Meeting between NAMR and PKNU

- **Agenda**
- 10:00-10:15 Introduction of participants by Dr. Chen and Dr. Kim
- 10:15-10:30 Introduction of NAMR by Dr. Chen
- 10:30-14:45 Introduction of PKNU by Dr. Kim
- 10: 45-11:45 Discussion
- 11:45-12:00 Group photo and exchange of gifts

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Meeting between NAMR and PKNU

- **Potential topics for discussion**
- a. Impacts of Climate Change and marine science
- b. Promotion of Ocean Literacy
- c. Training Center for Fisheries and Marine Science
- d. Training ship management center

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NAMR
國家海洋研究院
National Academy of Marine Research

About NAMR

National Academy of Marine Research

Ocean Affairs Council

- Coat Guard Administration
- Ocean Conservation Administration
- National Academy of Marine Research
  - Secretariat
  - Personnel Office
  - Office of Budget and Accounting
  - Planning and Training Center
  - Marine Policy and Culture Research Center
  - Marine Science and Information Research Center
  - Marine Ecology and Conservation Research Center
  - Marine Industry and Engineering Research Center
- Taiwan Institute of Ocean Technology

About NAMR

National Academy of Marine Research

Planning and Training Center

Proposing a strategic roadmap for marine talent development,promoting ocean literacy, and building a marine talent cultivation mechanism.

1. Building a model nation for ocean literacy through promoting the Ocean Science Sequence (OSS) programs, the courses suitable for the general public, and the NODASS Ocean Big Data Contest.
2. Developing general core and professional competency courses and establishing the marine talent cultivation mechanism.
3. Building a digital platform, the Taiwan Ocean Digital Academy (TODA), dedicated to enhancing ocean literacy and professional competency.

Marine Policy and Culture Research Center

Integrating marine governance information, advancing marine policy studies, and strengthening the foundation of marine culture.

1. Establishing a systematic framework of marine policy studies and analyzing marine policies at various levels.
2. Exploring the historical, cultural, and intellectual heritage of the ocean, constructing marine cultural landscapes and routes, and organizing educational / outreach activities to promote public understanding of maritime heritage.
3. Applying marine technology to strengthen in-situ preservation and monitoring of underwater cultural heritage.

Marine Science and Information Research Center

Planning marine observation and survey programs, building long term monitoring systems, and advancing data integration and smart analyses.

1. Conducting surveys on the hydrography, topography, seabed sediments, and water quality of Taiwan's surrounding seas and establishing a marine observation network.
2. Establishing the National Ocean Database and Sharing System (NODASS).
3. Applying big data and AI to develop ocean digital twins and other forward-looking technologies.
4. Operateing a research vessel fleet for oceanographic surveys and marine resource exploration.

Marine Ecology and Conservation Research Center

Establishing a long-term marine ecological monitoring system, conducting simulation analyses of ecological disasters, and fostering quantitative marine algal research.

1. Conducting surveys on marine ecosystems and building baselines of ecosystems and environmental DNA (eDNA) archives.
2. Developing underwater surveys and AI-based recognition and learning technologies to enhance the comparison and analysis of ecological survey data.
3. Establishing a land-based algal cultivation site as a platform for quantitative marine algal research and developing carbon sequestration potential and value-added products from marine algae.
4. Conducting ecological disaster identification (e.g., coral bleaching, toxic species) and simulation analyses of early warnings of ecological disasters.

Marine Industry and Engineering Research Center

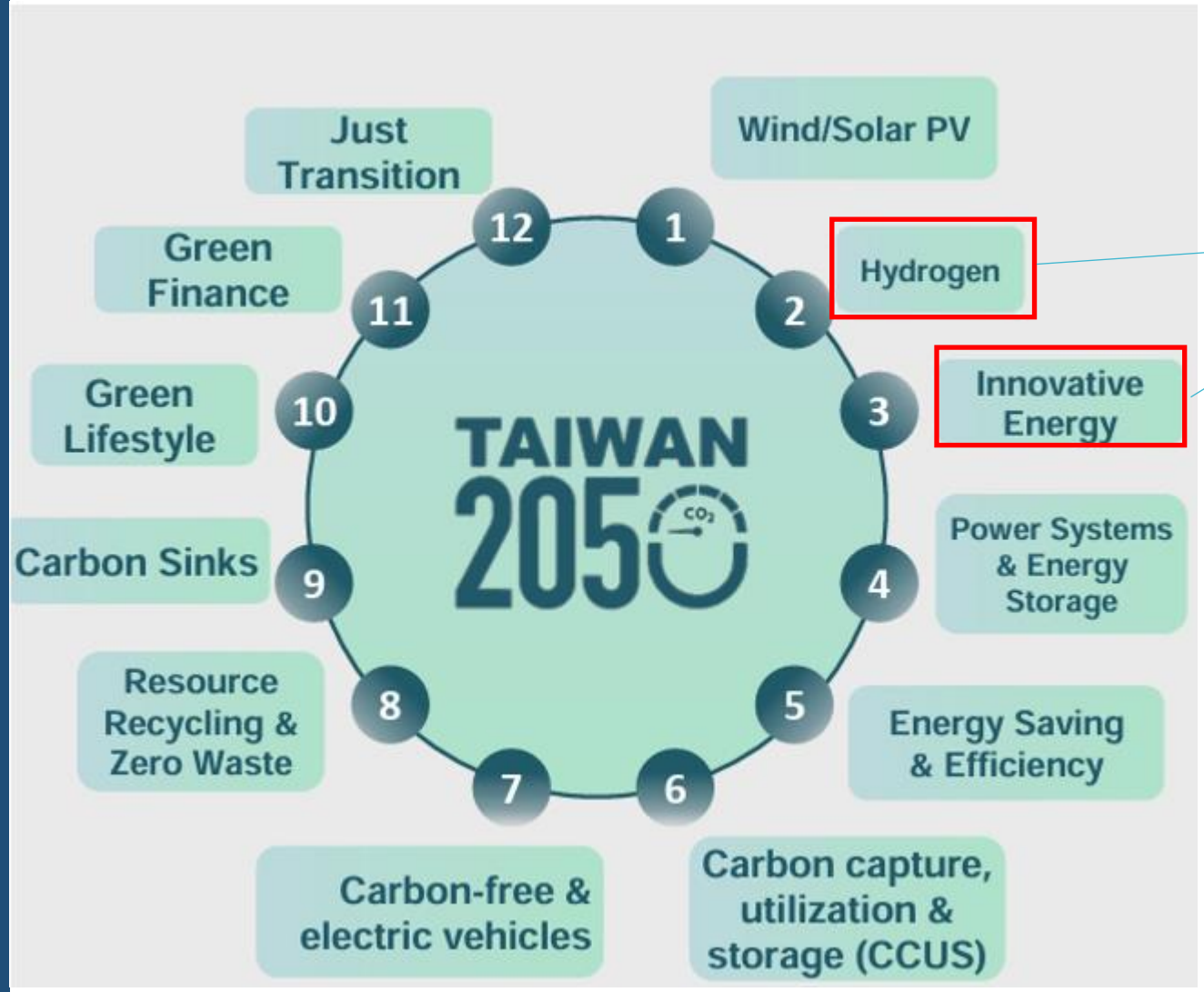
Developing smart marine technologies and fundamental marine engineering, and promoting innovative development of the marine industry.

