

# Policy Recommendation on deficient Supply of Seafarers in Korea

-Focusing on oversea transportation services-

Yong-An Park\*

## ABSTRACT

Seafarer is a driving force for various maritime industries and business activities such as merchant shipping, fishing, ship operation and management, safety management of ships and ports, pilotage, tug boat service, maritime distress judgment, marine insurance and dynamic positioning of oil and offshore vessels. Globally, there are common issues of seafarers: continual reduction of seafarers in developed countries such as the UK, Norway, Germany, France, and Korea; aging of seafarers; multi-nationalities on board a ship; and hence globalization of manning. The case of Korea adds a peculiarity in supply of seafarers: high separation rate and alternative service for compulsory military service as a main reason of becoming seafarer. Following the main results of Analytical Hierarchy Process (AHP) with a questionnaire on supply side of seafarer policy, the paper prioritizes income tax reduction among policy measures at first, then looks in the order of alternative service of military service, career management, improvement of working condition, order of industrial service merit, and drama or film starred by the actors of Korean seafarers respectively.

**Keywords:** Seafarer, supply, policy, separation rate, aging, Korea

---

\* Research Fellow at KMI, first and corresponding author, yapark@kmi.re.kr

# 1. Introduction

Seafarer as a job has difference with other jobs on land and ashore. The works of seafarers are performed on board and should be guarded by law, international agreements and convention. The adept skills of operating ships can be developed after a lengthy experience on board. The issues of seafarers are related with being a human on the one hand. On the other hand, those include also business activity and management in maritime industries. Seafarer is a key human resource of the maritime industries. It is a driving force for various maritime industries and business activities such as merchant shipping, fishing, ship operation and management, safety management of ships and ports, pilotage, tug boat service, maritime distress judgment, marine insurance and even dynamic positioning of oil and off-shore vessels (Gardner and Pettit, 1999a; Gardner and Pettit, 1999b). A stable supply of seafarers helps maritime industries keep their long-term growth. The harmonious composition of seafarers by duty, age and skill may play an essential for the growth of various maritime industries.

In the global trend of maritime manning, we could find major issues: continual reduction of seafarer in developed countries such as the UK, Norway, Germany, France, and Korea; aging of seafarers in developed countries; multi-nationalities and multi-culture on board a ship; and hence globalization of manning (Wu and Winchester, 2005; Progoulaki and Theotokas, 2010, 580; Silos et al., 2012; Thai et al., 2013). Korea has shown similar phenomena since the 1990s. Nowadays, the continual reduction and aging of seafarers can bring problems and bottlenecks in manning and affect indirectly marine incidents. Furthermore, the wide use of internet and social network service (SNS) tend to isolate the seafarer on board who have not enough access to internet and should sail while being spatially separated from family life.

Although Korea ranks 6<sup>th</sup> in the world fleet, it has suffered a shortage of seafarer supply, high rate of separation, aging of seafarer, and multi-culture among crews. The number of Korea's employed seafarers has decreased to 37,000 in 2014, down from 106,000 in 1990, and 50,000 in 2000. Furthermore, the number of seafarers is going to decrease and partial shortage of supply may extend further. As we saw in the marine disaster of car-ferry Sewol in 2014, one problem was aged seafarers involved in coastal transportation services. The aging trend of seafarers will be recognized as a crucial problem against keeping key officers and a supply of seafarers in the future. To curb this serious trend of aging seafarers is an urgent task for the government in order to maintain a strong base for the maritime industries. In addition, female seafarers are small in percentage, and their recruitment and working condition on deck are another essential part of Korea's seafarer policy.

This paper aims at reviewing issues of seafarer supply in the world and Korea, summarizing existing policies, assessing the policy measures for deficient supply of Korean seafarers after evaluating priority criteria by AHP analysis, and making recommendations and suggestions to policy makers. The paper is constructed as follows: Section II includes the literature review on the supply of seafarer, the research architecture and the methodology of the paper. Section III describes the issues and problems of Korea's seafarer policy. Section IV evaluates the priority of policy measures emphasized in the literature review and the existing policy of the Korean government after interpreting the results of AHP analysis. Section V concludes this paper.

