

KOREA'S OCEAN ECONOMY

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Ocean Economy Research Division

Jeong-In Chang, Ph.D.
jeongin@kmi.re.kr

Soo-Bin Jeong
jsbeen@kmi.re.kr

Janghan Kwon, Ph.D.
jkwon@kmi.re.kr

Sung-Eun Kim
sekim@kmi.re.kr

Dong-Uk Park
pdu@kmi.re.kr

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Jong-Deog Kim

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Haeundae beach



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1. Introduction

Background

In 2020 and 2021, the whole world found itself impacted by a pandemic. The pandemic has accelerated the transition towards a digital technology-based economic structure, which had previously been progressing at a slower pace, and brought major changes to the global value chain. Amid rapid changes in the global economy, the world is seeking innovative answers for a new leap forward. We are looking at a sustainable ocean economy as one of the answers. In order to diagnose the possibilities of innovation in the ocean economy and prepare a development strategy, it is essential to conduct a scientific evaluation of the size of ocean economic activities (OECD, 2019). For the sustainable development of each country's ocean economy, evidence-based policies using data and scientifically analyzed results should be promoted first. As an example, according to UNCTAD (2021), the export value of the ocean-based sector in 2018 was estimated at about \$2.5 trillion.

In order to diagnose potential opportunities of the ocean economy, there must first be an understanding of the ocean economies of individual countries. A country's ocean economy is closely intertwined with broader factors, including the particular environment, resources, technology, and economy of the nation, and so the type and size of ocean economic activities vary greatly from country to country. According to the OECD (2020), the six ocean economic activities which include marine fisheries, marine aquaculture, marine fish processing, shipbuilding, maritime freight transport and maritime passenger transport, accounted for 2% of the national GDP of high-income nations, 11% of the GDP of middle-income countries, and 20% for low-income and island countries, with each nation having different characteristics depending on its own particular circumstances and stage of economic development.

In the case of Korea, when compared with all 32 domestic industries, the ocean economy ranked 14th in terms of total output (based on the 2019 input–output table). This is 71.5% the size of the Korean automobile industry, and about

2.5 times that of the agricultural and forestry industries. The ocean economy has contributed to the national economy in terms of production, value-added, and employment.¹⁾

However, the shipping and shipbuilding economic contraction that started after the global financial crisis, the ensuing trade dispute, and the recent corona pandemic have had a major impact on the ocean and fisheries sector. Now is the time for Korea to come up with a growth strategy to take another leap forward in the ocean economy.

Despite this recognition by the Korean government and the public of the importance of the oceans and fisheries industry, there is a serious shortage of major economic indicators and data on the sector. Without a sufficient assessment of the ocean economy in terms of its production, value-added, and employment when compared with the national economy, it is difficult to accurately estimate the degree to which the ocean economy contributes to the national economy. The inability to accurately diagnose the present state creates significant limitations towards planning mid- to long-term development goals for the ocean economy five or ten years into the future. It is crucial to perform periodic and continual assessments and analyses in order to understand the ocean economy on a national scale. For this reason, this report intends to set a trajectory for the production of an annual report aimed at diagnosing the size and status of Korea's ocean economy, looking into trends in the individual industries that constitute it, and addressing the potential for Korea's ocean economy based on the results.

1) Korea is one of the world's largest shipping powers, handling more than 99 percent of its international freight as ocean freight shipping, with its Port of Busan, which is a major global container port. Korea also ranks first in terms of seafood consumption, at 58.9kg per person, while the number of annual beach users nation-wide totalled around 100 million. With 3,348 islands and mudflats stretching 2,487km², Korea's maritime jurisdiction covers an area of territorial waters 4.4 times bigger than its land. With 32.9% of the entire population living in coastal areas, 80% of Korean people believe that the economic activities of the ocean economy contribute to national development.

Objectives

This report aims to diagnose the range and size of Korea's ocean economy and recent trends in individual industries from 2018 to 2019. It is designed to help Korean and international experts in the ocean economy better understand Korea's ocean economy and its individual industries as well as contribute to assisting in the decision-making of policies that will nurture the ocean sector.

Target Industries

The ocean economy is defined as the sum of the ocean-based economic activities together with the services provided by the marine ecosystem. Ocean economy focuses on industrial activities in the market domain. Ocean economic activities are defined by taking into account all of their spatial, resource and behavioral aspects. The spatial dimension of ocean economic activities consists of industrial activities carried out in the ocean (including the coastline, sea area and marine spaces), the resource dimension consists of investments based on marine resources and the ocean environment, whereas the behavioral dimension includes industrial activities closely associated with use, development, management and preservation activities.

The ocean economic activities analyzed in this report include ten industrial activities that were selected based on the “2018 Special Classification of Korea's Marine and Fisheries Industry”.²⁾ The analysis is based on the 2018-2019 Input-Output Tables, the ones most recently published by the Bank of Korea.

2) The “2018 Special Classification of Korea's Marine and Fisheries Industry” consists of nine sections, 29 divisions, 68 groups, and 143 classes. This study analyzes 10 industries by dividing them into shipping and port industries.

**Table 1. Major Categories of the Input-Output Table for
the Marine and Fisheries Industry (42 Sections)**

code	Section	Special Notes	code	Section	Special Notes
1	Agricultural, forest and fishery goods	agriculture, forestry, fishery, and mining	22	Food and accomodations services	service industry
2	Mined and quarried goods		23	Communications and broadcasting services	
3	Food, beverage, and tobacco products	fabrication	24	Finance and insurance services	
4	Textile and leather products		25	Real estate services	
5	Wood and paper products, printing and reproduction		26	Professional, scientific, and technology services	
6	Petroleum and coal products		27	Business support services	
7	Chemical products		28	Public administration, defence, and social security services	
8	Non-metallic mineral products		29	Education services	
9	Basic metal products		30	Health and social care services	
10	Fabricated metal products		31	Art, sport and leisure services	
11	Computing machinery, electronic equipment, and optical instruments		32	Other services(S) and others(T)	
12	Electrical equipment		33	Fisheries production	ocean and fisheries industry
13	Machinery and equipment		34	Fishery product processing	
14	Transport equipment		35	Fishery product distribution	
15	Other manufactured products		36	Shipping industry	
16	Manufacturing services and repair services of industrial equipment		37	Port industry	
17	Electricity, gas and steam supply	electricity, gas,water supply and waste treatment	38	Building and repair of ships and offshore plants	
18	Water supply, sewage and waste treatment and disposal services		39	Marine and fisheries equipment manufacturing	
19	Construction	construction	40	Marine resource development and construction	

code	Section	Special Notes	code	Section	Special Notes
20	Wholesale and retail trade and commodity brokerage services	service industry	41	Marine leisure and tourism	ocean and fisheries industry
21	Transportation		42	Marine and fisheries services	

Note: Sections have been adopted from the Input-Output Table of the Bank of Korea, however, S.Other Services and T. Others were integrated into a single sector, resulting in 32 sections, to which 10 sections of marine and fisheries industry were added (from 33 to 42).

Resource: Written by the author with reference to the classification (sections) of the Input-Output Table and the sections of the Marine and Fisheries Industrial Special Classification System

Analysis method

The Input-Output Table centered on the ocean and fisheries industry was completed through a total of five steps. First, the research team selected statistical tables to be analyzed. The tables to be analyzed were the Input-Output Tables as of 2015-2017 and the Domestic Transaction Table based on the producer price index. Second, by linking the classification systems, the research team identified the sectors corresponding to the ocean and fisheries industry. Through the work of linking the Special Classification System for the ocean and fisheries industry with the KSIC (Korean Standard Industrial Code), and linking the KSIC with the basic sectors of the Input-Output Table, the research team identified the ocean and fisheries sectors using KSIC as a medium. Third, the research team examined various statistics to indirectly estimate the proportion of the ocean and fisheries industry. The principles used in calculating the proportion and information on the statistics used is presented in the Appendix. Fourth, the research team separated the sectors of the ocean and fisheries industry from the Basic Input-Output Table using the derived proportion, and integrated the results into the 10 ocean and fisheries industrial sectors. Fifth, the ocean and fisheries industry is estimated by reaggregating the 42X42 matrix of order (32 in basic industry sectors, ten in ocean and fisheries sectors) as an Input-Output Table centered on the ocean economy.

2. Key Findings

The total output of the Korean ocean economy was about 138.5 trillion won in 2019. On the same year, the value-added of the ocean economy was about 43.1 trillion won, accounting for about 2.3% of the total value-added of the country. The number of employees was about 689,000 persons. Marine and fisheries services take up 36.6% of the total value-added of the Korean ocean economy, followed by building and repair of ships and offshore plants (19.4%), shipping (9.4%), and fishery-products distribution (8.4%). The combined fisheries industries (fisheries production, processing and distribution) made up 20.0% of the value-added of the ocean economy. In terms of employment, marine and fisheries services had the largest number of workers employed, followed by fishery products distribution, building and repair of ships and offshore plants, and fisheries production.

Table 2. Gross output and value-added by industry in 2019

(In KRW trillion, ten thousand persons, %)

Major industry categories	Total output	Share (%)	Value-Added	Share (%)	Employment	Share (%)
Fisheries production	8.5	6.2%	3.0	7.0%	5.8	8.4%
Fishery-products processing	10.8	7.8%	2.0	4.6%	3.1	4.5%
Fishery-products distribution	6.8	4.9%	3.6	8.4%	8.0	11.5%
Shipping	24.9	18.0%	4.1	9.4%	3.5	5.1%
Port	7.1	5.1%	3.5	8.1%	4.7	6.9%
Building and repair of ships and offshore plants	39.8	28.7%	8.4	19.4%	7.5	10.9%
Marine and fisheries equipment manufacturing	4.7	3.4%	1.3	3.1%	1.3	1.9%
Marine resource development and construction	2.5	1.8%	0.9	2.2%	1.3	1.8%
Marine leisure and tourism	0.9	0.7%	0.5	1.2%	1.0	1.5%

Major industry categories	Total output	Share (%)	Value-Added	Share (%)	Employment	Share (%)
Marine and fisheries services	32.5	23.5%	15.8	36.6%	32.6	47.4%
Total	138.5	100.0%	43.1	100.0%	68.9	100.0%
Total domestic industries	4,365.9	-	1,900.7	-	2,455.7	-
Proportion of the ocean economy compared with total domestic industries	3.2%		2.3%		2.8%	

Resource: The author classified and calculated statistics for ocean economic activities using the Input-Output Tables (based on the production price index) and the Employment Table of the Bank of Korea in 2019

From 2017 to 2019, the gross output, value-added and the number of workers employed of the whole ocean economy gradually increased. The gross output increased by 3.4% on an annual average, from 129.5 trillion won as of 2017 to 138.5 trillion won as of 2019. Value-added increased by 4.1% on an annual average, from 39.8 trillion won as of 2017 to 43.1 trillion won as of 2019. The number of workers employed increased by 3.1% on an annual average, from 649 thousand persons in 2017 to 689 thousand persons in 2019. The marine and fisheries services played the biggest role in the increase of gross output, value-added, and the number of workers employed in the ocean economy, and the growth of the shipping industry and port industry was reflected. On the other hand, building and repair of ships and offshore plants and marine and fisheries equipment manufacturing showed a declining trend in 2019 compared to 2017 in terms of gross output, value-added, and the number of workers employed. The value-added of the ocean economy, excluding the building and repair of ships and offshore plants, showed a high growth of 5.6% at an annual average rate, from 2017 (31.2 trillion won) to 2019 (34.7 trillion won).

