NTOU's sustainability/climate action policy.

- **Provide local education programs or campaigns on climate change risks, impacts, mitigation, adaptation, impact reduction, and early warning**

1. The Ocean center continues to promote international student exchange activities, such as University Consortium on Aquatic Sciences (UCAS) and Summer Environmental Conservation Academic Research Camp across the Taiwan Straits and three places. The UCAS is held annually, and the research camps are held once in 2 years alternately with the alliance institutions. Although affected by the pandemic, we proceeded with the activities online.
2. The University of Hong Kong, Xiamen University, and Sun Yat-Sen University hold the "University Consortium on Aquatic Sciences (UCAS)" every year. This seminar is entirely led by graduate students, including the itinerary, agenda, and discussions. Teachers only play a consulting role, mainly in training students to organize and manage international academic seminars supplemented by mutual encouragement of academic research. Arrangements and conference reports are all conducted in English. The UCAS 2020 was initially scheduled to be held by the University of Hong Kong in March but was suspended due to the COVID-19 pandemic. However, in 2021, UCAS was organized online by Xiamen University from April 19-22. Four teachers and eight students from NTOU participated.

Evidence: Video Conference

(1)https://www.facebook.com/www.imb.ntou.edu.tw/photos/a.1168193133290856/4425301000913370/?type=3

(2) https://imb.ntou.edu.tw/p/405-1075-61665,c9910.php?Lang=zh-tw

2. Longgang Ecological Park - Firefly Season

"The Longgang Ecological Park of our school is rich in natural ecological resources. In April and May, every year, a large number of fireflies dance in the forest. A series of activities in the firefly season have been held to promote the concept of environmental conservation since 2000. The commentary and guided tours advocate the idea of firefly appreciation and correct knowledge and, at the same time, promote the education of the natural ecological environment, attracting thousands of people to appreciate fireflies every year.

In addition to the firefly viewing activities, ecological exhibitions will be held in the exhibition hall during the firefly season. The exhibition contents include ecological posters, photos, various living biological displays, and the representative native species of Longgang Ecological Park, butterflies, fireflies, and Keelung characteristics. Biology, marine ecology and conservation, etc., so that the public can learn more about ecological knowledge and realize the importance of environmental preservation."

Evidence: A series of activities in the firefly season
https://zh-tw.facebook.com/ntoufirefly/

3. 「SDGs United Nations Sustainable Development Goals」Theme exhibition

NTOU Annual Fixed Fee Purchasing Electronic Book. The first point is to expand the electronic book reader, a multi-reader recognition electronic book platform. The second point is the SDGs concept. For this reason, I have been promoting two projects in an electronic book.

(1) Linear Theme Exhibition:

The reading platform (website: https://ntou.ebook.hyreadtw/) is used by teachers and students of the National Taiwan Ocean University, which provides licensed e-books.

They selected 118 e-books from the library's tens of thousands of books. Two types of e-books, challenge selection in science and environment protection ecology, are compatible with the United Nations Sustainable Development Goal SDG13. Teachers and students of the whole school can

read directly at the site.

(2) Real Book Exhibition:

Design exhibition marine report printed seal on a plastic plate, Kagami QR CODE, and SDGs logo. The exhibition space is located in the second building of the bookstore, where the actual books are displayed in large and small sizes. You can see it immediately when the reader enters the library. Quickly scan QR codes, instantly borrow e-books, and promote SDGs goals.

Evidence: 「SDGs United Nations Sustainable Development Goals」Theme exhibition
https://ntou.ebook.hyread.com.tw/Template/RWD3.0/publisher-page.jsp?id=626

◆ Have a university Climate Action plan shared with local government and local community groups

1. Participate in cooperative planning for climate change disasters

Global climate change has frequently resulted in hydrological disasters and exacerbated the extent of damage in the recent decade. Consequently, engineering measurements should be conceived in advance for severe flood disasters induced by extreme weather conditions. Flash floods, resulting from high-intensity rainstorms and typhoons, can be found in most of the countries in Southeast Asia, mainly in the Philippines, Taiwan, and Thailand. The research team of the Center of Excellence of Ocean Engineering (CEOE) of National Taiwan Ocean University conducted an international cooperation project with King Mongkut's University of Technology Thonburi (KMUTT) in Thailand to jointly establish an early flood warning system to forecast river stage information in the upper Yom River Basin of Thailand. Research results and published in "The Journal of Hydrology."