## 2. Literature review and methodology

### 2.1 Literature review

Shipping moves about 90% of world trade (Chavin et al., 2013). Hence, the proper supply of workforce for seafaring will be a contributor of the continual growth of the world trade and economy. In a maritime country, we could find similar problems and trends in seafaring, such as shortage of officers or seafarers (Ng and Yip, 2006; Silos et al., 2012; Thai et al., 2013). As in the case of reduction of seafarer in the UK, a stable supply of seafarers, human capital for maritime industries is an essential factor for their long-term growth (Gardner and Petitt, 1999a; Thai et al., 2013). A severe decline in the number of seafarers makes a subsequent effect on businesses in the maritime related sector. Gardner and Petitt grouped maritime related businesses of land based into several categories: port, ship owners, shipbuilders, ship repairs, offshore, consultants, ship/cargo broking and other related activities shown as in the Appendix 1. (Gardner and Petitt, 1999a; Gardner and Petitt, 1999b).

The composition of seafarers by duty, age, and skill should be examined and be made ready to be available at the right time for various maritime industries (Glen and McConville, 2001a). These industries include the merchant marine, pilotage, overseas jobs, ship management, and offshore plants. The number of seafarers has been decreasing continually, but their stable supply is necessary for revival of maritime industries. In the review of Greek shipping companies, Progoulaki and Theotokas (2010) as listed in Table 1 suggest that integrated framework for managing human resources builds sustainable competitive advantage in maritime industry.

**Table 1.** Literature review on supply and demand of seafarers

Author	Subject	Major conclusion and suggestion
Gardner and Petitt, (1999a); Thai et al., (2013)	Analysis on reduction of seafarer in U.K	A stable supply of seafarers, human capital for maritime industries is an essential factor for their long-term growth.
Glen and McConville, (2001a)	Qualification of seafarers	A composition of seafarers by duty, age, and skill should be made ready to be available at the right time for various maritime industries.
Progoulaki and Theotokas, (2010)	Review of Greek shipping companies	An integrated framework for managing human resources builds sustainable competitive advantage in maritime industry
Ng and Yip, (2006).	Maritime education in Hong Kong	Lower attractiveness of seafarer to young generation and high separation ratio are critical points to redesign program of maritime education
Jeong (2004)	Policy suggestion of supply and demand of seafarers in Korea	Lowering of high separation rate is key solution to deficient supply.
Jun (2013)	Working condition of foreign seafarer in Korea	Suggestion of open provisions where a collective bargaining agreement can be approved by the competent authority.
Hwang (2007)	Improvement of supply and demand of seafarers in Korea	Career management of seafarers in Korea

In maritime safety, human factor related with seafarer is one of triggers to marine incidents in navigation in open sea and navigation with a pilot on board near a port (Chavin et al., 2013). Lower attractiveness of seafarer to young generation and high separation ratio of seafarer in maritime industry are critical points to redesign program of maritime education in Hong Kong (Ng and Yip, 2006). Maritime educational institutions have faced a necessity of program development which satisfies both the international standards such as International Convention on Standards of Training, Certification and Watchkeeping for Seafarers (STCW), and management skills in maritime related businesses ashore (Ng and Yip, 2006).

In Korea, the literature on supply and demand of seafarers has mainly covered the vision and action plans for balancing the supply and demand. The Korea Maritime and Port Administration (KMPA) initiated the vision, basic aims and action plans of the Korean government's policy in 1979. KMPA stressed the sufficient supply for export-driven economy, the balance between officers and ratings, and the promotion of boarding on foreign flag ships. Nevertheless, the policy agendas have been diversified into improvement of attractiveness of seafarer, reconsideration of seafarer policy, deficiency in supply, balancing supply and demand, working condition of foreign seafarer, and foreign seafarer in domestic merchant ships since the 1990s (Korea Maritime Institute, 2000; Jeong, 2004; Hwang, 2007; Kim, 2012; Jeon, 2013).

Recently, the Korea Marine Officers Association published the results of survey on the opinion of lifestyle and working condition of merchant marine seafarers in 2014 (Lim, 2015). The survey illustrates the following opinion of seafarers: the main attractiveness of seafarers would be a higher wage in comparison with the wage on land, less working days on board and more leave days, and career management for getting jobs on land; the main causes of separation from seafarers are stoppage of family life and society, and low wage.

Since Korea has similarities on supply of seafarer with other advanced maritime countries, this paper refers to the literature and tries to specify issues and problems in Korean cases. In Korea, the governmental involvement by financing seafarer education institutions has been typical. Therefore, it is crucial for policy makers to implement a proper policy action on seafarers' issues. The paper underlines the peculiarity of Korean seafarers and its improvement.

