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Opening a New Chapter on the Ocean -
A Report on the First National Oceans Day

韓國海洋資訊

Korea Ocean Information



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Our Pledge for the National Ocean Policy Blueprint: We Pay Our Tribute to the Sea!

Translated by Linguitronics

Minister of the Ocean Affairs Council: Chung-Wei Lee

We only have one ocean. So how ought we respond to the challenges that the ocean faces? The theme for this year's (2020) United Nations World Oceans Day is "Innovation for a Sustainable Ocean," under which UN Secretary-General António Guterres has pushed for governments and marine groups to dedicate themselves to protecting and preserving the world's oceans by focusing on innovation and technology, in the hopes of creating a new future for the oceans.

Taiwan has taken a new step this year in the area of ocean affairs. Last year (2019) saw the passing of the Ocean Basic Act, in which June 8 was designated as Taiwan's National Oceans Day. For the occasion of the first National Oceans Day, the First National Oceans Day 2020 event was held on June 8 this year. Domestic and foreign representatives from the world's governments, industries, as well as academic and research institutions gathered at the event to acknowledge and express hopes for Taiwan's handling of ocean affairs. On the occasion of the event, the Ocean Affairs Council announced the National Ocean Policy White Paper, an important cornerstone for Taiwan's ocean policy that demonstrates Taiwan's dedication and resolution in its respect for the sea. The event is discussed in detail in this issue's Special Report.

As the entire world slid under the shadow of the Coronavirus Disease 2019 (COVID-19), maritime industries were also subject to the impact of the pandemic. In such circumstances, how ought we ensure the safety and health of the ocean, the blue economy, and the human rights of seagoing crews? This issue's International Issues introduces the COVID-19 impact report compiled by the US Center for Strategic and International Studies (CSIS). In addition, the present issue contains a description of ocean issues in Republic of Korea, namely organizational structure, latest research and development, as well as how the country formulates domestic laws and regulations for international ocean law; it looks at the deep sea aquaculture industry in Republic of Korea, which offers Taiwan a model for policy and inspiration; it analyzes the institutionalization of international conventions in Taiwan, the promotion of deep ocean waters, and Republic of Korea's previous experience in the area, all of which is worth learning from.

Oceans are not just huge repositories of resources - their health is linked to the health of the entire world. Thus, we are duty bound to work together to create a sustainable marine environment that operates on the grounds of ecological sustainability, marine safety, and flourishing industries!

Polar ice cap at the Arctic Circle
Image by NASA on The Commons

<https://www.flickr.com/photos/nasacommons/35491836420/>



Opening a New Chapter on the Ocean – A Report on the First National Oceans Day

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Translated by Linguitronics

Keywords: National Oceans Day, National Ocean Policy White Paper, Tribute to the Sea

June 8 is designated by the UN as World Oceans Day, and the same date has been set as Taiwan's National Oceans Day under the country's Ocean Basic Act. On June 8, 2020, the celebration for the first National Oceans Day was held in the Kaohsiung Exhibition Center, where the 2020 National Ocean Policy White Paper was announced, demonstrating Taiwan's determination and resolution to pay tribute to the sea. It is hoped that this will bring people together to work towards building a marine environment with sustainable ecosystems, safe territorial waters, and prosperous industries.



The announcement of the National Ocean Policy White Paper at the ceremony for the first National Oceans Day
Image by Chia-wen Chung

The ocean, which covers 72% of the earth's surface, possesses both clear blue scenery and rich resources. Its health affects the health of the entire planet. While the world in 2020 was covered in the darkness of Coronavirus Disease 2019 (COVID-19), the UN published an article, "COVID-19: the ocean, an ally against the virus," which stated that bacteria found in the deep ocean can be used to speed up COVID-19 testing. The ocean is not just mankind's ally in the fight against viruses, its biodiversity and environmental resources are potential ocean resources that cannot be ignored. (Reference: <https://en.unesco.org/news/covid-19-ocean-ally-against-virus>)

Based on the ocean's importance, the UN designated June 8 as the World Oceans Day to remind people to consider, understand, and protect the ocean. "Innovation for a Sustainable Ocean" is the global theme for 2020. Due the increasing challenges faced by the ocean, UN Secretary-General António Guterres has been urging governments and relevant organizations to commit to protecting and

conserving the world's oceans through innovation and science. Taiwan has designated the same date as the National Oceans Day under the Ocean Basic Act. On June 8 this year, the celebration for the first National Oceans Day was held in the Kaohsiung Exhibition Center, and the 2020 National Ocean Policy White Paper was announced. This was done not only to demonstrate Taiwan's determination and resolution to pay tribute to the sea, but also to bring people together to work towards building a marine environment with sustainable ecosystems, safe territorial waters, and prosperous industries.

The start of National Oceans Day! Various parties gather to celebrate: the deepening of cooperative relationships between Taiwan and the world

At the ceremony, Chi-mai Chen, the former vice premier of the Executive Yuan, stated in his speech that it is very important for Taiwan, a maritime country, to have a specific and well-defined National Ocean Policy White Paper. The Ocean Basic Act, which was passed on November 1, 2019, designated June 8 as National Oceans Day and explicitly requested that the National Ocean Policy White Paper be announced within one year. Thanks to the Ocean Affairs Council's effort in gathering representatives of relevant industries, authorities, academia, research institutions, and non-governmental organizations, the National Ocean Policy White Paper was officially established within just 7 months. It is believed that, when in coordination with Executive Yuan's policy of "Tribute to the Sea," the National Ocean Policy White Paper will assist in formulating forward-looking and sustainable marine action plans in the future. Also, it is hoped that farseeing and innovative thinking will promote the sound development of marine affairs and grasp unlimited opportunities for marine development.

Legislator Jui-lung Lai and Legislator Chih-chieh Hsu both participated in the grand ceremony. In his speech, Legislator Lai expressed his hope for smoother workings of the Ocean Affairs Council, flourishing development in talent, funding, and related bills, as well as a more open ocean which is closer to people and which flourishingly co-exists with the world. Legislator Hsu thanked the Ocean Affairs Council and Coast Guard Administration in his speech for their unrelenting efforts to protect the borders and make Taiwan shine on the international stage. He also expressed his hope for more developments in marine tourism and culture in the future.

On this celebratory occasion, blessings were received from international friendship units, government administration teams, NGO organizations, industries, and academia. Congratulations for the first National Oceans Day were delivered in the form of a video. Director Brent Christensen of the American Institute in Taiwan stated, "I look forward to continuing the deepening of the US-Taiwan cooperative relationship in the future." Director Jean-François Casabonne- Masonnave of the French Office in Taipei



(Left) Group photo of honored guests: (from the left) Director-general Hsiang-wen Huang of the OCA, Ambassador Jarden Kephass of the Republic of Nauru, Minister Chung-Wei Lee of the OAC, Ambassador Diane Haylock of Belize, Ambassador Dilmei L. Olkeriil of the Republic of Palau, Deputy Director-general Hsin-chen Sung of the OCA. (Right) Group photo of honored guests: (from the left) Ambassador Neijon Rema Edwards of the Republic of the Marshall Islands, Ambassador Limasene Teatu of Tuvalu
Image by Chia-wen Chung (Left), Ocean Affairs Council (Right)

pointed out a key element in developing cooperative relationships with Taiwan, stating, "We must ensure that the ocean's regenerative cycle goes on endlessly." Ambassador Neijon Rema Edwards of the Republic of the Marshall Islands expressed her wishes: "We look forward to working with Taiwan on marine affairs and strengthening our partnership." The video communicated the international community's approval of Taiwan's marine affairs management and expectations for continued cooperative relationships with Taiwan.

Commendation of the driving force behind ocean affairs and the physical results presented at exhibition areas

At the ceremony, the Ocean Affairs Council showed a video on the results of administrative efforts. It explained the policy direction and actual business promotion status of the Council and the institutes governed by the Council, including the Coast Guard Administration, Ocean Conservation Administration, and National Academy of Marine Research. It also presented programs established as responses to "Tribute to the Sea," including the Environmental Protection Fleet and Diving Warriors. A total of 43 people and groups who had contributed to marine affairs were commended at the ceremony. These included government personnel who showed outstanding performance in promoting marine affairs in 2019. They actively promoted matters such as marine environmental education and sea turtle rescue within their roles in various institutes, including the Ministry of the Interior, Ministry of Transportation and Communications, Ministry of Transportation and Communications, and Council of Agriculture. Also present were representatives of the excellent-performing 2020 Environmental Protection Fleet established by local governments through the collaborative promotion efforts of the Ocean Conservation Administration, Ocean Affairs Council and Fisheries Agency, Council of Agriculture; outstanding representatives of the 2020 Diving Warriors who participated in national beach cleanup events; exceptional representatives of local governments recognized through the 2019 Marine Pollution Prevention Assessment. They all worked together to contribute immensely to marine debris management. The representative of the 2019 wild marine protected species rescue team was also commended for the team's rescuing of wild whales and dolphins, including pygmy killer whales; they gave wild marine animals the opportunity to continue living. Lastly, youth representatives to the 2020 Our Ocean Youth Leadership Summit (OOYLS 2020) will attend the Summit in Palau on behalf of Taiwan and explore marine issues with youth from various countries.