Table 3. Changes in the output, value-added and the number of workers employed in ocean economic activities and their proportional size within the national economy (2017-2019)

(In KRW trillion, 10 thousand persons)

Classification		2017	2018	2019
Output	Ocean economic activities	129.5	131.9	138.5
	Total domestic industries	4168.4	4336.6	4365.9
	Ratio	3.11%	3.04%	3.17%
Value-added	Ocean economic activities	39.8	41.4	43.1
	Total domestic industries	1812.1	1873.4	1900.7
	Ratio	2.19%	2.21%	2.27%
Employment	Ocean economic activities	64.9	68.2	68.9
	Total domestic industries	2453.0	2449.5	2455.7
	Ratio	2.64%	2.78%	2.81%
Ocean economic activities excluding shipbuilding	Gross output	87.8	96.1	98.8
	Value-added	31.2	34.2	34.7
	The number of workers employed	57.0	60.7	61.4

Resource: The author classified and calculated statistics for the ocean economic activities using the Input-Output Table of the Bank of Korea (based on production price index) from 2017 to 2019 and the Employment table.

Table 4. Annual growth rate and growth groups by ocean economic activity sectors (2017-2019)

Sector	Gross Output		Value-Added		The Number of Workers Employed	
	CAGR*	GGC**	CAGR	GGC	CAGR	GGC
Fisheries production	-1.3%	↓	-7.8%	↓	6.6%	↑
Fishery-product processing	-1.0%	↓	1.5%	↑	-4.8%	↓
Fishery-product distribution	2.4%	↑	1.6%	↑	-2.3%	↓
Shipping	9.5%	↑	7.1%	↑	18.1%	↑
Ports	6.4%	↑	5.4%	↑	3.2%	↑
Building and repair of ships and offshore plants	-2.4%	↓	-1.4%	↓	-2.3%	↓

Sector	Gross Output		Value-Added		The Number of Workers Employed	
	CAGR*	GGC**	CAGR	GGC	CAGR	GGC
Marine and fishery equipment manufacturing	-7.0%	⬇️	-6.9%	⬇️	-8.5%	⬇️
Marine resource development and construction	4.0%	⬆️	-1.1%	⬇️	0.8%	⬆️
Marine leisure and tourism	2.4%	⬆️	2.0%	⬆️	0.9%	⬆️
Marine and fisheries services	12.2%	⬆️	12.3%	⬆️	5.6%	⬆️
Total ocean economic activities	3.4%	-	4.1%	-	3.1%	-
Total domestic industries	2.3%	-	2.4%	-	0.1%	-
Total domestic industries, except shipbuilding	6.1%	-	5.6%	-	3.8%	-
Total domestic industries, except shipbuilding and equipment manufacturing	6.9%	-	6.2%	-	4.2%	-

Note: ⬆️ is a high-growth trend group (an industry that grows higher than the GAGR of total domestic industries), ⬆️ is growth trend group / an industry that grows lower than the GAGR of total domestic industries, but makes a positive (+) growth rate, ⬇️ is a decline tendency group (an industry of which GAGR is negative(-))

* CAGR: Compound Annual Growth Rate

** GGC: Growth Group Classification

A look into time-series changes reveals that the Korean ocean sector grew by 4.0%, from KRW 39.8 to 41.4 trillion in value-added between 2017 and 2018, and continued to increase by 4.2% to KRW 43.1 trillion in 2019. The increase in value-added in the marine and fisheries services industry had the biggest impact on the increase in value-added among all the sectors in the ocean economy. On the other hand, the recovery of building and repair of ships and offshore plants was delayed due to a sharp decline in shipbuilding orders after the global economic recession, limiting the increase of value-added within the overall ocean economy. The long-term recession of building and repair of ships and offshore plants had a negative impact on the marine equipment manufacturing industry, which supplies raw materials and components, so its value-added, output, and employment decreased.

Figure 1. GVA changes in the ocean economy (Korea)

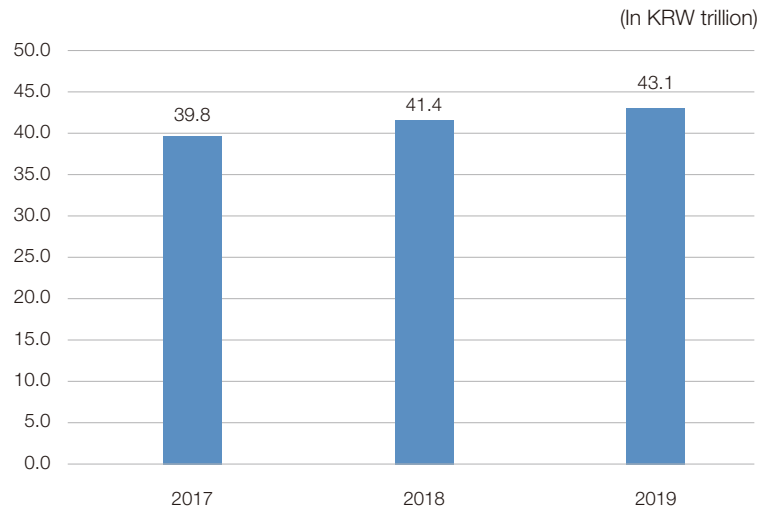
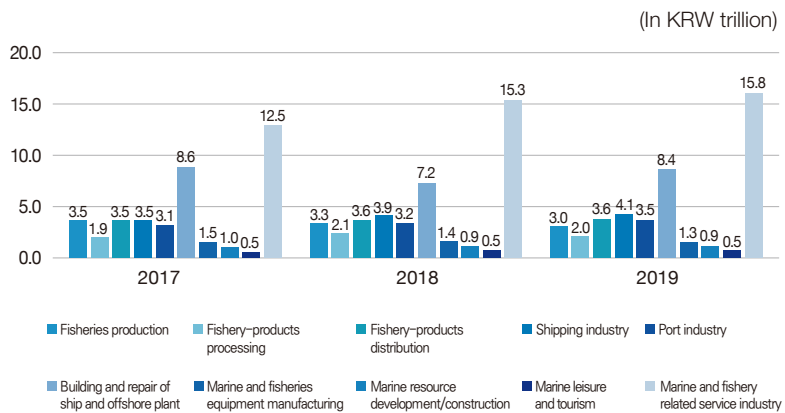


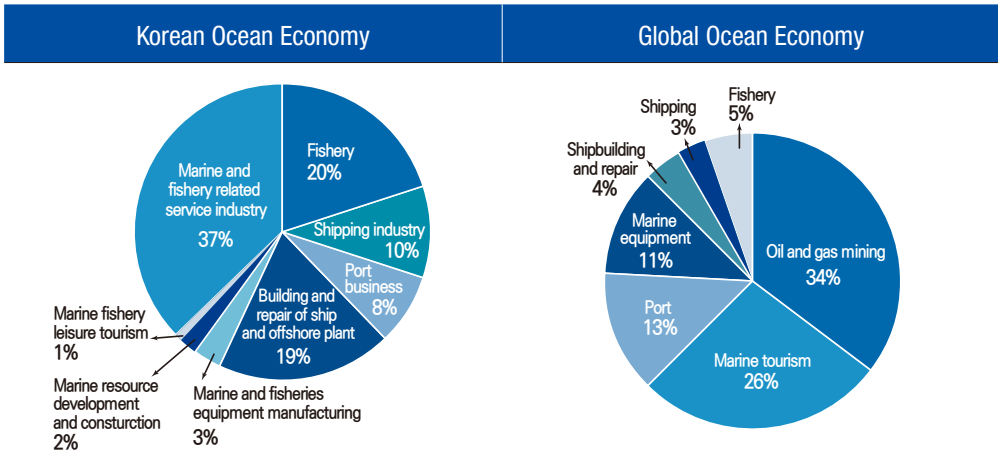
Figure 2. GVA changes in specific ocean economic activities



In the meantime, the global ocean economy (estimated at USD 1.5 trillion in value-added, 2010, OECD) is structurally dominated by industries that mostly take advantage of natural resources: offshore oil and gas (34%) and maritime and coastal tourism (26%) account for 60% of the total value-added within ocean-based industries.

On the other hand, in the Korean ocean economy, the marine and fisheries services industry had the highest rank (37%), followed by fisheries; fisheries production, fishery products processing, fishery products distribution all combined (20%), and the building and repair of ships and offshore plants (19%).

Figure 3. A structural comparison of Korean and global ocean economies



Resource: The Korean ocean economy chart (the left pie) was created by the author, the global economy chart (right) was made based on the ocean economy in 2030, OECD, 2016

Table 5. Value-added of ocean industries of major economies and Korea

Category	USA	China	UK	Ireland	France	Portugal	New Zealand	Australia	Korea
Size of ocean economy (share in GDP)	2016 USD 313.7 billion (1.7%)	2019 CNY 8.9 trillion (9.1%)	2012 GBP 38.5 billion (4%)	2018 2.2 billion Euro (1.1%)	2013 35.6 billion Euro (1.7%)	2018 7.2 billion Euro (3.1%)	2013 4 billion NZD (1.9%)	2017-18 AUD 42.4 billion (2.3%)	2019 USD 36.97 billion (2.3%)
Top industry (share in the sector)	Oil and gas/sand and gravel mining (36.8%)	Marine tourism (20.2%)	Oil and gas (51.1%)	Shipping and Maritime Transport (31.3%)	Coastal tourism (49.7%)	Recreation, sports, culture and tourism (44.4%)	Marine mineral resources (48.3%)	Offshore oil & gas exploration and extraction (60.0%)	Marine and Fisheries services (36.6%)
Second largest industry (share in the sector)	Marine tourism and leisure (33.3%)	Vessel traffic and marine transport (7.2%)	Marine transport (18.2%)	Marine tourism and leisure (29.1%)	Offshore Oil and gas services and Equipement (17.1%)	Fisheries, aquaculture, processing, wholesale and retail of its products (24.5%)	Shipping (24.2%)	Marine tourism and recreational activities (26.3%)	Building and repair of ships and offshore plants (19.4%)

* Converted at the average exchange rate of Korean won (1165.73) against the US dollar (market price) for 2019, published by the Bank of Korea. As for other countries, food and accommodations are included in marine leisure and tourism industries. However, in the case of Korea, food and accomodations are excluded from the marine leisure and tourism industry.