## 2.2 Methodology

This study starts from the collection of policy agendas in the literature as shown in Figure 1, arranges these issues after interviewing trainees and students in the Korea Institute of Maritime and Fisheries Technology (KIMFT) in 2016, and considers their needs. The process gives us main action plans and agendas for improving the deficient supply of seafarers in Korea. Since the action plans of seafarer policy necessitate mostly government budget, with some exceptional action plans such as the order of industrial service merit, we need elements of financial evaluation and selection criteria on policy projects. While inputting elements of financial evaluation and selection criteria on policy projects and using the Analytical Hierarchy Process (AHP) method, the paper could rank the action plans and policy agendas in accordance with the

evaluation criteria.

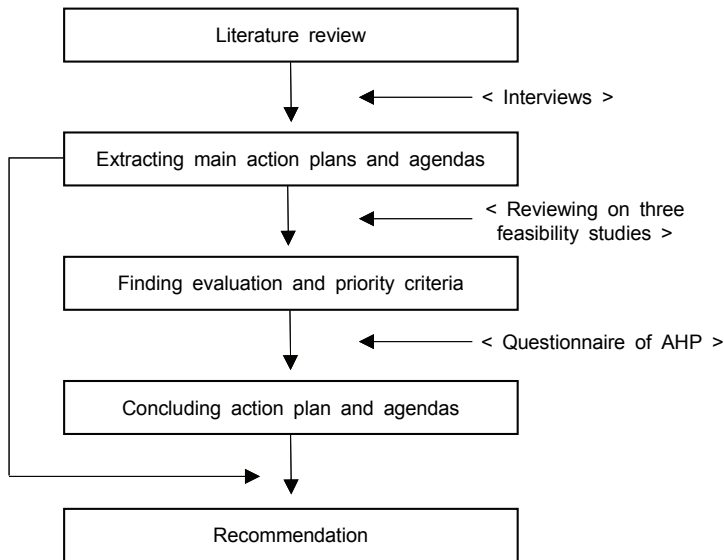


Figure 1. Research flow

The paper refers to the studies by the Korea Development Institute (KDI) in order to deduce evaluation criteria on policy measures of deficient seafarer while policy measures as a welfare project necessitate a feasibility study for allotting government budget. KDI is designated by the Korean government to evaluate Private-Public Partnership (PPP) projects in Korea and to study feasibility study on the projects.

We can find 502 cases of the feasibility and pre-feasibility study on policy projects in Korea since 2009, which have been implemented by KDI and inform us the elements of financial evaluation and selection criteria on policy projects (Kim et al., 2011). The 502 cases mainly comprise the PPP projects of social overhead capital (SOC) construction such as port, highway, and education building, and three welfare projects for the minority group such as pregnant women, young people, and family with a single parent (Korea Development Institute, 2016). From these three feasibility studies on welfare project, the paper concludes and adjusts the evaluation elements and selection criteria on seafarer policy in Korea.

The feasibility study on welfare project for a family with a single parent assesses three categories of evaluation criteria: suitability of service contents; policy consistency and promotion commitment; and service promotion risk. Meanwhile, the feasibility studies on welfare project for pregnant women and teenagers evaluate two categories: suitability of service contents and effectiveness of projects. Since the paper aims at suggesting action plans and policy agendas of seafarer supply, we can select suitability of service contents and effectiveness of projects as priority criteria, deleting policy consistency and promotion commitment, and service promotion risk which should be considered under the situation where welfare projects are already decided.

### 3. Present status and issues

The paper abstracts main issues of seafarer supply and demand in Korea into three phenomena: shortage of seafarer supply; aging of seafarer; and high separation rate. Although these issues seem to be interacted with each other, the issues of deficient supply and aging of seafarer in Korea are mainly related with high separation rate of young seafarers around the fifth year after graduation.

#### 3.1. Shortage of seafarer supply

The number of Korea's overseas seafarers has decreased to 37,000 in 2014, down from 106,000 in 1990, and 50,000 in 2000 (Korean Seafarers Welfare and Employment Center, 2014). Foreign flagged Korean seafarers drastically decreased to 3,000 in 2014, from 36,000 in 1990 and 6,000 in 2000. The duties of seafarers are classed as deck officer, engineer, and radio officer, and rating. According to the forecast of demand and supply of seafarer by Ministry of Oceans and Fisheries (MOF) of Korea, shortage of seafarer will amount to 26,763 in 2020 and 34,860 in 2030 which include numbers of merchant marine in oversea transportation services and coastal transportation services, fishing, and foreign flag vessels as listed in Table 2 (MOF, 2013). This long term shortage of seafarer will weaken the competitiveness of maritime industries in Korea and be one of the global issues.

