



**EAS** XIAMEN, CHINA  
6-8 NOVEMBER  
**CONGRESS2024**



**2024厦门国际海洋周**  
World Ocean Week in Xiamen

# Blue Synergy for a Shared Future: One Sustainable and Resilient Ocean

6-8 NOVEMBER 2024 • XIAMEN CITY, CHINA



**SUBTHEME 3.1**  
**INNOVATION AND DIGITIZING OCEAN ACTION**

## Marine Spatial Planning Utilizing a Big Data-driven Policy Simulator

PROCEEDINGS

### CONVENERS:



中华人民共和国自然资源部  
Ministry of Natural Resources of the People's Republic of China

厦门市人民政府  
Xiamen Municipal People's Government



# **Marine Spatial Planning Utilizing a Big Data driven Policy Simulator**

NOVEMBER 6, 2024, 14:30-17:30  
2A Meeting Room

## **1.0 Introduction**

### **1.1 Session Background**

With recent increases in intensity of marine spatial utilization and various activities, conflicts and activity overlaps among stakeholders are deepening. Particularly, there is a demand for establishing means of integrated management of marine space to promote rational development and utilization, and to induce eco-friendly and sustainable marine activities.

### **1.2 Session Objectives and Structure**

Securing scientific policy support technology to diagnose policy effects by performing simulations in a virtual reality (digital twin) environment.

In this session, experts from each country such as Korea, Japan, China, and Indonesia will share their expertise and know-how in marine spatial management, and build an international cooperation basis to realize sustainable marine space utilization.

### **1.3 Expected Effects**

Contribution to the development of intelligent marine spatial policy simulation technology based on a marine digital platform for predicting Asian marine activities and scenario-based spatial changes and policy diagnosis.

### **1.4 Conference Organizer**

Korea Institute of Ocean Science & Technology(KIOST)

## **2.0 Opening Ceremony**

Kwon, Suk-Jae (Research Scientist, Korea Institute of Ocean Science & Technology, and Technical Session Co-Chair, PEMSEA)

The development of a scientific policy simulator utilizing big data is anticipated to play a crucial role in the context of the Fourth Industrial Revolution.

Through this special session, we aim to exchange information and share perspectives on the latest technologies and policies related to policy simulators, particularly in the context of marine spatial management in East Asian countries such as South Korea, China, and Indonesia.

We also aspire to contribute to the development of intelligent marine spatial policy simulation technologies based on a marine digital platform, which will facilitate the prediction of maritime activities in Asia and provide scenario-based spatial changes and policy diagnostics.

This session is expected to address several key areas 1)Formulation of marine spatial management policies in Asia, 2)Development of scenarios for policy simulation, 3)Advancement of policy simulators for marine digital twins, 4)Verification and application of policy simulators based on the marine digital platform.

We look forward to fruitful discussions on these topics during the session.

## **3.0 Session Highlights**

### **3.1 Presentation 1**

- Kim, Choongki (Senior Research Fellow, Korea Environment Institute)
- Marine Spatial Planning and Offshore Wind Power Generation in Korea: A Data-Driven Approach Through an Environmental Information Platform
- Marine Spatial Planning (MSP) provides a structured framework to balance offshore wind power generation with ecological and social needs. Through tools like the One-Step Platform, we can make informed, sustainable decisions for site selection for offshore wind farm. South Korea's approach to MSP and offshore wind power generation represents a sustainable path forward in renewable energy. By balancing energy development with ecological and social needs, South Korea is building a foundation for a resilient future.

### 3.2 Presentation 2

- Son, Woo-Ju (Postdoctoral Researcher, Korea Maritime and Ocean University)
- Development of Simulator for Ship Activity Conflict and Future Demand
- This research introduces research on creating a marine spatial policy simulator leveraging to address increasing conflicts in marine space. By integrating data-driven predictive techniques, it aims to quantify traffic zones and anticipate trends affected by natural and artificial factors. The project emphasizes using maritime traffic density as a quantitative indicator to evaluate port and navigation zones. Ultimately, this research supports informed decision-making for marine spatial policy development and conflict resolution.
- Significant findings or innovations: This study quantitatively identifies densely populated areas of ships and helps quantitatively identify port and navigation zone in determining conflicts with various use zones when establishing marine spatial plans.
- Recommendations: The method of this study can identify traffic intensity areas and help select policy-based marine use zones.
- Links to SDGs or regional targets: This research can support SDGs 14: Conservation and sustainable use of oceans, seas and marine resources for development.

### 3.3 Presentation 3

- Nam, Jong-Oh (Professor, Pukyong National University)
- Analysis of Characteristic Factors Affecting Changes in Catch of Inshore and Offshore Fisheries Areas in South Korea using a Spatial Panel Model
- The research utilizes spatial panel analysis to assess spatial factors impacting the distribution and fluctuation of hairtail resources in South Korea, analyzing connections between hairtail distribution and marine environmental factors along with fishing activities.