1. Developing GoOcean to provide real-time ocean and safety information for water recreationists.
2. Building an ocean radar network and applying AI to enhance the monitoring and numerical simulation of waves and currents.
3. Exploring advanced technologies for marine energy and promoting the development of key technologies such as hydrogen production from seawater.
4. Constructing a Ship Model Laboratory to advance ship design research, hydrodynamic testing, and marine engineering development.

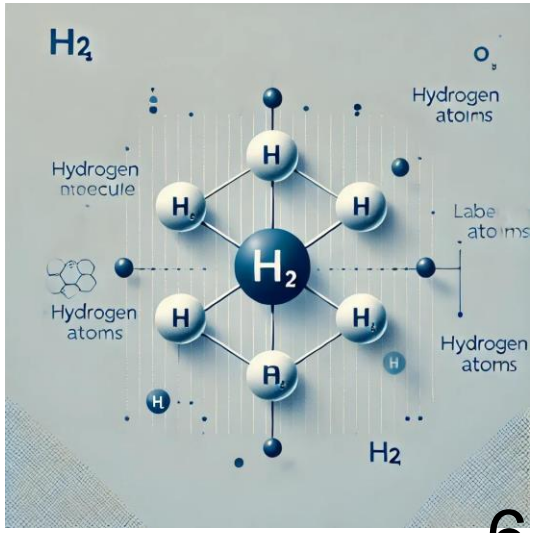
Taiwan‘s policies addressing climate change

Taiwan’s 2050 Net-Zero Transition

12 Key Strategies



Seawater electrolysis hydrogen production technology



Seawater electrolysis hydrogen production technology

In 2023

- A laboratory-scale seawater hydrogen production system was successfully integrated, resulting in the development of a 1 kW alkaline water electrolysis prototype with an energy conversion efficiency of 29.89% and hydrogen purity reaching 96.24%.
- Under low-temperature seawater conditions and an applied voltage of 14 V, the system is capable of producing hydrogen exclusively without generating chlorine gas.

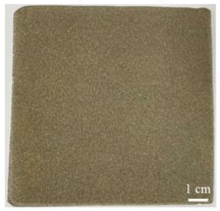
In 2024

- Stability tests of different components (titanium plates and graphite plates) in alkaline seawater were completed to serve as the basis for material selection aimed at improving the system's energy conversion efficiency.
- Additionally, compositional analysis was conducted on the brine generated from the system.

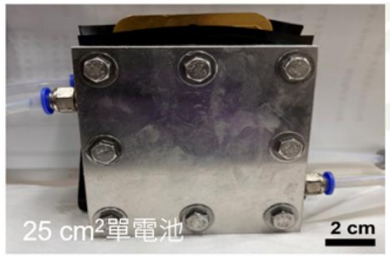
In 2025

- The energy conversion efficiency of the electrolyzer stack in the seawater hydrogen production system will be improved to over 40%.
- A comparative analysis between indirect and direct seawater electrolysis technologies will also be conducted as a basis for future technology development.

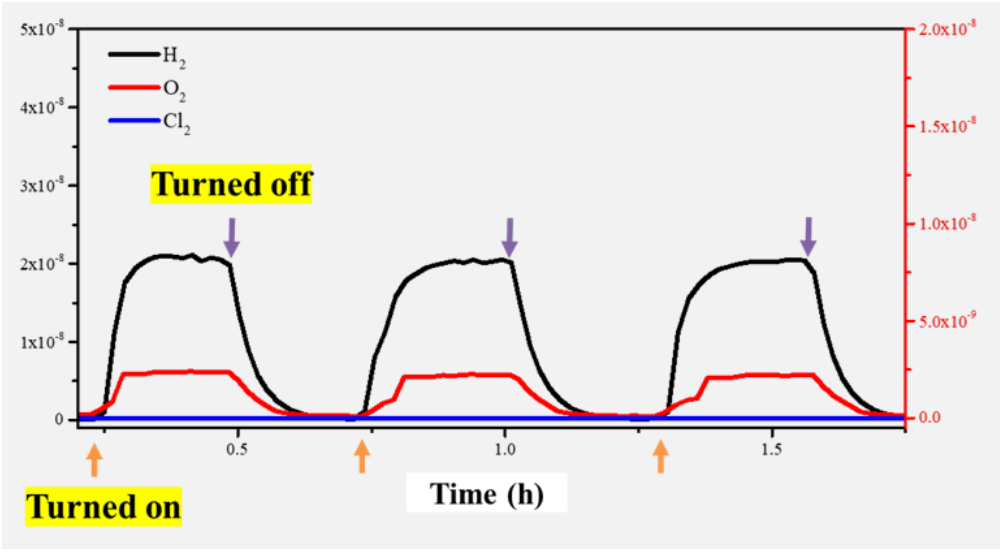
1. Low-cost seawater electrolysis catalysts