**Table 2.** Forecast of Demand for Korea Seafarer

Year / Area		Demand	Supply	Shortage
2015	Oversea transportation services	20751	9709	-11043
	Coastal transportation services	10516	8988	-1529
	Fishing	22160	15708	-6452
	Foreign flag vessels	5926	2832	-3094
	Total	59353	37236	-22117
2020	Oversea transportation services	22927	10499	-12428
	Coastal transportation services	10897	8876	-2020
	Fishing	20777	13170	-7607
	Foreign flag vessels	6586	1878	-4708
	Total	61187	34423	-26763
2030	Oversea transportation services	26146	11350	-14796
	Coastal transportation services	11496	8998	-2498
	Fishing	21029	8277	-12752
	Foreign flag vessels	5786	972	-4814
	Total	64457	29597	-34860

**Note:** The paper adopts the categories of marine transportation services in the Article 23 (Categories of Services) of Marine Transportation Act.

**Source:** MOF (2013).

Demand for seafarers has been differentiated into various fields, such as merchant marine operation, ship management, safety management, port operation, pilotage

service, management and operation of offshore plants, and coast guard. Seafarers are employed in various maritime positions ashore, including maritime safety supervisor (Article 58, Maritime Safety Law), pilot (Pilotage Act), and manager for safe operation of passenger ships (Article 22, Marine Transportation Law). The related industries with seafarers are specialized globally. For example, the Korean ship management industry held an industry introduction meeting in Japan after the enactment of the Ship Management Industry Development Act in 2013 and seeks to enter the Greek shipping market, the world's top shipping nation. This new maritime industry also requires seafarers.

### 3.2. Aging

In Korea, the average age of employed seafarers increased from 40.5 in 2001 to 49.7 in 2014 as illustrated in Table 3. This aging trend has become a universal phenomenon in all sectors of seafarers: ratings, deck officers, engineer officers, and radio officers. In the case of ratings, the average age increased from 39.9 to 50.2 during the same period. The average age of deck officers increased from 41.4 to 49.0, while that of engineer officers rose from 41.3 to 49.5.

**Table 3.** Average Age Change of employed Seafarers

(Unit: age)

Type of seafarer/Year	2001	2014
Total	40.5	49.7
Deck officer	41.4	49.0
Engineer officer	41.3	49.5
Radio officer	43.1	54.0
Rating	39.9	50.2

**Data:** Korean Seafarers Welfare and Employment Center (2002, 2015).

**Table 4.** Age Trend of Seafarers of Merchant Shipping

(Unit: %)

Age group		Less than 25	25 and over but less than 30	30 and over but less than 40	40 and over but less than 50	50 and over but less than 60	Over 60
Ratio	2001	6.7%	11.7%	29.6%	32.1%	19.8%	
	2014	2.5%	6.7%	11.3%	22.9%	36.5%	19.9%

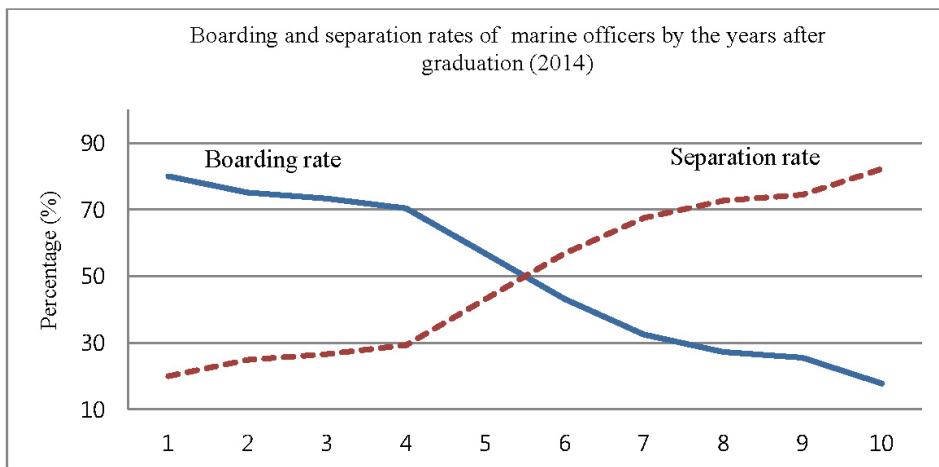
**Data:** Korean Seafarers Welfare and Employment Center (2002, 2015).

