

A Study on the Introduction Plan of the Places of Refuge in Domestic Areas based on the Analysis of Foreign Cases

Chang-Hyun Lee* · Sung-Hyeon Park**† · Jung-Sik Jeong**

* Graduate school, Division of Maritime Transportation System, Mokpo National Maritime University, Mokpo, 530-729, Korea

** Division of Maritime Transportation System, Mokpo National Maritime University, Mokpo, 530-729, Korea

국외 사례 분석을 통한 국내 선박 피난처 도입 방안에 관한 연구

이창현* · 박성현**† · 정중식**

* 목포해양대학교 해상운송시스템학부 대학원, ** 목포해양대학교 해상운송시스템학부

Abstract : A huge marine accident causes a loss of valuable lives, property and the serious marine environment pollution. IMO adopted resolution A.949(23) to provide Places of Refuge(PoR) to 'Ship in need of assistance', which is to minimize the secondary environmental pollution caused by marine accidents. If the level of risk exceeds a certain range, it is necessary to be designated as Places of Refuge(PoR) after evaluation of potential risk, which is based on the database of several marine environmental factors. Also, it is necessary to develop skills about quantification/standardization of vessel traffic safety, complexity and risk. Because there is the close relation between the problem of designating Places of Refuge(PoR) and the policy of nation for protecting the natural environment of coastal state, it is important to prepare related legislation. In this paper, introduction of Places of Refuge(PoR) in domestic areas have been suggested based on the analysis of several foreign designating cases.

Key Words : Places of Refuge(PoR), Ship in need of assistance, Marine accident, Marine environment pollution, Introduction plan

요 약 : 해상에서 발생하는 대형 해양사고는 재산상의 손실뿐만 아니라 심각한 해양환경 오염피해를 유발하고 있다. 국제해사기구(IMO)에서는 해양사고 발생으로 인한 2차적인 해양환경오염 피해를 최소화하기 위하여 “원조를 필요로 하는 선박”에 선박 피난처를 제공하도록 결의서 Res. A.949(23)로 채택하였다. 해상교통 환경 요소 등에 의한 데이터를 바탕으로 종합적인 측면에서 잠재적 위험평가를 실시하여 위험도의 레벨이 일정한 크기를 초과하게 되면 피난처로 지정될 필요가 있고, 선박의 통항안전성, 혼잡도 및 위험도의 정량화/표준화된 기술을 기반으로 선박 피난처 지정 시스템 기술개발이 시급하다. 또한, 선박 피난처를 지정하는 문제는 연안국의 자연환경을 보호하기 위한 국가 정책과 밀접한 관련이 있기 때문에 관련 법안을 마련하는 것이 최우선이다. 본 연구에서는 선박 피난처를 지정·운영하고 있는 외국 사례 분석을 통해 효율적인 국내 선박 피난처 도입방안을 마련하고자 하였다.

핵심용어 : 선박 피난처, 원조를 필요로 하는 선박, 해양 사고, 해양 환경오염, 도입방안

1. Introduction

In the sea, big and small marine accidents occur continuously in connection with the ship operation. It causes serious marine environmental pollution as well as an immeasurable loss of valuable lives and property.

Currently, in order to prevent the marine accident and the spread of the second and third damage caused by marine accident, IMO recommends to designate the Place of

Refuge(Hereafter “PoR”) in member nations by adopting the ‘Guidelines of PoR for ships in need of assistance’ as the resolution A.949(23) on December 2003 at the 23rd IMO general meeting.

In our nation, the large oil pollution accidents such as “M/T Sea Prince” in 1995 and the collision of “M/T Hebei Spirit” with the tugboat “Samsung T-5” in 2007 resulted in enormous disaster.

In this paper, we tried to extract significant factors for efficient introduction of PoR to domestic areas through the analysis of present cases of foreign countries.

* First author : sky007@mmu.ac.kr, 061-240-7423

† Corresponding author : shpark@mmu.ac.kr, 061-240-7171

2. Analysis of several foreign designating cases

2.1 The analysis of places of refuge in Denmark

About 60,000 foreign vessels navigate every year in Danish strait and within 5 miles from Danish territorial sea in Denmark besides the domestic ferry transportation.