Evidence: https://www.sciencedirect.com/science/article/abs/pii/S0022169422001196

2. Hydrological characteristics and the hydrological cycle of Taiwan's alpine hydrogeological environment cooperate with the National Science and Technology Council (NSTC).

The mountainous aquifers play essential roles in the hydrological cycle within the alpine watershed system. They are the headwaters of rivers and aquifers downstream and provide sustainable streamflow during the dry season.

However, due to its difficulty to access and limited workforce and budget, the field tests and experimental data were scarce, and a comprehensive theory to sufficiently describe the alpine hydrogeology system still needed to be updated. To understand the hydrogeological characteristics and hydrological cycle within the system and echo the research topic of "Alpine Hydrogeology System: Understand the governed hydrological processes of the system and the effects of climate change and altered land use on the system" proposed by the Ministry of Science and Technology, the experimental site located at Beinan River watershed, Taitung County, Taiwan is selected in this study.

Through the groundwater level analysis, hydraulic testing, salt and heat tracer tests combined with the baseflow recession analysis and numerical simulations, the paths of groundwater flow in the weathered soil, regolith, weathered bedrock, and fractured soil rock will be delineated. The hydraulic characteristics and groundwater residence time within each hydrogeological unit will be quantified. The potential recharge of streams contributed by groundwater will also be estimated. This study will collaborate with the project "OBTAIN: Carbon budget and element cycle regulated by alpine hydrogeology, chemical weathering, and erosion in the sub-tropical tectonic active region" to provide the critical elements of hydraulic properties, flow paths, residence time, and flux exchanges within

each hydrogeological unit. These data can help to understand the essential characteristics of rapid weathering and erosion processes and evaluate sediment transport mechanisms. The feedback from the OBTAIN project will also confirm the reliability of estimated hydraulic parameters obtained in this study and reinforce the fundamental theory of the alpine hydrological cycle.

The ultimate goal of this study is to comprehensively develop a hydrogeological conceptual model for the alpine system in Taiwan through the integration of field monitoring and testing, innovative technique development, and data analysis. This physical-based model can be applied to evaluate the effect of climate change and land use alteration on the alpine hydrogeological environments and provides further feedback analysis.

Evidence: https://www.grb.gov.tw/search/planDetail?id=13895021

3. Study on sea surface temperature around Taiwan Strait

This study uses the HdiSST data of the Taiwan Strait from 1870 to 2018 to observe the dynamic characteristics of sea surface temperature (SST) in the Taiwan Strait. It is preliminarily confirmed that the SST of the Strait has been warming and cooling in the past 150 years, and the overall temperature has increased by more than 1.6 degrees. Results help build knowledge and capacity to tackle climate change. Research results were published in 2021.

Long-term observations of interannual and decadal variability of sea surface temperature (SST) in the Taiwan Strait (TS) were studied from 1870-2018; the climatology data were obtained from the Met Office Hadley Centre, UK. The highest annual mean and lowest SST observed in the study period were 25.3 C in 1998 and 22.4 C in 1919, respectively. Six distinct regimes were identified. The first regime of reasonably stable or slightly cooling SST lasted through the 1920s. The two regime shifts of 1919-1945 and 1976-1977 to 1998 led to the two fast warming trends of 2.0 C in 26 years, from 22.5 C in 1919 up to 24.5 C in 1945, and of 2.4 C in 22 years, from 22.9 C in 1977 up to 25.3 C in 1998, respectively. Another two regime shifts initiated in 1945 (1945-1976) and 1998-1999 (1998-2011) led to 1.6 C and 1.0 C cooling, respectively. A recent and fast warming trend with 0.63 C/decade suggested that the warming hiatus from 1998 to 2011 faded away since 2012. The spatial distribution of climate trends through the decades across the TS revealed a solid spatial gradient along the Strait. In the north (southern East China Sea), the magnitude and rate of the overall SST warming between 1870 and 2018 were approximately 1.5 times that in the south (northern South China Sea).