The reason for aging of seafarers is that the age proportion of key maritime personnel from the under 25 group, the 30 to under 40 group and from the 40 to under 50 group has been decreasing, while those of the age group of 50 and over have been gradually increasing. The age group of under 25 decreased from 6.7% in 2001 to 2.5% in 2014 as shown in Table 4; that of under 30 from 11.7% to 6.7%; that of between 30 and 40 from 29.6% to 11.3%; and that of the 40 to under 50 group from 32.1% to 22.9%. On the other hand, the proportion of seafarers aged 50 and over increased remarkably from 19.8% to 56.4%.

The aging issue of Korean seafarers means that despite the training of seafarers through public funding, career stoppage has broken out highly in the under 40 age group. Jeong (2004) also shows a similar conclusion of deficient supply. Correspondingly, seafarers aged 50 and over sometimes restarted their careers as seafarers, even including seafarers aged over 60. The increasing proportion of aged seafarers is an unreasonable problem arising from career stoppage.

### 3.3. High separation rate

In Korea, as of 2014, the rate of the first year job taking is 80% including the reserves, 835 out of 1,043 graduates of officers who graduated in 2013 as shown in Figure 2. At the same time, the rate of separation is 20% with the number of 208 jobless. The rate of job taking decreases widely when they reach the fourth year, the finishing year of alternative service of compulsory military service. The rate of job taking in the fourth year stands 70.4%, but it decreases to 56.9% in the fifth year, to 43.2% in the sixth year, and as low as to 32.5% in the seventh year, respectively.



Data: Korea Seafarer's Welfare and Employment Centre (2015)

Figure 2. Boarding rate and separation rate of ship officer by graduation year

In the tenth year after graduation, the boarding rate of officers is 17.7% and the separation rate is 82.3%. In addition, female seafarers tend to avoid on board jobs because of marriage, child birth, child care, and domestic affairs. This makes the deficiency of supply and career stoppage worse.

The high separation rate means that the attractiveness of seafarer job is averagely lower than the jobs on land. It also puts a question on government financial aids on maritime education and training institutions. Therefore, it is necessary for the Korean government to find proper solutions to deficient supply of seafarers.



## 4. Policy measures and their priority

### 4.1. Measures of other countries

Separation of jobs on board and searching new jobs ashore by seafarers as well as declining number of seafarers take place in other maritime countries such as the UK. The UK government and maritime institutions including the Chamber of Shipping and the Marine Society tried to sustain maritime skills in land based jobs and businesses (Gardner and Pettit, 1999a; Gardner and Pettit, 1999b). Even in maritime related areas, seafarer experience is considered to be essential and an advantage (Gardner and Pettit, 1999a; Obano-Rojas et al., 1999). Hence, it is necessary for maritime industries to keep the balance between demand and supply of seafarers. A study by Glen and McConville on employment of the UK seafarer concludes that generating links between age profile of seafarers, their personal details, and features of vessels would represent wide variations of employment needs and short-term efforts to increase the supply of seafarer may be unsuccessful (Glen and McConville, 2001b). To solve the shortfall of British officers, the UK permitted foreign seafarers to serve senior officers on the UK registered ships (Gardner and Pettit, 1999b, 168). Lloyd's Register, an the UK based company, approaches the shortfall by training graduate and developing training program in order to fill the lack of seagoing experience (Gardner and Pettit, 1999b, 169-170).

Maritime education and its adjustment to new demands are another policy issues as in the case of Hong Kong. The Hong Kong Polytechnic University redesigned educational program of maritime by introducing PhD and Master degree course, and making curricula to be flexible which helps students to choose their achievement in serving on board or being management trainees in the maritime industries (Ng and Yip, 2008). In this redesigning, it was necessary to satisfy the international requirement on maritime education such as Seafarer's Training, Certification and Watchkeeping Code (STCW) (McCarter, 1999,11).

While taking a field survey on management of human resources of shipping companies, Progoulaki and Theotokas argue that the employment of low-cost seafarer leads to both cost reduction in short term and risky competitiveness in the long term. They remind us that seafarer is not a complement to a vessel but a sustainable strategic resource in maritime industries (Progoulaki and Theotokas, 2010, 582).

### 4.2. Arranging existing suggestions and policy measures

The paper gathered suggestions and recommendations on policy of seafarer supply in the literature after 2000, and rearranged them while adding additional suggestions from trainees and students in 2016. The suggestions which have been already implemented by the Korean government were considered in the arranged list of policy measures as illustrated in Figure 3. The paper refers to the studies by Jeong (2004) and Hwang (2007), and the seafarer welfare policy of the Ministry of Oceans and Fisheries (MOF) (2016).