(Left) Youth representatives for OOYLS 2020 receiving awards at the event. (Right) The new 4,000 naval ship model exhibited at the venue

Image by Chia-wen Chung(Left), Ocean Affairs Council (Right)

In order to let the public understand how the Ocean Affairs Council manages marine affairs, four exhibition areas were set up at the ceremony venue with the themes of "ecological conservation," "maritime security," "prosperous industry," and "marine debris recycling coalition." Physical exhibition items were also provided, including marine conservation educational items, results of marine debris removal, new naval ship vessels, a hydrological database prototype system, rotor drones, deep ocean water, and various types of products made with recycled marine debris. In addition, five friendly nation representatives – Ambassador Diane Haylock of Belize, Ambassador Jarden Kephass of the Republic of Nauru, Ambassador Dilmei L.Olkeriil of the Republic of Palau, Ambassador Limasene Teatu of Tuvalu, Ambassador Neijon Rema Edwards of the Republic of the Marshall Islands– were present at the ceremony to converse further with the Ocean Affairs Council. The exhibition areas, which received high praise, enabled visitors and the public to gain a deeper and more specific understanding of various topics on marine affairs.



(Left) Scene of National Oceans Day events. (Right) The demonstration of the force that maintains territorial water safety
Image by Ocean Affairs Council

Launching of the National Ocean Policy White Paper! Six proposed policy objectives

In order to show the determination and resolution to pay tribute to the sea, the Ocean Affairs Council chose Chi-mai Chen, the former vice premier of the Executive Yuan, and Minister Chung-Wei Lee of the Ocean Affairs Council to jointly announce the National Ocean Policy White Paper at the ceremony. Containing a total of 53,000 words organized into 8 chapters, the National Ocean Policy White Paper continues the National Oceans Policy Guidelines' goal of ocean sustainability. The National Ocean Policy White Paper sets specific goals and strategic guidelines for various areas, including marine rights and interests protection and governance, maritime safety and ocean security, marine conservation and environmental protection, development and innovation in the marine industry, marine culture and education, talent training, and marine scientific research and technological development. It is hoped that people's understanding and love for the ocean will be fostered, and that procedures for wise utilization and governance of the ocean will be formulated in order to achieve the maritime nation's vision of practicing oceanic thinking. With vigorous ambition and expansive inclination, efforts are being made to manage the ocean and build a wonderful maritime nation with excellent ecosystems, safety, and prosperity as we set sail for the world.

As a blueprint for national marine development strategies, the National Ocean Policy White Paper can not only provide guidelines for government bodies at all levels in reviewing and revising principal policies and administrative measures, it also proposes six main policy goals for different aspects of the ocean:

- I. Build regional strategic thinking and defend the rights, interests, and sovereignty over marine territories.
- II. Implement maritime law enforcement methods and promote regional security cooperation.
- III. Maintain marine ecological health and optimize marine environmental quality.
- IV. Establish industrial development goals and encourage blue industry upgrade.
- V. Build an ocean-friendly culture among citizens and cultivate nationwide oceanic thinking.
- VI. Foster scientific development momentum and build scientific research capabilities.

In coordination with the policy blueprint of the National Ocean Policy White Paper, the government will also establish a series of "Tribute to the Sea" related policies. In addition, citizens are encouraged to clean, understand, be close to, and go into the ocean. Respecting and understanding the ocean as well as the utilization of marine resources will enable Taiwan to make significant developments.

Conclusion

Taiwan is surrounded by ocean, and its people are closely connected to the ocean. It is our responsibility to place importance on marine development. The Ocean Affairs Council invited international institutes, governmental groups, and NGOs to join the celebration for the first National Oceans Day. At the event, physical exhibition areas were set up and outstanding representatives who contributed to marine affairs were commended. This aroused people's attention to National Oceans Day. And, further, the announcement of the National Ocean Policy White Paper was a declaration of the country's ocean policy blueprint and its determination. We believe that in the future, the people of Taiwan will work together to deepen marine awareness and jointly build a sustainable marine environment!



Friends from all around the world gather to congratulate Taiwan on its first National Oceans Day
Image by Ocean Affairs Council

COVID-19 at Sea: Impacts on the Ocean Security, Ocean Health, Blue Economy and Human Rights

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Keywords: COVID-19, pandemic, ocean security, ocean economy

COVID-19 at sea means that the blue economy, referring to the ocean-related industries, suffers from the COVID-19 pandemic. This type of industry inherently involves the movement of goods and people, posing a huge challenge for efforts to address the COVID-19 pandemic. Illustratively, ports are places where goods and people congregate and move, something antithetical to pandemic control. Many of the world's 4.5 million fishing vessels remain at sea for weeks or months at a time, leaving them intensively vulnerable to shipboard COVID-19 outbreaks that may arise from crew's infection at land. Despite these high risks of COVID-19 outbreaks, ports remain open, and fishing vessels must continue to fish, given that 90 percent of the world's cargo moves by sea, and fish provide essential protein for 1 billion people. The COVID-19 at sea has impacted the ocean in many aspects, including ocean security, ocean health, blue economy and human rights of the crew.

Impacts on ocean security and ocean health

The ocean is a poorly-policed frontier. The COVID-19 pandemic will exacerbate the offshore law enforcement gap, as coast guards and navies look inward to manage domestic crisis rather than police the seas. The US Navy has already canceled this year's joint naval exercises in the Gulf of Guinea, the world's most piracy-prone region, with 112 attacks in 2017. Pirates, poachers, and smugglers, on the other hand, continue to operate. They may even have greater incentive to resort to crime due to fewer opportunities to make benefits in a global recession.

As the pandemic is not yet effectively controlled, law enforcement on the ocean declines in the coming months and thus illicit fishing is likely to increase. This can be checked by watching data from vessel automatic identification system (AIS) and satellites to determine whether signals of illicit fishing, such as activity within marine protected area and AIS spoofing. A less secure ocean will be less well-managed and unable to sustainably provide resources like fish over the long term.

In contrast to the previously mentioned illicit fishing, legal industrial fishing operations are likely to decline, especially over the near term. The reasons behind this phenomenon are twofold: the high risk of infection at sea and supply chain complications caused by market closures. The last time a global crisis affects the fishing industry on a similar scale was World War II. During the war, the closure of the North Sea allowed regional cod and haddock stocks to rebound, resulting in robust catch throughout the 1950s. Accordingly, it is expected that similar examples of marine ecosystem resilience may occur during the pandemic, improving ocean health. However, any ecological recovery faces potential caveats, including:

- Decreased law enforcement at sea may give rise to more illegal fishing activities.
- Transshipment of fish at sea increases as ports are closed and access restricted. Such practices make it harder to police at sea and are likely to give rise to illicit fishing and human rights violations.
- Research cruises are cancelled and ocean science data hard to attain. This could undermine stock assessments and management regimes, which in turn makes it hard to implement sustainable management of the oceans.

Impacts on the blue economy

Fisheries are one of important sectors in the blue economy. It is noted that fish is the world's most widely traded food commodity, but market disruptions, as a result of the pandemic, have already begun to change that. Illustratively, consumers have dramatically increased demand for frozen and processed seafood while turning away from fresh caught products which they have often consumed. The reasons behind this phenomenon are twofold. One is that during periods of isolation, consumers are able to buy only frozen and processed seafood in supermarkets. The other is that in many developed countries, such as the United States, most consumers eat fresh fish in restaurants and other public spaces that are no longer open.

Market closures in Europe have caused a crisis for fishers in the United Kingdom, which exports 70 percent of its catch. In the United States, 90 percent of seafood is imported or processed overseas. Some US companies outsource a portion of their processing needs by sending US-caught seafood abroad to facilities in China before reimporting it for final packaging for the US market. Yet the COVID-19 pandemic may drive these companies to re-shore processing operations to avoid trade disruptions caused by the pandemic and future crises.

COVID-19 undoubtedly impacts the seafood sector. The impacts of the current outbreak differ for different categories of the vessels. Vessels are divided into three categories based on the duration of fishing trips. Three categories are established: 1. vessels that return to shore each day (Category I); 2. vessels that fish offshore for months to years and transship catch (Category II); 3. vessels that fish offshore for weeks or months but do not transship catch (Category III). Vessels of Category I are common in small-scale or near-shore fisheries, which are particularly common in developing countries. These vessels often do not run a risk of developing an outbreak while far offshore. However, they have established tightly linked shore-side networks with local markets, commercial buyers, processors, or families and communities who rely on the catch for food security. In this situation, social distancing may be impractical and outbreaks highly probable. To make things worse, many communities are poorly served by health infrastructure, increasing the risk of a global pandemic. Still, fishers may benefit from reduced competition with industrial fleets which are limited by concerns about offshore epidemic.

Vessels of Category II are relatively few in number but catch enormous quantities of fish on an industrial scale. They mostly operate in the Pacific and Indian Oceans (distant water fleets from China, Taiwan and Japan are among of them) and Russia's far eastern waters. Catch species from the vessels are diverse, including tuna, squid and pollock. Catch transshipment at sea limits their risk of exposure to COVID-19, allowing vessels that have been at sea since before the outbreak to continue operating relatively normally. However, any outbreak at sea would be catastrophic.

Global tuna fisheries are comprised mostly of the vessels of this category, mainly including longline and purse seine vessels. These vessels operate far offshore for weeks, months, or even years at a time. Pacific tuna purse seine fleets have to transship in port – often in island-states (e.g., Majuro, Marshall Islands; Suva, Fiji) before shipping catch to markets in Europe, Asia, and North America. Port closures make catch offloading at port impossible, leaving vessels at sea for a longer period of time. This not only adversely affects crew's life at sea but also poses a significant challenge for the industry.

