KOREA'S OCEAN ECONOMY 2019



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Hangyeong, JEJU



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1. Background and Objectives

Background

Our oceans are a source of life and a mediator for global environmental changes. On the economic front, they not only serve as international trade routes but also hold a vast repository of resources. The World Wide Fund for Nature (WWF) estimates the value of key ocean assets at USD 24 trillion dollars. The UN estimate the world "gross marine product" is about USD 2.5 trillion per year, and is seventh in comparison with world economy. When humanity needed to find new growth engines, people began to recognize the ocean as a new solution. Major maritime nations have recently turned their attention to ocean-driven economic growth, starting to enhance the status of oceans in policy implementation by developing national plans to foster the marine and fisheries sector, among other things.

In order to diagnose the potential of the ocean economy, an understanding of the ocean economies of individual countries must come first. The reason is that different countries focus on different industries and their key industries are different in size, because a country's ocean economy is closely related with its circumstances, including its environmental, resource, technology and economic conditions.

Korea is the world's fifth largest shipping power, handling 99.7% of international freight, with its Port of Busan ranked as the second largest transshipment container port in the world. It also comes in first place in terms of aquatic product intake at 58.9 kg per person while its annual beach users nationwide total about 100 million. With 3,348 islands and tidal flats stretching 2,487km^2, Korea's maritime jurisdiction covers an area of territorial waters 4.4 times bigger than its land area. With 32.9% of the entire population living in coastal areas, 80% of the Korean people think that economic activities of the marine and fisheries sector contribute to national development.

Despite the importance of marine and fisheries recognized by the government and Korean people, Korea is in serious shortage of major economic indicators and data on the sector. If sufficient assessments are not available for ocean economy in terms of its production, value-added and employment comparable with those of national economy, it is not easy to estimate accurately how much ocean economy contributes to the national economy. It is crucial to perform periodic and continuous assessments and analyses by which the ocean economy can be understood on a national scale. For this reason, KMI intends to produce every year a report aimed at diagnosing the size and status of Korea's ocean economy, looking into the trends of individual industries that constitute the ocean economy, and addressing the potential of Korea's ocean economy based on the results.

Objectives

In this respect, this report aims to diagnose the size and status of Korea's ocean economy as of 2015 and look into the recent trends of individual industries. It is designed to help domestic and foreign ocean economy experts understand Korea's ocean economy and specific industries as well as contribute to assisting decision-making on policies for fostering the marine and fisheries sector.

Target industries

Economic activities subject to analysis in this report are industrial activities: Ten industries were selected based on the "2018 Special Classification of Korea's Marine and Fisheries Industry". Moreover, the analysis for this report is based on the 2015 Input-Output Tables, which was recently published by the Bank of Korea.


Gwanganri, BUSAN

2. Key Findings

The gross output of the Korean marine and fisheries sector amounts to about KRW 147.9 trillion as of 2015, while its value added totals approximately KRW 38.4 trillion, accounting for about 2.52% of the gross value added (GVA) of the entire economy. Marine and fisheries services account for 26.0% of the sector's value added, followed by building and repair of ship and offshore plant(20.0%), shipping industry (18.1%), port industry (5.5%), and fisheries (fisheries production, processing and distribution, 19.5%). The sector also employs about 596,000 persons of which the largest share is taken by the marine and fisheries services industry, followed by building and repair of ship and offshore plant, fishery products distribution, and shipping in that order.

Table 1: Gross output and value added by industry

(In KRW trillion, 10 thousand persons, %)

High-Level Industry Classification	Gross output	Share (%)	Value added	Share (%)	Employ-ment	Share (%)
Fisheries production	7.4	5.0%	2.9	7.6%	5.1	8.6%
Fish processing	9.7	6.5%	1.6	4.1%	4.4	7.4%
Fishery products distribution	5.7	3.8%	3.0	7.8%	8.0	13.4%
Shipping industry	32.9	22.2%	6.9	18.1%	5.6	9.4%
Port industry	4.4	3.0%	2.1	5.5%	2.9	4.9%
Building and repair of ship and offshore plant	59.7	40.3%	7.7	20.0%	12.1	20.3%
Marine and fisheries equipment manufacturing	5.9	4.0%	1.6	4.3%	1.7	2.8%
Marine resources develop-ment and construction	4.6	3.1%	2.0	5.2%	2.0	3.3%
Marine leisure and tourism	1.1	0.8%	0.5	1.4%	1.0	1.6%
Marine and fisheries services	16.6	11.2%	10.0	26.0%	16.8	28.2%
Total	147.9	100.0%	38.4	100.0%	59.6	100.0%
All industries	3,717.0	-	1,520.9	-	2,382.9	-
Ratio of marine and fisher-ies industry to all industries	3.98%		2.52%		2.50%	

※Based on prices as of 2015 and Domestic Goods and Services Transactions Table

According to the time-series change, the value added of Korea's marine and fisheries sector declined sharply from KRW 42.1 trillion to 38.9 trillion between 2013 and 2014, and fell slightly to 38.4 trillion in 2015. This downward trend can be attributed directly to the reduced value added of the shipbuilding industry, which in turn was caused by rapid decreases in shipbuilding orders due to the global economic slowdown. In 2014, the value added of the shipbuilding industry fell by KRW 3.8 trillion year on year and then dropped by KRW 4.4 trillion in 2015. The shipbuilding industry suffered a sharp drop of 57% in value added over the 2010-2015 period. This can be explained by the fact that the shipbuilding, equipment manufacturing, shipping, and port industries combined take up a large share (48%, as of 2015) of the value added of Korea's marine and fisheries sector and they are by nature rather sensitive to external economic changes.

Table 2. Quantitative changes in gross output, value added and employment of the marine and fisheries sector

(In trillion KRW, thousand persons)

Classification		2010	2011	2012	2013	2014	2015
Gross output	Marine and fisheries (A)	150.0	154.6	156.4	145.2	147.0	147.9
	All industries (B)	3,144.4	3,483.9	3,579.8	3,599.4	3,658.0	3,717.0
	Share (A/B)	4.77%	4.44%	4.37%	4.03%	4.02%	3.98%
Value added	Marine and fisheries (A)	42.4	42.1	41.5	42.1	38.9	38.4
	All industries (B)	1,145.1	1,210.0	1,251.5	1,303.2	1,354.9	1,520.9
	Share (A/B)	3.70%	3.48%	3.32%	3.23%	2.87%	2.52%
Employ-ment	Marine and fisheries (A)	553	567	577	592	596	596
	All industries (B)	21,422	22,231	22,991	23,171	23,568	23,829
	Share (A/B)	2.58%	2.55%	2.51%	2.56%	2.53%	2.50%
Shipbuilding excluded Marine and fisheries	Gross output	83.5	80.8	84.7	81.1	82.8	88.2
	Value added	24.5	24.2	25.0	26.2	26.9	30.7
	Employment	432	436	458	466	465	475

Source: Authors' analysis based on the Input-Output Tables for 2010-2015 published by the Bank of Korea, focusing on the marine and fisheries sector

When the shipbuilding industry is excluded, however, the value added of the sector increased from KRW 24.5 trillion in 2010 to KRW 30.7 trillion in 2015, recording a compound average growth rate (CAGR) of 4.7%, while its employment also grew from 432,000 in 2010 to 475,000 in 2015 at a CAGR of 1.9%. Fishery products distribution, fish processing, marine leisure and tourism, and marine resource development and construction showed high growth trends above the average value added growth rate of all industries(5.8%) over the same period.

Table 3. Compound annual growth rates (CAGR) and industry groups classified by growth trend, by industry (2010-2015)

Industry	Gross Output		Value Added		Employment	
	CAGR	Industry Group	CAGR	Industry Group	CAGR	Industry Group
Fisheries production	-0.4%	↓	-3.5%	↓	-1.9%	↓
Fish processing	3.7%	⇑	8.6%	⇑	2.4%	⇑
Fishery products Distribution	8.0%	⇑	8.9%	⇑	5.6%	⇑
Shipping industry	-3.0%	↓	5.4%	↑	-1.2%	↓
Port industry	2.0%	↑	6.2%	⇑	4.4%	⇑
Building and repair of ship and offshore plant	-2.1%	↓	-15.6%	↓	0.1%	↑
Marine and fisheries equipment manufacturing	5.7%	⇑	7.2%	⇑	1.1%	↑
Marine resources development and construction	4.8%	⇑	6.4%	⇑	5.6%	⇑
Marine leisure and tourism	-1.8%	↓	8.0%	⇑	-0.0%	↓
Marine and fisheries services	6.1%	⇑	4.4%	↑	2.1%	↑
Marine and fisheries sector total	-0.3%	-	-1.9%	-	1.5%	-
All industries	3.4%	-	5.8%	-	2.2%	-

Note: ⇑ represents a high-growth industry group (industries with a higher CAGR than that of all industries), while ↑ indicates a growing industry group (with a lower CAGR than that of all industries but still a positive (+) rate) and ↓ indicates a declining-growth industry group (with a negative (-) CAGR).

In the meantime, the global ocean economy (estimated at USD 1.5 trillion in value added, 2010, OECD) is structurally dominated by industries mostly taking advantage of natural resources: Offshore oil and gas (34%) and maritime and coastal tourism (26%) account for 60% of total value added of the ocean-based industries, whereas three other industries combined (shipbuilding and equipment at 15%, water transport(shipping) at 5%, and port at 13%) take up only 33%.

