2020, accounting for 28.8% of academic publication nationwide.

14 LIFE BELOW WATER

LIFE BELOW WATER

R/V New Ocean Researcher 1

Launching R/V New Ocean Researcher 1

In August 2020, NTU officially took over the ocean research vessel, R/V New Ocean Researcher 1, from the Ministry of Science and Technology (MOST). This vessel took the place of Ocean Researcher 1, which had been used by NTU's Institute of Oceanography for 35 years. With the highest tonnage and longest cruising range, R/V New Ocean Researcher 1 will be used to advance atmospheric science and oceanography. Like a treasure hunting vessel and an observation station on the sea, R/V New Ocean Researcher 1 is the only research vessel in Taiwan that is equipped with a meteorological tower at the bow, which collects weather information when cruising and sends real-time information back to Central Weather Bureau via satellite communications. It breaks the limits of land-bound meteorological observation. R/V New Ocean Researcher 1 is used mainly in atmospheric and marine observation. With the latest detective technology that significantly expands the range of marine research, the vessel enables Taiwan's marine researchers to explore the larger, international oceans beyond smaller, local regions. They will be able to establish a more complete national marine database and ecological resources and move towards a new era of ocean research on sustainable development.

International Team Answers What's Happening Under the Sea

Ensuring the sustainability and stability of marine fish population is an important aspect in maintaining marine ecology, social economy, and food security. There are several hot spots of ocean warming in the Indian and Pacific Oceans, yet not much study has been done to assess the impact on various fish species. In August 2020, Associate Professor Hui-Yu Wang of NTU's Institute of Oceanography, Research Fellow Dr. Sheng-Feng Shen of Academia Sinica's Biodiversity Research Center, and Professor Mikko Heino of University of Bergen's Department of Biological Sciences (Norway) published the first study that assessed ocean warming's impact on fish species in the Indian and Pacific Oceans in *Nature Communications*. They also proposed management recommendations in the face of climate change. Their study does not only help improve the accuracy of assessing marine fish stocks, but also help predict the future population and trends of fish stocks under warming.

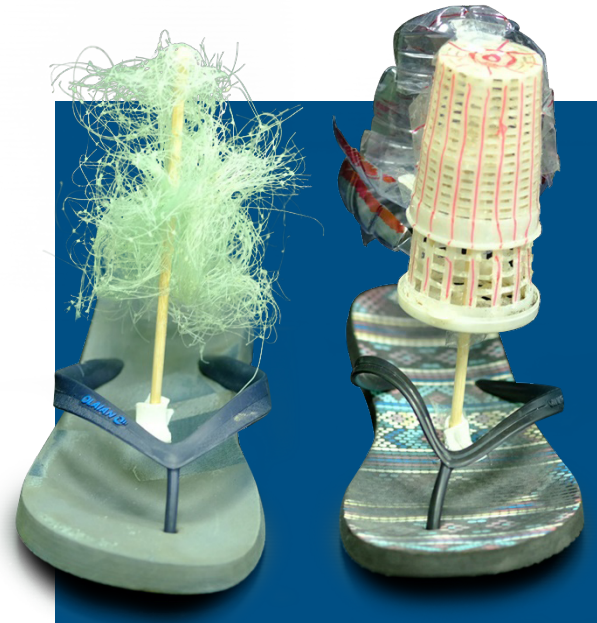
Long-term Warming Affects Aquatic Ecosystems

In order to provide an empirical analysis needed to resolve a long-standing debate about how climate change affects the stability of ecosystems, Professor Chih-hao Hsieh of NTU's Institute of Oceanography and Dr. Chun-Wei Chang of National Center for Theoretical Sciences led an international team, which analyzed long-term time-series data from 10 aquatic ecosystems around the world. They found that when the causal network of biodiversity interrelationships was weakened, long-term warming would indeed affect the stability of aquatic ecosystems. The results were published in *Global Chang Biology* in October 2020. The research team's findings provide new insights into the discussion of how biodiversity and ecosystem networks may affect the stability of ecosystems and have significant implications for ecosystem management.