Resource: Korea Maritime Institute(2021), pp.78-79; Ifremr(2017), p.118; Instituto Nacional De Statistica(2020), p.4; Australian Government(2021), p.46; Korean data was written by author.

3. Sectoral Findings

(1) Fisheries

Fisheries refer to industries that catch, harvest or cultivate marine animals and plants in seas, rivers, lakes or other bodies of water or industries that process or distribute such marine animals and plants. The Marine and Fisheries Industry Special Classification system classifies fisheries largely into fishery production, processing and distribution industries.

Fishing	Aquaculture
- Marine fisheries (deep-sea, offshore and coastal fisheries) - Freshwater fisheries	- Marine aquaculture - Inland aquaculture - Ornamental aquatic animal and plant farming
Fishing related service	Salt-harvesting
- Fishery catch transportation - Fishing-related services	

According to the 2019 Marine and Fisheries Industry Statistics Survey conducted by the Ministry of Oceans and Fisheries (MOF), a total of 90,216 businesses are engaged in the fisheries industries (production, processing and distribution). In 2019, per capita fishery product consumption in 2019 was 69.8 kg, while the self-sufficiency rate for fishery products was recorded at 68.4%.

The fisheries industry makes fishery products available as sources of quality animal protein at relatively low prices. Recently, however, it has faced various challenges, such as climate change, marine environmental pollution, decreasing marine resources, an aging population of fishermen and women as well as a new problem, the prolongation of the Covid-19 situation. Recently, the non-face-to-

face consumption of fresh food has become more common in people's daily lives, and the launch of Home Meal Replacement (HMR) food is in full swing, creating a good environment for the consumption of fishery products. In the future, the fisheries industry will promote the commercialization of domestic fisheries products, increase domestic raw materials for HMR, and expand the on-line transaction system.

Fisheries production (fishing and aquaculture)

Under the Marine and Fisheries Industry Special Classification system, the fishery production industry is divided into fishing, aquaculture, fishing-related services industry, and salt harvesting. The fishing industry is subdivided into marine and inland fisheries, and marine fisheries are broken down further into deep-sea, offshore, and coastal fisheries. Aquaculture is divided into marine aquaculture, inland aquaculture, and ornamental aquatic animal and plant farming, while fishing-related services is divided into fishery catch transportation and other fishing-related services.

Domestic fisheries production in 2019 was 3.86 million tons, a 2.4% increase of 91,000 tons compared to 3.77 million tons from the previous year, of which 912,000 tons were produced by offshore and coastal fisheries, 2.41 million tons by aquaculture and farming, 504,000 tons by deep sea fisheries, and 35,000 tons by inland fisheries. As of 2019, there were 65,835 vessels engaged in fisheries, weighing 557,000 tons. The total number of aquaculture licenses issued was 10,045 for a total licensed area of 161,750 ha. As for fishing ports, the bases of fisheries production, there were 113 national ports, 287 provincial ports, and 623 residential ports.

The recent situation of the fisheries production industry is characterized by reduced offshore and coastal fisheries production due to diminishing marine resources, the extension of voluntary rest for large fishing boats, etc., continued growth in seaweed farming production, and the deteriorating environment of aquaculture farms. While offshore and coastal fisheries production is on the decrease, aquaculture production is increasing. Aquaculture production has

been growing at an annual average rate of 6.4% for the past 10 years (2010–2019). Total production growth has been driven by seaweed production, which has been growing at an annual average rate of 8.1%.

Table 6. The volume of domestic fishery production

(In thousand tons)

	2018	2019	2020
Total fishery production	3,770	3,861	3,713
Offshore and coastal fisheries	1,012	912	932
Deep-sea fisheries	474	504	437
Inland fisheries	35	35	34
Aquaculture	2,250	2,410	2,309

Resource: the summary table for fish production trends(date of search : February 3rd, 2022.)

The Ministry of Oceans and Fisheries established a 5-year statutory plan, the “2nd framework plan on developing fisheries and fishing villages(2021-2025)”, based on the Framework Act on Fisheries and Fishing Villages Development. This plan presents the mid- to long-term vision and goals for the sustainable growth and competitiveness of fisheries and fishing villages and a concrete action plan that takes into consideration the newly changed domestic and international policy environment after the Covid-19 situation. Under the vision of “a fisheries industry and fishing villages preparing for the future with the people,” five policy goals were set: 1. The reorganization of fisheries production and management systems to be sustainable, 2. The supply of seafood that realizes consumer-oriented values, 3. The creation of a vibrant workplace and happy living place, 4. The strengthening of the global status of the fisheries industry, 5. The transition to a future growth industry. It also contains ten promotion strategies to realize these policy goals.

In 2019, the fisheries industry produced a gross output of KRW 8.529 trillion, a decrease of 2.6% from 2017. Value-added was reported at KRW 3 trillion,

recording a 15.0% drop from 2015³⁾. Employment stood at 57,800 in 2019, marking a increase of 13.6% from 2017.

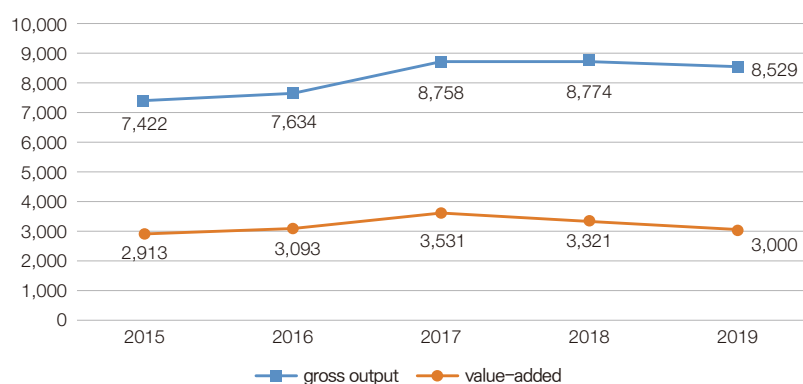
Table 7. Output, value-added and employment of the fisheries production industry

(In KRW billion, thousand persons, %)

Category	2017	2018	2019	Growth Rate
Gross output	8,758	8,774	8,529	-2.6%
Value-added	3,531	3,321	3,000	-15.0%
Employment	50.9	57.1	57.8	13.6%

Figure 4. Trends in the output and value added in fisheries production

(In KRW billion)



- 3) The reason for the recent sharp decrease of value added within the fishery production industry is the higher employee remuneration that accompanied the increased minimum wage raise, as well as the increase in operating expenses due to rising gas price since 2018. These factors resulted in a decreased the operating surplus, which is one component of value added.

Fishery-products processing

Under the Marine and Fisheries Industry Special Classification system, the fishery-products processing industry is divided into fish processing and preservation⁴⁾, seaweed processing and preservation, salt processing, and other fish processing. The fisheries processing statistics for 2019 released by the MOF put the number of fishery processing enterprises nationwide at 5,843. Recently due to the increase in single-person households and the expansion of women's participation in economic activities, the demand for Home Meal Replacement (HMR) and Meal Kit processed products through online distribution platforms is increasing. Among the various types of processed products, frozen processed products have been dominant, so the need to develop a differentiated fishery processed products that meets consumers' demand is emerging.

Fish processing and preservation	Seaweed processing and preservation
- manufacture of smoked, cooked or similarly prepared aquatic animal products - manufacture of dried and salted aquatic animal products - manufacture of frozen aquatic animal products - other processing and handling of aquatic animal products - manufacture of animal oils and fats	Salt processing
	Other fish processing

The gross output of the fishery-product processing industry in 2019 amounted to KRW 10.801 trillion, a drop of 2.0% against 2017. The GVA reached KRW 2 trillion, a 2.9% increase from 2017. The number of workers employed decreased by 9.4% to 31,200, compared with 2017.

4) It is divided into four sub-industries: the manufacture of smoked and cooked aquatic animal foods and similar products, the manufacture of dried and salted aquatic animal food products, the manufacture of frozen aquatic animal food products and the manufacture of aquatic animal oil and fat-based products.

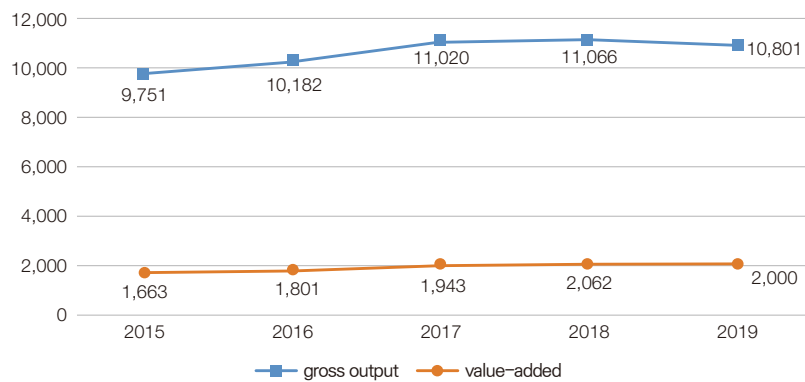
Table 8. Output, value-added and employment of the fisheries product processing industry

(In KRW billion, thousand persons, %)

Category	2017	2018	2019	Growth Rate
Gross output	11,020	11,066	10,801	-2.0%
Value-added	1,943	2,062	2,000	2.9%
Employment	34.5	30.0	31.2	-9.4%

Figure 5. Trends in the output and value-added of the fishery-products processing industry

(In KRW billion)



Fishery-products Distribution

Pursuant to the 'Marine and Fisheries Industry Special Classification System', the fishery-products distribution industry is divided into two sub-industries: wholesale and retail fishery product brokerage and fishery product transportation and warehousing. The brokerage, wholesale and retail industry is subdivided into fishery product brokerage, fishery product wholesale and retail, and ornamental aquatic animal and plant wholesale and retail, whereas the transportation and warehousing industry is broken down into fishery product transportation and refrigerated and frozen fishery product warehousing.

Fishery product brokerage, wholesale and retail	Fishery product transportation and warehousing
- Fisheries product brokerage (domestic and international) - Fisheries product wholesale and retail - Ornamental aquatic animal and plant wholesale and retail	- Fisheries product transportation - Refrigerated and frozen fisheries product warehousing

According to the 2019 Ocean and Fisheries Statistical Survey, a total of 41,098 businesses are engaged in the fishery product distribution industry.