Figure 1. GVA changes in the marine and fisheries industry of Korea

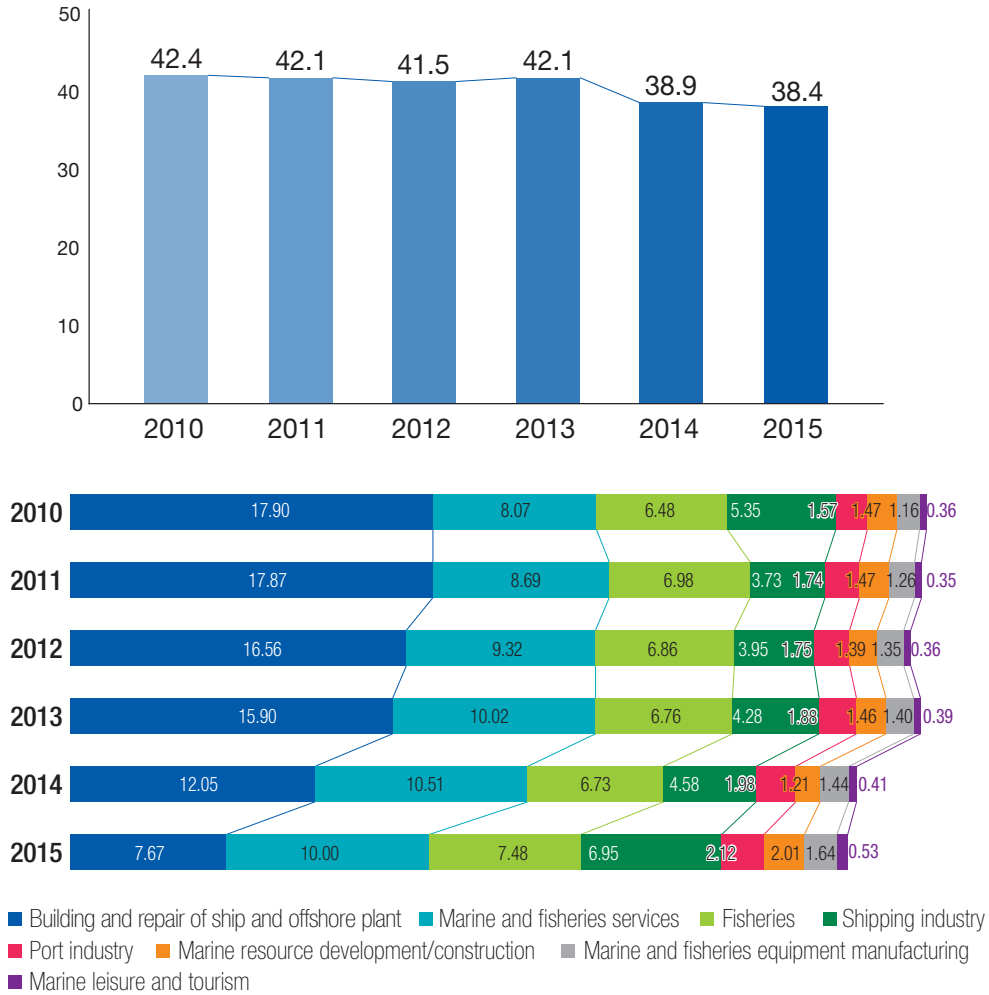
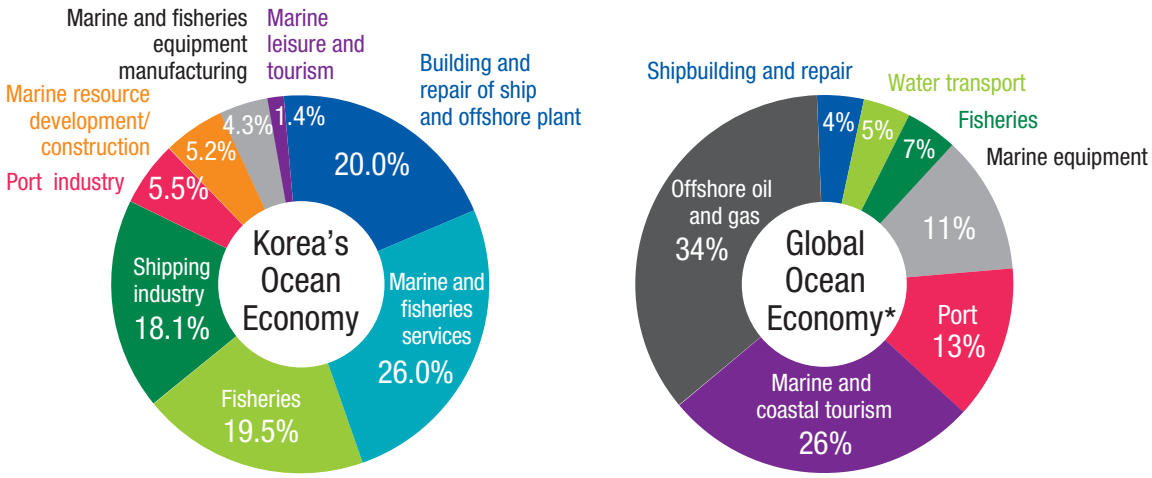


Figure 2. Structural comparison between Korean and world ocean economies



* OECD, The Ocean Economy in 2030, 2016

Table 4. Value added of the marine and fisheries sector – major economies and Korea

Category	US	China	UK	Ireland	France	Portugal	New Zealand	Australia	Korea
Size of ocean economy (share in GDP)	2016 USD 313.7 billion (1.7%)	2017 CNY 7.7 trillion (9.4%)	2012 GBP 38.5 billion (4%)	2018 2.2 billion Euro (0.7%)	2011 30 billion Euro (1.2%)	2013 4.7 billion Euro (3.1%)	2013 NZD 4 billion (1.9%)	2015-16 AUD 39.8 billion (2.3%)	2015 USD 33.9 billion (2.5%)
Top industry (share in the sector)	Oil and gas/sand and gravel mining (36.8%)	Marine tourism (17.1%)	Oil and gas (51.1%)	Maritime logistics (31.3%)	Marine tourism (48.3%)	Marine tourism (35.5%)	Marine mineral resources (48.3%)	Marine leisure and tourism (44.3%)	Marine and Fisheries services (26.0%)
Second largest industry (share in the sector)	Marine leisure and tourism (33.3%)	Vessel traffic and marine transport (8.5%)	Marine transport (18.2%)	Marine tourism and leisure (29.1%)	Oil and gas services (14.2%)	Fisheries (25.7%)	Shipping industry (24.2%)	Oil and gas mining (37.9%)	Building and repair of ship and offshore plant (20.0%)

* Converted at the average exchange rate of Korean won (1131.46) against the US dollar (market price) for 2015, published by the Bank of Korea. As for other countries, food and accommodation are included in marine leisure and tourism industries.
Source: Korea Maritime Institute, Analysis on Marine and Fishery Industries(2019) -Using 2015 Input-Output Tables-, 2019, pp.68-69



Jukbyeon, ULJIN

3. Sectoral Findings

(1) Fisheries

Classification of Korea's Marine and Fisheries Industry (2018) classifies fisheries largely into fisheries production, processing and distribution industries.

According to the 2017 Marine and Fisheries Industry Statistics Survey conducted by the Ministry of Oceans and Fisheries (MOF), a total of 95,980 businesses are engaged in the entire fisheries industry (production, processing and distribution industries combined), which employs a total of 638,647. In 2018, fishery products export amounted to USD 2,380 million, while imports reached USD 6,130 million, growing rapidly every year. Per-capita fishery product consumption in 2017 was 65.9 kg, while self-sufficiency in fishery products recorded 72.5%.

The fisheries industry makes fishery products available as a source of quality animal proteins at relatively low prices. Recently, however, it is faced with various challenges, such as climate change, ocean environmental pollution, decreasing marine resources, and aging of the fishing population. In order to cope with mega-trends including global opening, changing population and social structures, and the advent of new technologies driven by the Fourth Industrial Revolution, paradigm shifts are required in policies for the fisheries industry and fishing villages. In response to rising nationwide demand for the fisheries industry and fishing villages, we need to develop policies to realize a sustainable fisheries industry as well as preserve and maximize the multi-functionality of the fisheries industry and fishing villages.

Fisheries production	Fish processing	Fishery products distribution
- Fisheries - Aquaculture - Services incidental to fisheries and aquaculture - Salt production	- Fish processing and preservation - Seaweed processing and preservation - Salt processing - Other fish processing	- Fishery products brokerage and wholesale/retail - Fishery products transportation and storage

Fisheries production (fisheries and aquaculture)

Under the Classification of Korea's Marine and Fisheries Industry, the fisheries production industry is divided into fisheries, aquaculture, services incidental to fisheries and aquaculture, and salt production. The fisheries sector is subdivided into marine and freshwater fisheries, and marine fisheries is broken down further into distant-water, offshore, and coastal fisheries. Aquaculture is divided into three sectors; marine, inland, and aquarium fish/plants business, while services incidental to fisheries and aquaculture are divided into transportation of fishery products and other services incidental to fisheries and aquaculture.