2. Seawater single-cell assembly
3. Gas product analysis of seawater single cells

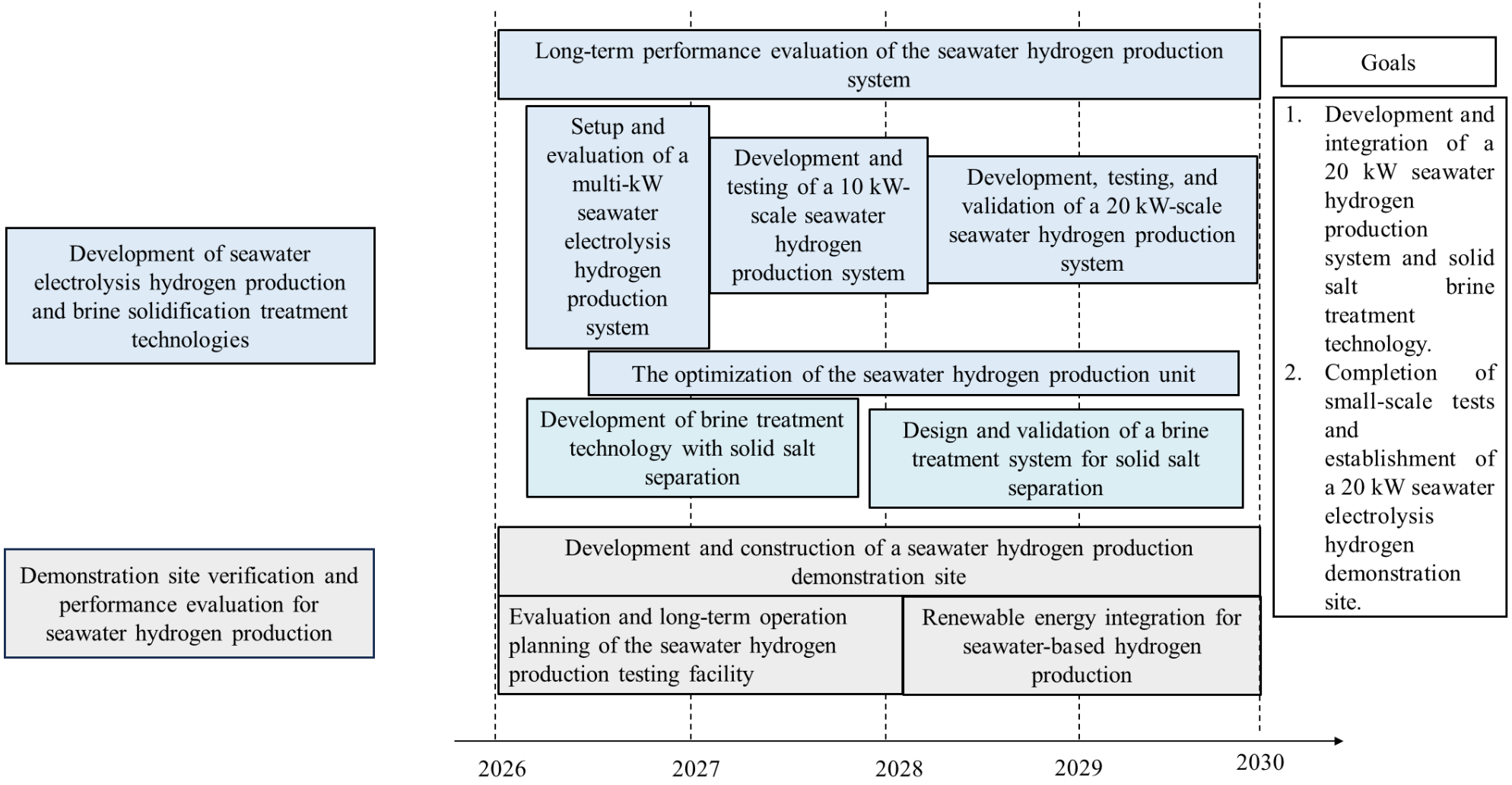


4. Prototype system assembly



Seawater electrolysis hydrogen production technology

Roadmap and goals for the development of seawater hydrogen production and brine treatment technologies



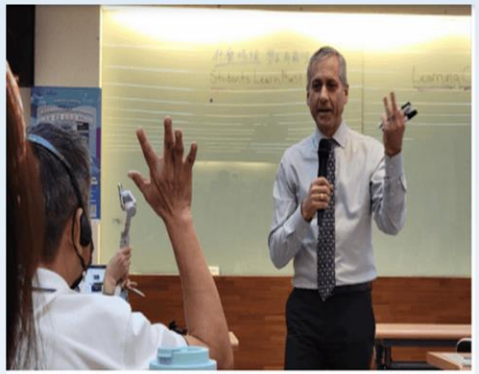
Ocean Science Sequence, OSS Promotion Highlights

- The **Ocean Science Sequence (OSS)** is a structured, multi-grade curriculum designed by Lawrence Hall of Science, UC, Berkeley to build students' understanding of the ocean and Earth systems in a progressive, developmentally appropriate way.
  - The OSS G3–G6 module introduces **basic ocean literacy concepts** for elementary students.
  - The OSS G6–G8 curriculum **integrates ocean, climate, and Earth systems science**.
- To further ocean science education, NAMR signed an agreement with the UC, Berkely in 2023 and promote this curriculum to students as well as the general public.