Looking at the “2nd framework plan on developing fisheries and fishing villages (2021-2025)” announced on March, 2021, it seeks to build a fishery product distribution system that realizes consumer-oriented values. Prior to fishery product distribution and supply, it promotes the preemptive safety management, and pursues a safe distribution and supply system to reinforce origin and history management. In addition, it announced that it would establish a consumer-friendly fishery-product distribution infrastructure by modernizing distribution facilities in production and consumption areas, and preparing a new distribution channel such as a comprehensive distribution system for live fresh fish.

The gross output of the fishery-product distribution industry in 2019 reached KRW 6.784 trillion, an increase of 4.8% from 2017, while its GVA surged by

3.1% to KRW 3.613 trillion over the same period. The number of employees decreased by 4.6% to 79,600, compared with 2017.

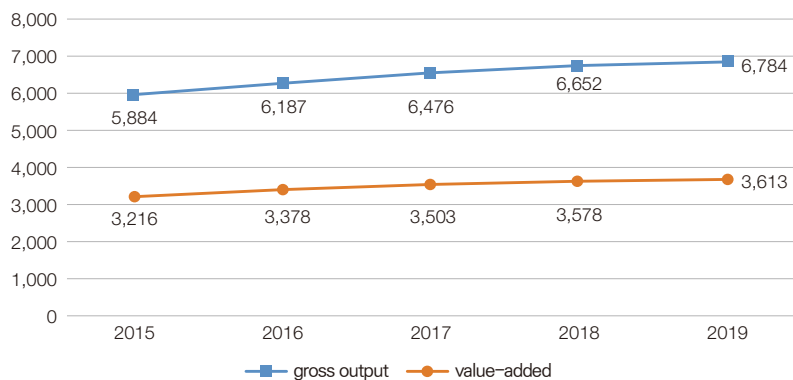
Table 9. Output, value-added and employment of the fishery-products distribution industry

(In KRW billion, thousand persons, %)

Category	2017	2018	2019	Growth Rate
Gross output	6,476	6,652	6,784	4.8%
Value-added	3,503	3,578	3,613	3.1%
Employment	83.5	81.4	79.6	-4.6%

Figure 6. Trends in the output and value-added of the fishery-products distribution industry

(In KRW billion)



(2) The Shipping Industry

The shipping industry is divided into passenger transportation, freight transportation, and other shipping services that support the transportation sectors. Both transportation sectors are divided into international water transportation, which takes place between a domestic port and a foreign port or between foreign ports, and coastal water transportation, which occurs within domestic ports.

Other shipping services include tugboat operations, marine transportation brokerage services for marine freight and vessel chartering, shipping agencies that serve as agents for transactions between marine transportation providers, vessel leasing services, and vessel management services that support the management of vessels and sailors, and the supply of oil and ship supplies.

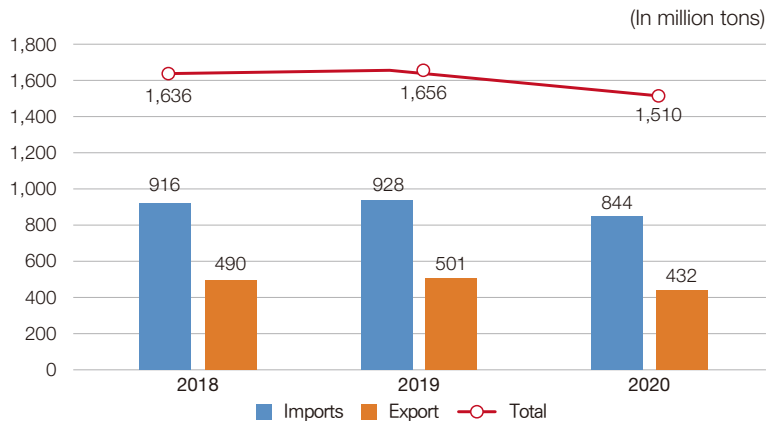
Passenger transportation	Freight transportation	Other shipping services
- International water transportation - Coastal water transportation - Other passenger transportation	- International water freight - Coastal water freight	- Tugboat operation - Marine transportation brokerage services - Vessel leasing service - Vessel management service

The type of business that represents the largest share of the shipping industry is international water freight transportation. This can be broken down into container ships, dry cargo vessels, oil tankers and special vessel markets, depending on the characteristics of the freight transportation and vessels involved.

In a trading nation with an outward-oriented economic structure like Korea, the shipping industry serves as part of the infrastructure industry and contributes greatly to the development of the national economy. Korea's dependence on foreign trade is at 63.51%, with 99.7% of import and export cargo being transported by ships, and 100% of raw materials such as crude oil and iron ore are transported by sea. In 2020, Korea's import and export sea freight volume was 1.5 billion tons (844.44 million tons in imports, 431.79 million tons

in exports). Korea's international water freight transportation industry consists of about 150 shipping companies.

Figure 7. Seaborne trade volume of Korea



Resource: PORT-MIS

The shipping industry is one of the top 10 sources of foreign currency income in Korea, contributing greatly to the improvement of the balance of payments. In 2020 alone, Korea's international freight transportation industry earned 15.3602 billion USD in foreign currency through cargo transportation, while other sea water transportation income (USD 3.5983 billion) such as leasing vessel revenue and passenger transportation (13.9 million USD) resulted in a total of 18.9724 billion dollars.

As sea water freight rates fluctuate significantly due to the COVID-19 crisis of 2020, the importance of the shipping industry has once again been drawing attention. The international water freight transportation industry is highly volatile and capital-intensive due to its sensitivity to changes in global economic conditions and the inelasticity of ship supply.

In 2020, coastal water freight transportation companies transported 233.9 million tons of cargo. As of 2020, there are 792 coastal water freight transportation companies, with a total of 1,970 vessels. There are 30 coastal water passenger transport operators, with a total of 59 vessels. The number of passengers who moved through coastal shipping in 2020 was 10.6 million, a decrease of 27.3%

compared to the previous year, due to the impact of the COVID-19 crisis.

The paradigm of the shipping industry is rapidly changing due to COVID-19, the 4th industrial revolution, and carbon neutrality. International environmental regulations on ships will be strengthened, and all ships around the world must be replaced with ships with low carbon emissions as soon as possible. In addition, as new technologies such as autonomous ships, big data, and block chains are introduced into the shipping industry, revolutionary industrial changes are expected in the future.

In the future, facing a post-Corona era, the reorganization of the global value chain is expected to accelerate. In addition, there is an expected acceleration of the digitalization of shipping in the private sector, led by Maersk and IBM, and the 4th industrial revolution in the public sector, such as smart ports. Due to the strengthening of environmental regulations, it is expected that a conversion of ship fuel will take place over the long term.

Compared to 2017, the shipping industry in 2019 significantly increased in terms of total output, value-added, and the number of employed workers. The causes for this are as follows. In 2017, it had not been long since the shipping industry recovered from an operating loss due to the Hanjin Shipping collapse in 2016, and in 2019, the BDI broke above the 2,500 mark for the first time since the 2008 financial crisis, and the tanker market situation had improved.

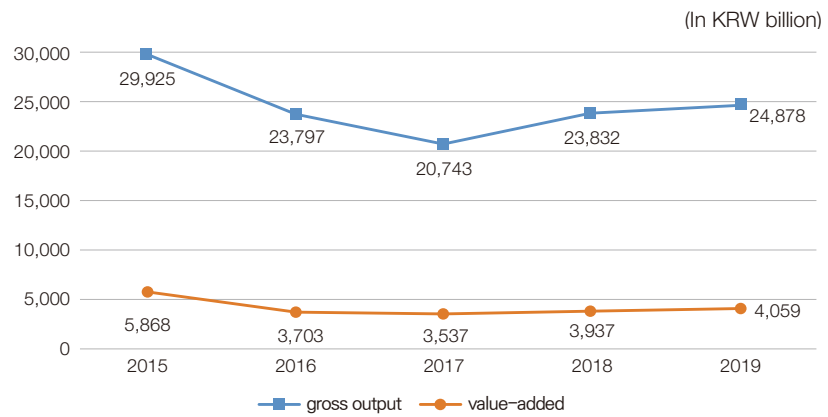
In 2019, the shipping industry produced a gross output of KRW 24.878 trillion, an increase of 19.9% from 2017, whereas its GVA recorded KRW 4.059 trillion, an increase of 14.8% from 2017. Employment also recorded its largest increase, up 9,900 persons (39.6%) to 35,100 persons over the same period.

Table 10. Output, value-added and employment of the shipping industry

(In KRW billion, thousand persons, %)

Classification	2017	2018	2019	Growth Rate
Gross output	20,743	23,832	24,878	19.9%
Value-added	3,537	3,937	4,059	14.8%
Employment	25.2	36.1	35.1	39.6%

Figure 8. Trends in the output and value-added of the shipping industry



(3) The Port Industry

The port industry is classified into two sectors: port transport support services, which provide logistics services within a port, and other port services that provide a wide range of incidental services. The port loading industry, which offers services to load and unload international trade cargo and domestic coastal freight at ports, plays a pivotal role in the national logistics system.

The port storage industry provides warehousing services at ports for freight such as general goods, frozen and refrigerated goods, agricultural products, wood, alcoholic beverages, vehicles, etc., while the 'cargo inspection, certification and weighing services' industry provides services for calculating the quantity of cargo, verifying the delivery and acceptance of cargo, and measuring cargo weights in the process of handling cargo at ports.

The freight packaging industry offers packaging services for freight, while the port and other marine terminal operations industry provides terminal services. The specialized ship supplies industry provides food, supplies and spare parts to vessels arriving in ports, and the port guard and security services industry plays the role of safeguarding the ports. In the meantime, other marine transport support services provide various support services such as pilotage, sea-fastening of cargo, and line handling.

Port transportation services	Other port business
- In-port storage - Port loading business - Cargo inspection, certification and weighing services	- Freight packaging business - Port and other marine terminal operations business - Specialized ship supplies business - Port guard and security services business

Korea has a total of 60 designated ports with 31 trade ports and 29 coastal ports. Up until now, Korea's port industry has maintained a solid growth rate, however, due to the impact of the pandemic in 2020, Korea's port cargo volume fell by 8.8% compared with the previous year. Compared with the 5.5% decrease

in 2009 during the the Global Financial Crisis, this latest decline is reported as the biggest cargo volume decrease.

Korea's port cargo volume reported in 2020 was broken down into 431.79 million tons in exports, 844.44 million tons in imports, and 223.03 million tons in domestic coastal cargo.