Domestic fisheries production in 2018 was 3.79 million tons (KRW 8,642 billion in value) of which 1.01 million tons were produced by offshore and coastal fisheries, 2.25 million tons by aquaculture and farming, 490,000 tons by distant-water fisheries, and 35,000 tons by freshwater fisheries. As of 2018, there are 65,906 vessels engaged in fisheries, weighing 539,000 tons at 15.55 million horse power. The total number of aquaculture licenses issued is 10,061 for a gross licensed area of 161,320 ha. As for fishing ports, which are the base for fisheries production, there are 110 national ports, 291 provincial ports, and 621 residential ports.

The recent situation of the fisheries production industry is characterized by reduced offshore and coastal fisheries production due to diminishing marine resources, continued growth in seaweed farming production, and the deteriorating environment of aquaculture farms. With the maximum amount of

fishery resources available offshore and in coastal estimated at 5.03 million tons, the National Institute of Fisheries Science assesses fishery resources for 2017 to be 3.04 million tons. Given the resource availability, there is a concern that, if the current fishing intensity remains unchecked, it will accelerate resource depletion. [1] While offshore and coastal fisheries production is on the decrease, aquaculture production is increasing rapidly. Aquaculture production has been growing at an annual average rate of 6.2% for the past 10 years (2009–2018). Total production growth has been driven by seaweed production, which has been growing at an annual average of 8.0%. Despite its continued production growth, aquaculture is faced with critical challenges: frequently-occurring natural disasters, controversy over the safety of farmed fishery products, the deteriorating environment in fishing grounds due to high-density culture and use of raw feed.

For this reason, the government announced the "Fisheries Innovation Plan 2030" in February 2019, under the vision of "realizing a sustainable and young fisheries industry and fishing villages living great together." This plan lays out policy directions to increase the total allowable catch (TAC) for offshore and coastal fisheries and aquaculture, reform the industry into a resource-management-oriented structure through the eradication of illegal fishing, and innovate aquaculture into a high-value-added industry by transforming it into an industrialized, eco-friendly and smart industry. To implement these directions, the government has been pushing forward with various policy initiatives.

Fisheries	Aquaculture
- Marine fisheries (coastal and offshore, distant-water) - Freshwater fisheries	- Marine aquaculture - Inland aquaculture - Aquarium fish and plants business
Services incidental to fisheries and aquaculture	**Salt production**
- Fishery products transportation - Other services incidental to fisheries and aquaculture	- Salt production

1) Ministry of Oceans and Fisheries (2019)

In 2015, the fisheries industry produced gross output of KRW 7,421.1 billion, a decline of 2.0% from 2010. Value added was reported at KRW 2,911.9 billion, recording a sharp drop of 16.4% against 2010. Employment in particular stood at 51,300 in 2015, posting a decrease of 9.2% from 2010.

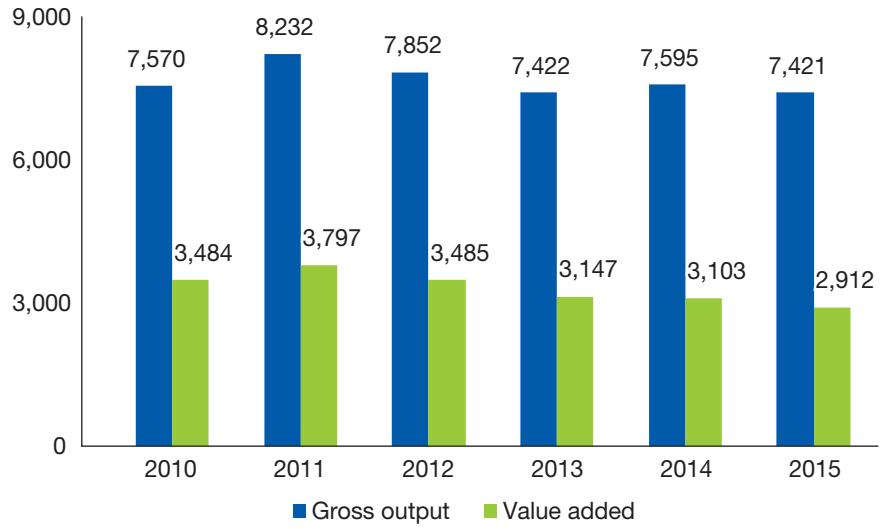
Table 5. Output, value added and employment of the Fisheries production industry

(In billion KRW, thousand persons, %)

Category	2010 (A)	2011	2012	2013	2014	2015 (B)	Growth (B-A) / A
Gross output	7,570	8,232	7,852	7,422	7,595	7,421	-2.0
Value added	3,484	3,797	3,485	3,147	3,103	2,912	-16.4
Employment	56.5	49.0	49.1	47.3	45.0	51.3	-9.2

Figure 3. Trends of the output and value added of the Fisheries production industry

(In billion KRW)





Jagalchi market, BUSAN

Fish processing

Under the Classification of Korea's Marine and Fisheries Industry, the fish processing industry is divided into fish processing and preservation[2], seaweed processing and preservation, salt processing, and other fish processing. The fish processing statistics for 2018 released by the MOF puts the number of fish processing enterprises nationwide at 5,003, with processed fish production at about 1.29 million tons. Among various types of processed products, frozen products, which are classified as relatively low-tech processing, take up 45.8% of total production, whereas seaweed products account for 20.4%, fish meat paste products for 9.7%, and seasoned products for 6.4%.

The fish processing industry is recently witnessing drastic changes in consumption trends due to increases in one-person households and women's participation in economic activities as well as the aging population. Home meal replacements (HMRs) are gaining great popularity, fueled by recent consumer trends in favor of higher-end, simpler and more diversified products, while the number of people who eat out for seafood, rather than at home, is increasing. To respond to these changes in fishery product consumption trends, it is urgent to develop strategy for the domestic fish processing industry. The reality is, however, that the main technique employed for fish processing is simply freezing raw products as the majority of domestic fishery product businesses are either small or very small. Consequently, it is mostly large companies that drive efforts to develop and export high-value-added fishery products processed by advanced processing technologies. In this respect, the government has been implementing a wide range of programs under the Fisheries Innovation Plan 2030 to foster the fish processing industry by creating and expanding processing and export clusters, developing new products customized to target consumer markets, strategically nurturing promising next-generation items, and supporting fishery companies to enter overseas markets.

Fish processing and preservation	Seaweed processing and preservation

- Smoked and cooked fishery products and other similar delicatessen
- Dried and salted fishery products
- Frozen fishery products
- Other processed fishery products
- Animal oil and fat

Salt processing

Other fish processing

The gross output of the fish processing industry in 2015 amounted to KRW 9,671.1 billion, a growth of 19.8% against 2010. While its GVA jumped to 1,569.6 billion, recording a hefty increase of 50.9% from 2010. The number of employees are 44,200, which is growing by 12.5% from 2010.

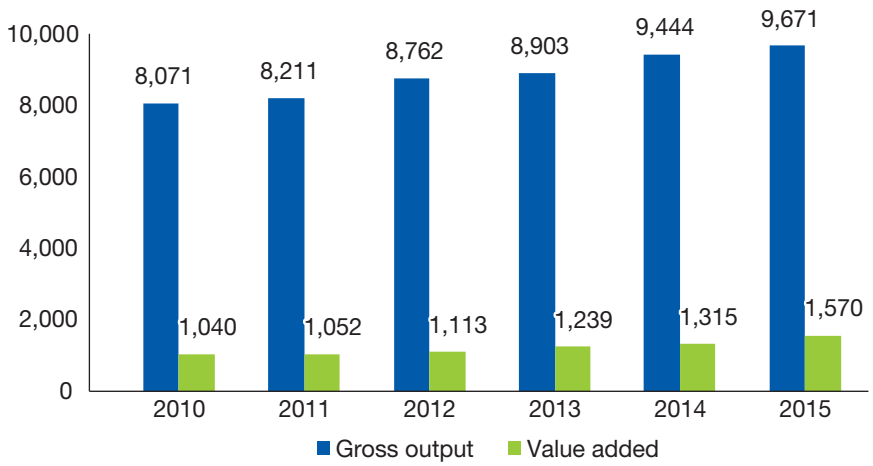
Table 6. Output, value added and employment of the Fish processing industry

(In billion KRW, thousand persons, %)

Category	2010 (A)	2011	2012	2013	2014	2015 (B)	Growth (B-A) / A
Gross output	8,071	8,211	8,762	8,903	9,444	9,671	19.8
Value added	1,040	1,052	1,113	1,239	1,315	1,570	50.9
Employment	39.3	36.6	38.3	39.4	40.7	44.2	12.5

Figure 4. Trends of the output and value added of the Fish processing industry

(In billion KRW)



Fishery products distribution

Pursuant to the Classification of Korea's Marine and Fisheries Industry, the fishery products distribution industry is divided into two sub-industries: fishery products brokerage, wholesale and retail, and fishery products transportation and storage. The brokerage, wholesale and retail industry is subdivided into fishery products brokerage, fishery products wholesale and retail, and aquarium fish and plants wholesale and retail, whereas the transportation and warehousing industry are broken down into fishery products transportation and refrigerated and frozen fishery products storage.

According to a fact-finding survey for 2017 conducted by the MOF, there are 42,997 companies engaged in fishery products distribution. As of 2018, there are 222 auction markets (at places of origin) nationwide, and route sales made through this network[3] total 1.608 million tons. Meanwhile, fishery products traded at wholesale markets close to consumers across the country are 400,000 tons as of 2017.