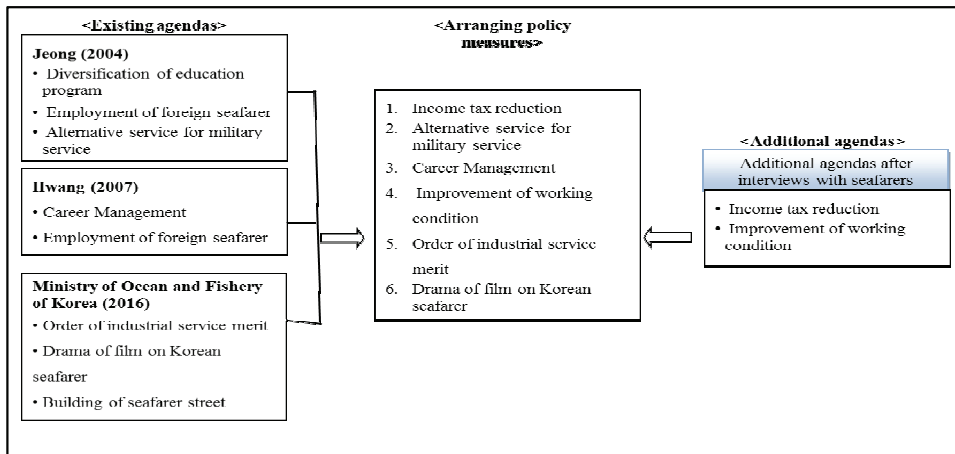


Figure 3. Arranging policy measures on seafarer welfare

The newly arranged policy measures include 1) income tax reduction, 2) alternative service of military service, 3) career management, 4) improvement of working condition, 5) order of industrial service merit, and 6) drama or film starred by the actors of Korean seafarer.

#### 4.3. Priority evaluation of priority of policy measures

This paper tries to find policy measures of seafarer while using AHP as shown in Figure 4. AHP questionnaire includes policy goal, evaluation criteria and policy measures. Deducing the main results of AHP questionnaire, the present paper assesses the priority of policy measures of MOF. The respondents of AHP questionnaire are three experts in seafarer association, two staffs of seafarer labor union, two professors or researchers, and three experts in shipping companies. The respondents have mostly worked over 20 years in maritime industry.

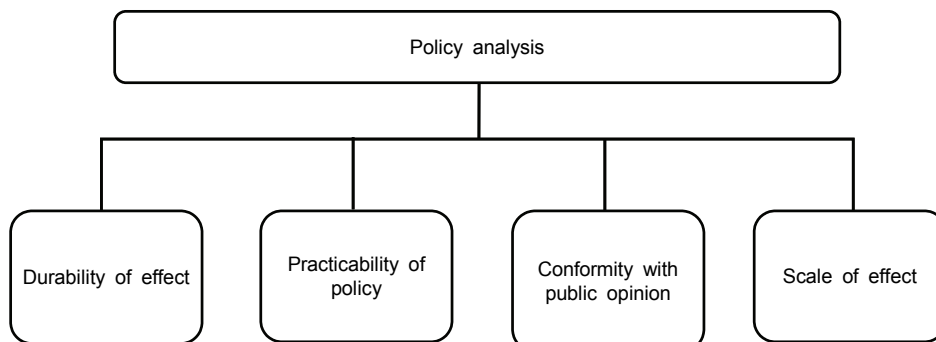


Figure 4. Hierarchy structure of AHP on Seafarer Policy

### 4.3.1 Main results

We adopt mainly the evaluation criteria items used in the pre-feasibility study on maternity leave of pregnant women or their husbands by KDI (2010) while adding peculiarity of seafarer policy: practicability of policy, conformity with public opinion, durability of effect, and scale of effect as demonstrated in Figure 4. The present paper selects three experts among the members of Task Force Team of Charming Seafarer Project in 2016.

