Times Higher Education
Sustainability
Impact Ratings

SDG 15

Life On Land

SDG 15.2.1 Events about sustainable use of land

In addition to sustainable land use, National Changhua University of Education (NCUE) is involved in various other projects or activities, including the Department of Biology's "Taoyuan International Airport Corporation Program/ Commissioned Planning and Design for Invasive Red Fire Ant Control Operations", Department of Geography's "Monitoring of Agro–Fishing Socio-Ecological Systems in the Coastal Wetlands of Western Taiwan(3/3)" and "From Knowledge Gaps to Sustainable Groundwater Action Plans: Disaster Risk Communication and Value Construction in the Land Subsidence Areas of Changhua", summarized in the following Table 1. The following section contains project descriptions.

Table 1. Related projects and events

Project Name	Funding Agency
Taoyuan International Airport Corporation Program/ Commissioned Planning and Design for Invasive Red Fire Ant Control Operations	Taoyuan International Airport Corporation
Monitoring of Agro–Fishing Socio-Ecological Systems in the Coastal Wetlands of Western Taiwan (3/3)	National Science and Technology Council
Climate Resilience Development and Disaster Adaptation Governance: A Participatory Approach with Just Transition — Subproject III "From Knowledge Gaps to Sustainable Groundwater Action Plans: Disaster Risk Communication and Value Construction in the Land Subsidence Areas of Changhua"	National Science and Technology Council

NCUE's relevant projects included:

1. Commissioned Planning and Design for Invasive Red Fire Ant Control Operations

   In order to protect navigational and public facilities in the airport area, uphold the nation's image, and reduce fire ant attacks on airport staff and travelers, monitoring and controlling invasive of red fire ants at Taoyuan International Airport are a must, and we must remain vigilant until their eradication in the Dayuan District. This project aims to continue red fire ant control across the airport, where operations must comply with strict aviation safety rules and adjust accordingly to different weather conditions. Tasks such as manpower planning, field monitoring, treatment planning and execution require a team equipped with both red fire ant control expertise and airport-specific experience (Figure 1).

Figure 1. Carrying out pest control operations in the terminal parking lot.

2. Monitoring of Agro–Fishing Socio-Ecological Systems in the Coastal Wetlands of Western Taiwan

The Department of Geography at NCUE is undertaken the National Science and Technology Council (NSTC) project "Monitoring of Agro–Fishing Socio-Ecological Systems in the Coastal Wetlands of Western Taiwan (3/3)." Fangyuan was designated as the core observation site to establish a place-based demonstrative observation program. This initiative implements long-term, fundamental, and critical monitoring of core socio-ecological system components, serving as the central hub within the Long-Term Socio-Ecological Research (LTSER) network in Changhua.

Field investigations at the station encompass water quality assessments, ecological surveys, and geomorphological monitoring in the Fangyuan, Hanbao, and Wanggong wetlands. A complete year of baseline surveys was accomplished in 2024, and continuous monitoring will be maintained in subsequent years. In-depth interviews with key local stakeholders constitute a vital element of the station's social research, which strengthened the LTSER platform's local engagement network. These interviews were systematically documented and analyzed stakeholder roles, functions, and relationships of stakeholders, as well as their experiences and observations of socio-ecological transformations, thus providing a robust social–ecological data foundation for the platform.

Drawing upon insights from these interviews and local documentary sources, the station developed questionnaires to further assess residents' opinions on environmental and renewable energy issues. Station staff also actively participate in local gatherings to identify emerging concerns and develop collaborative opportunities with community partners. The long-term monitoring program aims not only to advance scientific understanding but also to address locally relevant needs. See Figure 2 for relevant activities.

Figure 2. Attendance at the Symposium on Coastal Wetland Conservation in Changhua

3. From Knowledge Gaps to Sustainable Groundwater Action Plans: Disaster Risk Communication and Value Construction in the Land Subsidence Areas of Changhua

The project originally focused on filling knowledge gaps and facilitating risk communication surrounding land subsidence disasters, with the aim of establishing local development values

aligned with the principles of a just transition. In recent years, however, with the growing scale of renewable energy development under increasing pressure from the climate crisis, the research has shifted to examine issues of just transition related to the installation of solar and wind power facilities in the Fangyuan and Dacheng areas of Changhua. To date, ten local stakeholders—including village leaders, landowners, farmers, residents, and solar energy developers—have been interviewed, with the fieldwork still ongoing. Through qualitative interviews, the project seeks to identify knowledge gaps and shortcomings in risk communication, while attempting to propose potential solutions.

SDG 15.2.2 Sustainably farmed food on campus

One area is the Crop Garden developed by the Department of Biology, which facilitates sustainable food production on campus.

Figure1. Department of Biology's Crop Garden

SDG 15.2.3 Maintain and extend current ecosystems' biodiversity

NCUE has undertaken multiple ongoing projects and activities, including: Environmental Education Center's "Environmental Educator 24-hour and 100- hour Certification Course"; the Department of Biology's "Smart Development of New Eco-Friendly Pest Control Technologies for Ant Management in Commercial Applications"; Center for General Education has developed relevant General Education Courses, and Department of Fine Arts's "Ecological Homelands and Urban-Rural Sustainability: A Changhua Ecological Art Project", as indicated in Table 1. The following section contains project descriptions.

Table 1: Related projects and events

Project Name	Funding Agency
Environmental Educator 24-hour and 100- hour Certification Course	-
Smart Development of New Eco-Friendly Pest Control Technologies for Ant Management in Commercial Applications	Ministry of Science and Technology
"Plants and Human Civilization", "Changhua Studies"	-
Ecological Homelands and Urban-Rural Sustainability: A Changhua Ecological Art Project	Ministry of Education

1. Environmental Educator 24-hour and 100- hour Certification Course

   The Environmental Education Center (EEC) nurtures relevant environmental education talents. In conjunction with the project "Beautiful and Treasured Clams in Fangyuan and Dacheng: Sustainable Industry and Environment Project of Changhua's Two Cities Amid Climate Change" project, EEC provided relevant educational courses for the local and nationwide communities from July to October 2024, with the details shown in Table 2 and the activities shown in Figure 1-2:

Table 2. Environmental education course activities

Course Title	Time	Number of students
Specialized Program for Environmental Educator 24-hour Certification	August 2024	20
Environmental Educator 100-hour Certification Course	July 2024	8

Figure 1 Specialized Program for Environmental Educator NCUE

Figure 2 Environmental Educator 100-Hour Certification Course – Classroom Instruction

Links to course activities
https://www.facebook.com/media/set/?set=a.1080081833905178&type=3
https://www.facebook.com/media/set/?set=a.1082290977017597&type=3

2. Smart Development of New Eco-Friendly Pest Control Technologies for Ant Management in Commercial Applications

This project applies technology developed by Professor Chung-Chi Lin's ant control team and the university's spin-off A. nT Environmental Technology Co., Ltd. to provide scientific, effective, and eco-friendly ant control services currently lacking in the market.