The fishery products distribution industry of Korea still remains underdeveloped even though the government has continued to implement diverse support programs. To make matters worse, consumer distrust is high because of the unsanitary practices of handling fishery products in auction houses at places of origin and traditional markets across the nation, a shortage of cold chain capacity, false country-of-origin labeling, and concerns about the safety of imported fishery products. Hence, the government is striving to modernize distribution facilities and strengthen safety control for fishery products through the implementation of the Fisheries Innovation Plan 2030 in order to establish a culture in which consumers feel reassured about consuming fishery products. To this end, a number of projects are underway to increase cold chain facilities and vehicles, expand H-FAM (high-quality and hygienic fisheries auction market) hubs, innovate sanitation facilities in traditional markets, and strengthen the tracking of fishery products distribution history.

Fishery products brokerage, wholesale, and retail	Fishery products transportation and storage
- Fishery products brokerage (home and abroad) - Fishery products wholesale/retail - Aquarium fish and plats wholesale and retail	- Fishery products transportation - Refrigerated and frozen storage warehouse for fisheries

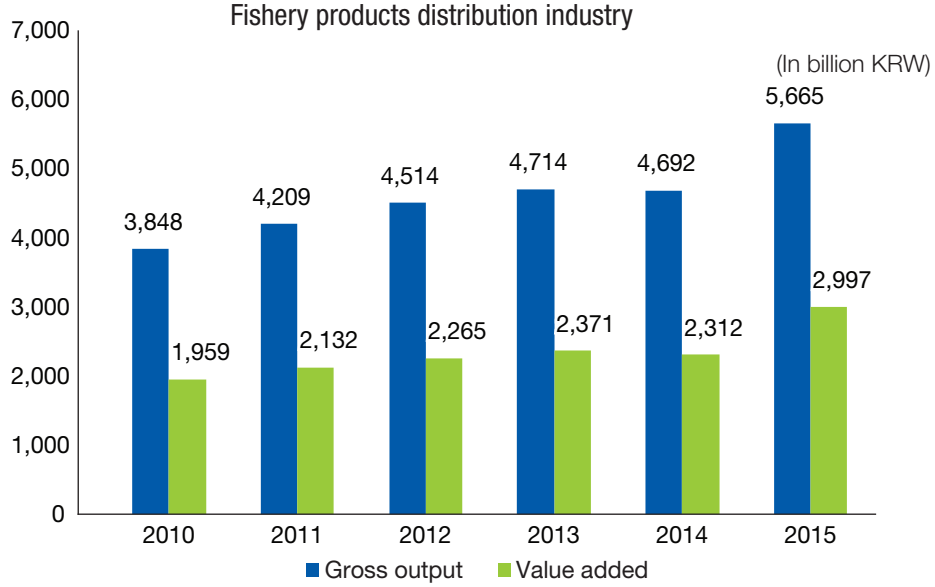
The gross output of the fishery products distribution in 2015 reached KRW 5,664.5 billion, an increase of 47.2% from 2010, while its GVA surged by 53.0% to KRW 2,997.3 billion over the same period, with its employment rising by 31.2% to 79,900.

Table 7. Output, value added and employment of the Fishery products distribution industry

(In billion KRW, thousand persons, %)

Category	2010 (A)	2011	2012	2013	2014	2015 (B)	Growth (B-A) / A
Gross output	3,848	4,209	4,514	4,714	4,692	5,665	47.2
Value added	1,959	2,132	2,265	2,371	2,312	2,997	53.0
Employment	60.9	62.8	64.6	64.5	65.8	79.9	31.2

Figure 5. Trends of the output, value added and employment of the Fishery products distribution industry



(2) Shipping Industry

The shipping industry is classified into passenger and freight transportation, and other shipping services supporting the transportation segments. Both transportation segments are divided into oceangoing transportation, which takes place outside and beyond the borders, and coastal transportation, which is available within the borders.

Other shipping services is divided into tug business, marine transportation brokerage services for marine freight or vessel chartering/hiring, shipping agency services to serve as an agent for a marine transportation service provider, ship leasing services to lease a ship owned by a person to another person, and ship management services to support the management of ships, lubricants, ship supplies and crew.

Passenger transportation	Freight transportation	Other shipping services
- Oceangoing passenger transportation - Coastal passenger transportation - Other passenger transportation	- Oceangoing freight transportation - Coastal freight transportation	- Tug business - Brokerage and agency - Ship lease - Ship management - Suppliers of lubricant and articles for ships

The type of business that represents the largest share of the shipping industry is oceangoing freight transportation. It can be broken down into container ship, dry cargo ship, oil tanker and special ship markets, depending on the characteristics of 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 export/import logistics infrastructure and contributes greatly to the development of national economy.

Korea's seaborne trade for exports and imports recorded 1,405.92 tons (915.5 million tons for imports, 490.41 tons for exports) in 2018, which means that 99.7% of total trade (exports and imports) was carried over the seas. About

150 shipping carriers are in business to transport export and import cargoes. In 2018 alone, these 150 or so carriers grossed KRW 32,264.8 billion in revenue from export/import freight transportation and marine transportation services for third-country markets. This revenue includes foreign exchange earnings worth USD 15.7 billion earned through export cargo and freight for third countries. When foreign exchange earnings from passenger transportation and ship leasing are added to this, the total foreign exchange earned by the oceangoing transportation industry in 2017 amounts to USD 19.7 billion.

The oceangoing freight transportation industry in particular faces the high risk of fluctuations in market prices, such as freight rates and ship prices, due to global economic fluctuations and inelastic ship supply. To manage such market risks, carriers and shippers enter into long-term contracts, and freight rate derivatives are offered in the dry cargo ship and oil tanker markets.

On the other hand, the total freight transported by the domestic coastal transportation industry is 109.37 million tons as of 2018. A total of 780 coastal freight transportation operators own a total of 2,013 ships. In comparison, a total of 14.63 million passengers traveled using coastal transportation services in 2018. A total of 69 coastal passenger transportation operators own a total of 166 vessels.

The shipping industry is in desperate need of reconstruction. In 2016, Hanjin Shipping, which was the largest container carrier in Korea, filed for court receivership and was liquidated in 2017. To restore the industry to a level that fits the status of Korea as a trade nation, it is urgent for both the government and industry to devote greater efforts together. Hence, the government founded the Korea Ocean Business Corporation in July 2018, to support carriers for ship financing and effectively carry out the implementation of Mandatory National Marine Transport programs and the provision of vessel scrapping subsidies.

Meanwhile, the Ballast Water Management Convention of which the enforcement was deferred by two years in 2017 entered into force in September 2019, and regulations on sulfur oxide (SOx) emissions are also expected to be reinforced further. It should be particularly noted that the SOx regulations will force shipping companies to switch to low-sulfur fuel such as LNG or install scrubbers

to remove sulfur oxides. Carriers are bound to incur costs, whichever option they may choose. Under the circumstances, what choice carriers will make and how they will raise funds to cover the costs are emerging as big issues in the industry.

In 2015, the shipping industry produced a gross output of KRW 32,862.5 billion, down by 14.1% from 2010, whereas its GVA recorded KRW 6,946.5 billion, posting a growth of 29.8% over 2010. Its employment fell by 5.9% to 56,300 over the same period.

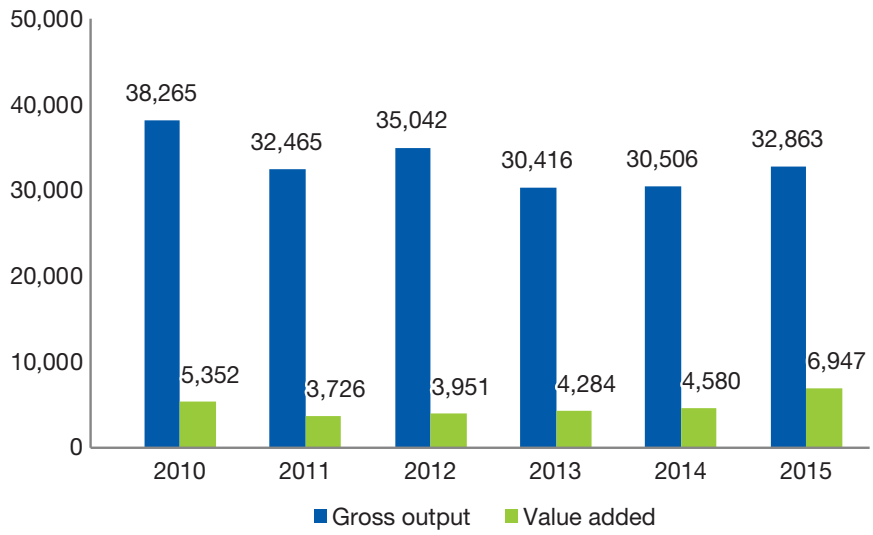
Table 8. Output, value added and employment of the Shipping industry

(In billion KRW, thousand persons, %)

Category	2010 (A)	2011	2012	2013	2014	2015 (B)	Growth (B-A) / A
Gross output	38,265	32,465	35,042	30,416	30,506	32,863	-14.1
Value added	5,352	3,726	3,951	4,284	4,580	6,947	29.8
Employment	59.8	59.9	70.7	72.7	70.3	56.3	-5.9

Figure 6. Trends of the output and value added of the Shipping industry

(In billion KRW)



(3) Port Industry

The port industry is categorized into two segments: port transport and support services to provide logistics services within a port and other port business to provide a wide range of incidental services.