In 2020, cargo handling by ports consisted of 410.95 million tons at Busan Port, 273.32 million tons at Gwangyang Port, 187.94 million tons at Ulsan Port, and 151.87 million tons at Incheon Port.

Table 11. Cargo handling performance by port industry

(In ten thousand tons, %)

Classification	2018	2019	2020	Ratio compared with previous year
Export cargo	49,042	50,130	43,179	-13.9%
Import cargo	91,551	92,785	84,444	-9.0%
Domestic coastal cargo	21,873	21,482	22,303	3.8%
Total cargo handling performance	162,466	164,397	149,925	-8.8%

Resource: e-Country Indicator, the current status of handling cargo volume in ports nationwide
(date of search: November 22nd, 2021)

Table 12. Cargo handling performance in major ports

(In ten thousand tons, %)

Classification	2018	2019	2020	Ratio compared with previous year
Busan Port	46,146	46,876	41,095	-12.3%
Gwangyang Port	16,360	15,745	15,187	-3.5%
Ulsan Port	30,193	30,971	27,332	-11.7%
Incheon Port	20,286	20,238	18,794	-7.1%
Others	47,976	49,238	47,517	-3.5%
Total	162,466	164,397	149,925	-8.8%

Resource: e-Country Indicator, the current status of handling cargo volume in ports nationwide
(date of search: November 22nd, 2021)

The Port of Busan is a major container transshipment hub in Northeast Asia, which serves China north of Shanghai, the west coast of Japan and many other regions with container cargo transshipment. As of 2020, the Port of Busan handled a total container volume of 21.82 million TEUs, Incheon Port handled 3.27 million TEUs and Gwangyang Port handled 2.16 million TEUs during the same year, together serving as Korea's key logistics ports along the ocean routes for international trade.

Table 13. Container cargo transshipment performance by major Korean ports

(In 10,000 TEU, %)

Classification	2018	2019	2020	Ratio compared with previous year
Busan Port	2,166	2,91	2,182	-0.4%
Incheon Port	312	309	327	5.8%
Gwangyang Port	241	238	216	-9.2%
Ulsan Port	49	52	54	3.5%
Pyeongtaek / Dangjin Port	69	72	79	9.7%
Other Ports	60	50	52	2.6%
Total	2,897	2,912	2,909	-0.1%

Resource: The Ministry of Oceans and Fisheries Yeosu Regional Office of Oceans and Fisheries, container cargo transshipment performance by major Korean ports (date of search: November 22nd, 2022)

The Ministry of Oceans and Fisheries has currently established the 4th Port Master Plan ('21-'30) to cope with changes in global economic conditions, shipping and port environments. The Port Master Plan (in 10-year increments) is a top-level plan (Article 5 of the Port Act) for a total of 60 ports (31 trade ports and 29 coastal ports) that includes port development strategies, policy directions for individual ports, and development and operation plans in order to realize high value-added smart ports with global competitiveness.

Through this plan, the Ministry of Oceans and Fisheries plans to strengthen the comprehensive logistics functionality to ensure the global competitiveness of Korea's port and to focus on creating new jobs and increasing value-added in

port areas by expanding related infrastructure in due course.

In order to increase the competitiveness of Korea's port industry, the government needs to push aggressive policies such as improving port operation efficiency, attracting high value-added companies through expansion the function of hinterland complex, and building sustainable energy ports in harmony with eco-friendly and new industries.

The gross output of the industry in 2019 was reported at KRW 7.085 trillion, growing at a rate of 13.2% since 2017. Its GVA climbed by 11.2% to KRW 3.491 trillion from 2017, and the number of employed workers rose by 6.5% from 2017 to around 47,500 persons.

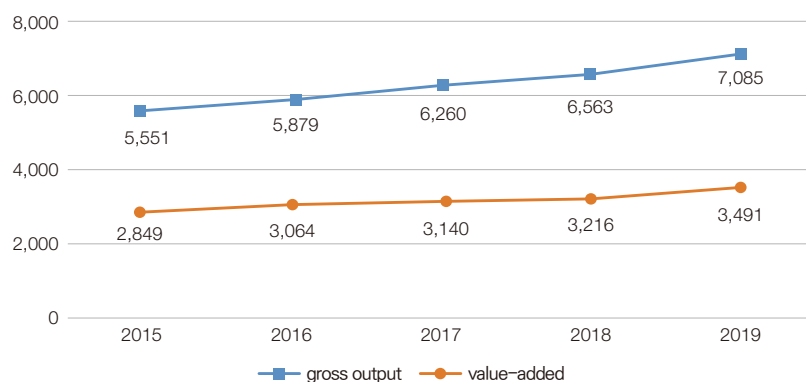
Table 14. Output, value-added and employment of the port industry

(In KRW billion, thousand persons, %)

Category	2017	2018	2019	Growth Rate
Gross output	6,260	6,563	7,085	13.2%
Value-added	3,140	3,216	3,491	11.2%
Employment	44.6	46.6	47.5	6.5%

Figure 9. The Trends of output and value-added in the port Industry

(In KRW billion)



(4) Building and Repair of Ship and Offshore Plant

The building and repair of ships and offshore plants is a knowledge-intensive key industry that designs and builds a great variety of vessels and offshore structures for such industries as shipping, ocean development and resource production, fisheries, marine leisure and tourism, and the arms industry. Korea's shipbuilding industry is driving the development of its global counterparts on the strength of its world-class competitiveness. According to Clarkson Research, a British shipbuilding and shipping market analysis agency, total global ship orders declined by 22.75% to 23.51 million compensated gross tonnage (CGT) from the previous year due to depressed global orders on account of the expanding uncertainty with the spread of COVID-19. However, Korea completed 8.66 million CGT through orders for high value-added ships such as LNG and crude oil carriers, large container ships, etc., accounting for 36.8% of the global market share.

The building and repair of ships and offshore plants industry is classified largely into the construction and maintenance of various types of vessels, the construction and maintenance of offshore plants and structures, and components manufacturing for vessels and offshore plants. First, the building and repair of ships is defined as industrial activities that build or repair all types of vessels with varying purposes, ranging from freight or passenger transport, fishing and angling to specialized purposes such as medical, fire-fighting and security tasks. Second, the building and repair of offshore plants refers to industrial activities that build or repair offshore plants, offshore oil- and gas-producing structures, or non-seagoing vessels. Lastly, the manufacture of sections for ship can be defined as industrial activities that manufacture parts and components for various types of vessels as well as offshore plants and structures.

Building and repair of ship	Manufacture of sections for ship
- Construction and maintenance of vessels for freight or passenger transport - Construction and maintenance of vessels for fishing and angling - Construction and maintenance of vessels for other uses	- Manufacture parts and components for various types of vessels - Manufacture parts of vessels for fishing and angling - Manufacture parts of vessels for other uses - Manufacture offshore plants and structures
Building and repair of offshore plant	
- Construction and maintenance of offshore plants and structures	

The shipbuilding industry, which builds ships among the construction and repair industries of ships and offshore plants, is an industry that builds various vessels used in the shipping industry, fisheries industry, and armament industry. It belongs to the transportation machinery industry among the heavy and chemical industries. It is a comprehensive assembly industry that spans all fields of manufacturing.

In addition, since the process of ships is very diverse and there is a limit to automation in the manufacture of large structures, many specialized personnel are required. Accordingly, the shipbuilding industry is not only a labor-intensive industry, but also a technology-intensive industry that requires advanced production technology. Another characteristic of the shipbuilding industry is the order production system.

Ships are ordered according to the route, cargo, and owner's taste, so it is impossible to mass-produce it due to the wide variety of construction specifications. Therefore, comprehensive technology that can satisfy various needs is required. In the shipbuilding industry, the development of related industries and the development of materials industries, such as iron and steel in particular, which require the development of related industries and secure skilled manpower, are also important factors. The shipbuilding industry creates demand for related industries, and related industries have relationships between supply and demand that provide the basic fields required in the shipbuilding industry.

In the future, the building and repair of ships and offshore plants industry is expected to expand its share in orders, mainly for LNG carriers. LNG is attracting attention as an eco-friendly fuel because its carbon dioxide emissions are relatively lower than those of fossil fuels. As the market demand for LNG increases, orders for LNG carriers and LNG fuel-powered ships are also expected to increase. As regulations are expected to be strengthened, the pressure to replace old ships is expected to increase.

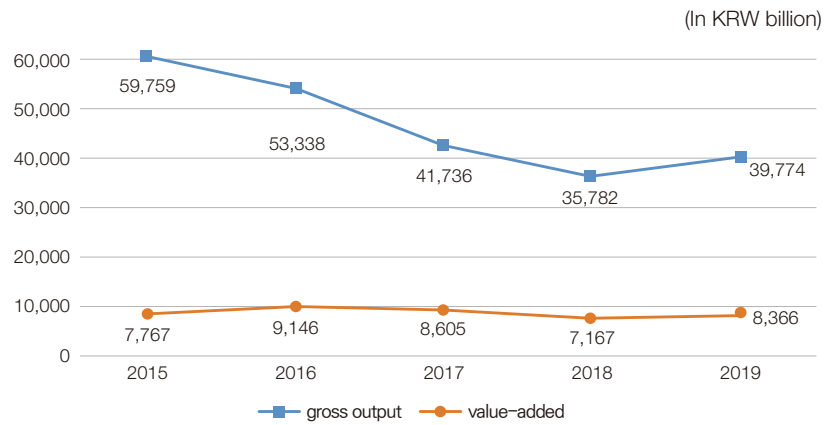
The building and repair of ships and offshore plants industry experienced a decreasing trend in 2017 in terms of gross output, value-added, and number of persons employed due to continued market stagnation since 2017. In 2019, the gross output from the building and repair of ships and offshore plants amounted to KRW 39.774 trillion won, down 4.7 percent from 2017. On the other hand, its GVA decreased to 8.366 trillion won, down 2.8 percent from 2017, and its number of employed workers decreased to 75.4 thousand persons, down 4.5 percent, respectively. In 2019, ship-owners' wait-and-see attitude continued ahead of the implementation of the International Maritime Organization's sulfur oxide (SOx) emission regulations, overlapping with the shipping market slump due to the impact of the U.S.-China trade dispute, resulting in a significant decrease in ship orders. In addition, the domestic 'big three' shipbuilders' 'order cliff' for offshore plants is also pointed out as a cause of the deterioration of the industry.