Ocean Science Sequence, OSS Promotion Highlights

Teachers plan lessons in a collaborative manner

OSS interntional partners-the US



學副主任 Craig Strang與課程設計專家Sarah Pedemonte示範教學

OSS specialists from the US are invited to demonstrate OSS courses and teaching.

Ocean Science Sequence, OSS Promotion Highlights

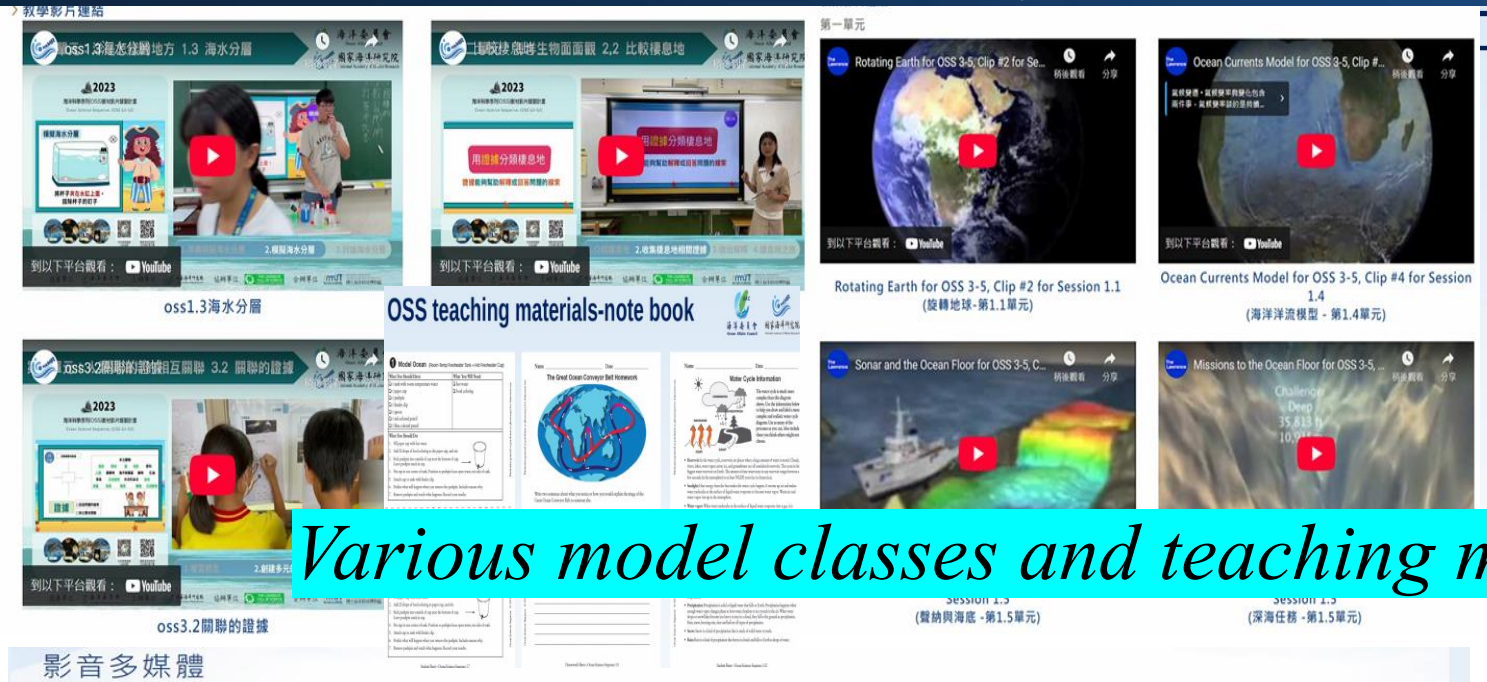
National Academy of Marine Research

Education and outreach programs held across counties and cities in Taiwan

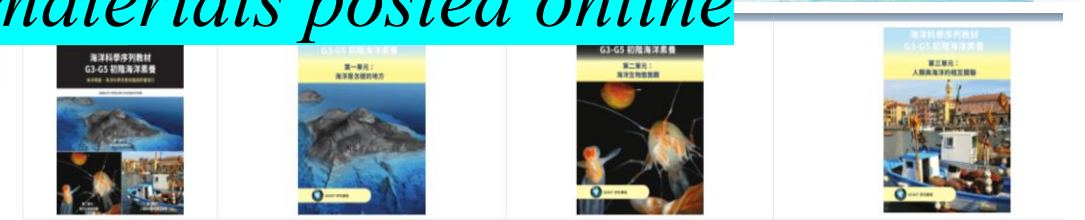
Ocean Science Sequence, OSS Promotion Highlights