Vessels of Category III are mostly common in fisheries such as the Peruvian Anchoveta fishery and many US fisheries. Vessels of this category may face huge challenges in dealing with the risk of COVID-19. Illustratively, fishers are possibly infected with COVID-19 on land, and then spend weeks or months at sea in cramped, crowded spaces on board, putting other crew members at increased risk of virus. In repose to this situation, the industry generally takes alternative approaches to reduce the impacts of the pandemic. For example, vessels in the largest US fishery – the Alaska pollock fishery – spend weeks to months at sea. However, in the face of potential market disruption and economic hardship, vessels may instead shorten voyages or alter processing protocols by re-shoring processing operations. It is noted that the original processing protocols often involve export and re-importation to and from China.



Ports are places where goods and people congregate and move, which is antithetical to pandemic control
Image by Chung-Ling Chen

Impacts on public health and human rights

COVID-19 outbreaks aboard fishing vessels represent a significant threat to public health. Fifty million people globally are employed in marine fisheries – largely in developing countries with poor records on safety, health, and human rights. Long-haul fishing vessels are cramped, crowded and exceptionally unhygienic. Crew are often malnourished and forced to work for up to 20 hours each day. A lack of medical supplies means cuts can stay infected for weeks. Moreover, many vessels rely on undocumented migrant workers who are not subject to public health controls.

A scenario is assumed with an incubation time of 5.1 days for COVID-19 and a fishing vessel with 30 people aboard. It can be seen that the entire crew are infected with virus under a month. Operating a ship with mostly sick crew members would be next to impossible, forcing ships back to return to port. Moreover, many distant-water fishing vessels use foreign ports in developing countries with poor health controls. New COVID-19 outbreaks could be generated when these vessels return back to ports. By contrast, other types of vessels such as in navies, coast guards and the shipping industry would be subject to the similar situation but are generally less crowded and better regulated, and so they face lower risks of infection.



With cramped spaces on board, any fisherman infected with COVID-19 may lead to outbreaks aboard fishing vessels
Image by Chung-Ling Chen

The pandemic affects the human rights of fishermen. Illustratively, fishermen who work on the vessels of Category I return to shore each day, have to continue to work and interacting with others, putting them at increased risk of the virus. Moreover, those who work on the vessels of Category II or III will face higher risks since they stay at sea at a longer period of time, reaching up to weeks or months. Those who show COVID-19 symptoms could face solitary confinement or be left at sea. If coast guards and navies oversight these vessels, fishermen, especially those in forced labor, will be left in a dire situation where they lack access to clean water and adequate food, rendering them more vulnerable to illness. To make things worse, if a vessel's workers do become infected, the vessel may be turned away at ports. This could leave sick and vulnerable fishermen without access to medical care, food or water stranded at sea.

In sum, proactive actions are needed to protect fishermen and improve public health and ensure them not being stranded at sea in vulnerable conditions. The concerned actions are such as providing health services to fishermen and monitoring their health. These services should be provided to those who are healthy and sick, regardless of their legal or illegal immigration status. (Most content of this article is excerpted and revised from the article: Covid-19 at sea: Impacts on the blue economy, ocean health, and ocean security by W. Saumweber et al. (2020). url: <https://www.csis.org/analysis/covid-19-sea-impacts-blue-economy-ocean-health-and-ocean-security>)



The pandemic leading to closures of fishing grounds may help improve ocean health

Image by Chung-Ling Chen

Republic of Korea's Deep Sea Water Industrial Development Strategies and Inspiration

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Translated by Linguitronics

Keywords: Ocean industry, deep sea water, Republic of Korea

Republic of Korea has a sea area of 444,000 square kilometers, 4.5 times its land area. With its 2,413 kilometers of coast line, the vast national sea territory provides Republic of Korea the space for developing its ocean industry. Republic of Korea started heavy industry development in the early 20th century, and built itself up through trading in the 1980s. Organizations such as Korea Ocean Research and Development Institute (KORDI) and Korea Maritime Institute (KMI) were set up for ocean development and strategy research, enlisting many overseas scholars to return to the country to specialize in research, which laid the foundation for marine technologies and marine strategies. In addition, to accelerate ocean industry development, Republic of Korea published Ocean Korea 21 in 2000, setting the strategic goal for Republic of Korea in becoming the world's 5th largest maritime country by 2030. The Second Basic Plan for Marine Fishery Development (2011 - 2020) was also established in 2010, the main objective of which is becoming a powerful maritime country. In 2017, President of Republic of Korea, Jae-in Moon, set the vision of becoming a "Global Marine Leader, Korea", with two objectives: achieve "Cleaner, Safer & More Productive Oceans," and 10% Share of Oceans and Fisheries in GDP by 2030. This study focuses on the introduction of deep sea water in Republic of Korea's ocean industry, to be used as future reference for Taiwan in promotion, management, and operation.

With the development of its economy, Republic of Korea has great demand in the utilization of marine resources. To effectively utilize the resources, the Republic of Korean government has, since 2000, been providing funding support for small and medium enterprises. Through technological development and innovation, the foundation for the development of Korea's ocean industry has been laid. In its emerging ocean industry, non-living ocean resources include minerals, energy, space resources, and non-living ocean resource exploration makes use of technologies, seafloor topography surveying technologies, ocean observation instruments, deep sea water, ocean energy usage, and ocean mining technologies.

Deep Sea Water

I. What is deep sea water

Deep Ocean Water (DOW) or Deep Sea Water (DSW) refers to sea water at the thermocline, at a depth below 200 meters. However, while there is no strict definition internationally, it normally refers to sea water extracted from a depth of below 200 meters. DSW, according to the Ministry of Ocean and Fisheries of Korea, is deep sea water pumped up from a depth of more than 200 meters below sea level. DSW has been seen as "new generation well-being water." The Water Resources Agency of the Ministry of Economic Affairs of Taiwan considers sea water pumped up from a depth below 200 meters of the ocean as DSW, which it also refers to as "21st century blue gold." Currently, countries with the largest scale in developing the DSW industry are Japan and the United States, and their definitions of DSW are based on this.

II. Characteristics of DSW

DSW is a special resource. It is found in the deep sea environment without sunlight, at low temperature, and under high pressure, and is clean and rich in nutrients. Not threatened by environmental pollution on the earth's surface, it does not contain bacteria, and has abundant minerals. The world's ocean has an average depth of 3,700 meters, hence nearly 93% of the world's sea water is DSW, which is also the most precious and pure water resource in the 21st century. DSW contains resources such as low-temperature energy, water, nutrients, minerals and metal elements (Taiwan Society of Deep Ocean Water Resource Application. Retrieved from <https://reurl.cc/3DzaXL>, Jul. 15, 2020). It can be used in food, healthcare, beauty care, agriculture, fishery, tourism, energy, and the various target industries include drinking water production, aquaculture, food processing, salt production, health supplements production, pharmaceutical manufacturing, hydrotherapy, skin toner production, and more. New technological methods can be used to enhance traditional technologies, which creates higher added-value, making the DSW industry an emerging ocean industry. In recent years, it has continuously caught global attention, and has very high development potential.

III. Applications of DSW

The United States, Norway, Japan, Taiwan, Republic of Korea, and China were among the first countries to develop DSW, most of them conducting studies on the health impact related to deep sea drinking water (DSDW) and developing products such as deep sea drinking water. The United States was the first country to develop DSW resources. In 1974, it set up the Natural Energy Laboratory of Hawaii Authority (NELHA), which extracted sea water from a depth of 1,000 meters for ocean thermal energy conversion, aquaculture, beverage and other industrial use, as well as for production of health food rich in minerals. Japan installed the first water pipeline in Kōchi Prefecture (320 meters deep, water intake 460 tons/day) in 1989 for industrial use. After gaining huge economic benefits, it subsequently set up DSW intake facilities in various locations, promoting DSW in industries such as aquaculture, food, drinks, cosmetics, and alcoholic products.

In the United States and Japan, various types of food made with DSW are already available on the market. For example, Japan's Asahi Beer, which is produced from DSW, has become an important beer manufacturer in Japan. Republic of Korea's DSW development started later, mainly in breeding of coldwater fish and production of products such as drinking water, salt, and mineral concentrates in the northeast region. In recent years, the local government has actively promoted the DSW industry, and after more than 2 years of toxicological assessment, the Ministry of Food and Drug Safety in 2019 approved the use of deep sea minerals extracts as new food ingredients, which can be used in products such as bread, drinks, and wine.



(Left)Mouth of deep sea water intake 1/8 model. (Right)Deep sea water drawing pipe
Image by Kochi Prefecture Deep Sea Water Promotion Office

The development of Taiwan's DSW industry is mainly in Yilan, Hualien and Taitung, the east coast being considered one of the best places in the world to obtain DSW. The terrain on the east coast has potential for developing the DSW industry, since its narrow continental shelf and huge depth difference make it easy to lay pipe for water intake. However, after ten years of development, only a small proportion of the expected output value is achieved at present. Research by the Industrial Technology Research Institute shows that after integrating national and private-sector strengths, the annual output of the DSW industry may reach tens of billions of NT\$ in the future. Together with improvements in industrial technologies, it can create more ocean economic value in the beverage, marine aquaculture, high-quality agriculture, flowers and plants, and vegetable industries every year. The Ocean Affairs Council and National Academy of Marine Research recently conducted research on technological development, development and management, and laws and regulations of the development of DSW in the eastern region, to be used in the development of Taiwan's ocean industry in the future.