Evidence: https://jmstt.ntou.edu.tw/journal/vol29/iss4/7/

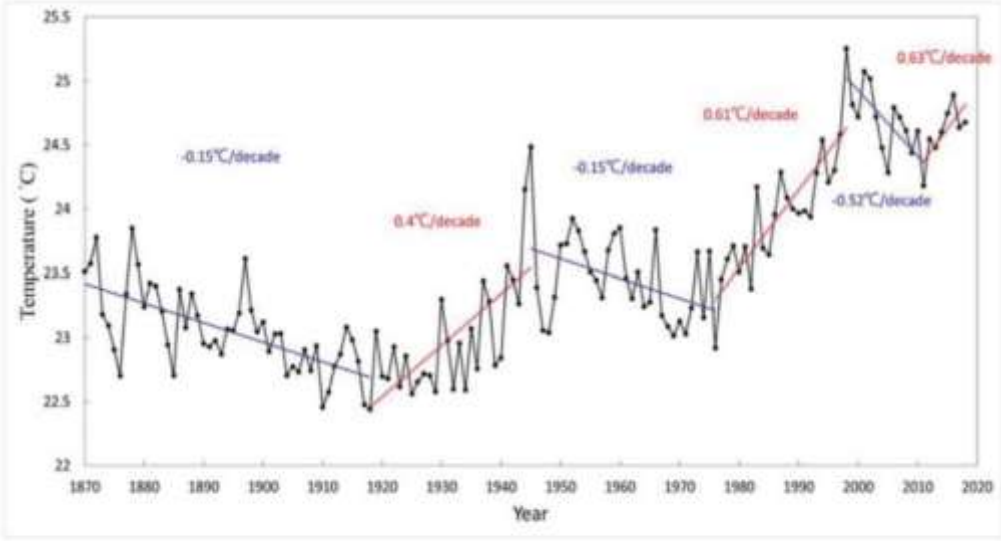


Fig. 4. Long-term annual variability of the SST in the TS (bounded by a polygon in Fig. 1).

RESEARCH ARTICLE

Long-Term Observations of Interannual and Decadal Variation of Sea Surface Temperature in the Taiwan Strait

Ming-An Lee [a,b], Wei-Po Huang [a], Yi-Lo Shen [c], Jinn-Shing Weng [d], Bambang Semedi [e], Yi-Chen Wang [b,*], Jui-Wen Chan [f]

[a] Center of Excellence for Ocean Engineering, National Taiwan Ocean University, Keelung, Taiwan, ROC
[b] EBFS, National Taiwan Ocean University, Keelung, Taiwan, ROC
[c] Penghu Marine Biology Research Center, Fisheries Research Institute, Council of Agriculture, Penghu, Taiwan, ROC
[d] Coastal and Offshore Resources Research Center, Fisheries Research Institute, Council of Agriculture, Kaohsiung, Taiwan, ROC
[e] Coastal Resilience and Climate Change Adaptation Research Group, Dept. of Fisheries and Marine Science, University of Brawijaya, Indonesia
[f] Taiwan Ocean Research Institute, Kaohsiung City, Taiwan, ROC

Abstract

Long-term observations of interannual and decadal variation of sea surface temperature (SST) in the Taiwan Strait (TS) were studied for the period 1870–2018; the climatology data were obtained from the Met Office Hadley Centre, UK. In the study period, the highest annual mean and lowest SST observed were 25.3 °C in 1998 and 22.4 °C in 1919, respectively. Six distinct regimes were identified. The first regime of fairly stable or slightly cooling SST lasted through the 1920s. The two regime shifts of 1919–1945 and 1976–1977 to 1998 led to the two fast warming trends of 2.0 °C in 26 years, from 22.5 °C in 1919 up to 24.5 °C in 1945, and of 2.4 °C in 22 years, from 22.9 °C in 1977 up to 25.3 °C in 1998, respectively. Another two regime shifts initiated in 1945 (1945–1976) and 1998–1999 (1998–2011) that led to 1.6 °C and 1.0 °C cooling, respectively. A recent and fast warming trend with 0.63 °C/decade suggested that the warming hiatus from 1998 to 2011 faded away since 2012. The spatial distribution of climate trends through the decades across the TS revealed a strong spatial gradient along the Strait. In the north (southern East China Sea), the magnitude and rate of the overall SST warming between 1870 and 2018 were approximately 1.5 times than those in the south (northern South China Sea).