National Academy of Marine Research

National Academy of Marine Research



Various model classes and teaching materials posted online



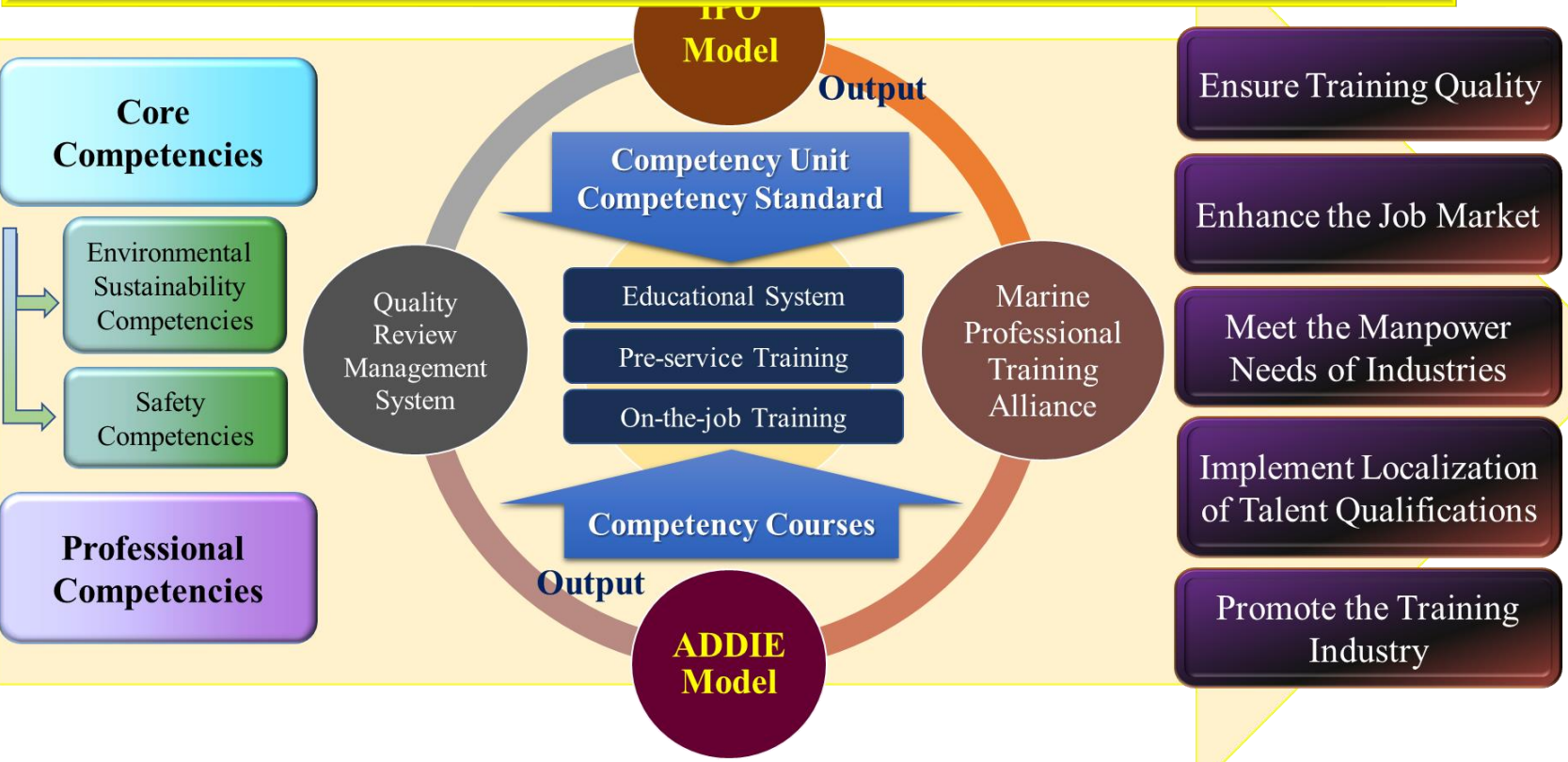
海洋科學序列教材(OSS) G3-G5初階海洋素養

第一單元： 海洋是怎樣的地方	第二單元： 海洋生物面面觀	第三單元： 人類與海洋的相互關聯	其他教學資源
1.1 海洋星球	2.1 介紹海洋生物	3.1 人類與海洋的相互關聯	彩色學習單
1.2 模擬洋流	2.2 比較棲息地	3.2 關聯的證據	卡片套組
1.3 海水分層	2.3 利用證據保護棲息地	3.3 調查過漁	G3-G5初階彩色投影片
1.4 認識洋流	2.4 觀察浮游生物	3.4 調查污染	單元一：教材影印包
1.5 海床	2.5 運動的適應	3.5 探索解決的方案	單元二：教材影印包
1.6 光、壓力、溫度和鹽度	2.6 攝食的適應	3.6 溝通問題與解決問題	單元三：教材影印包
1.7 水下滑翔機	2.7 大洋食物網		單元一：調查筆記本
1.8 生存空間	2.8 河口食物網		單元二：調查筆記本
	2.9 小小旅行家		單元三：調查筆記本
	2.10 棲息地的關聯		

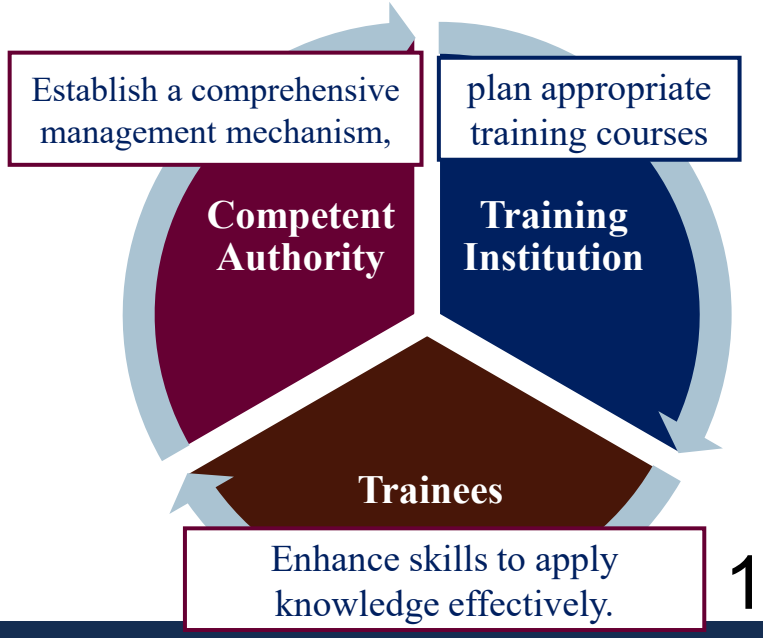
Development and Application of Competencies for Marine Occupation

❖ **Project Purposes**

- Develop a strategic roadmap for marine talent development.
- Build a marine talent cultivation mechanism for marine industries.
- Implement localized talent qualifications and certification.