The chemical fertilizer of Chinese ship named Fu shan hai(DWT 69,973) which navigates 3 miles off 'Bornholm', collided with Gdynia(DWT 3,930) of Cyprus nationality container ship on May 31st in 2003. It resulted in hundreds of oil spill to Danish coastal area and serious marine pollution as far as Spanish coast, which resulted in beginning of major discussion about designating PoR.

As shown in Fig. 1, by considering Danish coastal marine traffic on January 2004, Denmark designated 22 sea areas as PoR such as 'High pollution potential' 14 sea areas(9-Ports, 5-Anchorage) and 'Low pollution potential' 8 sea area (Sheltered area) at the Working Group, which consisted of many related government ministries such as the Environmental Protection and Forest Resources Division, Maritime Authorities, Marine Bureau in charge of watercourse matters and aims to minimize the secondary marine pollution caused by damaged vessels.

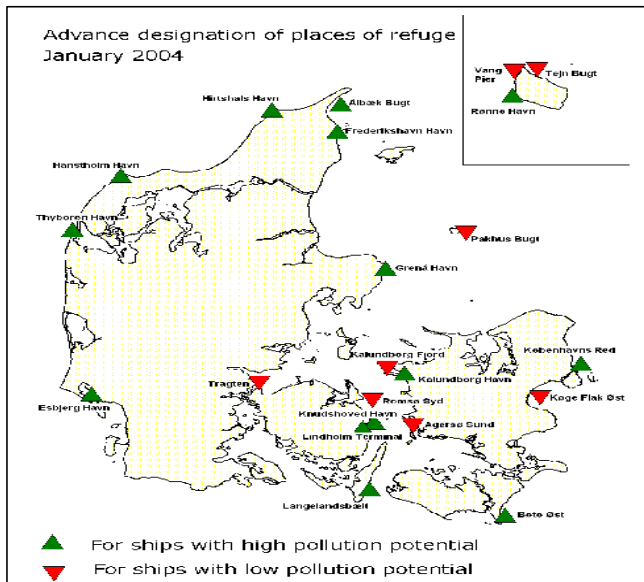


Fig. 1. Places of refuge ports and anchorages in Denmark.

Denmark promptly designated PoR by just considering the volume of vessel traffic. Therefore, we can evaluate only the probability about the potentially dangerous areas and it is difficult to predict the practical effectiveness of PoR related with minimizing the secondary marine pollution as well as the handling of ship accidents.

As a result, the position of PoR might be changed henceforth according to additional basic factors, for it is difficult to verify that those designated areas play an effective part as PoR.

2.2 The analysis of places of refuge in South Africa

In South Africa, SAMSA(South African Maritime Safety Authority) is in charge of the PoR-related work. As shown in Fig. 4, they operate PoR based on the data of domestic volume of vessel traffic(See Fig. 2) and the record of marine accidents from 1946 to 1984(See Fig.3).

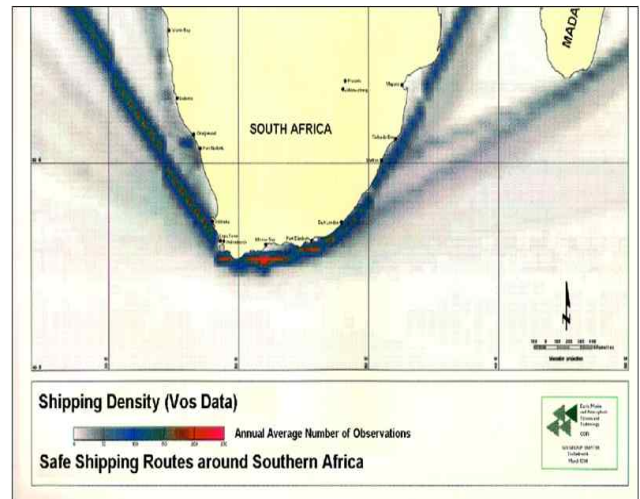


Fig. 2. South Africa vessel shipping density.