Table 15. Output, value-added and employment of the building and repair of ships and offshore plants industry

(In KRW billion, thousand persons, %)

Category	2017	2018	2019	Growth Rate
Gross output	41,736	35,782	39,774	-4.7%
Value-added	8,605	7,167	8,366	-2.8%
Employment	79.0	75.2	75.4	-4.5%

Figure 10. Trends in the output & value-added in the building and repair of ships and offshore plants industry



(5) Marine and Fisheries Equipment Manufacturing

This industry produces equipment, devices and materials specialized for ocean-based activities as well as equipment and materials for processing marine resources. In other words, it includes the designing and manufacturing of various types of equipment and devices installed in vessels and offshore plants, such as power and propulsion systems and auxiliary machinery, navigation and communication equipment, mooring and unloading equipment, and accommodation and safety equipment. It also includes various equipment and devices used in the process of producing, processing and distributing fisheries products. Due to the industrial structure, the industry has a close relationship with the building and repair of ships and offshore plants industry.

The marine and fisheries equipment manufacturing industry is divided into the marine equipment manufacturing and fisheries equipment manufacturing industries. Marine equipment manufacturing is classified into equipment and device manufacturing for vessels; equipment and device manufacturing for offshore plants, which manufactures equipment and devices such as drilling rigs, crude oil and gas processing facilities, equipment and machine offshore plants; equipment and devices for marine leisure and sports, and other marine equipment and devices such as underwater robots for exploring marine resources, sonar, and sewage control equipment and devices. The fisheries equipment manufacturing industry is divided into fishing equipment manufacturing, which produces cords, ropes, nets, etc., aquaculture equipment manufacturing, fishery processing equipment manufacturing, and angling equipment manufacturing.

Marine and fisheries equipment manufacturing	Fisheries equipment manufacturing
- Manufacture of equipment and instruments for vessel - Manufacture of equipment and instruments for offshore plants - Manufacture of equipment and devices for marine leisure and sports - Other marine equipment manufacturing	- Equipment and materials for fishing - Aquaculture equipment and materials - Manufacture of processing fisheries products - Manufacture of angling gear

A total of 1,572 businesses are engaged in the marine and fisheries equipment manufacturing industry, 442 businesses in marine equipment manufacturing and 1,130 businesses in fisheries equipment manufacturing, accounting for a large proportion of the fishery equipment manufacturing industry. Since the marine and fisheries equipment manufacturing industry is linked to diverse manufacturing sectors such as the machinery industry, steel industry, electronics industry, chemical industry, furniture industry, non-ferrous metal manufacturing industry, etc., it will lead the development of the ocean economy through high value-added.

The marine and fishery equipment manufacturing industry experienced a decreasing trend from 2017 to 2019 in terms of total output, value-added, and the number of persons employed. The continued downtrend of the shipbuilding industry in 2019 had an impact on sales and employment in the marine and fishery equipment manufacturing industry.

In 2019, the gross output of the marine and fishery equipment manufacturing industry was KRW 4.736 trillion, down 13.5% from 2017. The value-added was KRW 1.317 trillion, a drop of 13.3% compared to 2017. The number of persons employed was 13,300 in 2019, down 16.2% from 2017.

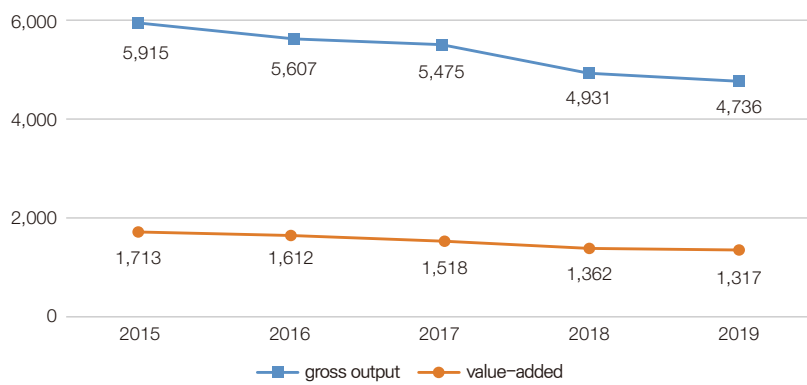
Table 16. Output, value-added and employment of the marine and fisheries equipment manufacturing industry

(In KRW billion, thousand persons, %)

Category	2017	2018	2019	Growth Rate
Gross output	5,475	4,931	4,736	-13.5%
Value-added	1,518	1,362	1,317	-13.3%
Employment	15.9	13.4	13.3	-16.2%

Figure 11. Trends in the output & value-added in the marine and fisheries equipment manufacturing industry

(In KRW billion)



(6) Marine Resources Development and Construction

The marine resources development and construction industry involves activities related to the mining, harvesting and processing of minerals and other water resources from coastal regions and oceans, developing marine renewable energy, activities related to the production of marine biotech products and the construction of ports, bridges, and offshore plants and structures.

Marine resource development	Marine construction
- Marine mineral resource mining - Seawater processing and supply - Marine renewable energy development - Marine biotech product manufacturing	- Port and marine bridge construction - Offshore plant and structure construction

Korea harvests sand and mines and extracts offshore crude oil and natural gas in its coastal region and exclusive economic zone (EEZ). Sea sand accounts for over 10% of Korea's total aggregate supply, but the issue of resource depletion led the government to announce a policy in 2017 to reduce its use of sea sand. The government also plans to gradually reduce sea sand mining by 2022. Deep-sea water is also mined to produce a diversity of products such as bottled water, beverages and cosmetics. The Korean marine renewable energy industry seeks to generate power using tidal currents, tidal power, wave power, offshore wind power, offshore solar power, and ocean thermal energy conversion. The share of marine energy in renewable energy is about 1.1%.⁵⁾ The marine biotechnology industry⁶⁾ includes businesses that produce marine bio-tech food products, pharmaceuticals, and chemical products (cosmetics). According to the Marine Biotechnology fact-finding survey conducted in 2018 by the Ministry of Ocean and Fisheries, the marine biotech industry has a total of 390 businesses, and the

5) Ministry of Trade, Industry and Energy(2016), p.90

6) The industry that provides products and services using marine bio-resources including fish, seaweed, shellfish and other organisms through the application of marine life sciences

number of research institutions is estimated at 154.⁷⁾

Korea's marine construction industry is mostly engaged in constructing and maintaining ports, building structures to protect the coastlines under coastal improvement programs, reclaiming land, and constructing offshore plants⁸⁾ as well as building bridges and laying submarine cables.

The gross output of the marine resource development industry was KRW 2.542 trillion as of 2019, accounting for 1.8% of the total output of the ocean economy of KRW 138.5 trillion, and 2.2% of the total value-added of the ocean economy of KRW 43.1 trillion. The marine resource development and construction industry has an increasing trend in gross output, and the number of persons employed over the past three years.

Recently, the gross output of the marine resources development and construction industry increased from KRW 2.351 trillion as of 2017 to KRW 2.542 trillion as of 2019, up 8.1% compared to the year of 2017. The value-added decreased by 2.2% during the same period, but the number of persons employed increased 1.7%.

Table 17. Output, value-added and employment of the marine resource development and construction industry

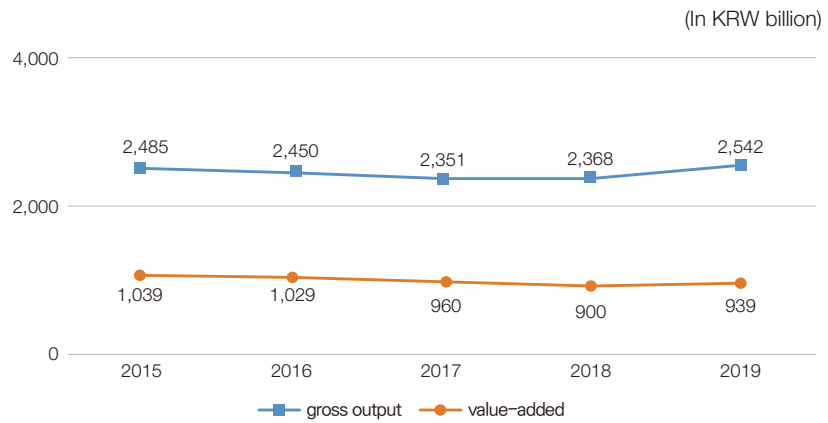
(In KRW billion, thousand persons, %)

Category	2017	2018	2019	Growth Rate
Gross output	2,351	2,368	2,542	8.1%
Value-added	960	900	939	-2.2%
Employment	12.3	12.0	12.6	1.7%

7) Ministry of Oceans and Fisheries(2019)

8) The Ministry of Oceans and Fisheries has been implementing coastal protection projects for about 370 coasts, with a budget of about KRW 1.9 trillion, for a 10-year period (2010-2019)

Figure 12. Trends in the output & value-added in the marine resource development and construction industry



(7) Marine Leisure and Tourism

Marine leisure and tourism is defined as “tourism-related activities in communities near or adjoining the sea and coast” and relies directly or indirectly on ocean space.⁹⁾ It can also be defined distinctly into two different aspects, space and activity. In spatial terms, marine leisure and tourism refers to leisure and tourism that takes place in coastal areas or ocean space where there is a sphere of living or activity that occurs via the medium of the sea. In terms of activity, it includes all leisure and tourism activities that are related to the sea or use the sea directly or indirectly, as well as fishery-related leisure and tourism activities such as recreational fishing. That is, all leisure and tourism activities carried out in an ocean space such as the beach, on the sea or under the sea, as well as all other businesses related to them, can be defined as the marine leisure and tourism industry.¹⁰⁾ Also included are the marina industry, cruises, marine amusement parks and theme parks, maritime museums, and marine nature parks as well as marine tourism such as fishing tourism businesses.

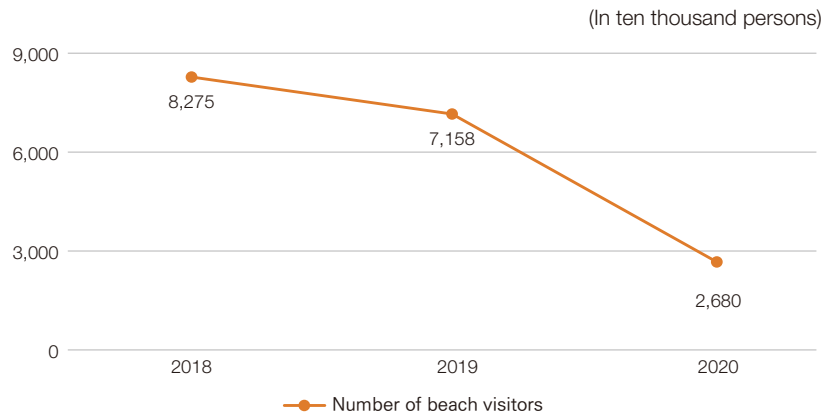
Marine leisure and tourism	Fisheries leisure and tourism
- Marine leisure facility operation - Marine tourism facility operation	- Fishing tourism - Other fisheries leisure tourism

Because of the prolonged social distancing due to the expanded COVID-19 situation and the increase in non-face-to-face services, the marine leisure tourism industry was also greatly affected. As safety becomes a key factor in marine leisure tourism, it is becoming smaller and individualized, and non-contact tourism is establishing itself as a trend. The number of users who visited the beach decreased by 63% from a total of 71.58 million in 2019 to 26.8 million in 2020. The biggest change in beach activities due to COVID-19 is the increase in demand for relatively less well-known small-scale beaches compared to existing popular large-scale beaches.