Keywords: Taiwan strait, Sea surface temperature, Decadal variation, Warming hiatus

1. Introduction

The Taiwan Strait (TS) is one of the world's most important passages connecting two large marine ecosystems (LMEs), namely the East China Sea (ECS) and South China Sea (SCS). A total of 504 and 288 million tons of fish were fished from the SCS and ECS LMEs, respectively, between 1950 and 2014; however, climate change is one of the major anthropogenic stressors impacting these two LMEs currently [1]. For example, under a high emissions scenario (representative concentration pathway 8.5) with status quo fishing in 2100, a 99% decline in biomass of 17 functional groups (e.g., benthic crustaceans, juvenile large croakers, and pomfret) in the SCS and eight functional groups (e.g., small demersal fishes, jellyfish, and large croakers) in the ECS were evaluated [1]. Interestingly, this strait is a favorable habitat zone for marine fishing grounds [2–9]. Investigations regarding distribution and

Received 1 October 2019; revised 4 May 2020; accepted 30 June 2020.
Available online 3 September 2021.

* Corresponding author.
E-mail address: livo723@yahoo.com.tw (Y.-C. Wang).

https://doi.org/10.5314/2709-6998.1507
2709-6998/© 2021 National Taiwan Ocean University.

◆ **Participate in co-operative planning for climate change disasters, that may include the displacement of people both within a country and across borders, working with government**

1. Higher Education Sprout Project The Featured Areas Research Center Program

Taiwan is affected by global changes, and the intensity and frequency of river and sea disasters are increasing; it is also facing the challenge of energy shortages. The purpose of the Center of Excellence of Ocean Engineering (CEOE) is to solve the critical issues of marine energy development and river and sea disaster prevention and focus on the research and application of essential technologies of "offshore wind power and marine energy" and "river and sea disaster prevention."In terms of crucial technology research and development and solving practical problems. In 2021, the center achieved actual results as follows:

(1) Development of an intelligent disaster prevention integration system platform for the sewer system on our campus.

(2) Application of the linearized shallow water equation to derive a new approximate analytical solution that can consider the tide level of the estuary.

(3) Establishment of a two-dimensional storm tide prediction model using the artificial intelligence method of multi-station output.

(4) Propose the most suitable model for predicting the trend of sea-level change in the waters near Taiwan.

(5) Analyze the vulnerability and risk of life safety caused by flooding disasters in the southern part of Taiwan. The risk maps of life safety under different rainfall conditions are presented and discussed to assist relevant government units in constructing disaster prevention projects and pre-disaster early-warning assessments.

(6) Over-utilization of coastal areas may lead to coastal erosion and shoreline retreat, which may threaten the lives and property losses of residents in coastal areas. Our research team applied numerical models to evaluate the influencing factors of coastal buffer zones and explore possible countermeasures from management planning and policy perspectives.

(7) Establish the beach line model proposed by Pelnard-Consider (1956) to simulate the dynamic change of headland bay. The time-varying beach shape on the coast of the headland bay under the action of waves and currents is deeply explored.

(8) Develop a real-time image recognition algorithm with an AI model to identify marine debris.

(9) Investigate the influence of the marine microplastic in the Kuroshio

(10) Analyze the marine debris with rotorcraft associated with route planning and image recognition

(11) The research and application of safe, ecological, and hydrophilic coastal protection

construction methods, including dynamic artificial headlands, offshore submerged dikes and beaches, and Prague resonance construction methods.

Evidence:
http://ceoe.ntou.edu.tw/a_page.aspx?MID=7091
http://ceoe.ntou.edu.tw/eng/a_page.aspx?MID=2080

2. Cooperate with the government to promote the new southward policy and actively promote academic and industry-university cooperation with Southeast and South Asian countries.

The Center of Excellence of Ocean Engineering (CEOE) research team of National Taiwan Ocean University conducted an international cooperation project with King Mongkut's University of Technology Thonburi (KMUTT) in Thailand. The title of this joint project is "Development of flood warning in the Upper Yom River Basin of Thailand," which was supported by the National Science and Technology Council (NSTC) in Taiwan. Floods in Thailand are natural disasters that happen nearly yearly during the monsoon season. The objective of the cooperation project was to assist the Thailand research team in building a simplified flood warning system that can exhibit real-time rainfall and discharge monitoring data and provide forecast results of river stage information. During the project, Taiwan and Thailand teams exchanged their experiments in hydrological modeling and field measurement techniques. A preliminary version of the watershed rainfall-runoff and channel flow model for flood forecast in the Upper Yom River Basin of Thailand was established to fulfill the goal of this first-stage joint research project.