Invasive ant outbreaks, driven by species spread, ecological change, and farming shifts, have expanded from isolated counties to 13 regions, becoming a nationwide issue. Despite annual investments exceeding NT$100 million, lack of specialized ant control expertise has hindered project results.

The market urgently needs a professional company capable of integrating and developing methods and agents for all invasive ant species in Taiwan, combining theory with practice, to eradicate harmful ants in priority areas and gradually expand control efforts nationwide (Figures 3-4).

螞蟻防治產品型錄

安特爾環境科技股份有限公司

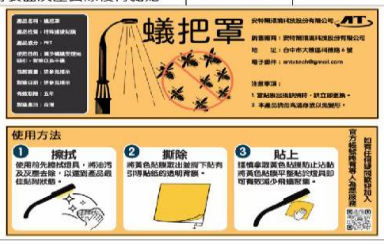
產品名稱	使用方法	規格	售價（新台幣）
速鉤蟻 (螞蟻餌劑)	1. 加入 1.5 公升水混合均勻 2. 放置於螞蟻出沒之處	單罐 150g	$ 350
			
螞賽剋 (螞蟻噴劑)	1. 加入 30 公升的水混合均勻 2. 直接噴灑於螞蟻體表	單罐 90g	$ 330
			
蟻把罩	1. 一組含十份燈膜 2. 請將表面灰塵去除後再黏貼	一組	$ 3,000
			

Figure 3. Ant Control Product Catalog

中華民國專利證書

發明第 I853783 號

發明名稱：微電流螞蟻阻隔裝置

專利權人：國立彰化師範大學

發明人：林宗岐

專利權期間：自 2024 年 8 月 21 日至 2044 年 3 月 31 日止

上開發明業經專利權人依專利法之規定取得專利權

經濟部智慧財產局 局長 廖承威

中華民國 113 年 8 月 21 日

Figure 4. Relevant Patent Certificates

3. Center for General Education

The Center for General Education offered relevant general education courses in the 2024 academic year.

“Plants and Human Civilization”

https://webap0.ncue.edu.tw/DEANV2/UploadDEAN/SUBJECT/1122/00242_0CCGE0179120.pdf

“Changhua Studies”

https://webap0.ncue.edu.tw/DEANV2/UploadDEAN/SUBJECT/1122/00262_0CCGE0185320.pdf

4. Ecological Homelands and Urban-Rural Sustainability: A Changhua Ecological Art Project

(1) NCUE Campus Arbor Day Event – **Free** Distribution of Indoor Potted Ivy

To enhance campus greening and promote ecological awareness among faculty and students, the Environmental Education Center and the Department of Biology, in collaboration with the USR project “Ecological Homeland · Urban-Rural Sustainability: Changhua Ecological Art Project”, jointly organized the National Changhua University of Education Campus Arbor Day Event – **Free** Distribution of Indoor Potted Ivy. Centered on promoting campus greening, the event encouraged faculty and students to incorporate plants into classrooms, offices, and everyday living spaces, fostering daily practices of greening both indoors and outdoors.

The event drew enthusiastic participation from the campus community. During the preparation phase, 60 ivy plants were distributed to pre-registered participants, followed by a lottery-based distribution of 137 more, totaling 197 plants distributed to over 230 participants. Participants engaged in hands-on planting, participants not only enhanced their awareness of plant care but also deepened their understanding of the role of plants in carbon reduction, cooling, and air quality improvement. Ivy, as a plant with air-purifying and greening functions, provided participants with opportunities to develop a practical understanding of maintaining and expanding ecological benefits, thereby supporting the social responsibility of higher education institutions’ roles in terrestrial biodiversity conservation, climate action, and sustainable lifestyles.

Figure 5. Event poster

Figure 6. Professor Shih-Feng Fu (Director of the Environmental Education Center and Department of Biology) interacting with students

Figure 7. The event drew enthusiastic participation from faculty, students, and administrative staff on campus.

Relevant links: https://reurl.cc/GNnnGD

(2) Plant Anatomy / Outdoor Teaching at the Botanical Garden of National Museum of Natural Science

This course adopted the format of an "ecological field trip," with the lecturer guiding 20 students out of the classroom and into real plant ecological sites, students were able to extend their knowledge of plants into hands-on observation and experience. Through professional ecological tours, students in this class not only learned to identify plant species and their characteristics, but also understood their roles of various plants within the ecosystem.

The course directly aligns with the core spirit of SDG 15, "Life on Land," emphasizing the protection, restoration, and sustainable management of terrestrial ecosystems. Through on-site observation, students gained a deeper appreciation for plant biodiversity and understood the importance of maintaining ecological balance and promoting sustainable development for modern society. At the same time, experiential learning fosters students' local ecological awareness and conservation mindset. This encourages them to apply their knowledge in future research or community projects, thereby helping the university fulfill its responsibility to promote local ecological sustainability and cultivate talent.

(3) Plant Morphology / Plant Field Trip at Sun Moon Lake Bi-Shui Trail

This course was based on Plant Morphology. The lecturer brought 25 students out of the campus and into diverse natural sites in central Taiwan. Through field investigations, students practiced identifying different plant species, and observed the external morphology of roots, stems, and leaves, as well as their environmental adaptations. Not only did this hands-on approach deepen students' understanding, but also encouraged them to apply their knowledge of plants, The course inspired students to connect ecological theories with field observations, cultivating both ecological sensitivity and mindful observation.

Incorporating ecological guided tours, the course encouraged students to transfer their specialized knowledge of plant morphology into contents that were accessible to the general public to enhance their communication and environmental education skills. By studying plant diversity and distribution, students gained a clearer understanding of the roles of different plants within terrestrial ecosystems. The students also reflected on the interactions between humans and the environment. The course fostered students' awareness of terrestrial ecosystem conservation, which closely aligns with SDG 15: Life on Land.

SDG 15.2.4 Educational programmes on ecosystems

NCUE's educational programs on ecosystems include Environment Education Centre's "Environmental Educator 24-hour and 100-hour Certification Course", and "Beautiful and Treasured Clams in Fangyuan and Dacheng: Sustainable Industry and Environment Project of Changhua's Two Cities Amid Climate Change" ; Department of Biology's "Changhua Coastal Meretrix lusoria Habitat Survey and Conservation Education Promotion Program" ; Department of Fine Arts's " Ecological Homelands and Urban-Rural Sustainability: A Changhua Ecological Art Project". The following section contains project descriptions.