The port loading and unloading, which offers services to load and unload international trade cargo and domestic coastal freight at a port, plays a very important role in the national logistics system. The port storage and warehousing business provides warehousing services for freight at a port, while the freight inspection, survey, and metage services business provide services to calculate the quantity of cargo, verify the delivery and acceptance of cargo, and measure cargo weights in the process of handling cargo at a port. The freight packaging business offers packaging services for freight, while the port and other marine terminal operations business provide terminal services. The supply of articles for ships provides food, supplies and spare parts to vessels coming to the port, and the port guard and security services business plays the role of protecting safety within a port.

In the meantime, other marine transport support services provide various support services such as pilotage, sea-fastening of cargo, and line handling.

Port transportation and support services	Other port business
- Port loading and unloading - Port storage and warehousing - Freight inspection, survey, and metage services	- Freight packing - Port and other marine terminal operation - Supply of articles for ships - Port security services - Other marine transportation support services

Korea's port cargo volume reported in 2018 is broken down into 490.41 million tons for exports, 915.5 million tons for imports, and 109.37 million tons for domestic coastal cargo. According to the Transportation Survey for 2017 published by Statistics Korea, the total number of enterprises engaged in water

freight handling (port loading business) is about 165 nationwide, generating KRW 3,048.7 billion in revenue with 14,427 persons on the payroll.

The Port of Busan is a major container transshipment hub in Northeast Asia, which serves North China above Shanghai, West Coast of Japan and many other regions with container cargo transshipment. As of 2018, Busan Port handled a total of 21.66 million TEU of which transshipment cargo amounts to 11.42 million TEU, accounting for 52.7% of the total. In 2018, the Port of Gwangyang handled 2.4 million TEU, serving as one of Korea's key logistics ports along the ocean routes for international trade. In the same year, the Port of Incheon handled 3.11 million TEU. Having outrun the Port of Gwangyang backed by increasing trade with China, Incheon has been growing into Korea's second largest container port in terms of handling volume.

The Korean port industry has many pending issues. First, the need for invigorating port hinterlands has emerged as a critical issue since ports started to be viewed as a logistics interface encompassing not just simple loading and unloading work but also value-added logistics activities in their hinterlands. Port authorities have been concentrating attention and efforts on value-added logistics activities to create jobs and earnings, fueled especially by the automation of loading, unloading and warehousing work.

Second, there are more loading service providers than competing ports, such as Singapore and Hong Kong. In other words, excessive competition in the port loading industry is another important issue to be resolved. In case of the New Port and North Port of Busan, it is reported that loading companies are staggering under heavy financial burdens as loading service rates continue to be pushed down by excessive competition.

Third, since the New Port of Busan started to rev up, a considerable portion of cargo handling has been transferred from the North Port to the New Port, giving rise to a new issue of how the North Port should be redeveloped.

Fourth, the automation of port loading work has triggered yet another critical issue: workforce restructuring. With automation drives underway, the port industry is struggling with the issue of reaching agreements on restructuring with port transport unions that provide dock workers.

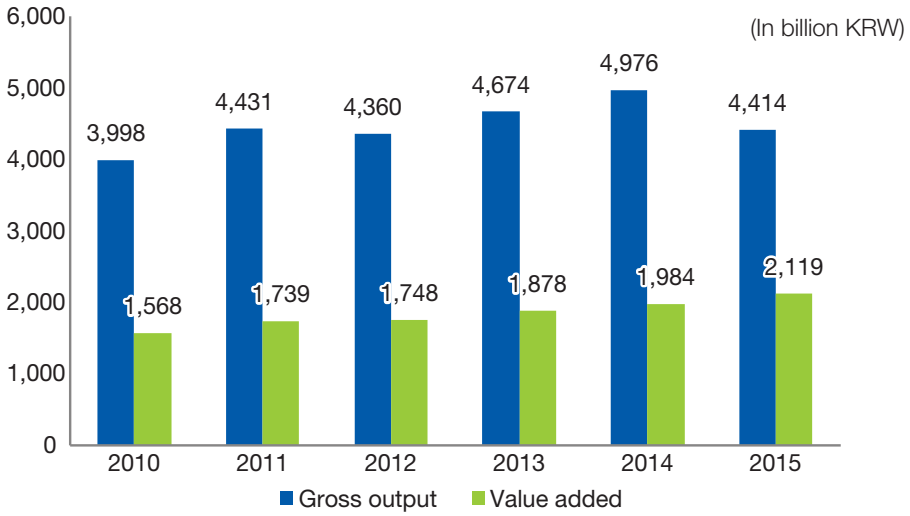
The gross output of the port industry in 2015 was reported at KRW 4,414 billion, growing at the rate of 10.4% over 2010, while its GVA climbed by 35.1% to KRW 2,118.6 billion compared with 2010, and its employment went up by 24.3% over 2010 to about 29,000.

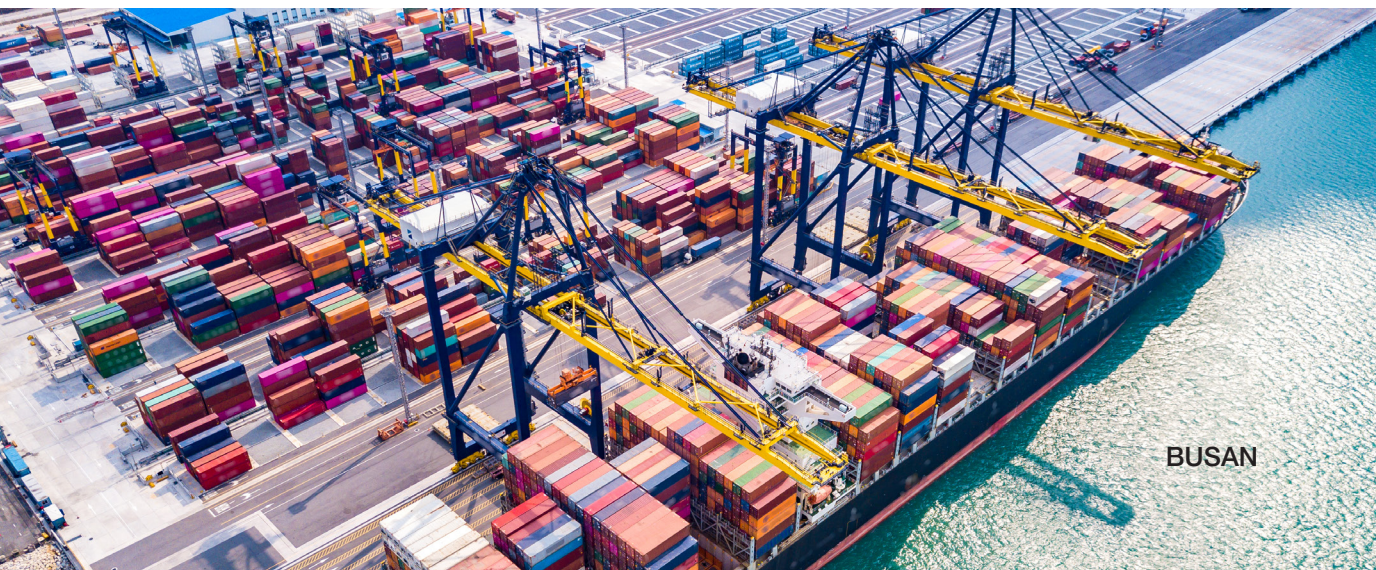
Table 9. Output, value added and employment of the Port industry

(In billion KRW, thousand persons, %)

Category	2010 (A)	2011	2012	2013	2014	2015 (B)	Growth (B-A) / A
Gross output	3,998	4,431	4,360	4,674	4,976	4,414	10.4
Value added	1,568	1,739	1,748	1,878	1,984	2,119	35.1
Employment	23.5	24.9	24.7	28.2	27.5	29.2	24.3

Figure 7. Trends of the output and value added of the Port industry





(4) Building and Repair of Ship and Offshore Plant

Building and repair of ship and offshore plant 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 arms. Korea's building of ship and offshore plant industry is driving the development of its global counterpart on the strength of its world-class competitiveness. According to Clarkson Research, a British shipbuilding and shipping market analysis agency, Korea clinched combined orders of 13.08 million compensated gross tonnage (CGT) out of the total global orders worth 31.08 million CGT, outracing China (10 million CGT) to take the top rank in 2018.

Building and Repair of ship and offshore plant is classified largely into building and repair of ship, building and repair of offshore plants and platforms, and manufacture of sections for ship and offshore plant. First, building and repair of ship is defined as industrial activities to build or repair all types of vessels that vary with their purposes ranging from freight or passenger transport, fishing and angling to special purposes such as medical, fire-fighting and security uses. Second, offshore plant and platform construction and repair refers to industrial activities to build or repair offshore plants, offshore oil-and-gas-producing structures, or non-seagoing ships. Lastly, ship and offshore plant component manufacturing can be defined as industrial activities to manufacture parts and components for various types of ships as well as offshore plants and platforms.