Evidence:
(1) https://www.grb.gov.tw/
(2) https://www.grb.gov.tw/search/planDetail?id=13535868
(3) https://www.grb.gov.tw/search/planDetail?id=13899095
(4) https://www.grb.gov.tw/search/planDetail?id=13534532
(5) https://www.grb.gov.tw/search/planDetail?id=13254798
(6) https://www.grb.gov.tw/search/planDetail?id=13895026
(7) https://www.grb.gov.tw/search/planDetail?id=13531392
(8) https://www.grb.gov.tw/search/planDetail?id=13602151
(9) https://www.grb.gov.tw/search/planDetail?id=13542884
(10) https://www.grb.gov.tw/search/planDetail?id=13538906
(11) https://www.grb.gov.tw/search/planDetail?id=13537324
(12) https://www.grb.gov.tw/search/planDetail?id=13323659
(13) https://www.grb.gov.tw/search/planDetail?id=13532156

Department	Project Director	Project Consignment	Title of Proposal
Institute of Earth Sciences	Min-Te Chen	Ministry of Science and Technology	Late Quaternary Climate Evolution of the Pacific Ocean (IV)
Institute of Earth Sciences	Min-Te Chen	Ministry of Science and Technology	Holocene Extreme Hydrographic Climate Change in the Western Pacific Marginal Seas (1)
Department of Harbor and River engineering	Cheng-Yu Ku	Ministry of Science and Technology	Study on Groundwater Characteristics and the Risk of Land Subsidence in Coastal Areas
Institute of Earth Sciences	Hui-Juan Pan	Ministry of Science and Technology	Application of Diffuse Reflectance Spectroscopy Methods to Coast Environmental and Paleoclimate and
Institute of Earth Sciences	Min-Te Chen	Ministry of Science and Technology	Late Quaternary Climate Evolution in the Warm Pool Indo-Pacific Oceans (1)
Department of Harbor and River engineering	Lien-Kwei Chien	Ministry of Science and Technology	Sub-Project3:The Study of Risk Assessment in Multi-Disaster and Protection Strategy of Climate Change in Coastal Areas
Department of Aquaculture	Yen-Ju Pan	Ministry of Science and Technology	Sustainable utilization of copepod resting egg resources in different climate regions: spatial and temporal distribution, and dormancy mechanisms
Department of Harbor and River engineering	Wei-Po Huang	Ministry of Science and Technology	The Study of Comprehensive Risk Assessment on Coastal Erosion and Strategies for Resilience Adaptability
Department of Harbor and River engineering	Sung-Shan Hsiao	Ministry of Science and Technology	Analysis of Dynamic Changes of Estuary and Coastal Environment and Review of Coastal Structure Protection Standards under Climate Change

Department	Project Director	Project Consignment	Title of Proposal
Department of Marine Environmental Informatics	Hung-Jen Lee	Ministry of Science and Technology	Global Environmental Change Effects on the Upwelling Variations around Taiwan Bank
Department of Marine Environmental Informatics	Jay Chih-Chieh Young	Ministry of Science and Technology	Risk and Uncertainty of Storm Surge at Southwestern Coast with Consideration of Climate Changes: Natural Variations of Typhoon Factors and Their Influences
Department of Marine Environmental Informatics	Chih-Chiang Wei	Ministry of Science and Technology	Study on the Integrated Numerical Weather and Wind-Wave Ai-Based Model to Predict Wind Field and Offshore Wind-Wave during Typhoons

◆ Inform and support the local or regional government in local climate change disaster or risk early warning and monitoring

1. Higher Education Sprout Project The Featured Areas Research Center Program

Taiwan is affected by global changes, and the intensity and frequency of river and sea disasters are increasing; it is also facing the challenge of energy shortages. The purpose of the Center of Excellence of Ocean Engineering (CEOE) is to solve the critical issues of marine energy development and river and sea disaster prevention and focus on the research and application of essential technologies of "offshore wind power and marine energy" and "river and sea disaster prevention."In terms of crucial technology research and development and solving practical problems. In 2021, the center achieved significant results as follows:

(1) Development of an intelligent disaster prevention integration system platform for the sewer system on our campus.

(2) Application of the linearized shallow water equation to derive a new approximate analytical solution that can consider the tide level of the estuary.

(3) Establishment of a two-dimensional storm tide prediction model using the artificial intelligence method of multi-station output.

(4) Propose the most suitable model for predicting the trend of sea-level change in the waters near Taiwan.