Chlorophyll-a, dissolved oxygen, salinity, sea surface temperature, and fishing efforts (tonnage and number of vessels) were considered as the explanatory variables, with hairtail catch serving as the dependent variable.

The study covered the southern sea areas, Busan, Gyeongnam, Jeonnam, and Jeju of South Korea, and used quarterly data converting raw data to natural logarithms over the last three years.

Statistical tests, including the Morans'I test for spatial autocorrelation and the SDM (Spatial Durbin Model) selection, tested the model's fit for analyzing spatial data dependencies.

As a direct effect, it was confirmed that high salinity decreased the catch in the hairtail fishing ground and an increase in fishing effort had a positive effect on the catch in the hairtail fishing ground.

As an indirect effect, it was confirmed that a 1% increase in Chl-a concentration, dissolved oxygen, and surface water temperature had a positive effect on the catch of hairtail in adjacent areas.

The findings from this study suggest that marine spatial information can be used to develop evidence-based fisheries management policies and effectively manage resource conservation and utilization by providing reliable information on factors affecting catch variation of specific fish species as well as spatial dependencies of these factors.

#### 3.4 Presentation 4

- Kang, Seungwon (Senior Research Scientist, Korea Institute of Ocean Science & Technology)
- Development and direction of policy simulators as decision-making tools.
- KIOST has been conducting a project named "Marine Spatial Policy Simulator based on digital twin platform." The objective of this project is to develop intelligent marine spatial policy simulation technology based on a marine digital platform. Specifically, the project includes predicting marine activities, analyzing spatial changes according to scenarios, and developing technologies for policy support. Through this project, the simulator produced is expected to provide policymakers involved in marine spatial planning with scientifically efficient forecasting and simulations, as well as to supply diverse scientific evidence to support social acceptability within the decision-making process for marine spatial policies.

### 3.5 Presentation 5

- Son, Donghwi (Researcher, Korea Institute of Ocean Science & Technology)
- Development of marine policy-supportive simulator for assessing the impact of coastal development on physical environments
- For the development of a marine policy-supportive simulator for assessing the impact of coastal development, we suggest a scientific approach for evaluating and deciding on the Marine Spatial Management Plan and Marine Use Zoning Map. The simulator employs numerical models like SWAN and Delft3D to analyze and predict marine and coastal dynamics across various spatial and temporal scales. Progress includes establishing a comprehensive database from collected tide, current, and wave data, and developing targeted scenarios for both short-term emergencies and long-term planning. Looking ahead, we aim to integrate these models into digital twins and enhance precision with advanced assessment indices using techniques such as the Kriging method.

### 3.6 Presentation 6

- Zhi Li (Associate Professor, Xiamen University)
- Comparisons of Two Catch-Quota Management Regimes: An Experimental Investigation
- We introduce the heterogeneity of harvesting capacity and uncertain recruitment stocks into a novel, quasi-continuous time experimental environment with a contemporaneous price externality. The allocation and coordination of harvesting efforts under both common pool (CP) management and individual quotas (IQ) management are investigated. We show that the CP-induced race-to-fish pushes subjects with a low capacity to reduce their harvesting efforts, sacrificing landings to maintain a profitable fish price, which leads to an extreme income gap compared to subjects with a high capacity. IQ management, however, narrows the income gap by keeping a high market price and protecting low-capacity subjects with secured individual quota. Uncertainty recruitment stocks result in more volatile prices and annual income levels, but IQ can stabilize prices and income levels more than CP.

#### **4.0 Panel Discussion**

- Chair: Luky Adrianto (Professor, Bogor University)
- Panel : 1. Kim, Choongki (Senior Research Fellow, Korea Environment Institute), 2. Son, Woo-Ju (Postdoctoral Researcher, Korea Maritime and Ocean University), 3. Nam, Jong-Oh (Professor, Pukyong National University), 4. Kang, Seungwon (Senior Research Scientist, KIOST), 5. Son, Donghwi (Researcher, KIOST), 6. Zhi Li (Associate Professor, Xiamen University)

The experts attending this special session are expected to contribute to realizing a sustainable and resilient ocean through scientific data and technology, aligning with the vision of the 8th East Asian Seas Congress: "One Sustainable and Resilient Ocean."

Over 50 experts in marine spatial management, government officials, and stakeholders from East Asia, including China, Korea, and Indonesia, gathered to enrich the special session on "Marine Spatial Planning Utilizing a Big Data-driven Policy Simulator."