**Table 5.** Evaluation criteria of AHP Analysis

Items	Score				
	Total	Seafarer	Association of Seafarer	Shipping company	Expert
Durability of effect	.534	.532	.539	.435	.450
Practicability of policy	.174	.094	.306	.166	.225
Conformity with public opinion	.051	.037	.054	.055	.065
Scale of effect	.242	.337	.101	.344	.260

**Table 6.** Priority of policy measures of AHP Analysis

Items	Score				
	Total	Seafarer	Association of Seafarer	Shipping company	Expert
Income tax reduction	.317	.532	.195	.424	.149
Alternative service of military service	.253	.241	.245	.293	.256
Career management	.198	.110	.256	.137	.260
Improvement of working condition	.156	.067	.236	.081	.155
Order of industrial service merit	.039	.032	.032	.029	.090
Drama of film hosted by Korean seafarer	.038	.019	.035	.037	.089

The main results of AHP analysis as shown in Table 5 are as follows. First, the first priority of evaluation items is emphasized on durability of effect and score of items as follows: durability of effect (0.534); scale of effect (0.242), practicability of policy (0.174), and conformity with public opinion (0.051). Second, the respondents stress firstly the project on income tax reduction and score of each project as follows: income tax reduction (0.317), alternative service of military service (0.253), career management (0.198), improvement of working condition (0.156), order of industrial service merit (0.039), and drama of film starred by the actor of Korean seafarer (0.038).

#### 4.3.2 Opinion by each group

We can find that most respondents stress the durability of effect as a key criterion. While seafarer, staffs of shipping companies, and experts next underline scale of effect, staffs of association emphasize practicability of policy. In regard to policy measures, seafarer and staffs of shipping companies recognize income tax reduction as a first priority; staffs of association and experts career management. The differences on priority of policy measures signal us diverse aspects of supply of seafarer and seafarer policy. Although the income tax reduction may promote supply of seafarer and lower separation rate, policy makers need complement this with other tools such as career management and alternative service for military service.

#### 4.3.3 Additional suggestion for policy measures

Seafarers in the interview of the paper exhibit a diverse opinion on policy measures. These contain the improvements in leave, accommodation on board, internet usage, pension and wage.

## 5. Conclusion

In Korea, seafarers have played a key engine to develop maritime industry and maritime related businesses and earned a lot of foreign exchange. Similar to global trend in seafarer, Korean seafarers illustrate issues in shortage of supply, high separation ratio of new-entrant officers, aging, continual advancement of female seafarer into the market, and multi-culture on board a ship. These phenomena have diverse effects on maritime industry and maritime related businesses ashore: port, ship operation, shipbuilding, ship repair, offshore, consulting, ship/cargo broking and other related activities.

The paper reviews and tries to find policy measures to issues and problems of seafarer in Korea. First, the paper recognizes that the respondents primarily emphasize durability of effect in score of 0.534 in evaluation criteria of AHP questionnaire; and then scale of effect in 0.242; practicability of policy in 0.174, and conformity with public opinion in 0.051, respectively.

Second, the respondents stress the project on income tax reduction: income tax reduction (0.317), alternative service of military service (0.253), career management (0.198), improvement of working condition (0.156), order of industrial service merit (0.039), and drama or film starred by the actor of Korean seafarer (0.038).

Third, while most respondents stress the durability of effect as a key criterion, seafarer and staffs of shipping companies, and experts next underline scale of effect but staffs of association emphasize practicability of policy too. In regard to policy measures, seafarer and staffs of shipping companies recognize income tax reduction as a first priority, while staffs of association and experts emphasize career management.

Fourth, a new system is needed to consider specific career experience and the possibilities of serving in maritime positions, according to work periods. It is necessary to make attractive working conditions for new comers as ship officers and seafarers

by shortening the working period on board and the flexible holiday schedule. More attractive working conditions will encourage female seafarers and new comers a longer term commitment as ship officers.

Even with these findings, we need to interpret diverse aspects of supply of seafarer and seafarer policy. For example, we can further and investigate the main reason and causes of high separation rate of seafarer through econometric methods.

## **Acknowledgements**

The author thanks much Dr. Kay-Shek CHO and Mr. Ashurov Abdulaziz for their help and comment.