Distribution of Republic of Korea's DSW intake facilities
Source/ UH, 2019. Deep Ocean Water Research, 19(3), 163-165

Republic of Korea's DSW development and current status

Republic of Korea's DSW intake facilities are concentrated in the northeast region (as shown in the diagram). As there is a need for continuous integration, system development, and industrialization for DSW, the Republic of Korean government passed the "Development and Management of Deep Sea Water Act" in 2007, and implemented it in 2008. Republic of Korea has 7 DSW intake facilities, 6 main development companies, and more than 50 DSW product companies at present; DSW is used in the rearing and transportation of aquatic products imported from abroad. In recent years, the Republic of Korean government has considered DSW as a useful resource for the emerging ocean industry, and hence has focused on the expansion of the scope of application of DSW, improving the legal system for pursuing diverse and high value-added products, investing in research and development, and promoting the recognition of DSW. Besides being used in drinking water production, DSW can also be used for various purposes, such as food, cosmetics, aquaculture, and agriculture. And apart from its use in food, DSW which has a temperature of lower than 3°C, can be used in air-conditioning, which effectively reduces the energy consumption of the cooling system by 60%. Republic of Korea's local government also actively promotes the development of new local industries, and has high expectations for the DSW industry.

The future of Republic of Korea's DSW development

The Third Basic Plan on DSW was implemented in 2019, establishing the objectives for DSW development. The Basic Plan aims to make reasonable use of DSW and promote industry diversification. Its directions include: 1. Strategies for using DSW resources in energy, seawater desalination, and responding to climate change; 2. Improve DSW's industry structure to attain industry diversification and high added-value; 3. Increase global competitiveness; establish and enhance the expansion of the market in the world's deep sea.

Republic of Korea's DSW laws and regulations

To manage DSW, Republic of Korea promulgated the Development and Management of Deep Sea Water Act in 2007. The purpose is to ensure that the country protects and manages DSW, and with environmentally friendly methods, develops or uses DSW for the future generation and public interest, thereby helping citizens live healthy and providing relevant industry development. To integrate with various industrial development, it has been amended more than ten times during this period. In the beginning, it encountered bottlenecks due to lack of food related standards and was unable to use and promote. In addition, besides requiring the Development and Management of Deep Sea Water Act to comply with the Drinking Water Management Act in terms of drinking, overall planning, licensing system, and water quality standards were also established. The Minister of Ocean and Fisheries is also endowed with the authority and responsibility of managing the DSW and ensuring its effective development. During the development process, if it affects ocean environment, the development may be restricted.

Republic of Korea's DSW developmental strategies

I. Strengthen marine scientific research

The objective of scientific research is not limited to ensuring the supply and quality of DSW, but also to understand its application potential. Study on the expanding scope of DSW application; pursue diverse and high added-value products.

II. Environmental management and monitoring system

Site development requires overall environmental impact assessment and risk and vulnerability assessment mechanisms to ensure the safety of the environment and drinking water, as well as sustainable development. Establish environmental management plan and environmental monitoring program to protect the ecosystem; attain effective marine environment management and sustainable use of resources.

III. Research and propose relevant supporting laws and regulations

Republic of Korea's Development and Management of Deep Sea Water Act comprises the various bases for development, management and practice. They could not be put into use in the early days due to lack of food standards. To expand the use of DSW, the Ministry of Ocean and Fisheries cooperated with the Ministry of Food and Drug Safety in establishing DSW processing standards, attaining the goal of diverse applications.

IV. Sufficient research budget

Insufficient research and development investment from the private sector affects the variety of DSW products, and the inability to afford research and development investment restricts the promotion of DSW products. The government promotes various funding and programs to increase DSW research and applications.

V. International collaboration and cooperation

The promotion of DSW originated in the United States and Japan, while Republic of Korea later joined in the development and promotion. Its research and development technologies, problem solving, and establishment of laws and regulations have received more international attention. Cooperation and experience exchange among various countries have become an international model for DSW development.

VI. Establish the usage plans for sea water resources

Republic of Korea has established usage plans for sea water resources, developed composite usage technologies for DSW, accelerated the industrialization schedule, developed various types of usage technologies for DSW, and expanded market scale, thereby strengthening the foundation for industrialization.

Conclusion

For purposes of ocean industry development, ocean resources protection, diverse technological development, and emerging ocean industry support, Republic of Korea has established such mechanisms as the Basic Plan, development fund, and Management Act. It develops diverse usage technologies for DSW, and conducts studies on industrialization together with the private sector, creating high value-added experience and policies in the new industry, which can be used as reference for Taiwan in promoting DSW.

Republic of Korea's Administrative Structure of the Ministry of Oceans and Fisheries and Its National Ocean and Fishery Development Plan

Kuan-Hsiung Wang (Professor, Graduate Institute of Political Science, National Taiwan Normal University)

Translated by Linguitronics

Keywords: Korea, Ocean Policy, Ministry of Oceans and Fisheries

Republic of Korea's institutions of ocean policy have gone through several developmental stages, including decentralization, centralization, and specialization. Today, the total number of personnel is 3,652, according to the latest 2017 organizational restructuring plan. With the promotional efforts of Korean President Jae-in Moon, it is hoped that the Ministry of Oceans and Fisheries will achieve the goal of becoming "Global Marine Leader, Korea," to which there are two separate goals: "Cleaner, Safer, and More Productive Oceans" and "10% share of oceans and fisheries in GDP by 2030."



Ministry of Oceans and Fisheries, Korea

Image by Minseong Kim (CC BY-SA 4.0)

[https://en.wikipedia.org/wiki/File:Ministry_of_Oceans_and_Fisheries\(South_Korea\).JPG](https://en.wikipedia.org/wiki/File:Ministry_of_Oceans_and_Fisheries(South_Korea).JPG)

Administrative history of Republic of Korea's Ministry of Oceans and Fisheries

In 1948, Republic of Korea announced the National Government Organization Act. The institutions responsible for managing marine affairs at the time were governed by two separate ministerial bodies, namely the Ministry of Transportation, Maritime Transportation Bureau and the Ministry of Commerce, Industry Fisheries Bureau. Republic of Korea's first and sole marine management institution was the Ocean Affairs Office, established in 1955. Its mission was the comprehensive administration of various affairs in the fields of fisheries, shipping, ports, shipbuilding, and maritime police. However, the Ocean Affairs Office was only in operation for 6 years before being dissolved in May, 1961. Its functions were separately transferred to several departments involved in marine affairs. At the time, there were 13 administrative departments involved in marine affairs, including the Fisheries Agency; Korea Maritime and Port Administration; Ministry of Science and Technology; Ministry for Food, Agriculture, Forestry, and Fisheries; Ministry of Commerce, Industry and Energy; and Ministry of Construction and Transportation. The state of having 13 institutions responsible for marine-related affairs continued for 35 years. Confusion inevitably occurred. The marine spaces which needed to be managed comprehensively were managed by decentralized administrative departments involved in marine affairs. This led to several problems, including low management efficiency and repeated project reformulation.

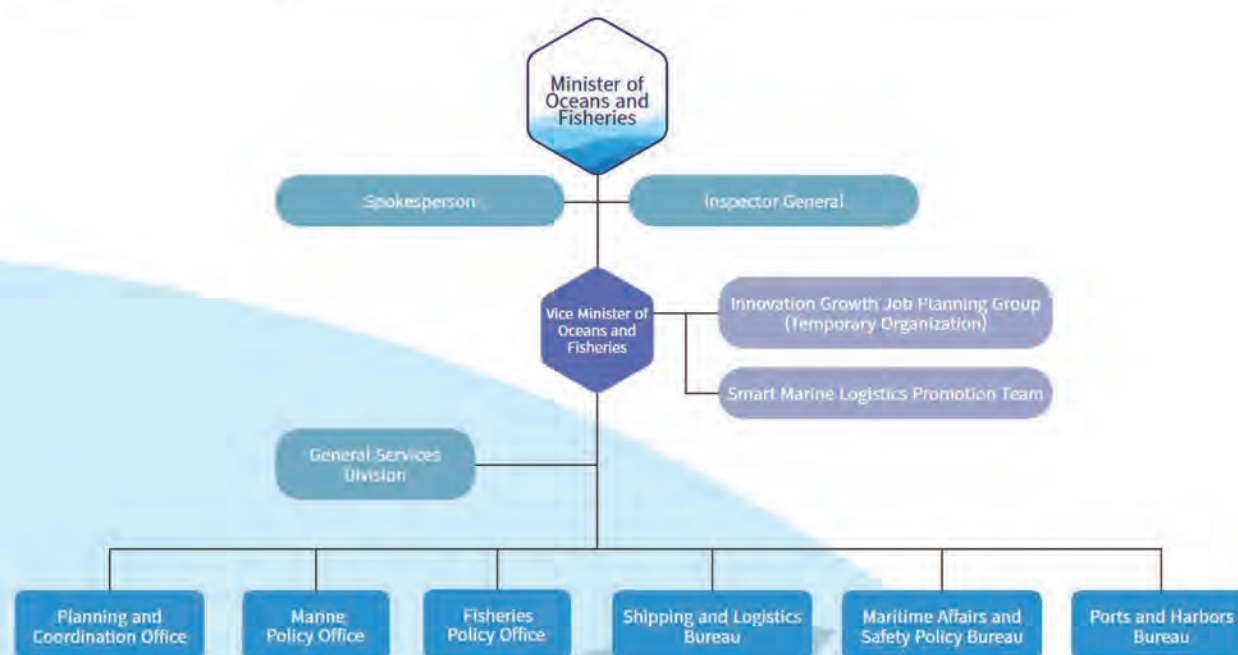
On January 25, 1996, President Young-sam Kim authorized the "Basic Plan of Ocean Development." This was a comprehensive plan formulated based on the Basic Law for Ocean Development. It comprised 108 tasks which fell under the responsibility of seven departments and four offices. The detailed status of plan implementation was required to be reported to the National Assembly every year. At the same time, Young-sam Kim also announced Presidential Decree No. 15135, which established the Ministry of Oceans and Fisheries. As Republic of Korea's decentralized management system for marine affairs came to an end after more than 30 years of operation, a new chapter of integrated marine management began.