Project Name	Funding Agency
Beautiful and Treasured Clams in Fangyuan and Dacheng: Sustainable Industry and Environment Project of Changhua's Two Cities Amid Climate Change	Ministry of Education
Ecological Homelands and Urban-Rural Sustainability: A Changhua Ecological Art Project	Ministry of Education

1. Environmental Educator 24-hour and 100-hour Certification Course

The Environmental Education Center (EEC) nurtures relevant environmental education talents. In conjunction with the project "Beautiful and Treasured Clams in Fangyuan and Dacheng: Sustainable Industry and Environment Project of Changhua's Two Cities Amid Climate Change" EEC provided relevant education courses for the local and nationwide communities from July to October 2024, with the details shown in Table 1 and the activities shown in Figure 1-2:

Table 1. Environmental education course activities

Course Title	Time	Number of students
Environmental Educator 24-hour and 100-hour Certification Course	August 2024	20
Environmental Educator 100-hour Certification Course	July 2024	8

Figure 1. Specialized Program for Environmental Educator 24-hour Certification at NCUE

Figure 2. Environmental Educator 100-hour Certification Course

Links to course activities
https://www.facebook.com/media/set/?set=a.1080081833905178&type=3
https://www.facebook.com/media/set/?set=a.1082290977017597&type=3

2. “Beautiful and Treasured Clams in Fangyuan and Dacheng: Sustainable Industry and Environment Project of Changhua’s Two Cities Amid Climate Change” and “Changhua Coastal Meretrix lusoria Habitat Survey and Conservation Education Promotion Program”.

   NCUE developed programs including “Coastal Biological Resources” and “Sustainable Development and Practice of Coastal Biological Resources”, and encouraged students to integrate theory and practice. The courses focused on coastal biodiversity, eco-friendly aquaculture, water and sediment testing, fish consumption culture, and low-carbon aquaculture promotion, alongside community collaboration to advance marine conservation and sustainable fisheries. In the same year, the industry–academia collaboration project “Changhua Coastal Meretrix lusoria Habitat Survey and Conservation Education Promotion Program” was carried out at Xinbao Wetland and Wanggong Harbor. The project aimed to invite schoolkids to step into the role of marine scientists through activities such as: “Hard Clam Habitat Surveys” (four seasonal sessions including sediment improvement trials), “Volunteer Surveyor Training” (4 sessions, 41 participants), “Seed Teacher Training” (3 sessions, 91 participants), and the “Hard Clam Detective Team” (4 sessions, 185 participants).

   In partnership with Caohu Junior High School, Hanbao Elementary School, and Lukang Elementary School to integrate scientific investigation with local education, the curriculum and hands-on activities included water quality testing, biodiversity surveys, bivalve classification, coastal tourism, and conservation education.

   Results showed that sediment improvement significantly boosted growth of coarse-grain substrate indicator species such as hard clams and Meretrix, suppressed the dominance of Cyclina sinensis, and enhanced carbon sequestration potential, as well as benthic biodiversity. The participation of schoolkids increased the amount of survey data and helped raise community conservation awareness, creating a demonstrative model combining science and education (Figure 3).

Figure 3. Meretrix lusoria Habitat Observation and Survey

3. Ecological Homelands and Urban-Rural Sustainability: A Changhua Ecological Art Project

(1) Plant Anatomy / Outdoor Teaching at the Botanical Garden of National Museum of Natural Science

This course adopted the format of an "ecological field trip," with the lecturer guiding 20 students out of the classroom and into real plant ecological sites, students were able to extend their knowledge of plants into hands-on observation and experience. Through professional ecological tours, students in this class not only learned to identify plant species and their characteristics, but also understood their roles of various plants within the ecosystem.

The course directly aligns with the core spirit of SDG 15, "Life on Land," emphasizing the protection, restoration, and sustainable management of terrestrial ecosystems. Through on-site observation, students gained a deeper appreciation for plant biodiversity and understood the importance of maintaining ecological balance and promoting sustainable development for modern society. At the same time, experiential learning fosters students' local ecological awareness and conservation mindset. This encourages them to apply their knowledge in future research or community projects, thereby helping the university fulfill its responsibility to promote local ecological sustainability and cultivate talent.

This course was based on Plant Morphology. The lecturer brought 25 students out of the campus and into diverse natural sites in central Taiwan. Through field investigations, students practiced identifying different plant species, and observed the external morphology of roots, stems, and leaves, as well as their environmental adaptations. Not only did this hands-on approach deepen students' understanding, but also encouraged them to apply their knowledge of plants, The course inspired students to connect ecological theories with field observations, cultivating both ecological sensitivity and mindful observation.

Incorporating ecological guided tours, the course encouraged students to transfer their specialized knowledge of plant morphology into contents that were accessible to the general public to enhance their communication and environmental education skills. By studying plant diversity and distribution, students gained a clearer understanding of the roles of different plants within terrestrial ecosystems. The students also reflected on the interactions between humans and the environment. The course fostered students' awareness of terrestrial ecosystem conservation, which closely aligns with SDG 15: Life on Land.

SDG 15.2.5 Sustainable management of land for agriculture (educational outreach)

NCUE has implemented activities including: Environmental Education Center's "Environmental Educator Certification Courses (24, 33, and 100 hours)" and the project "Beautiful and Treasured Clams in Fangyuan and Dacheng: Sustainable Industry and Environment Project of Changhua's Two Cities Amid Climate Change", Department of Geography's "Geographical Writing and Local Practices — Reconstructing Geographical Records of the Fangyuan Coastal Community in Changhua", "From Knowledge Gaps to Sustainable Groundwater Action Plans: Disaster Risk Communication and Value Construction in the Land Subsidence Areas of Changhua". The following section contains project descriptions.

Table 1. Related activities and projects

Project Name	Funding Agency
Beautiful and Treasured Clams in Fangyuan and Dacheng: Sustainable Industry and Environment Project of Changhua's Two Cities Amid Climate Change	Ministry of Education
Topographical Writing and Local Practices — Reconstructing Geographical Records of the Fangyuan Coastal Community in Changhua	Ministry of Education
Climate Resilience Development and Disaster Adaptation Governance: A Participatory Approach with Just Transition — Subproject III "From Knowledge Gaps to Sustainable Groundwater Action Plans: Disaster Risk Communication and Value Construction in the Land Subsidence Areas of Changhua"	National Science and Technology Council

1. Environmental Educator 100-hour Certification Course

The Environmental Education Center trains environmental education professionals. In coordination with the "Beautiful and Treasured Clams in Fangyuan and Dacheng: Sustainable Industry and Environment Project of Changhua's Two Cities Amid Climate Change" project, it offered related courses for local and national communities from July to October 2024. Details are shown in Table 2, with activities in Figures 1–2.