SDG14

288 studies published between 2016 and 2020,

accounting for 24.4% of academic publication nationwide.



"Flipflops Sailboats", exhibits at the Sea Waste Art Exhibition

Zero Waste: Sea Waste Art Exhibition

As part of the global community of Jane Goodall's Roots and Shoots, NTU Roots and Shoots is a sustainability society. Its mission is to encourage the youth to pay attention to their environment, the living organisms around them, community and culture, and environmental problems in their surroundings. Through academic discussion, learning, and effective actions, they will be able to contribute to the environment. In 2020, NTU Roots and Shoots organized the "Sea Waste Art Exhibition," where the youth cleaned the beach of Honeymoon Bay in Toucheng Township, Yilan County. They turned the waste they found on at the beach into materials for art creations as a way to demonstrate the impact of man-made waste on the environment and to tell the story of sea waste by linking human with the environment.

LIFE ON LAND

NTU Ecological Pond

Adopt a Tree: Instilling Vitality into NTU Campus

There are a wide variety of trees on NTU campus, with more than 20,000 trees growing on the 40-hectaare main campus. Each year, NTU makes great efforts in maintaining the campus landscape by trimming trees and lawns, replacing flowers, preventing and controlling pests and diseases, and treating or removing diseased plants. The Taitung cycads at the main entrance, the century-old camphor trees, and the Luchu pines around the Common Subjects Classroom Building are all protected trees on campus. Vegetation on NTU campus also harbors important habitats for animals, instilling vitality into the campus. As an important green space for the urban residents, NTU kicked off the "NTU Campus Tree Protection Project" in 2020, which solicited private donations to help with health inspection, pest prevention, and disease prevention of trees on campus as well as campus landscaping. Hopefully, the green assets on NTU campus will continue to flourish.

103 trees have been adopted through NTU Campus Tree Protection Project.

Language of Trees: NTU Tree Query System

The beautiful landscape on NTU campus shows different features in different seasons and has attracted visitors all year round. To help visitors identify trees that are protected and know which trees are in their best time of the year, all of the trees are labeled and listed in the Language of NTU Trees website, which provides a query system open to the public.

Campus Biodiversity Survey

As an important urban green space, NTU helps maintain biodiversity for the Taipei metropolitan area and preserves important native species in Taiwan's cultural and natural histories, including "Taitung cycad," the only endemic *Cycas* in Taiwan; the mother tree of Chinese fringetrees all over Taiwan; the extinct in the wild *Rhododendron kanehirae*; and the germplasm of Taiwanese rice. If birds are used as biological indicators of environmental change, the diverse habitats on NTU campus have attracted more than 50 species of birds. To learn about and manage the ecological environment and resources on campus, the university has carried out regular campus biodiversity survey since 2009, including birds, mammals, reptiles, amphibians, insects, plants, and green coverage. The goal is to understand the distribution of various species on campus, as well as the rise and fall of native species and exotic species, the information of which will become reference for NTU's management of biological resources in the future.

Maintaining Biological Diversity

The NTU Biodiversity Research Center was established in 2001, integrating NTU's rich academic energy and resources. It offers International Master's Program in Biodiversity, which cultivates talent with quality education and research. The Center also organizes events and research projects that involves social service and cooperation, in response to the concepts of "conservation, sustainable use, and equitable sharing of benefits" of the "Convention on Biological Diversity." In 2020, the Center was entrusted with a number of research projects, including national park management, climate change education promotion, endangered wildlife conservation, seabird population survey, campaign for feral pigeon prevention and control, and a refinement plan for national forestry carbon sink management. These efforts will contribute to the sustainability of life on land.

◀ The crested goshawk (top) and the collared scops owl (bottom) are two raptors often seen on NTU campus. Their presence means the campus has diverse habitats and species and provides steady food resources.

SDG15

220 studies published between 2016 and 2020, accounting for **36.6**% of academic publication nationwide.