In line with the specific state of Korea's marine administration, the Ministry of Oceans and Fisheries pulled apart the former organized system and rebuilt a new organizational structure. The structure integrates various ocean affair-related departments, including the Fisheries Agency; Maritime and Port Administration; Ministry of Science and Technology; Ministry of Agriculture, Forestry and Fisheries; Ministry of Industry Resources; Ministry of Environment; and Ministry of Construction and Transportation. In this way, marine management competency was distributed, and the new structure carried on the former Fisheries Agency's responsibility for fishery policy; the former Maritime and Port Administration's responsibility for sea transportation policies; the former Ministry of Science and Technology's responsibility for the research and development of marine science and technology; the former Ministry of Agriculture, Forestry and Fisheries' responsibility for fishery policy and statistics; the former Ministry of Industry Resources' responsibility for the development of marine resources, such as deep sea minerals; the former Ministry of Environment's responsibility for marine environmental protection, research, and surveying; the former Ministry of Construction and Transportation's responsibility for functions such as the management of waste-dumping in shared waters, ocean surveying, and the assessment of waterway and ocean security. In addition to carrying on the relevant functions of the former Police Agency, the newly established Korea Coast Guard gained several new responsibilities, including the management of marine pollution, marine security, and marine traffic safety. As a result, ocean affairs which were formerly managed separately by different bodies were integrated and managed by the Ministry of Oceans and Fisheries. The basic structure of modern marine affairs management mechanisms was thus established.

After Myung-bak Lee took office as president on February 25, 2008, he quickly reformed government functions and the public sector, and implemented a comprehensive ministry system. The amendment to the Government Organization Act made on February 29, 2008 rearranged 18 ministries into 15. The former Ministry of Construction and Transportation and the Sea Transportation Department of the Ministry of Oceans and Fisheries were merged into the Ministry of Land, Transport and Maritime Affairs (MOLTA). The former Korean Ministry of Oceans and Fisheries' responsibilities for ocean

policies, marine transportation and logistics, and marine environment were transferred to the MOLTMA. Its functions involved ocean policy, shipping, ports, marine environment, marine surveying, marine resource development, scientific and technological research, and marine safety. The Land Policy Bureau, Ocean Policy Bureau, Aviation and Railway Bureau, Policy Planning Office, Residential Land Office, Construction Policy Office, Logistics and Harbor Office, and Traffic Policy Office were established under the MOLTMA. The former Ministry of Agriculture and Forestry and the Fisheries Management Department of the Ministry of Oceans and Fisheries were merged into the Ministry of Food, Agriculture, Forestry and Fisheries (MOFAFF). The former Ministry of Oceans and Fisheries' fishery-related responsibilities, including fishery policies, fishing village development, and fishery product marketing, were transferred to the Fishery Policy Office under the MOFAFF. In addition, the Korea Coast Guard was rearranged into an office external to the MOLTMA.

After Geun-hye Park took office as president on February 25, 2013, she restored the Ministry of Oceans and Fisheries in accordance with her campaign promises. The Ministry of Land, Transport and Maritime Affairs was renamed Ministry of Land, Infrastructure and Transport, and administrative responsibilities, including ocean policies and the Korean Coast Guard, were transferred to the Ministry of Oceans and Fisheries. The MOFAFF handed over administrative responsibilities related to fisheries and was renamed the Ministry of Agriculture, Food and Rural Affairs. Such changes were made as a response to the changes in the ocean and fishery environments. The intention was to build a new national image, formulate strategic arrangements, and introduce new methods to manage knowledge and information. The goal was to make Republic of Korea become a top maritime nation that could effectively respond to the ongoing fishery disputes with China and Japan at the time. The Basic Plan of Ocean Development has three goals: create an ocean full of life, build a knowledge-based marine industry, sustainably utilize marine resources. Therefore, the matters that the Ministry of Oceans and Fisheries pay close attention to include promoting marine industry upgrades, improving port and harbor management efficiency, strengthening marine scientific and technological research, cleaning the marine environment, expanding protected marine areas, creating job opportunities, promoting green-energy vessels, enhancing marine safety, building a hub for international cruise ships, developing the fishing industry and fishery products, restoring fishery resource, and promoting recreational fisheries. All of which will enable Republic of Korea to create an even more brilliant future. (See the image below for the organizational structure chart of the Ministry of Oceans and Fisheries, Korea.)



Organizational Structure Chart of the Ministry of Oceans and Fisheries, Korea
Source/ Ministry of Oceans and Fisheries, <https://www.mof.go.kr>.

Jae-in Moon took office as president of Republic of Korea on May 10, 2017. His hope for the Ministry of Oceans and Fisheries was that it would achieve the goal of becoming "Global Marine Leader, Korea." Of which are two separate goals: "Cleaner, Safer, and More Productive Oceans" and "10% Share of Oceans and Fisheries in GDP by 2030." Under the aforementioned vision and goals, the Ministry of Oceans and Fisheries has set out to achieve the following plans by 2022:

- I. Its shipping industry becoming one of the top five in the world, and its ports developing into an international logistics hub.
- II. Restore fishery resources and promote fisheries with high added value.
- III. Promote marine recreational and tourism; create a business-friendly environment.
- IV. Conserve the healthy environment and strengthen marine safety management.
- V. Establish attractive fishery communities to vitalize the economy of coastal regions.
- VI. Defend marine territorial integrity; strengthen the status of the country as a global marine leader.

Republic of Korea's National Ocean and Fishery Development Plan

Before the establishment of Republic of Korea's Ministry of Oceans and Fisheries, when it still had a decentralized management system, no core marine policies had been formed. It was thus impossible to propose a clear direction for marine development. Therefore, it was also impossible to form a systematic management system and create a consistent driving force of policies. After the establishment of the Ministry of Oceans and Fisheries, the marine administrative works scattered across different departments were integrated into one system, creating significant achievements in the formulation of laws and policies.

Among these, the most significant was the formulation of the "Oceans and Fisheries Strategies for the 21st Century." Within four years after the announcement of "Ocean Korea 21," it played a central role in Republic of Korea's marine policy development plan. From 1996 to 2005, formulation of the "Basic Plan of Ocean Development," the establishment of a marine pollution management system, and the implementation of the long-term development plan that included defining marine ecology protection areas were the concrete results of Republic of Korea's implementation of comprehensive marine policies. In order to establish comprehensive marine policies, the Ministry of Oceans and Fisheries abolished the original "Marine Development Law" and formulated the "Basic Act on the Ocean and Fishery Development" in 2002. It later became the legal basis for the formulation of the "Basic Plan for Marine and Fishery Development" in 2004.

In terms of Republic of Korea's overall plans for oceans and fisheries, today there are two important documents which emerged after the beginning of this century. They are the first and second versions of "Ocean Korea 21." The first version of Ocean Korea 21 provides guidelines for national marine policies formulated between 2001 and 2010. It emphasizes the vigorous strengthening of the country's marine rights through putting Blue Revolution into practice. Republic of Korea states that four transformations are to be achieved in marine development: globalized transformation - see the entire world as a marine industry and implement development; future transformation - build pleasant territorial marine spaces for future generations; practical transformation - make oceanic development with the principle of furthering the national economy; local transformation - marine development that retains unique local features. There are three basic goals. The first is to increase the vitality of Republic of Korea's territorial waters. The second is to develop a knowledge-based marine industry. The third is to insist on the sustainable development of marine resources.

The 2nd National Ocean and Fishery Development Plan, also called OK 21 (2011-2020), was formulated based on the content of Article 6 of the Basic Act on the Ocean and Fishery Development. The changes were made as a response to the changes in the marine environment after the implementation of the previous edition of Ocean Korea 21. The second edition also targets specific marine areas, including Republic of Korea's exclusive economic territorial waters and coastal areas. The new plan will function as a comprehensive national plan for the marine and fisheries sectors, and a comprehensive plan for

other related sub-plans. Examples of sub-plans include the Comprehensive Marine Environmental Protection Plan, Comprehensive Management Plan for Coastal Areas, National Port Development Plan, Fisheries Promotion Plan, Marine Technology Development Plan, and Marine Tourism Plan.



Image by Ministry of Oceans and Fisheries

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http://www.mof.go.kr/jfile/view.do?fileId=MOF_ARTICLE_28312&fileSeq=6

An Introduction of Korea Institute of Ocean Science and Technology (KIOST)

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Keywords: National Oceanographic Research Institute, KIOST, Research Vessel, Underwater Robot, GOCI

The purpose of this report is to introduce the recent organizational development of KIOST and its core competencies, in the hope of enhancing our understanding of marine scientific research institutions in neighboring countries and as a reference for setting benchmark institutions.

Korea's research institutions are divided into three main categories: public research institutions, universities and corporate research institutions. Among them, the public research institutes are responsible for promoting and executing national strategic, fundamental, interdisciplinary and large-scale research. Universities mainly train talents and conduct small-scale basic research, while enterprises focus on industrial technology and high-tech R&D.

The establishment of Korea national oceanographic research institute can be traced back to 30 October 1973. The Korea Research and Development Institute (KORDI) was established under the Korea Institute of Science and Technology (KIST). With the establishment of the Sixth Republic of Korea, the organization of the public sector and the adjustment of public research institutions were reorganized. The Korea Institute of Ocean Science and Technology (KIOST) was established in July 2012 under a law named the "Korea Ocean Science and Technology Act" enacted at the end of 2011.

Purpose and mission

According to the "Korea Ocean Science and Technology Act", amended in April 2017, KIOST was established to "contribute to the development of national marine science and technology and ensure international competitiveness by systematically researching, developing, managing and using the ocean and its resources, and by nurturing experts in the ocean field.