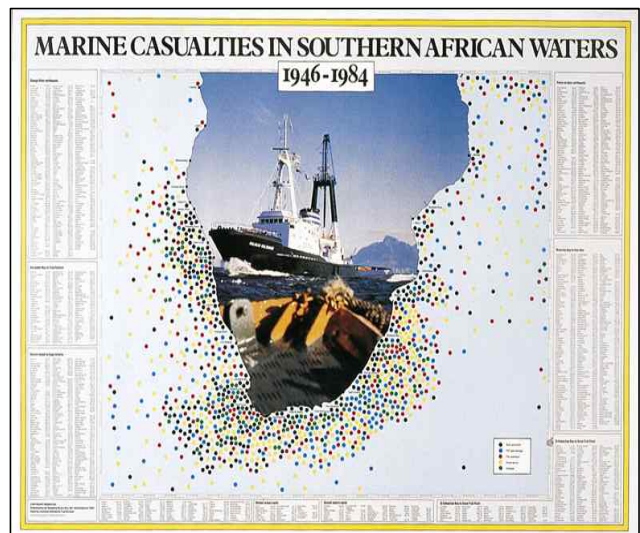


Fig. 3. Marine casualties in Southern African waters.

Like the case of Denmark, we can only evaluate the probability about the vessel accident areas based on the volume of vessel traffic and the records of ship accidents. For the estimation of the probability of ship accidents in

dangerous areas, such evaluation seems to be effective, but it is difficult to predict the practical effectiveness on whether those area can minimize secondary marine pollution as well as the handling of ship accidents.



Fig. 4. Places of refuge in South Africa.

2.3 The analysis of places of refuge in Alaska

Alaska Regional Response(A. R. R.) Team led by the United State of Coast Guard(USCG) is conducting the designation and operation of PoR in Alaska(Alaska, 2004; Kodiak, 2006). Fig. 5 is showing A. R. R. Team Guidelines.

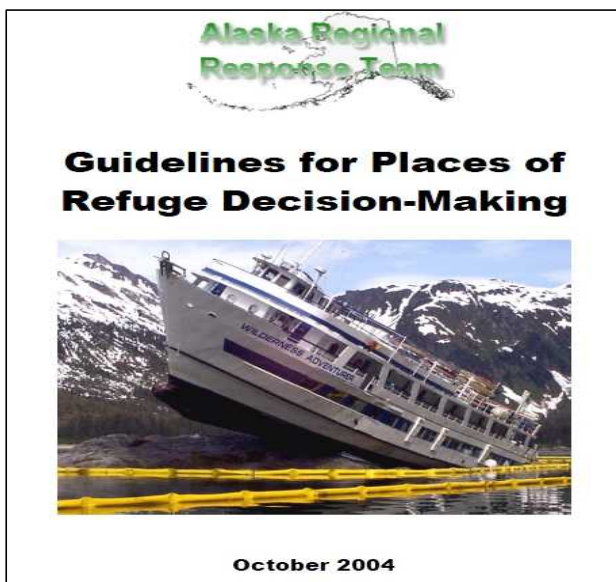


Fig. 5. A. R. R. Team Guidelines.

As shown below, several factors were analyzed to designate the PoR in Alaska.

- Response equipment depot
- Feeder, traffic, non-persistent
- Cruise and AMHS ship traffic
- Small cruise ship traffic
- Bulk fuel storage sites
- Subarea spills
- Frequent fishing vessel/tramper offload activities
- Key nearshore fishing grounds
- Setnet fishing grounds
- Cannery/abandoned cannery

Fig. 6 shows the several risk factors which have been taken into account and potential PoR in Kodiak area of Alaska. Fig. 7 is the picture of real designated locations in Kodiak. Table 1 is showing typical details of PoR(Shangin Bay) in Kodiak such as mooring locations, acceptable size of vessels, bottom type, sea conditions, and etc..

Table 1. Details of places of refuge in Kodiak

Shangin Bay	
ID Number	01-D
Mooring Locations	Nearest POR-04-12-D
Anchorage Locations	58°38.13'N 152°24.33'W
Docks/Piers	Nearest PPRO-04-51-L
Maximum Vessel Size	Deep draft, greater than 20,000 GT
Type of Berthing	Anchorage
Contact	N/A
Navigational Approach	Approach from N.NE
Minimum Water Depth	12 Fathoms in the swing area
Maximum Water Depth	22 Fathoms in the swing area
Maximum Vessel Draft	60 ft.
Swing Room/Dock Face	2000 ft.
Bottom Type	Shells
Prevailing Winds	Variable in direction an velocity
Currents	Alaska Coastal
Tides	Mean High Water-13.1 Mean Low Water- 1.6
Sea Conditions	Sheltered from southern swell only
Fog	Fog can occur during al seasons.