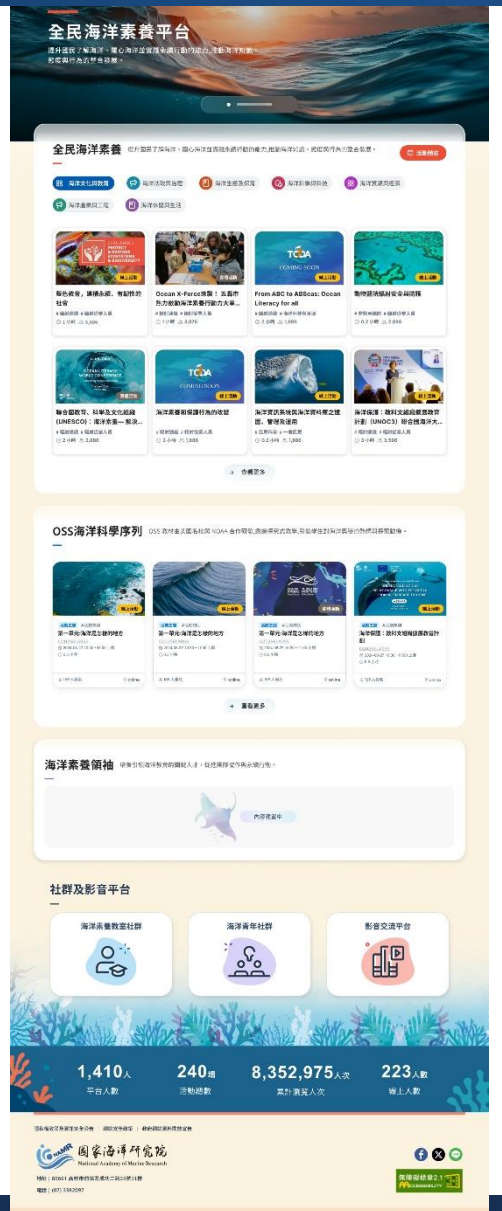
- Emphasizing the involvement of schools/training institutions as the main entities
- Implementing the cultivation of marine industry talents through public-private collaboration..
- Promote the independent and high-quality advancement of marine industry talent cultivation.

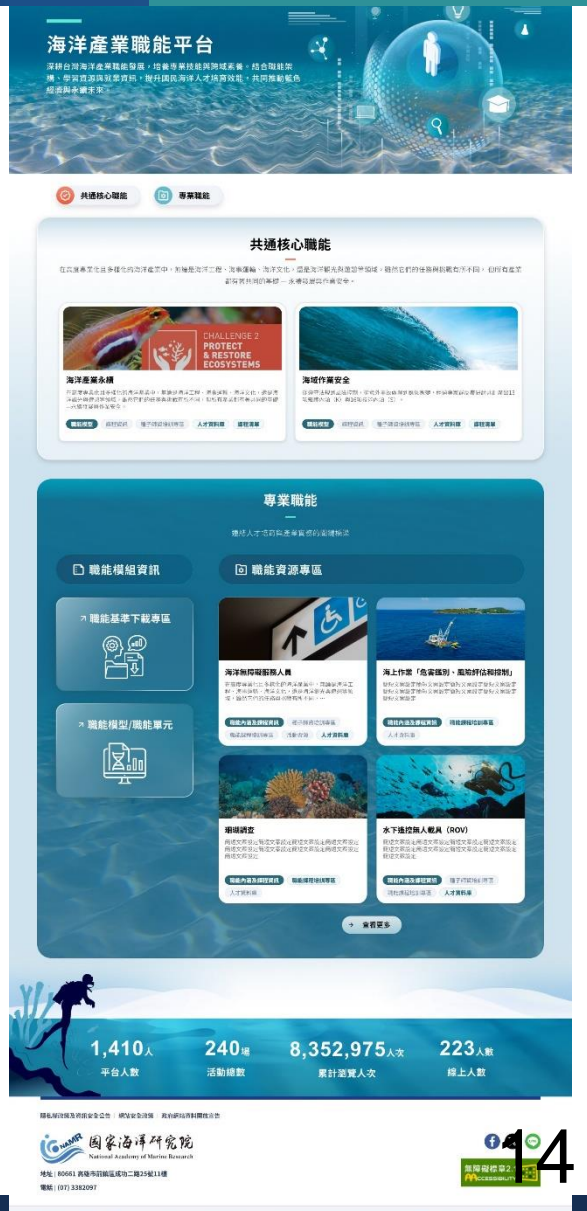


Taiwan Ocean Digital Academy (TODA)

海洋素養及海洋職能數位平台
Taiwan Ocean Digital Academy

National Academy of Marine Research





Development and Application of Competencies for Marine Occupation

Coral Investigation Competency Course

competency standards

- Total of 6 competency standards have been developed and announced on the Integrated Competency and Application Platform (iCAP).
  - Tower Technician for Offshore Operations 離岸作業水上支撐結構檢修人員 (Competency Standard Code: SET7233-001v2)
  - Subsea Structural Inspector for Offshore Operations 離岸作業水下支撐結構檢測人員 (Competency Standard Code: SET7233-002v1)
  - Offshore Coating Inspector 離岸作業塗裝檢查員 (Competency Standard Code: CCM7131-005v1)
  - Offshore Coating Maintenance Engineer 離岸作業塗裝維護人員 (Competency Standard Code: CCM7119-008v1)
  - Remotely Operated Vehicle (ROV) Supervisor 水下遙控無人載具（ROV）作業主管 (Competency Standard Code: SET7233-003v1)
  - Remote Operated Vehicle (ROV) Pilot 水下遙控無人載具（ROV）技術工程師 (Competency Standard Code: SET7233-004v1)

Outcome of Competency Model / Competency Standard

Offshore Coating Inspector Competency Course

Competency Model/Unit

- Total of 8 competency model have been developed.
  - Accessible Marine Service Personnel 海洋無障礙人員
  - Marine Environment Sustainability (Common Core Competency) Science and Technology Rescue Aids for Ocean Lifesaver 海域救助人員科技輔具救援
  - Offshore Operations “Hazard Identification, Risk Assessment and Risk Control” 離岸作業「危害鑑別、風險評估和控制」
  - Coral Investigation 珊瑚調查
  - Dynamic Position System Operation 船舶動力定位系統操作
  - Ship Design Evaluation - Motion Performance Design 船舶設計評估-運動性能設計
  - Marine Environmental Sustainability (Core Competency) 海洋環境永續(共通核心職能)
  - Maritime Operational Safety(Core Competency) 海域作業安全(共通核心職能)

NAMR Marine Talent Development

National Academy of Marine Research

- The National Academy of Marine Research (NAMR) develops both common core and professional competence courses in the marine field.
- Based on practical needs and priorities, NAMR establishes systematic training programs and develop and promote courses and activities in partnership with industries, governments, academia, and research sectors.
- The programs help learners enhance their knowledge and skills, enabling them to apply what they have learned in field environments.