The vision of KIOST is to lead Korea to become an ocean power by pursuing innovation and development in basic and applied ocean science and technology. Its main missions include: 1. research and commercialization of ocean resources and applications for the promotion of ocean science and technology, and 2. policy and organizational research and development of the science and technology required for ocean and polar research; 3. training and education of outstanding professionals in the ocean sector and public service; 4. development, testing and certification of ocean related equipment, machinery and technology. 5. to establish and operate marine infrastructure such as marine science research stations; 6. to commission research, joint research, joint ventures and other research and development projects; and to provide a wide range of services and facilities. In addition, it will promote the establishment of technical cooperation between domestic and foreign universities, research institutions and enterprises.

With this, KIOST has invested in scientific research off the coast of Korea, in the surrounding waters, in the polar and tropical regions, in harbor, ship and ocean engineering, in maritime safety-related technologies, in marine resource exploration and in marine environmental protection.

Organization and scale

KIOST operates as a legal entity with no more than 15 directors and supervisors in accordance with the "Korea Ocean Science and Technology Act", and the Board of Directors is composed of The Board of Directors and Supervisors is formed with the Ministry of Oceans and Fisheries as the main body and the Ministry of Science, Technology, Information and Communication and the Ministry of Strategy and

Finance as the secondary body. Under KIOST, there are a President and Vice President. The President directly oversees the Innovation Coordination Section, International Cooperation Department, Public Relations Section, Ocean Policy Institute, and Management Division. And assisted by the Vice President, the President supervises the Research Project Development Division, the Marine Environmental and Climate Research Division, the Marine Resources Research Division, the Coastal & Ocean Engineering Division, and the Marine Domain Management Research Division, Ocean Research, Operations & Support Department, KIOST School, South Sea Research Institute, East Sea Research Institute, and Jeju Research Institute. The headquarter of Institute is located in Yeongdo-gu, Busan. The organizational structure of KIOST is shown in Figure 1.

In terms of human resources, KIOST have two senior managers, 382 general full-time staff, and 360 supporting full-time staff at the end of 2019. The total number of staff was 744. And the government subsidized income was 163.1 billion won. According to the budget and manpower statistics for the past 5 years (Retrieved from: https://www.kiost.ac.kr/kor/sub01_04.do), although the budget was maintained at 170 to 210 billion won. However, the number of staff has increased from 400 to 700 in the past two years, mainly due to the increase in the number of contract employees. The manpower supplement in the form of contract to meet the needs of the expansion of organizational tasks.

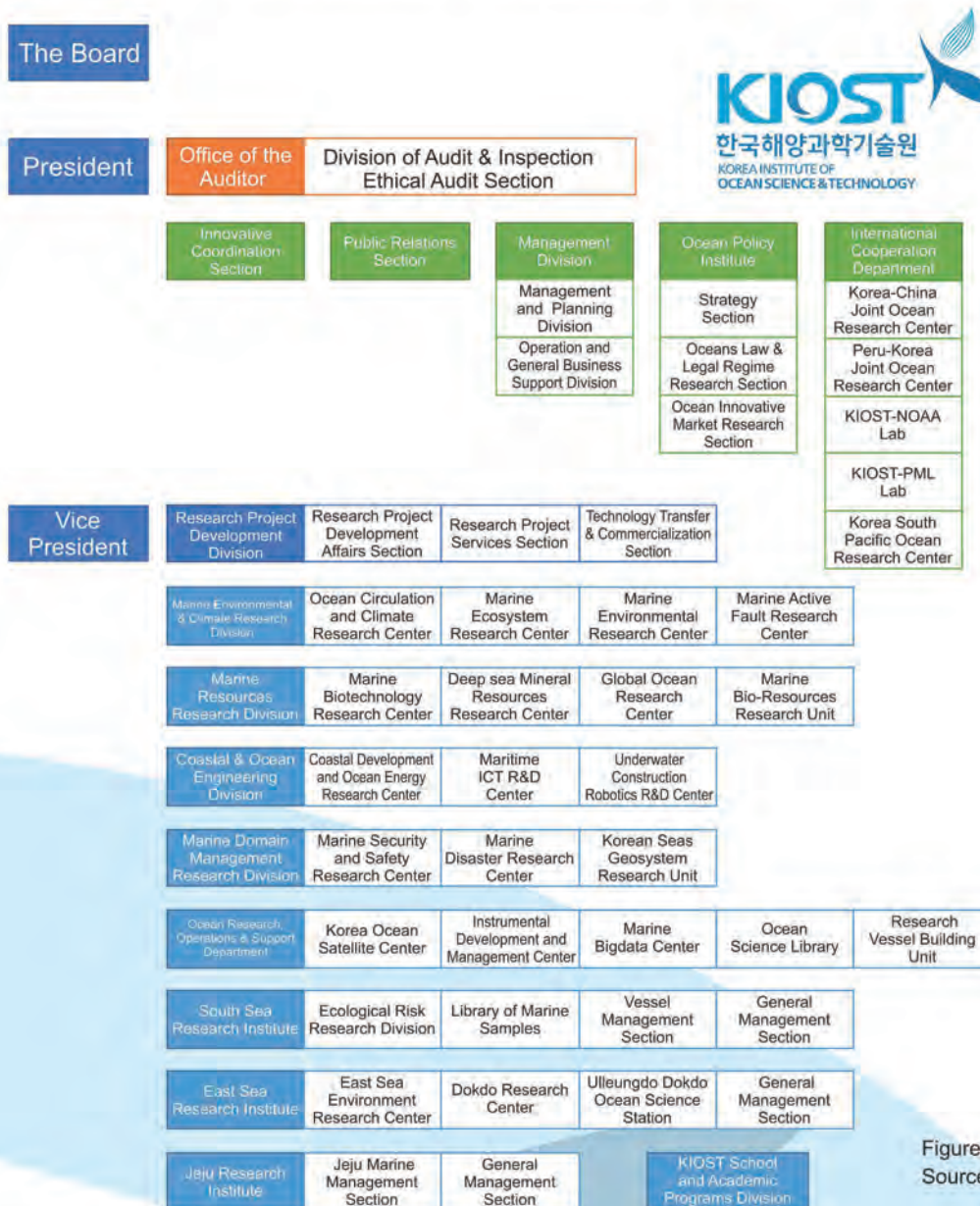


Figure 1/ Organization of KIOST
Source/ https://www.kiost.ac.kr/eng/sub01_04.do

Marine survey and research equipment

Republic of Korea is reintegrating government departments to formulate a national strategy for ocean and fisheries, and is actively investing in key ocean-related research and technology development. After many years of efforts, KIOST is gradually developing its ocean research and supporting industry development by supporting domestic and international ocean-related research projects with its GOCI series satellites, underwater robots and research vessels.

I. Geostationary Ocean Color Imager (GOCI)

The Coastal Zone Color Scanner (CZCS) has been launched by the United States since 1978. Since then, the importance of ocean watercolor satellites in marine ecosystem monitoring has been increasing. In the past, NOAA/NASA has been using high quality long-term observation data to provide dynamic information about the Earth's oceans, such as SeaWiFS and MODIS. Korea has also launched an orbital satellite named KOMPSAT-1 with Ocean Scanning Multispectral Imager (OSMI) for global water colour monitoring by the Korea Aerospace Research Institute (KARI) in late 1999.

Although conventional ocean watercolor satellites provide global coverage, orbital satellites have lower temporal resolution. In view of the dynamic characteristics of ocean and the need to monitor changes in coastal waters, KIOST proposed a synchronous ocean watercolor satellite project after reviewing the international ocean satellite development.

GOCI image is centered at latitude 36°N, longitude 130°E and provides long-term monitoring information within the area of 2500 km x 2500 km with a spatial resolution of 500 m. It is capable of providing 8 observations per hour during Northeast Asian daylight hours.

In the second year of GOCI's launch, KIOST initiated the GOCI-II program with the expectation that it would be able to enhance the quality of its data, and provide more accurate and reliable data. The new satellite will be able to improve its spatial resolution and spatial and temporal coverage by improve its imaging technology and increasing the number of bands. Although behind schedule for 2018, the new satellite was be launched in February 2020 from the Space Center in Guyana, France. The launch of GEO-KOMPSAT-2B will provide a new satellite for the future development of the Asia-Pacific region between Northeast Asia, Southeast Asia and even Australia. It will provide data on the marine environment covering nearly one-third of the world's total area.

KIOST establishes Korea Ocean Satellite Center (KOSC) to develop synchro satellites after reviewing the development of international watercolor satellites. At that time, the idea was really bold because Korea was not only in the development and launch of satellites, but also in the design of sensors on board. It has to rely on Europe for manufacturing, or the United States for the comparison and verification of remote sensing information. But as it turns out, this project not only puts Korea at the forefront of ocean geosynchronous satellite. Moreover, by inviting international research institutes to participate, Korea's international level in watercolor remote sensing has been rapidly enhanced.

Table 1/ A list of Korean Ocean Satellites

Sensor	Satellite	Operation Period	Spatial Resolution (m)	No. of Bands	Spectra (nm)	Orbit	Cycle
OSMI	KOMPSAT-1	Dec. 1999 ~ Jan. 2008	850	6	400~900	SSO	3day
GOCI	COMS	Jun. 2010 ~	500	8	402~885	GEO	hourly in daylight
GOCI-II	GEO-KOMPSAT-2B	Feb. 2020 ~	250	13	360~900		half-hourly in daylight

Consolidated by the author

II. Underwater Robots

According to the analysis of underwater robotics market research by a Chinese Research & Consulting company. The global underwater robotics industry stood at US\$2,334 million in 2017 and grew to US\$2,725 million in 2018. With technological advancements in the industry and expansion of the downstream application market, the global underwater robotics industry is expected to grow to USD 9,120 million in 2025.