When analyzing the designating factors in case of Alaska PoR, it can be seen that only a small part of the volume of vessel traffic is considered unlike the cases of Denmark and South Africa which put emphasis on the analysis of the volume of vessel traffic. By focusing on the marine environmental protection caused by applicable secondary damage and dealing with the ship in the accident and support elements, it is important to respond to marine accidents at their initial stage in Alaska.

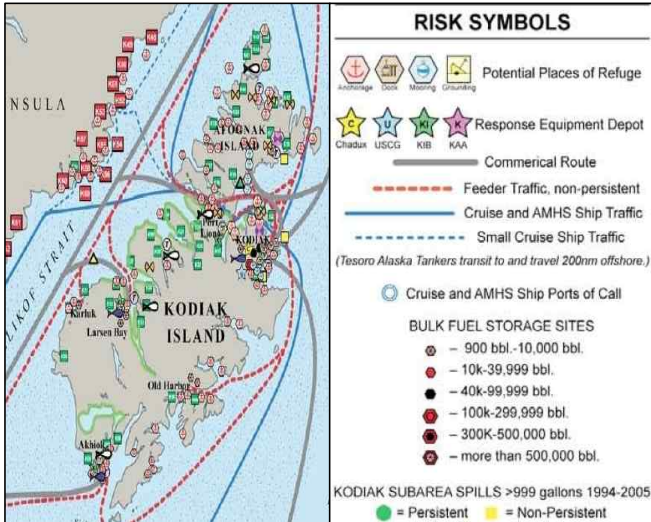


Fig. 6. Potential places of refuge and risk factors(Kodiak, Alaska).

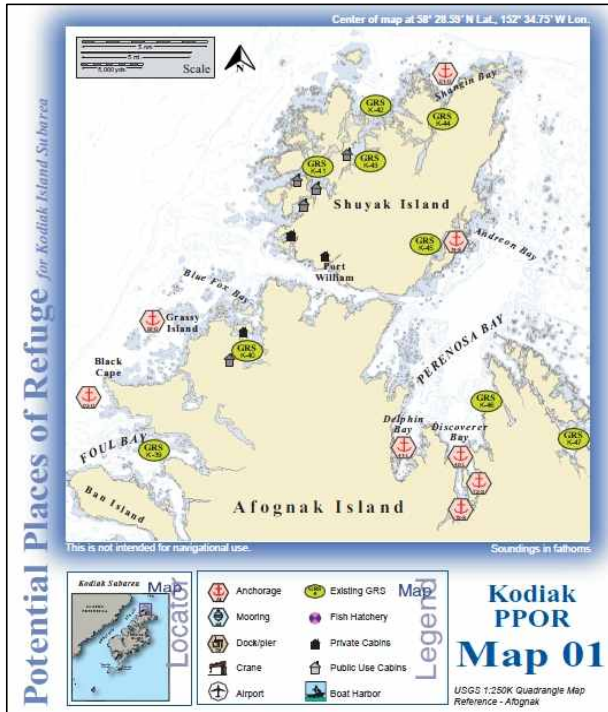


Fig. 7. Places of refuge map in Kodiak.

2.4 The analysis of places of refuge in other foreign countries

The PoR is designated and operated in other countries such as the United Kingdom, Canada, Australia, and Norway in addition to Denmark, South Africa, and U.S. But such countries except Norway are not opening positively the position of PoR to prevent secondary damage of marine pollution due to accidents inside the homeland coast, besides contact number and procedures for PoR.

Table 2 shows the contact manner after occurrence of

marine accident in the United Kingdom coast. Fig. 8 and Fig. 9 are only opening the PoR guideline and address in Canada and Australia(Australian Transport Council, 2009; Transport Canada, 2007). Unlike this case, Norway is providing the positions of PoR, but it doesn't open the use procedure and guideline(Fig. 10).