9) Korea Maritime Institute (2015), p.9.

10) Korea Maritime Institute (2015), p.10.

Figure 13. Number of beach visitors (2018~2020)



Resource: the press release from the Ministry of Oceans and Fisheries (September 18th, 2020)

Various government policies for marine leisure tourism are continuously being promoted. In order to respond to the gradually increasing fishing population, the Ministry of Ocean and Fisheries announced the 2nd Basic Fishing Plan (2020-2024), and set a vision for safe and sustainable fishing and the fishing industry that revitalizes the local economy, and various tasks have been prepared.

In order to meet the increasing demand for marine leisure tourism, the Ministry of Oceans and Fisheries prepared the “Marine Leisure Tourism Promotion Measures” in 2019 to announce a regional base building project and is in the process of promoting a plan to make it a marine leisure tourism attraction. As of 2020, a total of 5 locations have been selected, and 3 locations are scheduled to break ground in 2021, starting with Seogwipo, Jeju.

Meanwhile, as the “Act on Management and Utilization of Marine Healing Resources” was enacted in February 2020 and related enforcement ordinances were prepared in 2021, it is expected to contribute to the vitalization of the marine healing industry.

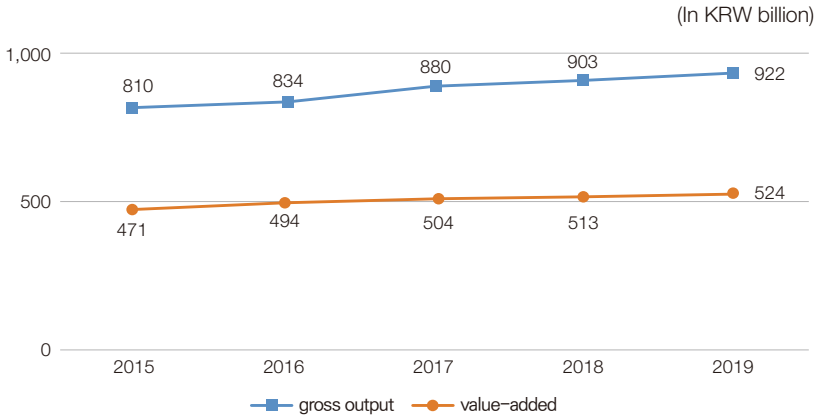
The gross output and value-added of marine leisure and tourism has an increasing trend. The gross output of the marine leisure and tourism industry was KRW 922.4 billion as of 2019, accounting for 0.7% of the total gross output of the entire ocean economy (KRW 138.5 trillion), whereas its GVA totalled KRW 524.2 billion, accounting for 1.2% of the sector (KRW 39.8 trillion). As measured

by its share of the sector, the marine leisure and tourism industry still remains at a very low level in both output and value-added. However, the gross output of the industry in 2019 jumped by 4.8% from 2017. Its GVA also increased by 4.0%. By contrast, the number of persons employed fluctuated during the same period, and slightly increased by 1.7% compared to 2017.

Table 18. Output, value-added and employment of the marine leisure and tourism industry

(In KRW billion, thousand persons, %)				
Category	2017	2018	2019	Growth Rate
Gross output	880	903	922	4.8%
Value-added	504	513	524	4.0%
Employment	10.2	9.5	10.4	1.7%

Figure 14. Trends in the output and value-added of the marine leisure and tourism industry



(8) Marine and Fisheries Services

The marine and fisheries services industry is defined as “industrial activities that provide professional services specializing in ocean economic activities such as information, finance, insurance, law, accounting, management consulting, and leasing services”.¹¹⁾ According to the Marine and Fisheries Industry Special Classification Definitions approved by Statistics Korea, this industry includes marine waste treatment and ocean cleaning/restoration, wholesale and retail of marine and fisheries equipment and materials, maintenance of marine and fisheries equipment and materials, marine and fisheries employment brokerage and suppliers, marine and fisheries education and training services, marine and fisheries professional, science and technology services, marine and fisheries finance and insurance, marine and fisheries associations and groups, and restaurants specializing in fishery products.

- Marine waste treatment and ocean cleaning/restoration
- Marine and fisheries equipment and materials - wholesale and retail
- Marine and fisheries employment services and suppliers
- Marine and fisheries education and training services

- Marine and fisheries professional, science and technology services
- Marine and fisheries finance and insurance
- Marine and fisheries associations and groups
- Restaurants specializing in fishery products

It can also be classified according to the types of services offered in the field of oceans and fisheries: information provision services, financial and insurance services, legal and consulting services, and other professional services. Marine and fisheries services can create synergy if converged with major industries that currently play large roles in the Korean economy (fisheries, marine ports, shipbuilding, equipment and materials).

According to the ocean and fisheries industry statistics research in 2019, a

11) Ministry of Oceans and Fisheries (2018), pp.17-18.

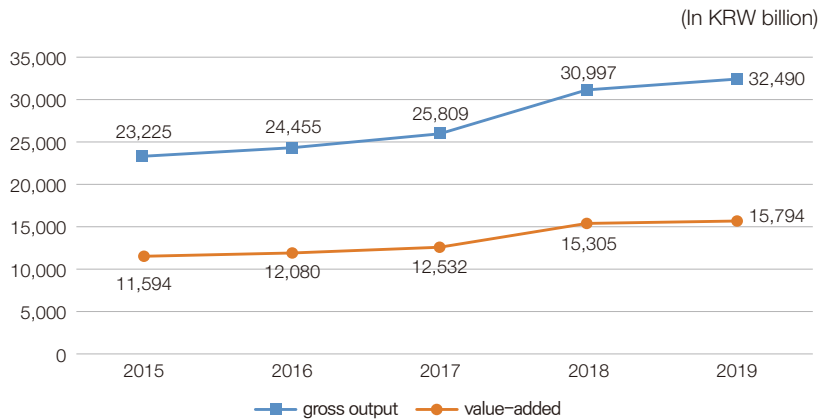
total of 59,576 businesses are engaged in marine and fishery services, which account for 35.5% of the whole ocean and fisheries related businesses (167,749).

Table 19. Output, value-added and employment of the marine and fisheries services industry

(In KRW billion, thousand persons, %)				
Category	2017	2018	2019	Growth
Gross output	25,809	30,997	32,490	25.9%
Value-added	12,532	15,305	15,794	26.0%
Employment	292.5	320.7	326.5	11.6%

The overall gross output, value-added and employment in the industry has tended to increase. As of 2019, the gross output of the industry totalled KRW 32.490 trillion, an increase from KRW 25.809 trillion by 25.9%. Its GVA increased by 26.0%, from KRW 12.532 trillion in 2017 to KRW 15.794 trillion in 2019. On the other hand, the number of persons employed increased from 292.5 thousand in 2017 to 326.5 thousand people in 2019.

Figure 15. Trends of the output and value-added of the marine and fisheries services industry



4. Conclusions

With the pandemic, the world is undergoing tremendous economic changes. Delayed economic activities intensify the volatility of global trade volume, and trade disputes between regions and decarbonization policies are becoming visible.

At a time of high uncertainty, when policies for the economic reconstruction and maritime economic development need to be prepared, it is ever more significant to have an objective diagnosis of the past and present state of the ocean and fisheries industry and its prospects for the future. The Ocean Economy Research Division of the Korea Maritime Institute has carried out the task of diagnosing and analyzing Korea's ocean economy. Following the establishment in 2018 of the Input-Output Tables (2010-2017) that centered on ocean economic activities, in 2021, the research division determined the scale and industrial structure of the ocean economy from 2018-2019.

The gross output of the ocean economy in 2019 was estimated at about KRW 138.5 trillion and the number of employed workers was 6,890 thousand persons. Its gross value-added was around KRW 43.1 trillion, making up 2.3% of the total national GVA. In terms of the GVA, the gross output of the marine and fisheries service industry accounted for 36.6% and made up the largest portion. Next came the building and repair of ships and offshore plants (19.4%), the shipping industry (9.4%), and the fisheries product distribution industry (8.4%). From 2017 to 2019, the annual average of the output and value-added of the marine and fishery equipment manufacturing industry dropped. In terms of actual amount, the sector that showed the greatest decline was the building and repair of ships and offshore plants industry, which showed a decrease in value-added of approximately KRW 240 billion and a decrease in gross output by approximately KRW 2 trillion during the same period. On the other hand, in

terms of output and value-added in the marine and fisheries service industry, the average annual growth rate was about 26%. The value-added of ocean economic activities grew at an annual average rate of 4.1% during the same period, exceeding the average value-added growth rate of all industries (2.4%).

As can be seen from the analysis results up to 2019, the growth of the marine and fishery service industry is accelerating as the domestic industrial structure changes towards one more focused on the service industries. Therefore, it is time to develop a high value-added strategy for the marine and fishery service industry. In particular, there is a need to strengthen the competitiveness of the fisheries distribution industry and to increase the value-added of the fisheries processing industry on account of the change in demand patterns due to the COVID-19 situation. To this end, preparing policies for technological innovation in the aquaculture industry is required to ensure a stable supply of raw materials. Shipping and shipbuilding sectors are expected to face greater volatility than before due to the changes in the global trade structure, and will need convergent ways to link related services such as finance and law. The marine leisure and tourism industry has to prepare a new growth strategy in consideration of the marine leisure trends and demands that have changed since the COVID-19 outbreak. A new policy is needed to meet the growing demand for “healing tourism” and the young generation’s growing preference for leisure tourism.

Future tasks related to the measurement of the ocean economy are as follows. The marine and fishery leisure tourism sector needs to include food and lodging businesses, which are included in the international marine economy classification. For this, it is necessary to redefine the spatial range of marine leisure and tourism industry activities in the marine sector, and to provide a measurement system that can grasp the scale of consumption and expenditure as well as the supply side currently being measured. Lastly, a satellite account for the marine and fisheries industry should be established which can secure timely GDP data for the marine and fisheries industry in connection with national account data, and use this data to supplement the results of inter-industrial

analysis. To this end, with the support of the Ministry of Oceans and Fisheries, a three-year pilot study of the marine and fisheries satellite account is underway (2020-2022) and is scheduled to be published in 2023. The establishment of ocean economy satellite accounts will contribute to the accuracy of ocean economy measurement work in the future, to the development of an economic effect experimental (simulation) models and to the linking of mid-to-long-term prospects to future forecasting. In addition, Korea's establishment of an ocean economy satellite account will contribute to the establishment of a common system for measuring the global ocean economy.