Building and repair of ship and offshore plant industry has the following characteristics. First of all, it has profound ripple effects on downstream industries that require vessels for their operations, such as shipping and fisheries industries, as well as upstream industries, such as steel, machinery, electricity, electronics and chemicals. Second, it creates a large number of jobs because not only design, production and control technologies but also advanced information technology (IT) is essential for the industry. Besides this, it is also critical for the industry to secure an adequate level of skilled labor since there are limitations in automating the great diversity of shipbuilding processes and

the process of constructing large-scale structures inherent in the industry. Third, it is a capital-intensive industry as it needs to be equipped with large-scale production equipment and facilities including fleet, docks and cranes. Fourth, it contributes greatly to the improvement of trade balance as the construction of high-priced export ships can generate high foreign exchange earnings and subsequently make high contributions to exports. Fifth, it is also very important from the perspective of national defense. There are many countries in the world that strive to maintain and develop ship and offshore plant construction into a national industry, regardless of its market competitiveness.

As for the Korean shipbuilding industry, which was hit hard by the global financial crisis, it has started showing signs of recovery since the beginning of 2019. According to the Ministry of Trade, Industry and Energy (2019), worldwide shipbuilding orders in the January-August period totaled 13.31 million CGT, and Korean shipbuilders racked up orders worth 4.64 million CGT, which put Korea in second place after China (5.02 million CGT). Moreover, if measured by the value of orders, Korean shipyards topped the list and outperformed China (USD 10.9 billion) by bagging orders worth USD 11.3 billion in total in the first eight months of this year. Given that it usually takes one to two years to build a ship and deliver on an order, it is considered that the Korean shipbuilding industry remains on a moderate recovery path.

Building and repair of ship	Manufacture of sections for ship and offshore plant
- Building and repair of cargo ship - Building and repair of fishing boat - Building and repair of other ship	- Manufacture of sections for cargo ship - Manufacture of sections for fishing boat - Manufacture of sections for other ship - Manufacture of sections for offshore plant and platform
Building and repair of offshore plant and platform	

The gross output of the building and repair of ship and offshore plant in 2015 totaled KRW 59,664 billion, recording a decrease of 10.3% from 2010. Its GVA also tumbled by 57.1% over 2010 to KRW 7,673 billion, with its employment at 120,700 in 2015.

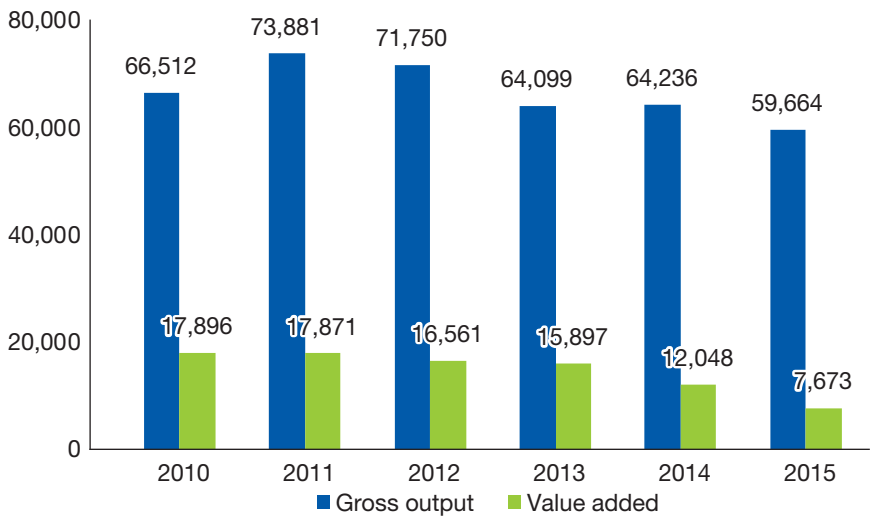
Table 10. Output, value added and employment of Building and repair of ship and offshore plant industry

(In billion KRW, thousand persons, %)

Category	2010 (A)	2011	2012	2013	2014	2015 (B)	Growth (B-A) / A
Gross output	66,512	73,881	71,750	64,099	64,236	59,664	-10.3
Value added	17,896	17,871	16,561	15,897	12,048	7,673	-57.1
Employment	120.3	131.3	118.8	125.9	131.4	120.7	0.4

Figure 8. Trends of the output and value added of the Building and repair of ship and offshore plant industry

(In billion KRW)



(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. It includes the designing and manufacturing of various types of equipment and materials 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. The production and international trade of marine and fisheries equipment have recently been expanding. At the same time, the industry's relationship with building and repair of ship and offshore plant which is inevitable under the industrial structure–has also been shifting gradually from the vertical relationship in the past to a horizontal one.

The marine and fisheries equipment manufacturing industry is divided largely into marine equipment manufacturing and fisheries equipment manufacturing. Marine equipment manufacturing is defined as ship-related equipment manufacturing such as radio navigational aid apparatus, deck machinery, and marine pollution prevention equipment; offshore plant-related equipment manufacturing such as drilling rigs, oil and gas processing equipment, and mooring equipment and facilities; marine leisure and sports equipment manufacturing such as surfboards and scuba gear; and other marine equipment manufacturing for exploring and developing marine resources, researching and analyzing oceans, and cleaning and restoring the ocean environment. On the other hand, fisheries equipment manufacturing refers to fishing equipment manufacturing for fishing such as cords, ropes and nets; fish processing equipment manufacturing; aquaculture equipment manufacturing such as feeds; and leisure fishing equipment manufacturing such as recreational fishing gear and baits.

Equipment and materials mounted on a vessel represent a very high percentage of the vessel price at about 55% to 65%. Therefore, they are generally considered to have great potential in creating practical and high value-added. The marine and fisheries equipment industry is characterized as follows. First, the hull forms

and types of vessels ordered are diverse, and the quantity requirements of certain equipment and materials per vessel are limited, making it difficult to standardize vessel equipment or materials. In response, the industry takes a “multi-item, small-sized production” approach. Second, a shipyard typically places equipment and material orders only after a certain period of time has passed since the acceptance of a shipbuilding order. Consequently, the construction period and delivery time are relatively short. Third, when entering a shipbuilding contract, the ship owner tends to designate specific brands for equipment and materials that are functionally crucial for the vessel. This makes it difficult for a newly-developed material or equipment to find its way into the market. Also, shipbuilders apply strict quality control standards as they have to meet diverse international standards on the durability, corrosion resistance and safety of a vessel.

Marine equipment manufacturing	Fisheries equipment manufacturing
- Ship-related equipment manufacturing - Offshore plant-related equipment manufacturing - Marine leisure and sports equipment manufacturing - Other marine equipment manufacturing	- Fishing equipment manufacturing - Aquaculture equipment manufacturing - Fish processing equipment manufacturing - Leisure fishing equipment manufacturing

In 2015, the marine and fisheries equipment manufacturing industry reported a gross output of KRW 5,850 billion, up by 31.7% over 2010. Over the same period, its GVA jumped by 41.5% to KRW 1,636 billion, while its employment rose by 5.6% to 16,800.

Table 11. Output, value added and employment of the Marine and fisheries equipment manufacturing industry

(In billion KRW, thousand persons, %)

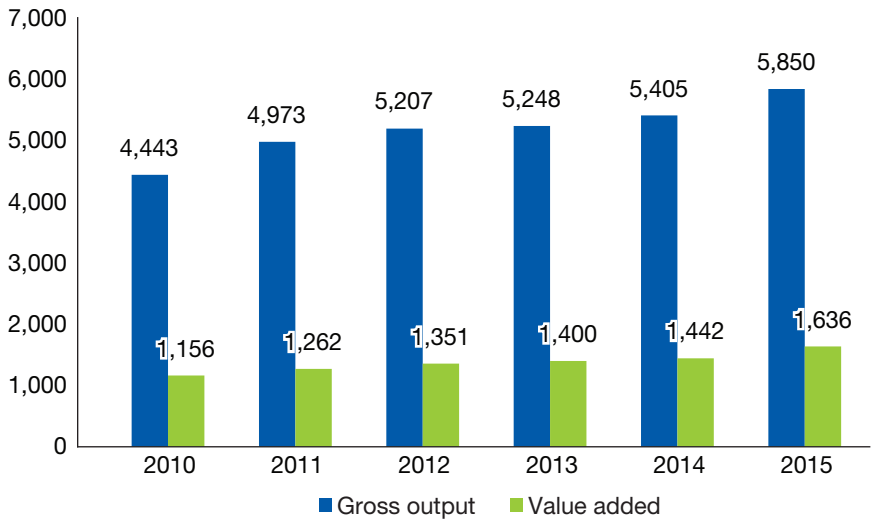
Category	2010 (A)	2011	2012	2013	2014	2015 (B)	Growth (B-A) / A
Gross output	4,443	4,973	5,207	5,248	5,405	5,850	31.7
Value added	1,156	1,262	1,351	1,400	1,442	1,636	41.5
Employment	15.9	16.9	16.9	17.8	18.7	16.8	5.6



Gohyeon, GEOJE

Figure 9. Trends of the output and value added of the Marine and fisheries equipment manufacturing industry

(In billion KRW)



(6) Marine Resources Development and Construction

The marine resources development and construction industry involves activities to mine, process and supply marine mineral and other water resources from coasts and oceans, activities to produce marine bio-products, and the construction of ports, bridges, and offshore plants and structures.