❖ **Ocean Policy Vision**

In response to the *2025 National Ocean Policy White Paper*, NAMR is committed to creating a sound environment for the development of the **Blue Economy**, and to co-creating a **Safe Ocean**, a **Sustainable Ocean**, and a **Prosperous Ocean**.

Safe Ocean	Sustainable Ocean	Prosperous Ocean
Marine Safety Core Competency Courses	**Marine Sustainability Core Competency Courses**	**Accessible Marine Service Personnel Professional Competency Courses**

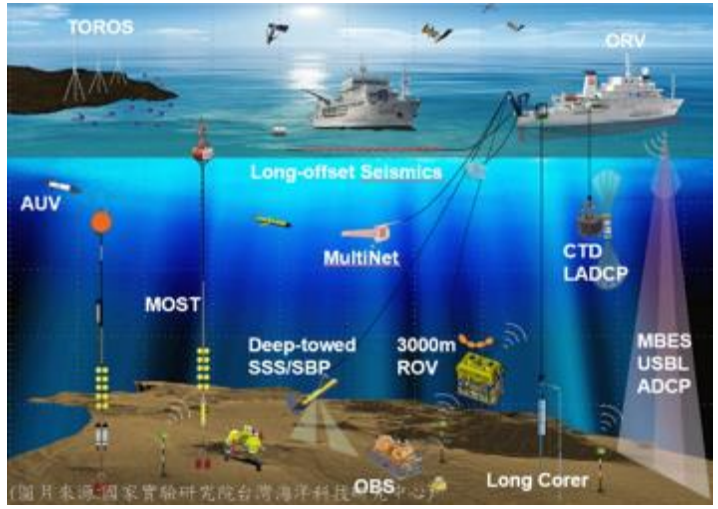
Marine Scientific Survey

Marine Scientific Survey

TOPIC	Hydrological survey	Bathymetric and seafloor mapping survey	Ecological survey
Observational Data	Temperature (salinity), waves, acidity currents, internal waves,soundscape, turbidity…	Topography, seabed characteristics, lithology, fault structure, landslides, seafloor resource …	Ecosystem, marine environment, water quality, habitat, biodiversity…
Application	Underwater Defense detective and Tracking	Geohazard map	Marine Industry and Recreation Safety
	Claims for damages from shipping traffic and marine pollution	Marine conservation and habitat restoration	5G&AIoT Application in Marine
Marine Big Data	NODASS		