Since 2013, the Ministry of Oceans and Fisheries and KIOST's Underwater Construction Robotics R&D Center (UCRC) has been actively investing in the development of Korea's own underwater robotics technology in view of future maritime engineering needs in marine resource development (e.g., offshore wind turbine installation, marine power generation equipment, underwater cable installation, etc.), with the expectation of gaining market share in the rental and sale of underwater construction robots for water depths between 500 and 2,500 meters in the future.

The first prototypes of the URI-L and URI-T underwater construction robots were completed in 2016, followed by the URI-R prototype in 2017. These robots were also successfully field-tested for performance in the East China Sea during September and October 2018 at 500 meters underwater. In which the URI-L is a lightweight work capable robot that provides underwater environmental surveys, underwater structural construction and work support and maintenance operations. URI-T, on the other hand, is a subsea construction robot for heavy-duty work that can bury submarine cables or install heavy structures at depths of up to 2,500 meters. The URI-R is a track-mounted heavy robot that can embed pipelines into hard surfaces or perform high-precision rock crushing and levelling Work. The URI-R is designed as a crawler wheel attached to the seabed. The URI-L and URI-T, on the other hand, move horizontally or vertically underwater by propellers.

KIOST will invest an estimated \$32 million USD over the four-year period 2019-2022 to advance this technology, field test it and improve the performance of the robots to facilitate the rapid commercial deployment of these technologies on real-world marine construction sites.



Figure 2/ Development of KIOST's underwater construction robots in Korea (URI-L · URI-T · URI-R)

Source/ KIOST

http://www.kioست.ac.kr/cop/bbs/BBSMSTR_000000000075/selectBoardArticle.do?bbsId=BBSMSTR_000000000075&nttlId=20449

III. Research vessel operations

Republic of Korea has an icebreaking research vessel "ARAON" which is used to support two Antarctic research stations. In addition, five research vessels were maintained by the KIOST, and the information about their elements and operational purpose is summarized in Table 2. The R/V ISABU is a new, large research vessel that can be used for scientific research work in the open ocean. Other ships are mainly used for research in the waters around Korea and off the coast of Korea.

Table 2/ Principal specifications of KIOST Research Vessels

Name	ISABU	ONNURI	EARDO	JANGMOK 1	JANGMOK 2
MMSI	440393000	440452000	440100900	440002680	NA
					
Completion	2016	1992	1992	2005	2012
Length×Beam (m)	99.8 × 18	63.8×12	49×8.6	24×5.2	24×4.8
Gross tonnage (tons)	5,894	1,422	357	41	35
Speed (knots)	15	12.5	16	13	16
Accommodation (Researchers)	60 (38)	41 (24)	32 (18)	15 (11)	12 (8)

Consolidated by the author

Research areas of KIOST

Korea is aware that it still has a long way to go in the field of marine science compared to advanced countries. A series of programs to develop national marine science and technology and enhance international competitiveness, with the following objectives: 1. Strengthening of leading ocean science and technology capacity through the challenging fusion and convergence research; 2. Establishment and promotion of new ocean industry, and development of industrialization-based technology; 3. Support for systematic ocean science and technology that can resolve national and social issues. However, given the wide range of oceanographic topics to be studied, KIOST places special emphasis on project selection and management. These include: 1. Mission-oriented organization management and project scale enlargement; 2. Establishment of ocean industry hub for the fourth industrial revolution; 3. Joint research for the people's living; 4. Establishment of research-oriented management system based on ethics.

Concluding remarks

Looking back at the rapid development of KIOST in recent years, we can see that the Ministry of Oceans and Fisheries and the Ministry of Science, Technology, Information and Communication have made concerted efforts to develop Korea into an ocean power through their organization, operation and project development.

According to the research results revealed on the official website of KIOST, more than 1,700 papers have been published in domestic and international journals/conferences since its establishment in July 2012, which fully demonstrates Korea's ambition to develop marine science and technology under the spirit of scientism.

What's more, Korea's investment in underwater robots and ocean satellites shows that they are pursuing the development of marine science and technology from a global perspective. Korea's strategy is to differentiate and develop, and to track, import and absorb advanced technologies through international cooperation. In recent years, we have also observed Korea's participation in a number of regional and international research projects, as well as its participation in international organizations such as APEC and the United Nations. To play an active role in leading the global development of scientific and policy issues in ocean science and fisheries.

Republic of Korea's Practice of Domesticating the UNCLOS

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Pei-Lun Tsai (Assistant Professor, National Taiwan Ocean University)

Keywords: Republic of Korea, Marine Resources, United Nations Convention on the Law of the Sea, Marine Regime

The Republic of Korea ratified the United Nations Convention on the Law of the Sea in 1996 and began the process of domesticating relevant ocean laws and regulations and establishing pertinent regimes. The ROK's practice can be of reference to Taiwan as the latter enhances the mechanisms for ocean management.

Introduction

The Republic of Korea (ROK) is located on the Korean Peninsula, surrounded by water on three sides: the Yellow Sea to the west, the Korea Strait to the southeast, and the Sea of Japan to the east. To the north, the ROK shares a border with Democratic People's Republic of Korea, separated by a demilitarized zone running along the 38th parallel. In addition to the territory on the Korean Peninsula, the ROK is comprised of more than 3,000 islands, around 470 of which are inhabited, and 2,800 uninhabited. The largest island, the Jeju Island, lies southwest of the Korean Peninsula, between the East China Sea and the Yellow Sea.

While the ROK is a peninsular state, it has long placed heavy emphasis on its maritime rights and interests. Not only has it completed the ratification procedure in accordance with domestic law and become a party to the United Nations Convention on the Law of the Sea (UNCLOS), it has also taken steps to gradually enacted or modified ocean-related legislations, bringing them in line with the UNCLOS.

Overview of the ROK's Ocean Management

After World War II, the ROK President, Syngman Rhee, issued the "Presidential Declaration of Maritime Sovereignty", specifying the geographical coordinates of points, which, when connected, formed the "Peace Line", or the "Syngman Rhee Line" (see Figure 1). The Declaration proclaimed the scope of the ROK's maritime sovereignty and fishery resources. It also contained jurisdictional claims over the continental shelf surround the Korean Peninsula. According to the "Fishery Resources Protection Act" promulgated in the same year, all vessels, regardless of nationality, must obtain the ROK government's permission before operating inside the Line. Failure to obtain such permission would result in heavy penalties.



Figure 1/ The Scope of the "Syngman Rhee Line"

Source/ The Ministry of Foreign Affairs of Japan

<https://www.hk.emb-japan.go.jp/chi/territory/takeshima/issue.html>

After the demarcation of the "Syngman Rhee Line" across the Yellow Sea, the East China Sea, and the Sea of Japan, the ROK unilaterally began boarding, arresting, and even shooting foreign vessels (mostly Japanese vessels) violating the abovementioned rule, triggering strong protests from Japan. After years of protests, the ROK officially abolished the Line in 1961. However, according to the 1952 demarcation of the "Syngman Rhee Line", the "Dokdo Islands" (referred to as "Takeshima Islands" by Japan) were within the Line and have been subjected to the factual control by the ROK until today. Such development later led to the dispute between the ROK and Japan regarding sovereignty over the Islands.

After the adoption of the UNCLOS in 1982, the ROK signed the UNCLOS on March 14, 1983 and ratified it in 1996. It is the eighty-fifth state to become a party to the UNCLOS. In the subsequent years, the ROK have continued to establish domestic maritime regimes, including those relating to the baseline, territorial sea, contiguous zone, continental shelf, and exclusive economic zone (EEZ), pursuant to the UNCLOS. In addition to incorporating the UNCLOS in its domestic law, the ROK also made effort towards the harmonization and coordination within various laws and regulations, further contributing to effective marine management. Yet in fact, the ROK has enacted relevant marine legislations before its ratification of the UNCLOS in 1996. Such legislations include the "Submarine Mineral Resources Development Act" in 1970 and the "Territorial Sea Act" in 1978.

The Baseline and Territorial Sea Regimes

After the Second World War, the ROK did not have clear territorial claims before the adoption of the 1978 "Territorial Sea Act". Then the "Enforcement Decree of the Territorial Seas Act" (which was promulgated in accordance with the Territorial Sea Act), prescribed 23 basepoints of straight baseline (see Figure 2) established an early form for the territorial regime. The "Territorial Sea Act" was then subjected to multiple amendments: in 1995, it was renamed to "Territorial Sea and Contiguous Zone Act" and amended again in 2018. The ROK's coast line along the western and southern part of the Korean peninsula is deeply indented and cut into, and it is surrounded by a great number of islands. According to the "Enforcement Decree of Territorial Sea and Contiguous Zone Act", which has been amended along with the Act itself, the 23 basepoints prescribed have not been revised after 1978.

The ROK adopted the combination of normal and straight baselines in its Enforcement Decree, pursuant to Article 14 of the UNCLOS. The breadth of the territorial sea is 12 nautical miles, with the exception of the Korea Strait area bordering Japan's Tsushima Island, which adopts a 3-nautical-mile radius (see Figure 2). The breath of the ROK's continuous zone is 24 nautical miles, in accordance with UNCLOS.