Korea harvests sand and mines and extracts offshore oil and natural gas in its coasts and exclusive economic zone (EEZ). Sea sand accounts for over 10% of total aggregate supply in Korea, but the issue of resource depletion led the government to announce a policy in 2017 to reduce use of sea sand. It also plans to reduce sea sand mining gradually by 2022. Deep-sea water is also mined to produce diverse 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 seawater temperature differences. The share of marine energy in renewable energy is about 1.1%.[4] The marine biotechnology industry[5] includes businesses to produce marine bio food products, pharmaceuticals, and chemical products (cosmetics).

Korea's marine construction industry is mostly engaged in constructing and maintaining ports, building structures to protect the coastlines under coast improvement programs[6], reclaiming land, and constructing offshore plants as well as building bridges and laying submarine cables.

Marine resource development	Marine construction
- Extraction of marine mineral - Seawater processing and supply - Marine renewable energy development - Marine bio-products manufacturing	- Port and marine bridge construction - Offshore plant and structure construction

The gross output of the marine resources development and construction industry as of 2015 is KRW 4,623.3 billion, taking up 3.1% of the total gross output of the marine and fisheries sector (KRW 147.9068 trillion), while its GVA accounts for 5.2% of that of the entire sector (KRW 38.3902 trillion).

Recent changes in the marine resources development and construction industry show that its gross output increased 26.3% from KRW 3,660.4 billion in 2010 to KRW 4,623.3 billion in 2015, with its GVA jumping 36.3% from KRW 1,473.4 billion to KRW 2,008 billion over the same period. The industry employment increased 31.3% from 15,100 in 2010 to 19,800 in 2015, picking up again in 2015 after a temporary dip in 2014. This fluctuation over the two years is considered to be caused by the fluctuation in the marine construction sub-industry, which represents a large share of the marine resources development industry.

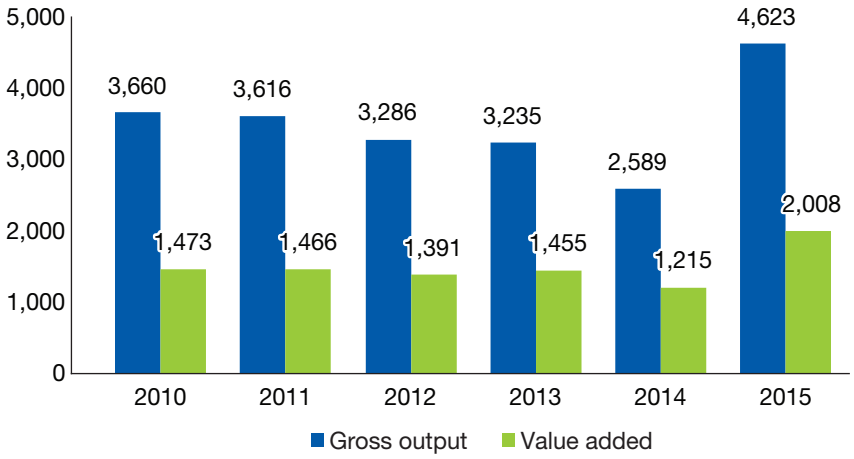
Table 12. Output, value added and employment of the Marine resource development and construction industry

(In billion KRW, thousand persons, %)

Category	2010 (A)	2011	2012	2013	2014	2015 (B)	Growth (B-A) / A
Gross output	3,660	3,616	3,286	3,235	2,589	4,623	26.3
Value added	1,473	1,466	1,391	1,455	1,215	2,008	36.3
Employment	15.1	18.7	18.7	16.8	13.7	19.8	31.3

Figure 10. Trends of the output and value added of the Marine resource development and construction industry

(In billion KRW)





Sihwa, GYEONGGI

(7) Marine Leisure and Tourism

Marine leisure and tourism is defined as "activities taking place for tourism purposes in communities near or adjoining the sea and coast" and relying directly or indirectly on ocean space.[7] It can also be defined separately from two different perspectives, 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 exists a living sphere or sphere of activity, which was formed with the sea as a medium. 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, sea or under the sea as well as all other businesses related to them can be defined as the marine leisure and tourism industry.[8] Also included are marina, cruise, marine amusement park and theme park, maritime museum, and marine nature park operations as well as marine tourism such as the fishing and tourism business. In 2010, the Ministry of Oceans and Fisheries(MOF) developed its First Marina Port Framework Plan (2010-2019) to initiate the systematic development of marina ports and revised the plan (2015-2019) later. The MOF designated seven marina ports and 58 reserved marina port areas across the country. Currently, marinas are in operation in 16 out of the 58 areas designated under the Framework Plan, with 42 scheduled for development.[9] There are 260 MOF-designated beaches nationwide as of 2018, with the annual number of visitors estimated at about 103.3 million in 2017.[10] Fishing, one of the segments that represent the leisure and tourism industry, has recently been showing a growth trend with both fishing boats and users growing significantly. The number of fishing boat users has almost doubled as it soared by 99.5% from 2.248 million in 2010 to 4.484 million in 2019.[11]

The gross output of the marine leisure and tourism industry is KRW 1,146.5 billion as of 2015, accounting for 0.8% of the total gross output of the entire

11) Ministry of Oceans and Fisheries (2018), p.2

marine and fisheries sector (KRW 147.9 trillion), whereas its GVA totals KRW 533.1 billion, accounting for 1.4% of the sector (38.4 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.

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

The gross output of the marine leisure and tourism industry in 2015 dropped from KRW 1,255.1 billion in 2010 to KRW 1,146.5 billion in 2015. By contrast, its GVA jumped significantly from KRW 362.7 billion in 2010 to KRW 533.1 billion.

Table 13. Output, value added and employment of the Marine leisure and tourism industry

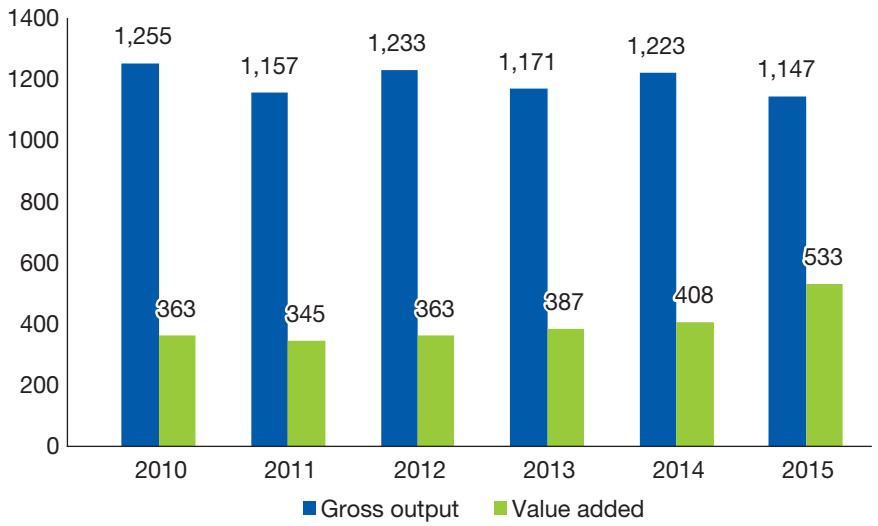
(In billion KRW, thousand persons, %)

Category	2010 (A)	2011	2012	2013	2014	2015 (B)	Growth (B-A) / A
Gross output	1,255	1,157	1,233	1,171	1,223	1,147	- 8.7
Value added	363	345	363	387	408	533	47.0
Employment	9.6	9.9	10.4	10.7	11.0	9.6	0.0



Figure 11. Trends of the output and value added of the Marine leisure and tourism industry

(In billion KRW)



(8) Marine and Fisheries Services

The marine and fisheries services industry is defined as “industrial activities to provide professional services specializing in marine and fisheries industries, such as information, finance, insurance, law, management consulting, and lease services.[12] According to the Marine and Fisheries Industry Special Classification Definitions approved by Statistics Korea, this industry includes marine waste management and remediation activities, marine and fisheries equipment wholesale and retail, marine and fisheries equipment repair, activities of employment placement agencies and provision of HR for marine and fisheries, marine and fisheries education and training services, marine and fisheries professional, science and technology services, marine and fisheries finance and insurance, marine and fisheries membership organizations, and fish and seafood restaurants.

It can also be classified according to the types of services offered in the field of marine 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).

- Marine waste management and remediation activities - Marine and fisheries equipment wholesale and retail - Marine and fisheries equipment repair - Activities of employment placement agencies and provision of HR for Marine and fisheries - Marine and fisheries education and services	- Marine and fisheries science and technology services - Marine and fisheries finance and insurance - Marine and fisheries membership organizations - Fish and seafood restaurants

As of 2015, the gross output of the marine and fisheries services industry

totals KRW 16,589.3 billion, taking up about 11.2% of the total gross output of the entire sector (KRW 147.9 trillion), whereas it posts a GVA of about KRW 10 trillion, accounting for 26.0% of the GVA of the entire sector (KRW 38.4 trillion). The gross output grew from KRW 12,350.9 billion in 2010 to KRW 16,589.3 billion in 2015, with the GVA on a steady upward path.