16 PEACE, JUSTICE AND STRONG INSTITUTIONS

PEACE, JUSTICE AND STRONG INSTITUTIONS

NTU Legal Service

Established by renowned legal scholar Professor Lian-Gong Qiu, NTU Legal Service is the first pro bono legal service in Taiwan. Under the guidance of full-time professors from NTU's College of Law and with the devotion of law students, NTU Legal Service provides free legal service to the public every Saturday. Since its establishment in 1979, it has serviced more than 36,659 people. The breakout of COVID-19 in early 2020 forced the service to stop for six months in order to protect the students' health, during which time the students did case study research instead. The service resumed in the second half of the year, and they handled as many as 604 cases. NTU Legal Service provides legal consultation and tries to find out the facts and legal doubts about each case. Students have the opportunity to get hands-on experience with real legal incidents, learn to identify legal facts, and make appropriate legal judgment. They will also get to know the struggles and hardships of the disadvantaged, how the law should be practiced in order to do justice, and cultivate the spirit of altruism. When a citizen does not have the resources to hire a lawyer, they can seek legal assistance from NTU Legal Service.

Since NTU Legal Service establishment in 1979, it has serviced more than **36,659** people.

NTU Children and Family Research Center

NTU Children and Family Research Center has been advocating the rights of children and families in Taiwan since 2012. For the benefit of research, the Center established Taiwan's first national database that keeps long-term data of abused children and their physical and mental health. Among the surveyed subjects, 1.7% have experienced seven types of violence (bullying, sexual violence, physical violence, mental violence, witnessing domestic violence, negligence, and community violence) when they were fourth graders. Yet of the abused children, only 20% have received protection from the social workers. The long-term research has pointed out the risk factors and protective factors, which will provide an important basis for the central and local governments when they formulate policies and measures of children's protection. In addition, the Center has also promoted the judicial interview system for children's sexual assault cases. The system was officially incorporated into the law on December 8, 2015, as Article 15 (1) of Sexual Assault Crime Prevention Act. The Center also provides training of professional judicial interview skills for judicial interviewers, so that they can acquire credible testimonies and effectively protect children's judicial rights and interests in cases of child sexual assault, child protection, and child witnesses.

Chen Wen-Chen Incident Memorial Square

In 1981, NTU alumnus Dr. Chen Wen-Chen was found dead for unknown reasons on NTU campus, which was a shock in Taiwan and abroad. In March 2015, NTU Affairs Meeting approved the proposal made by faculty and students and decided to name the square between the Library and Information Science Building, First Student Activity Center, and Multi-Purpose Classroom Building "Chen Wen-Chen Incident Memorial Square." To make this project a reality, Dr. Chen Wen-Chen Memorial Foundation, NTU's Department of Mathematics, NTU Student Association, and NTU Graduate Student Association jointly launched a fundraising campaign. Dr. Chen Wen-Chen Memorial Foundation donated the funds raised to NTU on behalf of all the donators. The construction began in July 2020 and was completed in February 2021. The memorial square is not just a reminder of Dr. Chen's tragic death, but it is also a reminder to the community that human rights, democracy, and freedom are always worth fighting for.

Chen Wen-Chen Incident Memorial Square

SDG16

68 studies published between 2016 and 2020, accounting for 16.8% of academic publication nationwide.

17 PARTNERSHIPS FOR THE GOALS

PARTNERSHIPS FOR THE GOALS

Global Health and Service-Learning Club

In order to solve unequal distribution of medical resources and inequity in healthcare, in 2012 NTU Hospital and School of Medicine organized a yearly overseas medical mission to Ladakh, India. In 2017, the Global Health and Service-Learning Club was established to carry on with the mission's experience and resources from sponsors. At first, the club was mainly composed of medical students. Later on, students from other departments began to join. The club has kept the tradition of visiting Ladakh, India every year and working with local schools to provide medical and educational assistance. During the eight years of service, the club has developed an "empowerment assistance" mode, where they serve, support, and train local healthcare providers from a local perspective. They have established a self-assistance system to replace the previous "single-time assistance" system, which provided materials or construction service temporarily. The new system will make long-term and fundamental changes. On the one hand, they educate school nurses and dormitory administrators with healthcare knowledge. On the other hand, they help train local healthcare providers. Ladakh is situated on the border of China and India, and the residents include Tibetan Buddhists, Muslims, and Hinduists. To avoid breaking religious taboos, the club members would adjust the teaching content according to the local beliefs and customs. The respect the club members show for the locals enables them to work with local communities with mutual trust and harmony and create long-term and stable changes in Ladakh. In 2020, NTU gave the Global Health and Service-Learning Club a Social Devotion Special Award to acknowledge its achievements.