Table 2. Environmental education course activities

Course Title	Time	Number of students
Environmental Educator 100-hour Certification Course	July 2024	8

Figure 1. Environmental Educator 100-hour Certification Course – Classroom Instruction

Link to course activities: https://www.facebook.com/media/set/?set=a.1082290977017597&type=3

2. Topographical Writing and Local Practices — Reconstructing Geographical Records of the Fangyuan Coastal Community in Changhua

   Using the coastal community of Fangyuan Township, Changhua, as the field of practice, this project adopted the method of topographical writing to investigate the spatial features of traditional courtyard houses (sanheyuan) that were abandoned along the coast. In addition, the project traced the histories of the houses, including its development and the lives of local residents. The aim of the project was to reconstruct the geographical records of these villages that have faded with time, integrating rural geography theories with the skills of topographical writing, while also assisting the community in gradually achieving the goals of landscape preservation and transformation.

   Under the guidance of Professor Yu-Ling Song, thirty students from the Department of Geography enrolled in the course Rural Geography conducted three rounds of fieldwork in Fangyuan Township, Changhua County. A presentation of the students' research findings was held at the Oilseed Academy, where local village heads, community leaders, artists, and returning youth were invited. The event also featured roundtable discussions, following the "World Café" format to facilitate the exchange of ideas among participants, and reflect on the results of each group's investigation of the old houses.


Figure 2. Aerial photography of abandoned sanheyuan (traditional courtyard houses) in the Fangyuan area of Changhua County.

Figure 3. Project Presentation at Oilseed Academy

3. From Knowledge Gaps to Action Plans for Sustainable Groundwater: The project originally focused on filling knowledge gaps and facilitating risk communication surrounding land subsidence disasters, with the aim of establishing local development values aligned with the principles of a just transition. In recent years, however, with the growing scale of renewable energy development under increasing pressure from the climate crisis, the focus shifted to exploring the just transition issues arising from solar and wind power projects in the Fangyuan and Dacheng areas of Changhua. Currently, 10 local village chiefs, landowners, farmers, residents, and solar energy developers have been interviewed, and further interviews are planned. Through qualitative interviews, the study aims to identify gaps in knowledge and risk communication, and to propose potential solutions.

SDG 15.2.6 Sustainable management of land for tourism (educational outreach)

NCUE has undertaken various projects and activities, including the Department of Biology's Project of "Commissioned Planning and Design for Invasive Red Fire Ant Control Operations." The following section contains project descriptions.

1. Project of Entrusted Planning and Design for RIFA Control

   In order to protect navigational and public facilities in the airport area, uphold the nation's image, and reduce fire ant attacks on airport staff and travelers, monitoring and controlling invasive of red fire ants at Taoyuan International Airport are a must, and we must remain vigilant until their eradication in the Dayuan District. This project aims to continue red fire ant control across the airport, where operations must comply with strict aviation safety rules and adjust accordingly to different weather conditions. Tasks such as manpower planning, field monitoring, treatment planning and execution require a team equipped with both red fire ant control expertise and airport-specific experience (Figure 1).

Figure 1. Assisting contractors in identifying red fire ants

SDG 15.3.1 Sustainable use, conservation and restoration of land (policy)

NCUE has at least four ongoing projects and activities, including: Environmental Education Centre's "Environmental Educator 24-hour and 100-hour Certification Course", the Department of Biology's "Commissioned Planning and Design for Invasive Red Fire Ant Control Operations"; Department of Geography's "Changhua County Landscape Conservation Promotion Project", as listed in Table 1. The following section contains project description.

Table 1. Related activities and projects

Project Name	Funding Agency
Environmental Educator 24-hour and 100-hour Certification Course	-
Commissioned Planning and Design for Invasive Red Fire Ant Control Operations	Taoyuan International Airport Corporation Company
Changhua County Landscape Conservation Promotion Project	Changhua County Government Agriculture Department

1. Environmental Educator 24-hour and 100-hour Certification Course

The Environmental Education Center (EEC) aims to nurture environmental education talents. In conjunction with the project "Beautiful and Treasured Clams in Fangyuan and Dacheng: Sustainable Industry and Environment Project of Changhua's Two Cities Amid Climate Change" project, EEC provided relevant education courses for the local and nationwide communities from July to October 2024, with the details shown in Table 1 and the activities shown in Figure 1-2:

Table 2. Environmental education course activities

Course Title	Time	Number of students
Specialized Program for Environmental Educator 24-hour Certification at NCUE	August 2024	20
Environmental Educator 100-hour Certification Course	July 2024	8

Figure 1. NCUS's Specialized Program for Environmental Education Personnel

Figure 2. Environmental Educator 100-hour Certification Course – Classroom Instruction

Links to relevant course activities

https://www.facebook.com/media/set/?set=a.1080081833905178&type=3

https://www.facebook.com/media/set/?set=a.1082290977017597&type=3

2. Commissioned Planning and Design for Invasive Red Fire Ant Control Operations

In order to protect navigational and public facilities in the airport area, uphold the nation's image, and reduce fire ant attacks on airport staff and travelers, monitoring and controlling invasive of red fire ants at Taoyuan International Airport are a must, and we must remain vigilant until their eradication in the Dayuan District. This project aims to continue red fire ant control across the airport, where operations must comply with strict aviation safety rules and adjust accordingly to different weather conditions. Tasks such as manpower planning, field monitoring, treatment planning and execution require a team equipped with both red fire ant control expertise and airport-specific experience (Figure 3).

Figure 3. Mixing pesticide

3. Changhua County Landscape Conservation Promotion Program

Through a series of workshops and events, this program sought to raise public awareness of the Bagua Mountain landscape. It aimed to deepen understanding of the local environment fostering a sense of pride and responsibility toward preserving it.

In 2024, activities engaged 52 participants:

(1) “Capturing Landscape Beauty with Drones”: a combination of theoretical and hands-on practice held on August 31 at Fangyuan Putian Temple and Haikong Trail. Participants learned how to operate drones to document landscapes gaining new perspectives on their beauty and the importance of conservation from above.

(2) Two “Mineral and Rock Soap Workshop” sessions held on September 28 and 29 at National Changhua University of Education’s Shengyang Hall. Participants soaps modeled after natural minerals and rocks, enhancing their understanding of geology and reinforcing their appreciation for landscape preservation (Figure 4).

Figure 4. Landscape Conservation Promotion Program: Mineral and Rock Soap Workshop

SDG 15.3.2 Monitoring IUCN and other conservation species (policies)

There is no recorded presence of species listed the IUCN Red List or the National List of Protected Species on this campus.