Table 2. Contact site of U.K places of refuge

DISTRICT	
Northern Ireland	Warren Point to Lisanally
	Carlingford to Portstewart Bay
	Carlingford to Portstewart Bay(Anchorages)
West Coast of Scotland	Clyde Port
	Portree, Isle of Skye to Oban
	Loch Scriden to Loch Snizort
	Outer Hebrides to Clyde
East Coast of Scotland	Shetland Islands
	Gourdon to Eyemouth
	Gourdon to Eyemouth(Anchorages)
North East	Berwick to Seaham
East	Whitby to The Wash
	Tetney Monobuoy to Kings Lynn
South East	Great Yarmouth to Canvey Island
	Caister to Thames Estury
	Chatham to Littlehampton
South & South West	The Downs to Beachy Head
	Bognor to Trevoise Head
	Bognor to Trevoise Head inc Isles of Scilly
Bristol Channel & South Wales	Lundy Island to Aberayon
	Fishguard to Sharpness
North West	Liverpool to Silloth
	Tremadoc Bay to Ramsey Bay(Isle of Man)

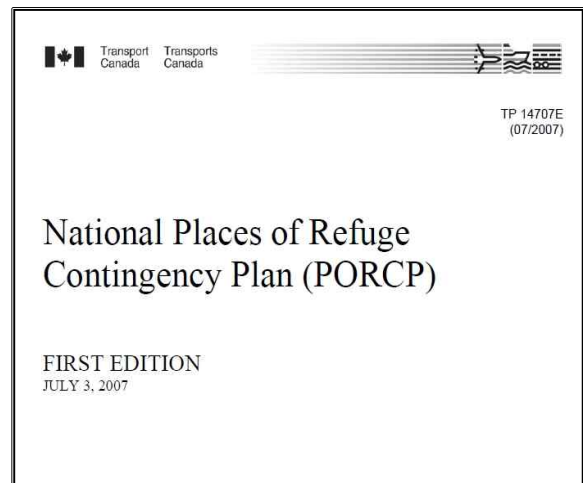


Fig. 8. Canadian places of refuge plan.

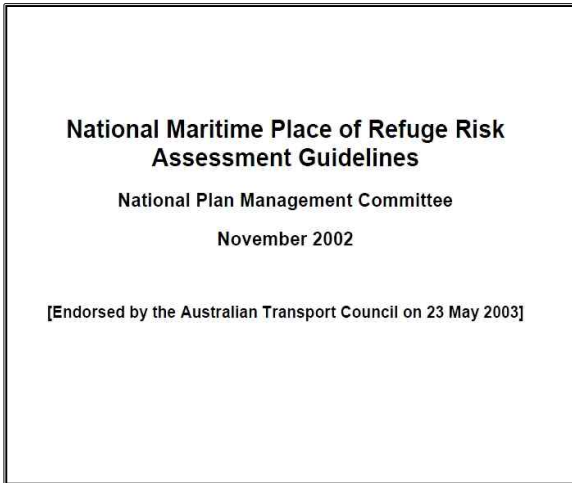


Fig. 9. Australian places of refuge plan.

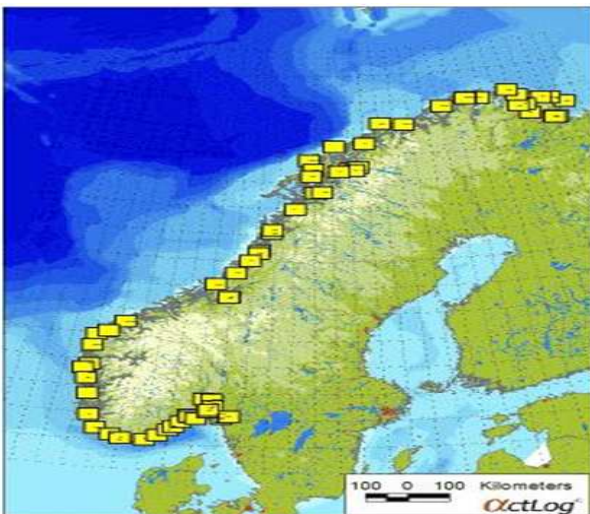


Fig. 10. Places of refuge map in Norway.