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(date of search: February 3rd, 2022)

Appendix 1. Classification of Korea's Marine and Fisheries Industry(2018)

High-level classification	Mid-level classification	Low-level classification	ISIC4 code
Fisheries production	Fishing	Marine fishing	0311
		Freshwater fishing	0312
	Aquaculture	Marine aquaculture	0321
		Inland aquaculture	0321 0322
		Aquarium fish and seaweed culture	
	Services incidental to fisheries and aquaculture	Services incidental to fishing and aquaculture	0321 0322
	Salt production	Salt collection	0893
Fishery-products processing	Fishery-product processing	Aquatic animal processing and storage	1020 1040
		Seaweed processing and storage	1020
		Salt processing	2029
		Other fisheries processing	2012 3211 3212 3821
			4610 4791
			4630 4649
			4669 4721 4773
Fishery-products distribution	Fishery-products brokering and wholesale/retail	Fisheries wholesale/retail	4620 4773
			4923 5012
			5210
	Fishery-products transportation and storage	Fisheries transportation	5011 5021 5022
			5012
			3315 5011 5012
			5021 5022 5229 7730
Shipping and port industries	Shipping industry	Freight transportation	5210 5224 5229
			3315 4630 4649
		Other shipping services	4659 4661 4663
			4669 4690 5222 5229 8010
	Port industry	Port transportation support services	

High-level classification	Mid-level classification	Low-level classification	ISIC4 code
Building and repair of ship and offshore plant	Building and repair of ship	Building and repair of cargo ship	3011
		Building and repair of fishing boat	3011
		Building and repair of other ship	3012
	Building and repair of offshore plant and platform	Building and repair of offshore plant and platform	3011
		Manufacture of sections for cargo ship	2511
	Manufacture of sections for ship and offshore plant	Manufacture of sections for fishing boat	2599
		Manufacture of sections for other ship	2811
		Manufacture of sections for offshore plant and platform	3011
		Manufacture of sections for offshore plant and platform	2511
		Manufacture of sections for offshore plant and platform	2824
Marine and fisheries equipment manufacturing	Marine equipment manufacturing	Ship-related equipment manufacturing	2630
			2651
			2740
			2813
			2816
			2819
			2829
		Offshore plant-related equipment manufacturing	2630
			2651
			2740
			2813
			2816
			2819
			2824
			2829
		Marine leisure and sports equipment manufacturing	2819
			1399
	Fisheries equipment manufacturing	Other marine equipment manufacturing	2029
			2651
			2790
			2819
			2829
			3011
		Fishing equipment manufacturing	1104
			1394
			1623
			3230
			1080
Marine and fisheries equipment manufacturing	Fisheries equipment manufacturing	Aquaculture equipment manufacturing	1394
			1623
			2029
			2100
			2220
			2310
			2790
			2813
			2815
			2819
			2829
			3011
		Fisheries processing equipment manufacturing	1702
			2825
		Leisure fishing equipment manufacturing	0143
			0149
			1020
			1080
			3230

High-level classification	Mid-level classification	Low-level classification	ISIC4 code	
Marine resources development/ construction	Marine resources production, supply, and development	Marine mineral resources mining	0610	
			0620	
			0710	
			0721	
			0729	
			0810	
			0892	
			0899	
	Seawater processing and supply	1104		
		3600		
	Marine renewable energy development		3510	
	Marine bio-products manufacturing	Marine bio-products manufacturing	3530	
			1079	
	Port and sea-crossing bridge construction	Port construction	2029	
2100				
4100				
4220				
Marine and fisheries plant and structure construction	Marine plant and structure construction	4220		
		4290		
		4321		
		4390		
Aquaculture facility and artificial reef installation and construction		4390		
Marine and fishing leisure and tourism	Marine leisure and tourism	Marine leisure facility operation	8541	
			9311	
			9329	
			5011	
			5021	
			5022	
			9102	
			9103	
	Leisure and tourism	Recreational fishing tourism	9321	
			5011	
			5012	
			5520	
			5021	
			5022	
Other fishing leisure tourism		9329		
Marine and fisheries services	Marine waste processing, cleanup, and recovery	Marine waste processing, cleanup, and recovery	3811	
			3900	
			4220	
			4290	
	Marine and fisheries equipment wholesale and retail	Marine and fisheries equipment wholesale and retail	Marine leisure and sports equipment wholesale and retail	4649
				4763
				4649
				4652
			Leisure fishing equipment wholesale and retail	4659
				4649
				4764
				4610
	Ship, vessel components, and related equipment brokerage, wholesale, and retail		4649	
			4652	
		4659		
		4663		

High-level classification	Mid-level classification	Low-level classification	ISIC4 code
Marine and fisheries services	Marine and fisheries equipment wholesale and retail	Fishing and aquaculture equipment wholesale and retail	4620
			4630
			4649
			4659
			4669
			4721
			4722
			4764
			4772
			4773
		Fisheries processing machine wholesale	4659
	Marine and fisheries equipment repair	Marine equipment repair	3311
			3312
			3315
			3319
			5222
			9512
			9522
			9524
			9529
			3312
			3319
	Marine and fisheries HR employment and supply services	Marine and fisheries HR employment and supply services	7810
			7820
			7830
	Marine and fisheries education services	Marine and fisheries education services	8522
			8530
			8549
		Marine science and technology services	3320
			7020
			7110
			7120
			0321
			0322
			7020
			7110
			7120
			7500
		Marine R&D	7210
		Fisheries R&D	
		Marine and fisheries publishing and information system development	5813
		6201	
		6202	
Marine and fisheries finance and insurance	Marine and fisheries finance and insurance	6419	
		6492	
		6511	
		6512	
Marine and fisheries associations and organizations	Marine and fisheries associations and organizations	9411	
		9412	
		9420	
		9499	
Fish and seafood restaurants	Fish and seafood restaurants	5610	

Appendix 2. Output, Value Added and Employment Table for the Marine and Fisheries Sector in 2019 (in USD)

High-Level Industry Classification	Output (USD millions)	Value-added (USD millions)	Employment
Fisheries & aquaculture	7,316	2,574	57,847
Seafood processing	9,266	1,715	31,244
Seafood wholesale and retail	5,819	3,099	79,616
Shipping	21,341	3,482	35,128
Port	6,078	2,995	47,476
Shipbuilding and offshore plant	34,119	7,177	75,417
Marine machine & equipment	4,062	1,129	13,321
Marine resource development and construction	2,181	805	12,552
Marine leisure & tourism	791	450	10,397
Marine services(mapping, surveying, consulting, education, R&D)	27,871	13,549	326,485
Total	118,845	36,975	689,483

Note: USD 1 = KRW 1,165.73 in 2019

Appendix 3. Method for Calculating the Ratio of the Marine and Fisheries Industry

1. Materials Used

The ratio of the marine and fisheries industry was calculated using the ‘Supply Amount by Sector Table’, which is appended to the Input-Output Table for 2015, 2015 economic census data, as well as marine and fisheries industry statistical surveys from 2016 to 2017. Statistics Korea’s pertinent surveys were utilized, such as the transportation industry survey and the service industry survey, as well as other industrial surveys.

2. Principles for Calculating ratio

The proportional size of each group on the Marine and Fisheries Industry Special Classification System was calculated utilizing the following five principles.

1) One-To-One Connection

If the Marine and Fisheries Industry’s Special Classification and the basic sector of the Input-Output Table are matched one-to-one, the ratio should be reflected as 1.

2) Utilizing the Attached Table (Supply Amount Table)

If the groups and categories in the Marine and Fisheries Industry Special Classification System do not connect one-to-one with the basic sectors of the Input-Output Table, the ratio is calculated by associating the classification in the Supply Amount Table by sector and by item, which is annexed to the Input-Output Table, and contains the supply amount for more detailed subcategories than the basic groups and classes in the Input-Output Table.

3) Utilizing the Ratio of Sales Survey Statistics

When the groups and categories of the Marine and Fisheries Industry Special

Classification System and the Supply Amount Table by sector cannot be linked one to one, a survey statistics authorized by Statistics Korea is used to calculate the proportion of the sales. Economic census microdata sales are used as the denominator, and marine and fisheries industry statistical surveys and relevant industrial statistics sales are used as the numerator.

4) Utilizing Statistics Besides Sales

When calculating the ratio of the marine and fisheries industry based on sales is difficult, the ratio of the ocean sector is calculated utilizing statistics besides sales. For example, the ratio of visitors to marine resource parks among all domestic natural parks is utilized for marine leisure and tourism and the ratio of sea aggregate collection out of the total amount of domestic aggregate collection is respectively utilized for marine resources and construction (aggregate collection).

5) Utilizing the Intermediate Demand Rate

In some sectors of the marine and fisheries equipment manufacturing industry and the marine and fisheries service industry, the demand for equipment (service) from the marine and fisheries industry becomes a numerator and the total intermediate demand for equipment as denominator

3. Targets and Time Series Processings

The ratio of the marine and fisheries industry derived in this study was applied to the row and column of each relevant marine and fisheries industry in the Domestic Transaction Table. That is, the derived ratio was applied to the output, including intermediate transactions and final demand, as well as added value. Also, in terms of employment, it is assumed that the employment coefficient of the parent industry in the sector based on the Input-Output Table is the same as that of the marine and fisheries industry. The same ratio of the marine and fisheries industry was applied to the Employment Table, which contains information on the number of employers and the number of employees per 1 billion won of output.

The ratio by year is calculated based on (1), (4), and (5) of the five principles for calculating proportion size introduced above, as well as the Domestic Transaction Table for the year (in the cases of (1) and (5)) and other statistics for the year. Other annual statistics (in the case of (4)) are used to calculate the ratio for each year. However, in the cases of principles (2) and (3), the ratio is calculated using the Supply Amount Table or economic census data published every 5 years under the assumption that the economic structure has not changed significantly. At this time, the standard for the utilization of published data every five years is to use the data from the year closest to the time of analysis. In this study, the ratio of the relevant sectors for 2016-2017 was calculated collectively and applied based on the 2015 reference data.





Wind power generation in Ansan, Gyeonggi-do

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KMI KOREA MARITIME INSTITUTE

26, Haeyang-ro 301 beon-gil,
Yeongdo-gu, Busan, Republic of KOREA
TEL : 82-51-797-4800 FAX : 82-51-797-4810



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