

# 14

## LIFE BELOW WATER



2018-2022 Publications

43



Course Units

35



Student Engagements with Units on SDG 14

996



2018-2022 Percentage of all Taiwan Publications

2.4%

## Research

### Using New Satellites to Observe the Seafloor Topography

Seafloor topography influences ocean circulation, seabed resources, and biodiversity; it can also be used to interpret the evolution of seafloor structures. Satellite measurements help us understand the global seafloor topography. The South China Sea (SCS) is an oceanic area with active satellite seafloor mapping, which is a semi-closed sea with complex geological structures. The research team led by Professor Chein-Way Hwang of NYCU's Department of Civil Engineering utilized the latest surface water and ocean topography (SWOT) satellite, which uses a synthetic aperture radar altimeter to scan SSHs over a 120-km wide swath along its sub-satellite tracks, to discover more structural features in the South China Sea from space. This research used satellite altimetry technology to display the characteristics of the SCS seafloor, maintaining Taiwan's leading position in the field of satellite altimetry research and contributing to global earth science research.

### Ocean Exploration and Environmental Analysis Technology

Climate change is having an increasingly detrimental effect on marine ecology. Associate Professor Gee-Conn Chen of NYCU's Institute of Electrical and Computer Engineering joined an inter-university, interdisciplinary research team for the "Development and Application of Ocean Exploration and Environmental Analysis Technology Under Climate Change" project, which uses autonomous underwater vehicles (AUV) and AI technology to conduct underwater monitoring and surveys. The team also established a set of AI underwater unmanned vehicles and a charging system that can automatically collect, analyze, and record imaging, acoustic and hydrological data in coral reef ecosystems. The results of this research can be applied to marine pollution prevention, ecological and environmental conservation, and promote industry development while also exploring the legal and ethical issues regarding the application of AI in marine science.



## Social Impact

### **Helping Taiwan Develop Coastal Disaster Prevention Technology**

The Waisanding Sand Bar is a natural barrier in the coastal area of Yunlin and Chiayi, which many studies in the past have indicated is gradually shrinking each year. Aside from impacting the local natural landscape and environment, this can also damage the local fish farming and tourism industries. The research team led by Professor Hsien-Kuo Chang of NYCU's Department of Civil Engineering was commissioned by the National Academy of Marine Research to carry out the "Waisanding Sand Bar Erosion Prevention Technology Development and Strategy Formulation Plan." The plan aims to assess the feasibility and applicability of using AI sensing technology to monitor topographic changes, and conduct analysis and discussions on areas and special landforms with more dramatic changes on the Waisanding Sand Bar to better understand why those changes occur. The research results will help the government formulate coastal disaster prevention strategies, reduce the potential for disasters to occur and the loss of coastal land, and achieve sustainable coastal development.

### **Seawater Desalination Technology Exchange and Industry Connections**

NYCU's Environmental Technology & Smart System Research Center (ETSS) is the operating base for Taiwan's "Academy Industry Alliance for Promoting Water Purification Technology" and a member of the "Water Affairs Organization." In 2022, the center helped the Water Affairs Organization organize the "Seawater Desalination Forum," inviting experts, scholars, and manufacturers of seawater-derived products. Professor Chih-Pin Huang, director of the ETSS, spoke about technology, economic feasibility, and future applications of reusing and adding value to seawater brine in the forum. The forum enhanced seawater desalination technology exchanges, strategic cooperation, and industry connections between the government, industry, and academia, thereby enhancing the resilience of Taiwan's water supply.



## Education & Cultivation

### Cultivating Talents in Hydraulics and Marine Engineering

The teaching and research at NYCU's Department of Civil Engineering focuses on integrating the needs of human life and strives to achieve the overall balance of energy, ecology, and environment (EEE). The Hydraulic and Marine Engineering Group of this department provides solid and far-reaching foundational knowledge for students to pursue research or employment in the field of hydraulics and marine engineering. Relevant courses offered over the past five years include: Hydrology, Hydrolic Engineering, Coastal Processes, Marine Renewable Energy, Principles of Hydrolic Models, and Open Channel Hydraulics. NYCU hopes that the talents trained by the department can further the sustainable preservation of the marine environment and resources that surround Taiwan, and make substantial contributions to the maintenance of our national land and economic development.

### Student Voluntary Beach Cleanups

The NYCU ChongDe Young Volunteers student club organizes many environmental conservation activities such as mountain and beach cleanups each year. In 2022, the club organized three environmental cleanup activities, visiting Taoyuan's Yongan Fishing Harbor, Hsinchu's Xinfeng Hongmao Harbor, and Hengshan, Hsinchu. These beach and mountain cleanups foster students' appreciation for the environment and encourage them to value the protection of nature and the marine ecosystem, greatly contributing toward the sustainable development of the marine ecosystem, climate, and environment.

## Stewardship

### Improving Marine Education Literacy and Conservation Awareness

As Taiwan is surrounded by the ocean, all people should be equipped with knowledge on marine environments and marine conservation. NYCU invited maritime author, Associate Professor Hung-Chi Liao, to give a lecture as part of the University's general education curriculum, using a literary perspective to introduce people to fish ecology and fishing culture, so that people could gain a deeper understanding of the diverse connections between fish and mankind, as well as the problems of depleted fish sources and spearfishing. The NYCU Libraries also curated the exhibition "The Ocean and NYCU" in 2022 to commemorate NYCU's great contributions to cultivating maritime transport talents and furthering Taiwan's shipping industry. To this day, NYCU continues to cultivate talents in maritime transport through the "Department of Transportation and Logistics Management," elevating marine technology to protect the coastal and marine areas. Additionally, the Community and Peer Education Center of NYCU's Liberal Arts College plans to organize five seminars, field trips, and workshops on marine issues in 2023 to fully elevate students' marine knowledge and marine conservation awareness.