SDG 15.3.3 Local biodiversity included in planning and development

The buildings on our university campuses were constructed in compliance with relevant laws and regulations. Biodiversity was also taken into consideration during the planning and developmental stages. For example, during the construction of Wang Jin-Ping Activity Center, we added foliage by planting yew plum pine, Chinese juniper, crape myrtle, bamboo, camellia, etc., around the center. Relevant photos are as shown in Figure 1.

Figure 1. The yew plum pine and Chinese juniper planted next to the staircase leading to Wang Jin-Ping Activity Center

“Beautiful and Treasured Clams in Fangyuan and Dacheng: Sustainable Industry and Environment Project of Changhua’s Two Cities Amid Climate Change” and “Changhua Coastal Meretrix lusoria Habitat Survey and Conservation Education Promotion Program”

NCUE developed programs including “Coastal Biological Resources” and “Sustainable Development and Practice of Coastal Biological Resources” and encouraged students to integrate theory and practice. The courses focused on coastal biodiversity, eco-friendly aquaculture, water and sediment testing, fish consumption culture, and low-carbon aquaculture promotion, alongside community collaboration to advance marine conservation and sustainable fisheries. In the same year, the industry–academia collaboration project “Changhua Coastal Meretrix lusoria Habitat Survey and Conservation Education Promotion Program” was carried out at Xinbao Wetland and Wanggong Harbor. The project aimed to invite schoolkids to step into the role of marine scientists through activities such as: “Hard Clam Habitat Surveys” (four seasonal sessions including sediment improvement trials), “Volunteer Surveyor Training” (4 sessions, 41 participants), “Seed Teacher Training” (3 sessions, 91 participants), and the “Hard Clam Detective Team” (4 sessions, 185 participants).

In partnership with Caohu Junior High School, Hanbao Elementary School, and Lukang Elementary School to integrate scientific investigation with local education, the curriculum and hands-on activities included water quality testing, biodiversity surveys, bivalve classification, coastal tourism, and conservation education.

Results showed that sediment improvement significantly boosted growth of coarse-grain substrate indicator species such as hard clams and Meretrix, suppressed the dominance of Cyclina sinensis, and enhanced carbon sequestration potential, as well as benthic biodiversity. The participation of schoolkids increased the amount of survey data and helped raise community conservation awareness, creating a demonstrative model combining science and education (Figure 2).

Figure 2. The NCUE team and Changhua Marine Food Research Center jointly conducted habitat sampling and surveys during winter

SDG 15.3.4 Alien species impact reduction (policies)

Invasions by alien species, which can impact the campus ecology, can be managed with prevention control and eradication techniques, which are the two measures implemented by NCUE. Preventive management helps monitor and avert invasions from alien species. Eradication operations involve the use of manual, mechanical, physical, chemical, or biological control methods to eliminate alien species quickly, which can effectively prevent them from spreading further, and minimize losses.

Figure 1shows the surveyed information on alien species on campus. It can be observed that alien species include Forcipomyia Taiwan, while other species have not been found.

學校外來種動植物及植物疫病調查表(調查記錄用)

學校/館所	名稱(含校區):	國立彰化師範大學(進德校區)		學校代碼: 0015
	館/校(區)址:	彰化縣彰化市進德路1號		
填報人資料:	姓名:	黃志生	單位及職稱:	總務處採購事實產管理組/組員
	電話(含分機):	04-7232105#5847	電子郵件:	sunny2012@cc.ncue.edu.tw
調查日期:		113 年 11 月 28 日		

一、林木疫病

種類	本年度總計病株數	本年度已防治病株數
褐根病	4(株)	4(株)
刺胸釉小蜂	0(株)	0(株)

*填寫項目未發生或未防治請填「0」。

二、外來入侵植物

種類	總覆蓋面積/株	已移除面積/株	危害座標(X(E),Y(N))	分布方式	建議防制作為
小花蔓澤蘭	1520(m^2)	330(m^2)	24.079552250029842, 120.55709728485702	□零星 ■集中	■優先防治 □追蹤監測
香澤蘭	0(m^2)	0(m^2)		□零星 □集中	□優先防治 □追蹤監測
銀膠菊	0(m^2)	0(m^2)	本項不填		
銀合歡	0(株)	0(株)			
日本菟絲子	0(m^2)	0(m^2)			

*面積單位平方公尺(m^2),項目未發生或未防治請填「0」。

三、校園內其他外來入侵動物與滋擾昆蟲

種類	從未發現	今年無發現 但曾經發生	今年有在校園中發現 正在持續防治	今年有在校園中發現 尚未進行防治
紅火蟻	■	□	□	□
荔枝椿象	□	■	□	□
龍眼雞	■	□	□	□
秋行軍蟲	■	□	□	□
斑腿樹蛙	■	□	□	□
海蟾蜍	■	□	□	□
綠簡蜥	□	■	□	□
福壽螺	■	□	□	□
美國螯蝦(小龍蝦)	■	□	□	□
琵琶鼠(垃圾魚)	■	□	□	□
魚虎	■	□	□	□
埃及聖鷺	■	□	□	□
家八哥、林八哥、白尾八哥	■	□	□	□
疣胸琉璃蟻	■	□	□	□
小黑蚊	□	□	■	□

Figure 1. Surveyed information on alien species on campus.

Link to the relevant information:
https://www.facebook.com/photo.php?fbid=1277339694179390&set=pb.100057101154022.-2207520000&type=3

SDG 15.3.5 Collaboration for shared land ecosystems

NCUE has multiple ongoing projects and activities, including the Environmental Education Centre's "Beautiful and Treasured Clams in Fangyuan and Dacheng: Sustainable Industry and Environment Project of Changhua's Two Cities Amid Climate Change "; Department of Biology's "Changhua Coastal Meretrix lusoria Habitat Survey and Conservation Education Promotion Program", "Strengthening Hualien County Red Imported Fire Ant Control Plan", "Hualien Fenglin Recreation Area Invasive Fire Ant Control Plan", "Kaohsiung City Flying Ant Damage Survey and Control Strategy Assessment Plan", "Gaomei Wetland Land Crab Hotspot Monitoring and Control Operations", "Kenting National Park Yellow Crazy Ant Control Plan", "Project of Entrusted Planning and Design for RIFA Control", and Department of Geography's "Geographical Writing and Local Practices — Reconstructing Geographical Records of the Fangyuan Coastal Community in Changhua", as listed in Table 1. The following section contains project description.