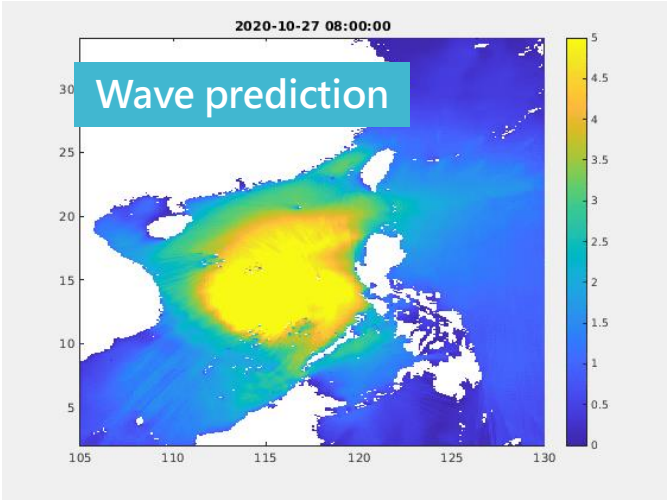
Main projects in progress

Construction of Research vessels



NODASS

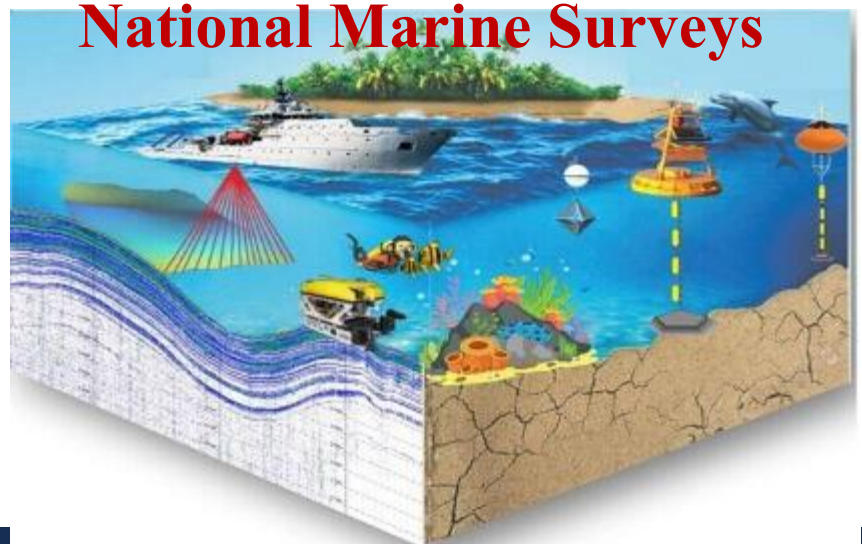
Ocean Modeling



National Marine Surveys

Hydrological Survey

Geophysical Survey

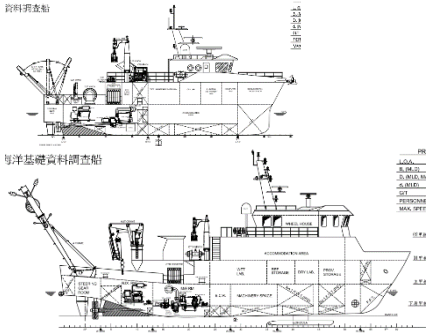


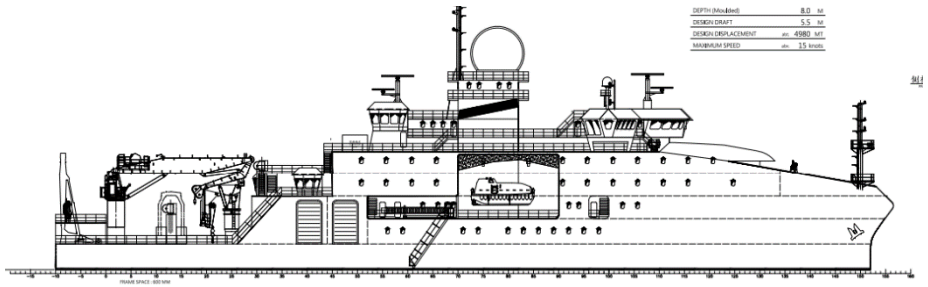
- → Physical oceanography
- → Chemical oceanography
- → Undersea soundscape
- → Geomorphology
- → Marine geohazards
- → Seabed resources

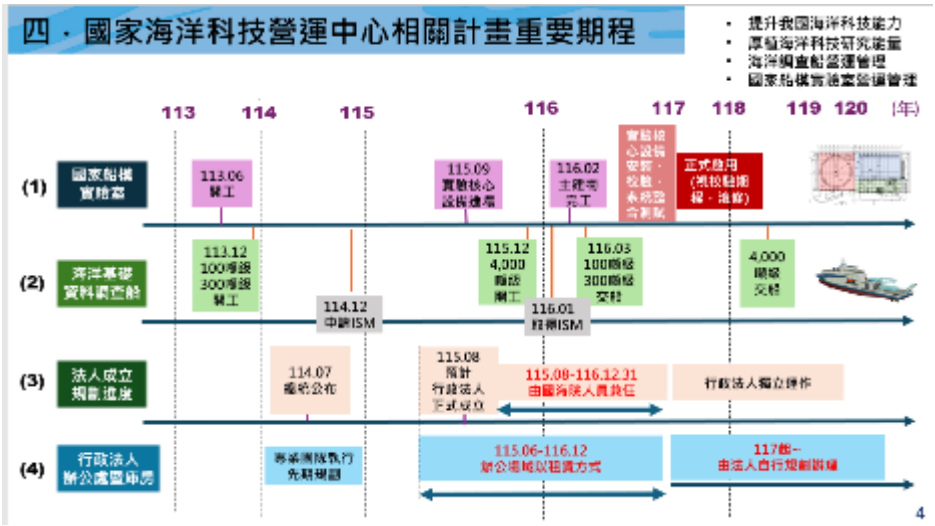
Research vessels

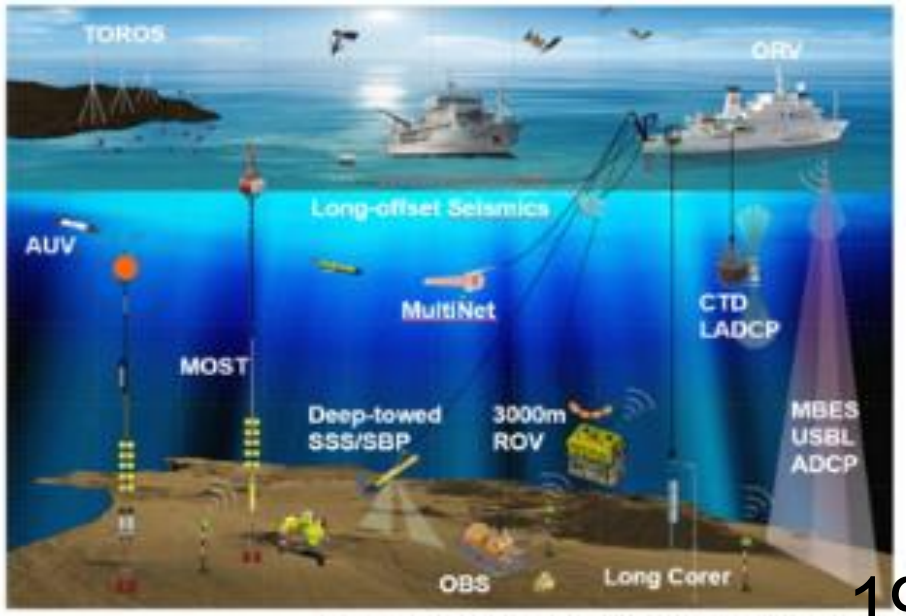
Construction and Delivery Schedule

- 100-ton R/V (27.3m): Dec 2024 – 2027
- 300-ton R/V (40m): Dec 2024 – 2027
- 4000-ton R/V(100m): Dec 2026 – 2029









Equipment and Capabilities

- Underway & CTD with multi-parameter sensors, and water sampling Rosette
- SBE/MBES Shallow Water(150~700 kHz) / Mesopelagic Zone (40~100 kHz) / Deep Sea(9~5 kHz)
- SSS,SBP, ADCP/LADCP,
- Core Sampling system / Grab sampler
- Remotely operated vehicle / AUVs / SeaGliders
- Plankton MultiNet,
- DGPS, USBL, Gravity Meter …

Thank you for your listening