3. Introduction designation plan for domestic places of refuge

South Korea is located on the major traffic route connecting Asia and North America. Sea transportation with China and Russia is increasing continuously around the Korean Peninsula coastal area. South Korea is also located on the sea areas having a high probability of ship accident and pollution spread due to increase of the volume of vessel traffic and complexity of marine environment. As analyzed previously, several countries are performing many researches to minimize the secondary damage and oil pollution. PoR is being designated and operated to reduce additional serious damage.

However there is a case of PoR, which are not based on the probability about the occurrence of ship accidents through vessel traffic analysis and the records of marine

accidents but based on the initial reaction to minimize the secondary damage after ship accidents. Although many studies related to the volume of vessel traffic and sea environment are performed until now, there have been almost no studies about PoR which can minimize the secondary damage based on the data of the volume of vessel traffic and accidents. In order to accurately evaluate the evaluation factors about sea areas designated as PoR in foreign countries, following basic data should be thoroughly analyzed.

3.1 The natural environment investigation · analysis

Because natural factors like topographical characteristic, which are closely related with ship accident, may cause danger in ship operation, natural environmental factors of targeted coastal areas should be analyzed as follows.

- Investigation and analysis of weather condition : wind direction and speed, fog, visibility, and etc.
- Investigation and analysis of ocean condition : ocean current, depth of water, tide, and etc.
- Investigation and analysis of physiographic condition : traffic lane and traffic flow, topographic characteristics
- Investigation and analysis of nautical beacon status
- The other conditions investigation and analysis including the distribution of the fishery and area, and etc.

3.2 The marine accident investigation · analysis

The cause of the marine accident can be grasped by analyzing following factors in targeted coastal area

- Investigation and analysis about marine accidents per ship type
- Investigation and analysis about marine accidents per tonnage
- Investigation and analysis about marine accidents per location and distribution
- Investigation and analysis about marine accidents per cause

3.3 The general status investigation and analysis in the object sea area

The risk according to the characteristic and frequency of vessel arrival/departure can be evaluated through the analysis of vessel arrival/departure status of major trade port. Also, the general risk excluding environmental factors can be evaluated through the analysis of external factors like harbor development plan.

- Investigation and analysis of main vessel route in targeted sea area
- Statistical analysis per ship type and tonnage of arrival/departure vessel in major port
- Investigation about harbor development plan of targeted sea area

3.4 Evaluation and analysis of oil diffusion simulation

In order to evaluate the designating PoR, whether those area can substantially perform as PoR or not, several factors should be analyzed.

Fig. 11 shows the numerical simulation of initial diffusion of spilled oil in Taean(Jung, 2009). By grasping the diffusion flow due to the oil from ship, the damage of marine pollution can be minimized through the efficient prevention task of marine pollution.

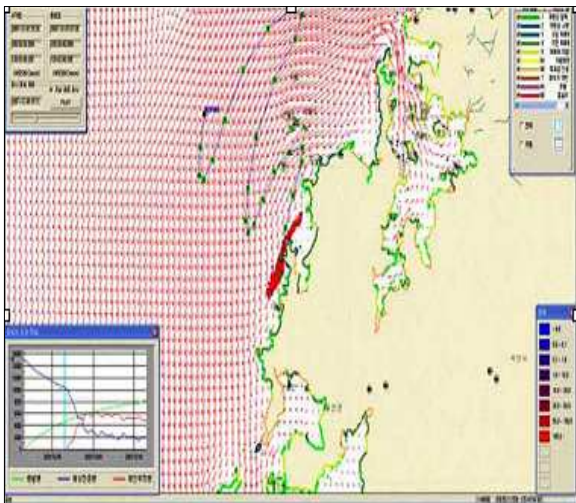


Fig. 11. Simulation of oil pollution in Taean.

3.5 The support facility investigation

After designating any PoR on the basis of marine environmental factors, such area should be evaluated whether it is practically perform as PoR by investigating present status of the facilities, which repair the ship into possible navigation and prevent the marine pollution.