Table 1. Related projects and events

Project Name	Funding Agency
Beautiful and Treasured Clams in Fangyuan and Dacheng: Sustainable Industry and Environment Project of Changhua's Two Cities Amid Climate Change	Ministry of Education
Changhua Coastal Meretrix lusoria Habitat Survey and Conservation Education Promotion Program	Wanggong Community Development Association, Fangyuan Township, Changhua County
Strengthening Hualien County Red Imported Fire Ant Control Plan	Animal and Plant Health Inspection and Quarantine Agency, Ministry of Agriculture
Hualien Fenglin Recreation Area Invasive Fire Ant Control Plan	East Longitudinal Valley National Scenic Area, Tourism Administration, Ministry of Transportation and Communication
Kaohsiung City Flying Ant Damage Survey and Control Strategy Assessment Plan	Agriculture Bureau of Kaohsiung City Government
Gaomei Wetland Land Crab Hotspot Monitoring and Control Operations	Agriculture Bureau of Taichung City Government
Kenting National Park Yellow Crazy Ant Control Plan	Kenting National Park Headquarters, National Park Service, Ministry of the Interior
Commissioned Planning and Design for Invasive Red Fire Ant Control Operations	Taoyuan International Airport CorporationCompany
Geographical Writing and Local Practices — Reconstructing Geographical Records of the Fangyuan Coastal Community in Changhua	Ministry of Education

1. “Beautiful and Treasured Clams in Fangyuan and Dacheng: Sustainable Industry and Environment Project of Changhua’s Two Cities Amid Climate Change” and “Changhua Coastal Meretrix lusoria Habitat Survey and Conservation Education Promotion Program”.

   NCUE developed programs including “Coastal Biological Resources” and “Sustainable Development and Practice of Coastal Biological Resources”, and encouraged students to integrate theory and practice. The courses focused on coastal biodiversity, eco-friendly aquaculture, water and sediment testing, fish consumption culture, and low-carbon aquaculture promotion, alongside community collaboration to advance marine conservation and sustainable fisheries. In the same year, the industry–academia collaboration project “Changhua Coastal Meretrix lusoria Habitat Survey and Conservation Education Promotion Program” was carried out at Xinbao Wetland and Wanggong Harbor. The project aimed to invite schoolkids to step into the role of marine scientists through activities such as: “Hard Clam Habitat Surveys” (four seasonal sessions including sediment improvement trials), “Volunteer Surveyor Training” (4 sessions, 41 participants), “Seed Teacher Training” (3 sessions, 91 participants), and the “Hard Clam Detective Team” (4 sessions, 185 participants).

   In partnership with Caohu Junior High School, Hanbao Elementary School, and Lukang Elementary School to integrate scientific investigation with local education, the curriculum and hands-on activities included water quality testing, biodiversity surveys, bivalve classification, coastal tourism, and conservation education.

   Results showed that sediment improvement significantly boosted growth of coarse-grain substrate indicator species such as hard clams and Meretrix, suppressed the dominance of Cyclina sinensis, and enhanced carbon sequestration potential, as well as benthic biodiversity. The participation of schoolkids increased the amount of survey data and helped raise community conservation awareness, creating a demonstrative model combining science and education (Figure 1).

Figure 1. The NCUE team and Changhua Marine Food Research Center jointly conducted habitat sampling and surveys during winter

2. Strengthening Hualien County Red Imported Fire Ant Control Plan

   The distribution area of invasive red fire ants in Hualien has increased from about 1,200 hectares in

2019 to approximately 3,000 hectares in 2023. Currently, the main infestation areas remain concentrated in Fenglin Township and Guangfu Township, with some preading over to nearby areas such as Wanrong Township. Although the infestation has slightly expanded, the overall situation is still under control. With immediate and strengthened control measures, red imported fire ants in Hualien can be effectively contained to prevent large-scale spread.

Taiwan's control strategy mainly relies on chemical treatment, using manpower with backpack sprayers for small areas or modified all-terrain vehicles (ATVs) for large-area spraying. However, even ATV spraying has limitations and downsides such as low coverage and uniformity, time-consuming, and labor-intensive. Areas such as valleys and slopes are inaccessible to ATVs, resulting in untreated areas.

In recent years, advances in drone technology have expanded its applications to include pesticide spraying. The use of drones not only reduced workers' exposure to chemicals and mitigates labor shortages but also made it possible to treat areas inaccessible to ATVs like valleys and slopes, thereby significantly enhancing control efficiency (Figure 2).

Figure 2. Unmanned Aerial Spraying System

3. Hualien Fenglin Recreation Area Invasive Fire Ant Control Plan

Since the first detection of invasive red fire ants in Hualien County in 2020, the infestation has expanded to Fenglin Township, Guangfu Township, and Wanrong Township (see Appendix 1: National Fire Ant Control Center's List of Infested Areas), with Fenglin and Guangfu identified as the most severely affected.

The Hualien Fenglin Recreation Area, situated at the periphery of the initial detection zone in Fenglin Township, reported its first fire ants in 2021 (Case No.: (Consult) 1100423-01). In December 2023, our team conducted field surveys confirming the distribution of red fire antismog 94 surveyed 50-meter grids, 17 grids (18%) showed signs of infestation (see Figure 1). The ants were mainly concentrated around the northern sewage treatment plant and adjacent new roads, as well as the southern camping and construction zones, suggesting the spread may be associated with soil movement during construction activities.

Of the 17 infested grids, 76.5% were exhibited activity levels 3–4, indicating high fire ant activity in most affected areas. Comprehensive control measures are urgently needed to prevent further spread. Active eradication efforts are underway to remove the area from infestation control and

ensure visitor safety once the recreation area's reopenings. Relevant photos are shown in Figure 3.

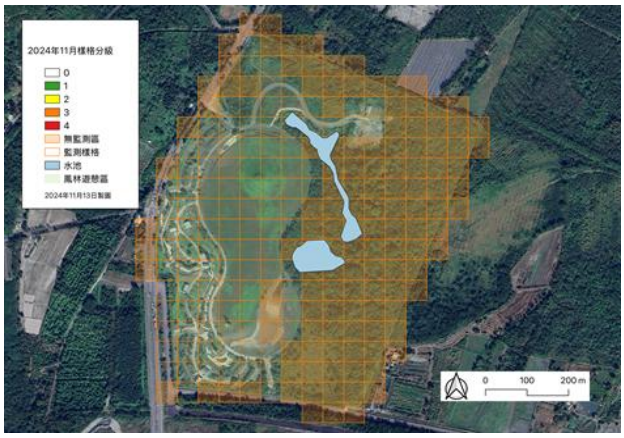


Figure 3. November 2024 Fire Ant Activity Level Changes in 50-Meter Grids at Hualien Fenglin Recreation Area

4. Kaohsiung City Flying Ant Damage Survey and Control Strategy Assessment Plan

In recent years, Qimei District, Kaohsiung City has experienced severe infestations of flying ants during summer and autumn nights. Experts have identified the species responsible as the brown flat technomyrmex ant (Technomyrmex brunneus). During their mating flights, queens and males are drawn to light sources, resulting in large-scale invasions of farms, homes, and businesses at night, which have caused serious disturbances to residents and negatively affected the tourism industry.