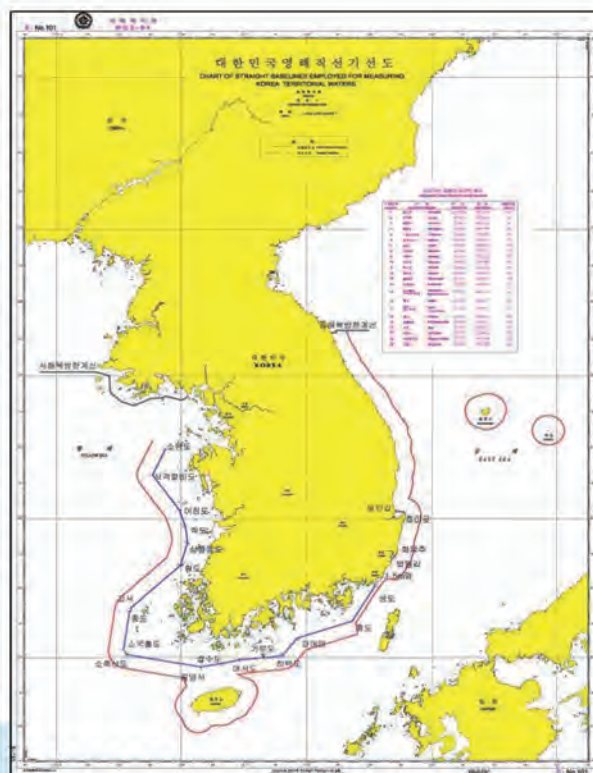


Figure 2/ The ROK's Straight Baselines (Blue) and Territorial Sea (Red)

Source/ The Ministry of Land, Infrastructure and Transport of ROK
http://www.molit.go.kr/USR/policyData/m_34681/dtl.jsp?id=592

According to the ROK's "Territorial Sea and Contiguous Zone Act" and its Enforcement Decree, foreign vessels engaged in illegal fishing activities can be subjected to prison term of up to five years or maximum fine of 300 million South Korean won (approximately NTD\$ 7.98 million), and "when the circumstances are considered serious, such ship, its equipment, its catches, and other articles may be confiscated".

The Exclusive Economic Zone Regime

The ROK promulgated its "Exclusive Economic Zone Act" in August 1996, in accordance with Article 57 of the UNCLOS, and officially proclaimed its EEZ. In 2017, the ROK combined its EEZ and continental shelf regimes and promulgated the "Exclusive Economic Zone and Continental Shelf Act". Since the establishment of the EEZ regime in 1996, it has extended its EEZ to 200 nautical miles. The Act also stipulates the rights enjoyed by the ROK and the rights and obligations of foreign vessels in the ROK's EEZ. The regime adopted the median line principle, and absent agreements specifying otherwise, the ROK cannot exercise its right behind the median line.

While the ROK signed the UNCLOS in March 1983, it delayed its EEZ proclamation until 1996. Such delay was rooted in the ROK's belief that it was a major actor in the field of distant-water fishing and that the benefits and interests involved in such fishing activities were far greater than those involved in offshore fishing. Another reason for the delay related to the semi-closed East Sea. The ROK expected that an EEZ proclamation would lead to disputes between neighboring States. However, once Japan adopted the "Law on the Exclusive Economic Zone and Continental Shelf" in June 1996, the ROK subsequently enacted its own EEZ Act.

In order to safeguard the fishing resources in the EEZ, the ROK promulgated the "Act on the Exercise of Sovereign Rights on Foreigners' Fishing", etc. within the EEZ in 1996, which later gone through multiple amendments. According to the latest version amended in 2017, foreign vessels engaged in illegal fishing activities in the ROK's EEZ may be subjected to maximum fine of 100 million South Korean won (approximately NTD\$ 2.66 million), and the vessel, its equipment, its catches, and other articles may be confiscated.

After the UNCLOS established the new EEZ regime, coastal states around the world gradually proclaim their respective EEZs, leading to the overlapping claims of the ROK and Japan. On order to maintain peace and stability in the region's maritime order, and on the basis of the spirit and principles of the UNCLOS, in 1998 and 2000, the ROK concluded fishery agreements with Japan and China respectively. Such agreements serve as provisional mechanisms before the delimitation of their EEZs, establishes order for fishing activities, and reduce fishing disputes.

The Continental Shelf Regime

As the ROK declared the "Syngman Rhee Line" in 1952, it asserted its jurisdictional rights over the continental shelf surround the entire Korean peninsula. In 1970, the ROK promulgated the "Submarine Mineral Resources Development Act" and declared seven oil development zones. The southern limit of the southernmost development zone is located more than 250 nautical miles away from the ROK's territory. The ROK based its claim on the principle of natural prolongation. On the issue of continental shelf, the "Agreement between Japan and the ROK Concerning the Establishment of Boundary in the Northern Part of the Continental Shelf Adjacent to the Two Countries" was concluded in January 1974, and the "Agreement between Japan and the ROK Concerning Joint Development of the Southern Part of the Continental Shelf Adjacent to the Two Countries" was concluded on the same day. According to the latter Agreement, the ROK and Japan designated a "Joint Development Zone" (See Figure 3), setting aside disputes concerning delimitation and jointly developing oil and natural gas.

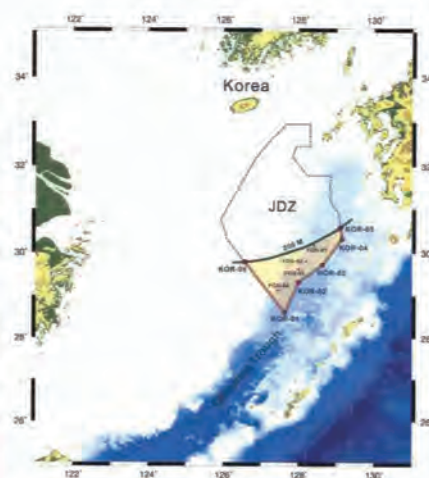


Figure 3/ The Joint Development Zone of the ROK and Japan and the Scope of "Preliminary Information" Submitted to the CLCS
Source/ CLCS https://www.un.org/depts/los/clcs_new/submissions_files/preview/kor_2009preliminaryinformation.pdf

The Commission on the Limits of the Continental Shelf (CLCS), which was established pursuant to Article 76(8) of the UNCLOS, adopted the “Scientific and Technical Guidelines of the Commission on the Limits of the Continental Shelf” in May 1999. According to the Guidelines, coastal states wishing to claim continental shelf exceeding 200 nautical miles must submit relevant supporting information before May 12, 2009. The ROK submitted “Preliminary Information” on May 11, 2009, and the continental shelf the ROK claimed included the “Joint Development Zone” (see Figure 3). The ROK further presented its submission to the CLCS on December 26, 2012 (See Figure 4), proclaiming continental shelf extending to the “Okinawa Trough”, which lies 350 nautical miles outside of the ROK’s coast, expanding the claims beyond those indicated in the 2009 “Preliminary Information” and seeking better maritime rights and interests. This demonstrates the ROK’s ambition in the development of marine resources.

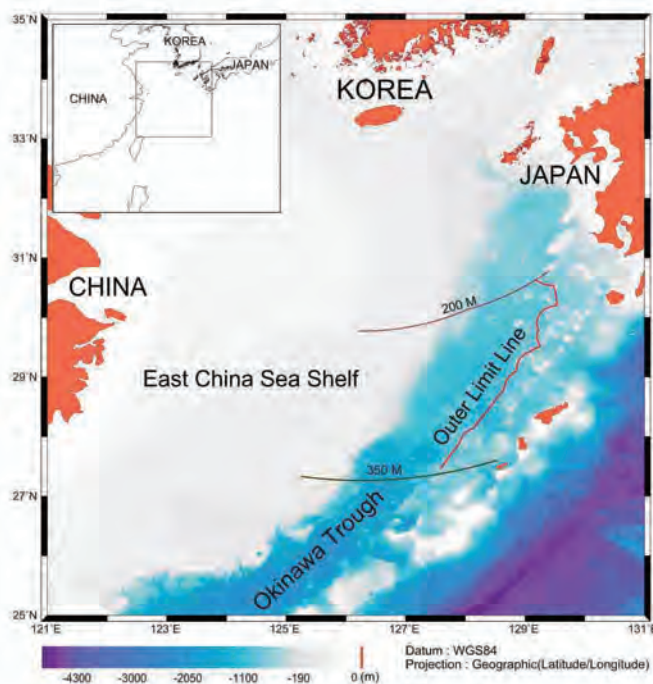


Figure 4/ The Delimitation of the Outer Limits of Continental Shelf Submitted by the ROK in 2012

Source/ CLCS

https://www.un.org/depts/los/clcs_new/submissions_files/kor65_12/executive_summary.pdf

Conclusion

The ROK has gone through various stages of UNCLOS domestication, and the goal has long been safeguarding national marine resources. The ROK’s territorial sea, contiguous zone, EEZ, and continental shelf regimes operate within the framework of the UNCLOS. In particular, fishing resources are of significant importance to the ROK. In order to effectively deter foreign vessels from conducting illegal fishing activities, the enactment or amendment of domestic laws often involve penalties, commensurate with the violations. Foreign individuals engaged in illegal fishing activities in the ROK’s territorial sea may be subjected to prison term of less than five years or maximum fine of 300 million South Korean won. Those illegally fishing in the ROK’s EEZ may be subjected to the maximum fine of 100 million.

Additionally, the ROK continues to seek to enhance its maritime rights, including through the expansion of its continental shelf, the conclusion of fishery agreements with neighboring States, and the gradual amendments of relevant domestic laws. Such efforts have been made to ensure its maritime rights and interests, to establish maritime order, and to adhere to the international trends with respect to ocean management. The ROK’s relevant practice can be of reference to Taiwan as the latter navigates the domestication of the UNCLOS.

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