- Investigation and analysis about demand and accessibility of major prevention tool such as Coast Guard having a response vessel
- Investigation about support equipment status about oil pollution
- Investigation about demand of shipyard which can repair the ship

- Investigation and analysis about accessibility of large floating crane and its status

3.6 The gathering of expert's opinions and potential risk evaluation

With regard to the inconvenience and improvement part of designating PoR, not only the advices of field employee and related companies through the public hearing but also the opinions of domestic experts at the seminar and report meeting should be seek.

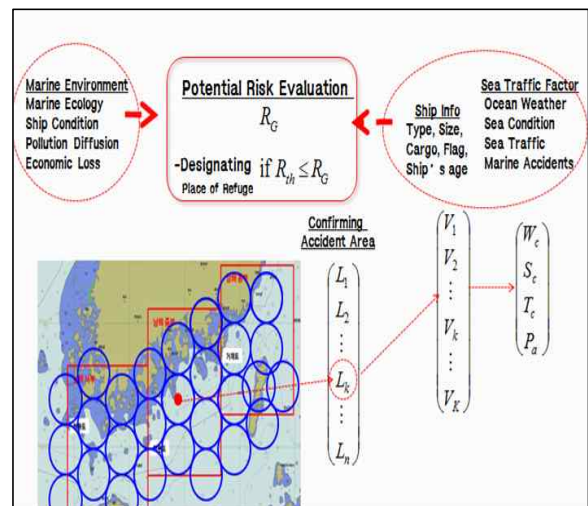


Fig. 12. Evaluation for the places of refuge.

After evaluating the ship condition, and predicting the marine pollution diffusion and economic loss which is based on the database of geographical distribution on marine environment characteristic, marine traffic environment and biology, then potential risk evaluation is conducted synthetically. If the level of risk exceeds a certain range, it is necessary to be designated as PoR. Fig. 12 is showing this process.

After selecting optimum places on the basis of evaluation factors of the potentially dangerous areas and evaluation data whether such places efficiently perform the work as PoR or not, government-related organization and association should notify related legislations for designating PoR and procedures guide book to the countries, classification societies and ship companies managing vessels(National and foreign flag) which navigate domestic coast.

4. Conclusion

Due to growth of marine transportation and increasing complexity of sea traffic environment, the probability of

marine accident and damage of marine pollution are increasing continuously. To prevent marine accidents in advance, it is necessary to develop skills about quantification/standardization of vessel traffic safety, complexity and risk. Also, it is urgent to develop PoR designating system technology based on those skills.

Because there is the close relation between the problem of designating PoR and the policy of nation for protecting the natural environment of coastal state, it is important to prepare related legislation.

The accident of foreign flag ship when navigate Innocent Passage under international law and domestic marine law, may cause marine environmental pollution to domestic coast. So, it can be very sensitive problem of designating PoR.

Actually, the Prestige accident occurred in 2002 which leads to the concrete discussion about designating PoR, the damaged ship leaking a large amount of oil resulted in tremendous damage of marine pollution not only to Spain coast but also to the surrounding nations. Because the Spanish government forced the ship to leave their own coast, that made the situation worse.

The natural environment of home and surrounding nations can be protected by designating PoR. The quick measure can be done about the marine pollution accident by securing PoR designation technology. Also, it is possible to minimize the secondary damage and to secure the human and material resources. Therefore, plan for designating and operating PoR should be discussed seriously at the national level.

References

- [1] Alaska Regional Response Team(2004), Guidelines for Places of Refuge Decision-Making, pp. 1-7.
- [2] Australian Transport Council(2009), National Maritime Places Risk Assesment Guidelines, pp. 1-25.
- [3] Jung, Tae Sung(2009), Numerical Simulation of Spilled Oil Dispersion in Taeon Coastal Zone, Journal of the Korean Society for Marine Environmental Engineering, Vol. 12, No. 4, pp. 264-272.
- [4] Kodiak PPOR Workgroup(2006), Potential Places Of Refuge, pp. 1-7.
- [5] Transport Canada(2007), National Places of Refuge Contingency Plan(PORCP), pp. 1-30.

Received : 2012. 04. 30.

Revised : 2012. 06. 05.

Accepted : 2012. 06. 25.