In addition, another invasive species, the thoracic dolichoderus ant (Dolichoderus thoracic us), was detected in Shanlin District in 2023. This ant is particularly attracted to sugary fruits and commonly nests in fruit trees, where its clustering behavior not only causes nuisance but also reduces crop quality.

To curb their spread and population growth, survey sites will be established in affected areas for continuous monitoring, enabling the implementation of early and targeted control measures. Relevant photos are shown in Figure 4.

Figure 4. The research team established a Line community group with local stakeholders.

5. Gaomei Wetland Land Crab Hotspot Monitoring and Control Operations

Gaomei Wetland supports a rich population of land crabs but has recently been invaded by the yellow crazy ant, one of the world's top 100 worst invasive species, posing a serious threat to crab survival.

In 2024, bi-monthly liquid bait control operations were conducted in May, July, September, and November, accompanied by continuous monitoring of yellow crazy ant distribution and density in April, June, August, and October. Surveys detected yellow crazy ants at 54 sites, including 14 with mild infestation (level 1), 15 moderate (level 2), 13 medium-high (level 3), 9 high (level 4), and 3 severe (level 5).

Given the limited effectiveness of current control, it is recommended that efforts be intensified next year by increasing baiting frequency to monthly and expanding the treatment to include the pavilion zone (sites 1–24). Relevant photos are shown in Figure 5.

Figure 5. Surveyors placing liquid bait stations in the study area from April to October 2024.

6. Kenting National Park Yellow Crazy Ant Control Plan

Drawing on the Australian government's large-scale baiting strategy against yellow crazy ant super colonies on Christmas Island—which effectively suppressed their populations—the Kenting National Park Yellow Crazy Ant Control Plan continues this proven approach.

The plan called for increased bait dosage in key land crab hotspots and expanded baiting operations to port areas to reduce super colony density and mitigate threats to the land crab population. Liquid bait stations and artificial nest traps will be used to monitor population dynamics within control

zones, assess baiting effectiveness, and provide data to support long-term management strategies and recommendations for yellow crazy ant control in Kenting National Park. Relevant photos are shown in Figure 6.

Figure 6. Yellow Crazy Ant control operations

7. Commissioned Planning and Design for Invasive Red Fire Ant Control Operations

In order to protect navigational and public facilities in the airport area, uphold the nation's image, and reduce fire ant attacks on airport staff and travelers, monitoring and controlling invasive of red fire ants at Taoyuan International Airport are a must, and we must remain vigilant until their eradication in the Dayuan District. This project aims to continue red fire ant control across the airport, where operations must comply with strict aviation safety rules and adjust accordingly to different weather conditions. Tasks such as manpower planning, field monitoring, treatment planning and execution require a team equipped with both red fire ant control expertise and airport-specific experience (Figure 7).

Figure 7. Ant nest injection treatment

8. Topographical Writing and Local Practices — Reconstructing Geographical Records of the Fangyuan Coastal Community in Changhua

Using the coastal community of Fangyuan Township, Changhua, as the field of practice, this project

adopted the method of topographical writing to investigate the spatial features of traditional courtyard houses (sanheyuan) that were abandoned along the coast. In addition, the project traced the histories of the houses, including its development and the lives of local residents. The aim of the project was to reconstruct the geographical records of these villages that have faded with time, integrating rural geography theories with the skills of topographical writing, while also assisting the community in gradually achieving the goals of landscape preservation and transformation.

Under the guidance of Professor Yu-Ling Song, thirty students from the Department of Geography enrolled in the course Rural Geography conducted three rounds of fieldwork in Fangyuan Township, Changhua County. A presentation of the students' research findings was held at the Oilseed Academy, where local village heads, community leaders, artists, and returning youth were invited. The event also featured roundtable discussions, following the "World Café" format to facilitate the exchange of ideas among participants, and reflect on the results of each group's investigation of the old houses.

Figure 8. Aerial photography of abandoned sanheyuan (traditional courtyard houses) in the Fangyuan area of Changhua County.

Figure 9. Project Presentation at Oilseed Academy

SDG 15.4.1 Water discharge guidelines and standards

1. NCUE manages all generated effluent by routing it through a centralized wastewater treatment plant. The treated water is then discharged through outlets approved and regulated by the authorities. The university complies with the regulations outlined in the Water Pollution Control Act (Link https://law.moj.gov.tw/LawClass/LawAll.aspx?media=print&pcode=O0040001) and Water Pollution Control Act Enforcement Rules (Link https://law.moj.gov.tw/LawClass/LawAll.aspx?media=print&pcode=O0040002) in handling and reporting the discharge of wastewater. Every year in July, NCUE submits a report that includes the water quality testing results for both the raw wastewater and the discharged wastewater for the period from January to June of the current year. Additionally, in the following year, by January, NCUE submits a report that covers the water quality testing results for both the raw wastewater and the discharged wastewater for the period from July to December of the preceding year.

   The following is a screenshot of NCUE's reports on the webpage of the "Waste/Polluted Water Management System for Businesses and Sewage Systems" (WPMIS) of the Ministry of Environment as shown in Figure 1:

Figure 1. Screenshot of the "Wastewater Management System for Industrial and Sewerage Systems" webpage of the Ministry of Environment.

2. The photos of the wastewater treatment plant are shown in Figure 2-5.

Figure 2. Jinde Campus Wastewater Treatment Plant

Figure 3. Jinde Campus Wastewater Treatment Plant

Figure 4. Baoshan Campus Wastewater Treatment Plant

Figure 5. Baoshan Campus Wastewater Treatment Plant

3. The Water Pollution Control Act requires annual calibration of the water meter for the effluent of the school's wastewater treatment plant. Figure 6 and Figure 7 show the calibration and correction report of NCUE's wastewater treatment plant effluent water meter issued by an inspection institution accredited by the Ministry of Environment.