Table 14. Output, value added and employment of the Marine and fisheries services industry

(In billion KRW, thousand persons, %)

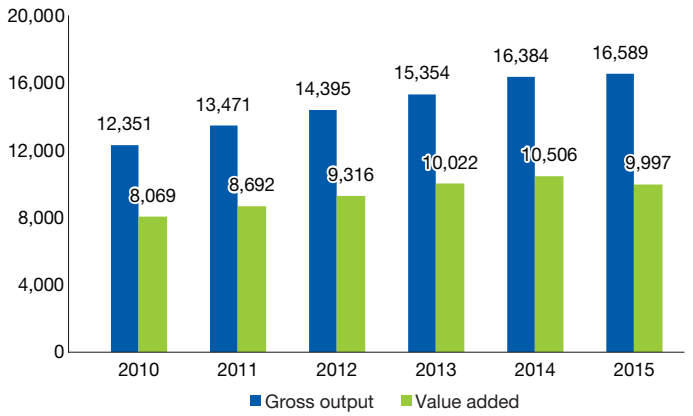
Category	2010 (A)	2011	2012	2013	2014	2015 (B)	Growth (B-A) / A
Gross output	12,351	13,471	14,395	15,354	16,384	16,589	34.3
Value added	8,069	8,692	9,316	10,022	10,506	9,997	23.9
Employment	151.7	157.3	164.4	168.7	172.1	167.9	10.7

The gross output and value added of marine and fisheries services are mostly on the increase, but GVA posted a slight year-on-year decline in 2015.

The gross output increased 34.3% from KRW 12,350.9 billion in 2010 to KRW 16,589.3 billion in 2015, while its GVA rose 23.9% from KRW 8,068.9 billion in 2010 to KRW 9,997.3 billion in 2015. Employment went up 10.7% from 151,700 in 2010 to 167,900 in 2015.

Figure 12. Trends of the output and value added of the Marine and fisheries services industry

(In billion KRW)





Haeundae, BUSAN

4. Conclusions

In order to ensure the future development of Korea's ocean economy, it is necessary to diagnose the past and present states of its ocean economy and to forecast the future. To this end, the Economy and Industry Research Office of the Korea Maritime Institute conducted research to diagnose and analyze the ocean economy of Korea. It created new Input-Output Tables (2010-2015) focusing on the marine and fisheries sector and identified the size and industrial structure of the sector based on them.

The gross output of the marine and fisheries sector in 2015 is estimated at about KRW 147.9 trillion, with its gross value added at about KRW 38.4 trillion. Compared with 30 highest-level sectors, the marine and fisheries sector ranks in 9th place in gross output and 15th in value added. The gross output of marine and fisheries accounts for 42.8% of that of the No. 1 sector (electric and electronic equipment including semiconductors, KRW 345.4 trillion), 71.2% of the construction sector (KRW 207.9 trillion), 77.8% of the automotive sector (KRW 190.1 trillion). It is also about 2.7 times bigger than agriculture and livestock (KRW 54 trillion). In terms of value added, Korea's marine and fisheries are specialized in the manufacturing and service sectors, unlike the word's marine and fisheries structure, which is mainly focused on offshore oil and gas mining and marine tourism. Time-series trends indicate that the (direct) GVA dipped from KRW 42.4 trillion to KRW 38.4 trillion over the 2010-2015 period due to the economic recession of global shipping and shipbuilding industries. The downturn in the two industries, which when combined takes up a large share, worked as a trigger to increase variability in the sector. If the shipbuilding industry is excluded, however, the sector grew from KRW 24.5 trillion in 2010 to KRW 30.7 trillion in 2015 at an annual average of 4.7%.

The research team makes the following proposals as policy directions to seek the growth of the ocean economy of Korea:

First of all, we should pay keen attention to the industries with high value-

added and employment-to-GDP ratios, namely fishery products distribution, port industry, marine leisure and tourism, and marine and fisheries services. As they have greater effects on value-added and job creation than other industries, they are expected to be more effective in policy implementation, and they also present great promise for future growth. For this reason, it is urgent to develop growth strategy for these industries.

Second, policy support is required to maintain and expand the quantitative scales of major industries that account for large shares of the sector, such as shipping, shipbuilding, port and fisheries. With regard to fisheries, it is urgent to strengthen the competitiveness of the distribution industry and turn fish processing into a high-value-added industry. As for shipping and shipbuilding, the industrial community should seek to develop win-win strategies, while the government should explore diverse industrial policies to provide support for R&D and link the industries with other related service industries such as finance and legal services.

Third, the marine leisure and tourism industry has great growth potential in terms of value added and employment although it currently represents only a small share of the sector in quantitative terms. It requires growth strategy that takes into consideration leisure trends and demand for marine leisure activities in the future. For this purpose, it is necessary to develop a plan to quantify the industrial size and thus figure out the scale of activity on both consumption and supply sides.

Lastly, the marine and fisheries services industry is creating the most jobs and expected to grow further in the future on the strength of its high value-added ratio (VAR). It is necessary to provide policy support and train professionals for the purpose of nurturing the professional, science and technology services segment.

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

High-level classification	Mid-level classification	Low-level classification
Fisheries production	Fisheries	Marine fisheries
		Freshwater fisheries
	Aquaculture	Marine aquaculture
		Inland aquaculture
		Aquarium fish and plants business
	Services incidental to fisheries and aquaculture	Services incidental to fisheries and aquaculture
	Salt production	Salt production
Fish processing	Fish processing	Fish processing and preservation
		Seaweed processing and preservation
		Salt processing
		Other fish processing
Fishery products distribution	Fishery products brokerage and wholesale/retail	Fishery products brokerage
		Fishery products wholesale/retail
		Aquarium fish and plants wholesale/retail
	Fishery products transportation and storage	Fishery products transportation
		Refrigerated and frozen storage warehouse for fisheries
Shipping and port industries	Shipping industry	Passenger transportation
		Freight transportation
		Other shipping services
	Port industry	Port transportation and support services
		Other port business
Building and repair of ship and offshore plant	Building and repair of ship	Building and repair of cargo ship
		Building and repair of fishing boat
		Building and repair of other ship
	Building and repair of offshore plant and platform	Building and repair of offshore plant and platform
	Manufacture of sections for ship	Manufacture of sections for cargo ship
		Manufacture of sections for fishing boat
		Manufacture of sections for other ship
		Manufacture of sections for offshore plant and platform
Marine and fisheries equipment manufacturing	Marine equipment manufacturing	Ship-related equipment manufacturing
		Offshore plant-related equipment manufacturing
		Marine leisure and sports equipment manufacturing
		Other marine equipment manufacturing
	Fisheries equipment manufacturing	Fishing equipment manufacturing
		Aquaculture equipment manufacturing
		Fish processing equipment manufacturing
		Leisure fishing equipment manufacturing

High-level classification	Mid-level classification	Low-level classification
Marine resources development/ construction	Marine resources production, supply, and development	Extraction of marine mineral
		Seawater processing and supply
		Marine renewable energy development
	Marine bio-products manufacturing	Marine bio-products manufacturing
	Port and sea-crossing bridge construction	Construction of port
		Construction of sea-crossing bridge
	Marine and fisheries plant and structure construction	Construction of marine plant and structure
		Installation and construction aquaculture facility and artificial reef
Marine leisure and tourism	Marine leisure and tourism	Marine leisure facility operation
		Marine tourism facility operation
	Fisheries leisure and tourism	Fishing tourism
		Other fisheries leisure tourism
Marine and fisheries services	Marine waste management and remediation activities	Marine waste management and remediation activities
	Marine and fisheries equipment wholesale and retail	Marine leisure and sports equipment wholesale and retail
		Offshore plant and other equipment wholesale and retail
		Leisure fishing equipment wholesale and retail
		Ship, vessel components, and related equipment brokerage, wholesale, and retail
	Marine and fisheries equipment repair	Fisheries and aquaculture equipment wholesale and retail
		Fish processing machine wholesale
		Marine equipment repair
		Fisheries equipment repair
	Activities of employment placement agencies and provision of HR for marine and fisheries	Activities of employment placement agencies and provision of HR for marine and fisheries
	Marine and fisheries education and services	Marine and fisheries education and services
	Marine and fisheries science and technology services	Marine science and technology services
		Fisheries science and technology services
		Marine R&D
		Fisheries R&D
		Marine and fisheries publishing and information system development
	Marine and fisheries finance and insurance	Marine and fisheries finance and insurance
	Marine and fisheries associations and organizations	Marine and fisheries associations and organizations
	Fish and seafood restaurants	Fish and seafood restaurants

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

High-Level Industry Classification	Output (USD millions)	Value-added (USD millions)	Employment
Fisheries production	6,558.8	2,573.5	51,342
Fish processing	8,547.4	1,387.2	44,211
Fishery products distribution	5,006.4	2,649.0	79,902
Shipping industry	29,044.4	6,139.4	56,285
Port industry	3,901.1	1,872.5	29,165
Building and Repair of ship and offshore plant	52,732.0	6,781.1	120,747
Marine and fisheries equipment manufacturing	5,170.5	1,445.7	16,843
Marine resource development and construction	4,086.1	1,774.4	19,803
Marine leisure and tourism	1,013.3	471.1	9,598
Marine and fisheries services	14,661.9	8,835.8	167,972
Total	130,722.1	33,929.8	595,868

Note: USD 1 = KRW 1,131.46 in 2015



Ganghwa-gun, INCHEON

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