## References

- Chauvin C., Lardjane S, Morel G, Clostermann J. and Langard B. 2013. "Human and organizational factors in maritime accidents: Analysis of collisions at sea using the HFACS." *Accident Analysis and Prevention*, 59, pp.26-37.
- Gardner B.M. and Pettit S.J. 1999a. "Seafarers and the land based jobs market." *Marine Policy*, 23(1), pp.103-115.
- Gardner B.M. and Pettit S.J. 1999b. "The land based jobs market for seafarers." *Marine Policy*, 23(2), pp.161-175.
- Glen D. and McConville J. 2001a. "An analysis of the employment durations of UK seafaring officers 1999." *Marine Policy*, 25, pp. 293-301.
- Glen D. and McConville J. 2001b. "Employment characteristics of UK seafaring officers in 1999." *Marine Policy*, 25, pp.215-221.
- Glen D. 2008. "What do we know about the labour market for seafarers? A view from the UK" *Marine Policy*, 32, pp.845-855.
- Hwang J. 2007. "Supply/demand and policy agendas of Korea seafarer." *Maritime and Fishery*, Korea Maritime Institute, 278, pp.34-45.
- Jeon, Y. W. 2013. "A Study on the Working Conditions of Foreign Seafarers." *Journal of Korea Institute of Maritime Law*, 25(2), 1-28.
- Jeong B. 2004. "Problems and responding policies of supply and demand of seafarer." *Maritime and Fishery*, Korea Maritime Institute, 235, pp.29-45.
- Kim J. Kim J. and Choi S. 2011. "Public-Private Partnership Infrastructure Projects: Case Studies from the Republic of Korea Volume 1 and 2." Korea Development Institute, 235, pp.29-45.
- Kim, Y. M. 2012. "A Study on the Management of Foreign Crew in Domestic Merchant Vessel." *Journal of the Korean Society of Marine Environment & Safety*, 18(2), 123-129.
- Korea Development Institute. 2016. [www.kdi.regulation.kr/research report/pimac.jsp](http://www.kdi.regulation.kr/research_report/pimac.jsp), as of 1st of April 2016.
- Korea Maritime Institute. 2000. *Attractive Measures for balancing Supply and Demand of Seafarers in the 21<sup>st</sup> Century*.
- Korea Maritime and Port Administration. 1979. *Basic aims of Korea seafarer policy*.
- Korean Seafarers Welfare and Employment Center. 2002. *Korean Seafarer's Statistical Year Book*.
- Korean Seafarers Welfare and Employment Center. 2015. *Korean Seafarer's Statistical Year Book*.
- Lim J. 2015. *Results of survey on the opinion of lifestyle and working condition of merchant marine seafarers*. Korea Marine Officers Association.
- McCarter C. P. 1999. "STCW '95: implementation issues." *Marine Policy*, 23(1), pp.11-24.
- Ministry of Government Legislation of Korea. 2016. Marine Transportation Act, as of 1st of April 2016 in [www.moleg.go.kr/english/](http://www.moleg.go.kr/english/).
- Ministry of Oceans and Fisheries of Korea. 2013. Research of Basic Plan of Demand and Supply of Seafarer.

- Ng, J.M. and Yip, T.L. 2009. "Maritime Education in a Transdisciplinary World: The Case of Hong Kong." *The Asian Journal of Shipping and Logistics*, 25(1), pp.69-82.
- Orbando-Rojas B, Gardner B. and Naim M. 1999. "A system dynamic analysis of officer manpower in the merchant marine." *Marine Policy*, 26(1), pp.39-60.
- Pettit S.J, Gardner B.M, Marlow P.B, Naim M.M. and Nair R. 2005. "Ex-seafarers shore-based employment: the current UK situation." *Marine Policy*, 29, pp.521-531.
- Progoulaki M. and Theotokas I. 2010. "Human resource management and competitive advantage: An application of resource-based view in the shipping industry." *Marine Policy*, 34, pp.575-582.
- Silos J.M, Piniella F, Monedero J. and Walliser J. 2012. "Trends in the global market for crews: A case study." *Marine Policy*, 36, pp.845-858.
- Thai V.V, Balasubramanyam L, Yeoh K.K.L. and Norsofiana S. 2013. "Revisiting the seafarer shortage problem: the case of Singapore." *Marine Policy*, 40(1), pp.80-94.
- Wu B. and Winchester N. 2005. "Crew study of seafarers: a methodological approach to the global labour market for seafarers." *Marine Policy*, 29, pp.323-330.

**Appendix 1.** Maritime related business ashore by Gardner and Pettit

Area	Maritime Operations Land Based	Maritime Operations Water Based	Financial and other services	Shipbuilding and Marine equipment	British Shipping	Miscellaneous
Detailed business	Surveyors / Inspection	Ports	Insurance	Marine Equipment	Ship Owners	Charitable
	Cargo Surveyors	Port Services	Banking	Shipbuilders / Repair	Ship Management	Education
	Classification	Towage / Salvage	Ship / Cargo Broking		Crew Management	Publishing
		Dredging	Ship Chartering		Ships Agents	Miscellaneous
		Offshore	P and I Clubs			
		Pollution Control	Loss Adjusters			
			Legal			
			Consultants			

Source: Gardner and Pettit (1996)