AJE Amount Jun Enterprise

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校驗校正報告

Calibration Report

報告序號	AJ-1140402-01	校驗日期	2025/4/2
校驗客戶	國立彰化師範大學實山校區	產品名稱	轉子式流量計
產品型號	F1-TR + DNFS	產品序號	S/N:20160311
產品尺寸	DN 80 / 3"	校驗人員	林 孟 傑

現場校驗校正相關資訊
現場受測錶量測數值為 47.69 M3/hr ; 標準量測計器量測數值為 47.965 M3/hr
標準量測計器攜帶型超音波流量計(經TAF認可校正實驗室認證,認證有效期限至114/4/9)
現場受測錶設定參數 K = 15.030 ,其器差值計算如下:
(47.69 - 47.965) / 47.965 x 100% = - 0.57 %

備 註:

1. 器差值 = (Q - Qs) / Qs x 100%
   Q 為現場受測錶量測數值
   Qs為標準量測計器量測數值
2. 報告結果依據使用者規範,判別合格與否
3. 現場校驗校正方法採流量動態流動時同步拍攝,取得現場受測錶量測數值及標準量測計器量測數值,再依據取得數值進行器差值計算
4. 現場量測數值同步拍攝取樣照片如下頁
5. 現場受測錶設定參數,為儀錶現場受測時內部設定值

量鈞企業有限公司 圖

AJ-1140402-01 P.1/2

AJE Amount Jun Enterprise

Figure 6. Calibration report of the water meter of NCUE's wastewater treatment plant effluent water meter (Page 1)

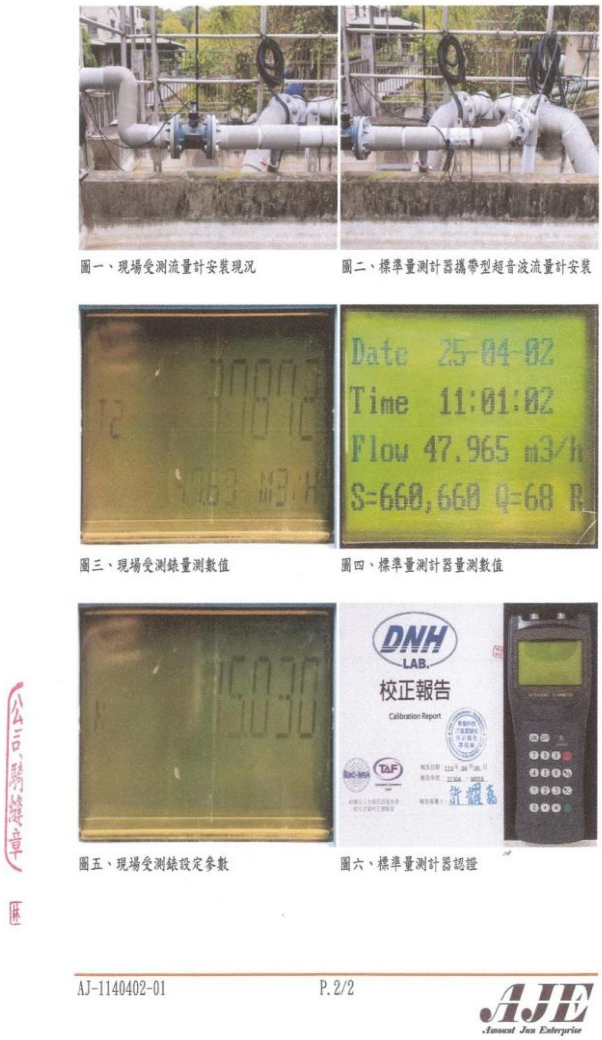

Figure 7. Calibration report of the water meter of NCUE's wastewater treatment plant effluent water meter (Page 2)

4. In accordance with the Water Pollution Control Act and Waste Disposal Act, the sludge removal and treatment operations have been carried out as required. Relevant photos are as shown in Figures 8-11.

Figure 8. Sludge removal and treatment on Jinde Campus of NCUE

Figure 9. Sludge removal and treatment on Jinde Campus of NCUE

Figure 10. Sludge removal and treatment on Baoshan Campus of NCUE

Figure 11. Sludge removal and treatment on Baoshan Campus of NCUE

5. According to the Water Pollution Prevention and Control Act, water quality inspection is conducted once every six months. Relevant photos are as shown in Figures 12-15.

Figure 12. Water quality inspection on Jinde Campus

Figure 13. Water quality inspection on Jinde Campus

Figure 14. Water quality inspection on Baoshan Campus

Figure 15. Water quality inspection on Baoshan Campus

6. In 2024, the variety of operations of wastewater treatment plants on both campuses, including water quality inspection and regular reporting all passed the examination.

SDG 15.4.2 Policy on plastic waste reduction

NCUE implements campus-wide plastic waste sorting and recycling in accordance with the guidelines established by the Ministry of Environment., These include the 'Restrictions on the Use of Shopping Plastic Bags, Targeted Users, Implementation Methods, and Effective Dates,' 'Restrictions on the Use of Disposable Tableware, Targeted Users, and Implementation Methods,' 'Restrictions on the Use of Single-Use Plastic Straws, Targeted Users, and Implementation Methods,' and 'Guidelines for Administrative Agencies and Schools to Reduce the Use of Disposable Tableware and Packaged Drinking Water. The plastic recycling data for the past three years at NCUE is as shown in Table 1, relevant photos are as shown in Figures 1-2.

Table 1. The plastic recycling data for the past 3 years at NCUE

Year	Plastics recycling (kg)
2022	10,581
2024	10,292.9
2024	9,645.5

Figure 1. Signs indicating that plastic shopping bags are not provided for free, and that single-use plastic straws are not available for dine-in customers

Figure 2. Fourteen categories of establishments are not permitted to provide plastic shopping bags for free.

Environmental Protection Department's Regulatory Shared System - Regulatory Content “Restrictions on the Use of Plastic Shopping Bags, Implementation Methods, and Implementation Dates”: https://oaout.moenv.gov.tw/law/LawContent.aspx?id=GL006482

Environmental Protection Department's Regulatory Shared System - Regulatory Content “Restrictions on the Use of Disposable Tableware, Applicable Entities, and Implementation Methods”: https://oaout.moenv.gov.tw/law/LawContent.aspx?id=GL006481

Environmental Protection Department's Regulatory Shared System - Regulatory Content “Restrictions on the Use of Single-Use Plastic Straws, Applicable Entities, and Implementation Methods”: https://oaout.moenv.gov.tw/Law/LawContent.aspx?id=GL007530

Guidelines for Administrative Agencies and Schools to Reduce the Use of Disposable Tableware and Packaged Drinking Water:

https://hwms.moenv.gov.tw/dispPageBox/getFile/Get.aspx?FileLocation=PJ-EPATW%5CFiles%5C&FileName=2650.pdf

https://hwms.moenv.gov.tw/dispPageBox/getFile/Get.aspx?FileLocation=PJ-EPATW%5CFiles%5C&FileName=2691.pdf

SDG 15.4.3 Policy on hazardous waste disposal

NCUE has set up the “NCUE Key Points for Removal and Disposal of Laboratory Waste”. NCUE cleans up and transports the waste generated by school laboratories in the entire school twice a year. Relevant photos are as shown in Figure 1.
(https://saftyweb.ncue.edu.tw/var/file/10/1010/img/1027/675906012.pdf)

Figure 1. NCUE cleans up and transports the waste generated by school laboratories twice a year. The wastes are transported to the Environmental Resources Research and Management Center at National Cheng Kung University for further processing