(5) Analyze the vulnerability and risk of life safety caused by flooding disasters in the southern part of Taiwan. The risk maps of life safety under different rainfall conditions are presented and discussed to assist relevant government units in constructing disaster prevention projects and pre-disaster early-warning assessments.

(6) Over-utilization of coastal areas may lead to coastal erosion and shoreline retreat, which may threaten the lives and property losses of residents in coastal areas. Our research team applied numerical models to evaluate the influencing factors of coastal buffer zones and explore possible countermeasures from management planning and policy perspectives.

(7) Establish the beach line model proposed by Pelnard-Consider (1956) to simulate the dynamic change of headland bay. The time-varying beach shape on the coast of the headland bay under the action of waves and currents is deeply explored.

(8) Develop a real-time image recognition algorithm with an AI model to identify marine debris.

(9) Investigate the influence of the marine microplastic in the Kuroshio

(10) Analyze the marine debris with rotorcraft associated with route planning and image recognition.

(11) The research and application of safe, ecological, and hydrophilic coastal protection

construction methods, including dynamic artificial headlands, offshore submerged dikes and beaches, and Prague resonance construction methods.

Evidence:
http://ceoe.ntou.edu.tw/a_page.aspx?MID=7091
http://ceoe.ntou.edu.tw/eng/a_page.aspx?MID=2080

2. Studying the impacts of ocean acidification on coral reefs

Adding to the mounting shreds of evidence, this study supports the general expectation that ocean acidification (OA) would reduce the overall accretion of coral reef ecosystems. However, increased CaCO3 dissolution in response to OA may pose a more severe threat to this reduction than decreased coral calcification. Therefore, although recent studies have found that calcification by some corals may be relatively tolerant to OA, the persistence of coral reefs is still at risk due to enhanced CaCO3 dissolution.

Evidence:
(1) Mesocosm was used to study ocean acidification's impacts on coral reefs.

(2) Field work in Dongsha Atoll to study the impacts of ocean acidification on coral reefs.

3. Studying the potential of seagrass meadows in mitigating ocean acidification

This study demonstrates that the hydrodynamic regime may primarily affect the biogeochemical processes in seagrass meadows, thereby modulating their capacities in OA buffering and CO2 sequestration. This study provides a valuable theoretical consideration for conserving and restoring seagrass meadows as a promising strategy for climate change mitigation.

Evidence:

(1) Fieldwork in Kenting to study the impacts of ocean acidification on coral reefs.

(2) Fieldwork in Dongsha Island to study the potential of seagrass meadows in mitigating ocean acidification.

4. Disaster relief volunteer resilient community in Keelung City

The Keelung City Fire Department held the "110 Years First Disaster Prevention Personnel Training Course", inviting the chiefs and officers of the Zhongzheng District and Nuannuan District. The Keelung City Fire Department and the cooperation team assisted the city government in coordinating the "Disaster Prevention Training Program." A total of four training programs were carried out in 109-110. The disaster prevention personnel system was extended to the four

administrative districts of the city, including Zhongshan District (echelon 1), Renai District, Qidu District (echelon 2), Zhongzheng District, Nuannuan District (echelon 3), Anle District, Xinyi District (echelon 4). strengthen the three elements of disaster mitigation: "self-help, mutual assistance, public service" "Assistance," and inviting citizens to participate in disaster prevention.

Evidence: Introduction of program

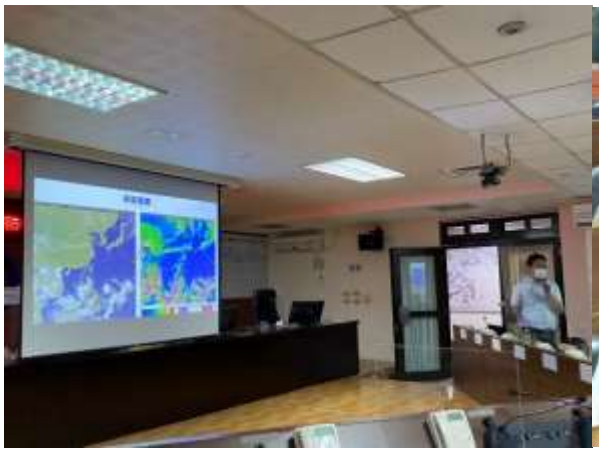
https://www.klfd.klcg.gov.tw/tw/klfd1/2024-106987.html

5. The disaster prevention training

To enhance the ability of Keelung city disaster, the prevention personnel was held using meteorological information, interpret disaster potential, and plan the map data of evacuation shelters. About 30 personnel from disaster prevention and fire department business units participated in the training. This course includes two major themes: (1) meteorological information application and disaster prevention propaganda and (2) essential map production and interpretation. The course aims to enhance Keelung city's disaster prevention and relief capabilities, enhance the national awareness of risks and disaster prevention, and strengthen the resilience of various regions.