In particular, government officials and experts from East Asia expressed significant interest in the development of policy simulator technology for marine spatial management in China and Korea.

### Forum Outline

#### 1. Backgrounds and Objectives

- Session Topic  
Utilizing Big Data-Based Policy Simulator for Marine Spatial Management
- Session Background  
With recent increases in intensity of marine spatial utilization and various activities, conflicts and activity overlaps among stakeholders are deepening. Particularly, there is a demand for establishing means of integrated management of marine space to promote rational development and utilization, and to induce eco-friendly and sustainable marine activities.
- Session Objectives  
Securing scientific policy support technology to diagnose policy effects by performing simulations in a virtual reality (digital twin) environment.
- Session Structure  
In this session, experts from each country such as Korea, Japan, China, and Indonesia will share their expertise and know-how in marine spatial management, and build an international cooperation basis to realize sustainable marine space utilization.
- Expected Effects  
Contribution to the development of intelligent marine spatial policy simulation technology based on a marine digital platform for predicting Asian marine activities and scenario-based spatial changes and policy diagnosis.
- In this regard, this forum is aiming to
  - ✓ Derivation of marine space policies and development of simulation evaluation indicators for each policy
  - ✓ Policy simulation scenario development
  - ✓ Development of policy simulator for maritime digital twin
  - ✓ Verification and utilization of policy simulator based on maritime digital platform

#### 2. Conference Organizer

- Korea Institute of Ocean Science & Technology(KIOST)

#### 3. Venue and Dates

- Venue : Xiamen, China
- Dates : November 6, 2024 / 14:30 – 17:30

### Provisional Program



09 30-10:00 **Registration**

**14:30-14:40 Opening Ceremony**

**Opening Address**

**Kwon, Suk-Jae (Research Scientist, Korea Institute of Ocean Science & Technology, and Technical Session Co-Chair, PEMSEA)**

**Group Photo**

**14:40-16:40 Presentation Session 1**

**Presentation 1: Marine Spatial Planning and Offshore Wind Power Generation in Korea: A Data-Driven Approach Through an Environmental Information Platform**

Kim, Choongki (Senior Research Fellow, Korea Environment Institute)

**Presentation 2: Development of Simulator for Ship Activity Conflict and Future Demand**

Son, Woo-Ju (Postdoctoral Researcher, Korea Maritime and Ocean University)

**Presentation 3: Analysis of Characteristic Factors Affecting Changes in Catch of Inshore and Offshore Fisheries Areas in South Korea using a Spatial Panel Model**

Nam, Jong-Oh (Professor, Pukyong National University)

**Presentation 4: Development and direction of policy simulators as decision-making tools.**

Kang, Seungwon (Senior Research Scientist, Korea Institute of Ocean Science & Technology)

**Presentation 5: Development of marine policy-supportive simulator for assessing the impact of coastal development on physical environments**

Son, Donghwi (Researcher, Korea Institute of Ocean Science & Technology)

**Presentation 6: Comparisons of Two Catch-Quota Management Regimes: An Experimental Investigation**

Zhi Li (Associate Professor, Xiamen University)

**16:40-17:00 Break Time**

**17:00-17:30 Panel Discussion**

**Chair: Luky Adrianto** (Professor, Bogor University)

**Panel**

**Panel 1.** Kim, Choongki (Senior Research Fellow, Korea Environment Institute)

**Panel 2.** Son, Woo-Ju (Postdoctoral Researcher, Korea Maritime and Ocean University)

**Panel 3.** Nam, Jong-Oh (Professor, Pukyong National University)

**Panel 4.** Kang, Seungwon (Senior Research Scientist, KIOST)

**Panel 5.** Son, Donghwi (Researcher, KIOST)

**Panel 6.** Zhi Li (Associate Professor, Xiamen University)

## ANNEX 2. Supporting Files

### Photos



Over 30 experts in marine spatial management, government officials, and stakeholders from East Asia, including China, Korea, and Indonesia, gathered to enrich the special session on 'Marine Spatial Planning Utilizing a Big Data-driven Policy Simulator.



Here is Professor Luky Adrianto participating in a panel discussion during the special session on "Marine Spatial Planning Utilizing a Big Data-driven Policy Simulator."

### **Presentation Materials**

01\_Kim, Choongki (Marine Spatial Planning and Offshore Wind Power Generation).pdf

02\_Son, Woo-Ju (Development of Simulator for Ship Activity Conflict).pdf

03\_Nam, Jong-Oh (Analysis of Characteristic Factors Affecting Changes).pdf

04\_Kang, Seungwon (Development and direction of policy simulators).pdf

05\_Son, Donghwi (Development of marine policy-supportive simulator).pdf

06\_Zhi Li (Comparisons of Two Catch-Quota Management Regimes).pdf