Since 2012, the club has provided voluntary service in Ladakh, India over **8** years.

Members of Global Health and Service-Learning Club celebrate school anniversary at a local school in Ladakh.

GLIP: Distance Co-Learning with East Asian Partners

In 2020, NTU developed the Global Learning Initiatives Program (GLIP) together with the Association of East Asian Research Universities (AEARU). Member universities are invited to open thematic interdisciplinary courses, with SDGs and globalization as the general direction of course development. GLIP allows students to experience an international learning environment and resources via diverse co-learning modes. They are able to exchange ideas with teachers and students from different universities. NTU students can also use distance learning to take courses offered by top universities in East Asia and interact with their faculty and students. Besides the experience of international exchange, the credits of these courses offered by partner universities are recognized by NTU. Since GLIP kickstarted in the second semester of academic year 2020, 106 students have participated in this program.

Global ATGS Trains Agricultural Talent for SE Asia

Southeast Asian Regional Center for Graduate Study and Research in Agriculture (SEARCA) and NTU jointly offer a scholarship program to students from the member countries of Southeast Asian Ministers of Education Organization (SEAMEO). Southeast Asian students that study the Master Program in Global Agriculture Technology (Global ATGS) and Genomic Science at NTU will receive generous scholarships. SEAMEO aims to promote educational cooperation in Southeast Asia. SEARCA, which was established in 1997, is responsible for agricultural-related issues. It is the oldest agency under SEAMEO, and is devoted to integrating higher education resources and promoting agricultural innovation. THE Global ATGS master's program is an interdisciplinary degree program taught in English by faculty from NTU's College of Biosciences and Agriculture and College of Life Science. The program aspires to recruit and cultivate talents through scholarships and to promote sustainable agricultural innovation.

GASE Promotes Global Partnerships and Connections

The Ministry of Science and Technology (MOST) and NTU co-founded MOST Center for Global Affairs and Science Engagement (GASE), whose mission is to enhance the ties between Taiwan and international scientific research and to cultivate international researchers in Taiwan. GASE's steering committee is composed of representatives from 15 universities. Integrated resources from inside and outside of MOST allows GASE to actively promote local science research institutes to work with global partners. In 2020, GASE's Four Season Speech Series invited Dr. Jane Goodall, DBE, the United Nations Messenger of Peace and Laureates of Tang Prize in Sustainable Development, to deliver a speech on the importance of post-pandemic life, ecological conservation, and sustainable development via videoconferencing. Dr. Goodall answered questions from the audience after her speech, which was an enriching experience for the students that attended the event.

Sustainable Development Hand in Hand

In March 2020, NTU and Taiwan Institute for Sustainable Energy (TAISE) signed an MOU to establish a bilateral cooperation relationship. In September 2020, they jointly organized an industrial exchange workshop, where Delta Electronics, E. Sun Financial Holding Company, TAISE, and NTU shared the thinking of sustainable business development and social responsibility, as well as how to encourage businesses to adopt the ESG (environmental, social, governance) concept of responsible governance.

STARS: Sustainability Tracking, Assessment & Rating System

The 2020 NTU Social Responsibility and Sustainability Report used STARS (Sustainability Tracking, Assessment & Rating System) as its framework, making it the first social responsibility report in Taiwan that was based on STARS. More than 1,000 universities around the world have joined the STARS framework, which evaluates higher education institutions' performance in sustainability. NTU is one of them. STARS is a comprehensive, multi-disciplinary framework covering teaching, research, on- and off-campus promotion, as well as sustainability actions, such as carbon emissions, energy, and transportation; it also evaluates a university's governance in areas such as environment safety, investment, and minority groups. Evaluation and rating made by STARS is a good indicator of how higher education institution perform in sustainability.