Evidence: Introduction of training

https://www.facebook.com/social.klcg/posts/2015764041904490



6. Simulation exercises in Shazi Village, Zhongzheng District, Keelung City

The education training on Simulation exercises in Shazi Village, Zhongzheng District, Keelung City, was held on September 17, 2021, in the Badou elementary school in Keelung City. More than 30 representatives from the Industrial Development Department, the Fire Department (Zhongzheng Unit), the Police Department (Badouzi Sub-station), and the Environmental Protection Bureau were invited to participate in the education training. During typhoons and torrential rain, all units are monitored and alerted to prepare for the preventive evacuation of dangerous areas at any time. When the government support fails to arrive in time, how should the people carry out rescue and rescue actions independently and finally carry out the post-disaster environmental cleanup and restoration work to restore the appearance of their pre-disaster homes. In addition, this drill also combined the earthquake prevention and disaster prevention propaganda small theater to promote the three steps of earthquake protection entertainingly. Through drama performances, "get down cover, and stabilize," as well as the purchase of drinking water and dry food in the disaster prevention area of the store.

Evidence: Simulation exercises in Shazi Village

https://www.youtube.com/watch?v=xz2buDJOtbg

◆ Collaborate with NGOs on climate adaptation

1. Environmental Education Promotion

(1) NTOU Rainwater Park

Hai Da Rainwater Park is an environmental education facility with the theme of water resources education, which was certified by the Environmental Protection Administration of the Executive Yuan in April 102 (the validity period of certification is five years). It has successfully passed the evaluation operation review in 105 and 109, and the certification status was extended to April 116. The "Hai Da Rainwater Park" is an environmental education facility with the theme of water resources education. With rainwater utilization as the central orientation, strengthening water resources storage and recycling, and providing an outdoor environmental education teaching activity and demonstration site suitable for school (elementary, junior high, and high school) teachers and students, authorities, and the general public to experience. The curriculum includes outdoor teaching, lectures, video viewing, and DIY teaching. In addition, we will continue to promote the concept of sustainable ecology and environmental education activities at Shanghai University. This concept has been certified as an environmental education facility by the Environmental Protection Agency (EPA) and the "Longgang Ecological Park," located on the slope of the campus and in the surrounding hinterland.

Keelung has abundant water resources. Rainwater is collected from the roofs and facades of buildings, and after simple water treatment, it can achieve the goal of energy saving and rainwater utilization. This course uses rainwater collection and storage systems such as rainwater harvesting on the roofs of buildings, water flushing, water harvesting by ropes and straws, water harvesting on building facades, rainwater filtration systems, and rainwater flushing and watering systems to collect and utilize rainwater in the field effectively so that participants can learn through practical observation that water resources are precious and limited and should be cherished and fully used. To achieve the effect of environmental sustainability education and to strengthen the promotion and application of the practical benefits of sustainable campus promotion.

(2) Training for environmental education personnel

NTOU is an environmental education institution accredited by the Executive Yuan Environmental Protection Administration. On May 10, 2016, NTOU obtained accreditation to assist the government in ecological education staff training and environmental lectures, including a 30-hour environmental education core course (for the education pipeline) or a 24-hour environmental education course (for the school staff experience pipeline). Through our "Environmental Education Facility" (National Taiwan University Rainwater Park) and the "National Taiwan Ocean University Environmental Education Institute," we offer environmental education staff certification and extension courses to obtain training qualifications and assist in the application for the certificate.

a. "38 hours of core subjects study for environmental educators" (apply to EPA for certification through the academic channel).

b. "38 Hours of Core Subjects for Environmental Educators" (apply to EPA for certification through the experience channel).

c. "38 hours of Extension for Environmental Educators" workshop. (Application for extension of the certification period for environmental educators already obtained).

d. "Environmental Educator 24-Hour Experienced Core Subject Study" class (apply to the Ministry of Education for certification through the experiential channel).

Evidence: NTOU Rainwater Park

http://ind.ntou.edu.tw/~linuf/