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# Port Governance Structure: the Port of Yangon

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## ABSTRACT

The Yangon port is recognized as the only international (gateway) port for Myanmar. It handles about 90 % of the country's normal exports and imports to date. Its governance structure has been inherited from the colonial age and the administrative body changed from time to time. Presently, Myanma Port Authority is the sole authority to manage all ports in Myanmar. This study aims to analyze the governance structure of Yangon port in Myanmar and its implications. Good prospective is ahead with the supporting economic reform measures presently brought about by political reforms.

**Keywords:** Yangon Port, port management, port governance, development

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# 1. Introduction

Myanmar is the largest country in mainland Southeast Asia, and its strategic geographic location at the intersection of China and India, two of the world's most dynamic economies, favors the position to be a regional trading hub. It has the lowest population densities in the region, with fertile lands, significant agricultural potential and rich in natural resources. In recent years, political changes has taken place encompassing transitions – from an authoritarian military system to democratic governance, from a centrally directed economy to a market-oriented economy, and from 60 years of internal conflict to peace in border areas.

However, as the country is recognized as relatively far behind the globalization process, it could not enjoy other development that other countries in the region have enjoyed. Thus, rush into development steps are found in every sector. With the changes in politics, economic growth is also expected. The transitions have the potential to create opportunity and shared prosperity for the people of Myanmar and for the country to resume its place as one of the most dynamic economies. The economy grew at 7.3 percent in 2012/13, with the main drivers of growth being increased gas production, services, construction, foreign direct investment, and strong commodity exports<sup>2)</sup>. In tandem with the economy, the port industry in Myanmar has also not developed. Despite this, the involvement of private interest in terminal operations has been experienced. This paper explores the governance of Myanmar Gateway Port around its economic and political environments and possible implications for the port authority are examined.

## 2. Background and Literature Review

A series of port governance structures of different ports were studied, covering different geography in the literature<sup>3)</sup>. Port governance in China was studied in the context of economic and political context<sup>4)</sup>. It is justifiable in the view that transport is a derived demand, and thus any government's economic reform attempts will be affected in the port sector, which is an important node in the international transport chain. Economic reforms, of which privatization, corporatization and decentralization are at its heart, have been the context for the country's concurrent reform of its port industry. In the port governance in Korea, it was found out that Korean ports have passed through a variety of port governance stages: it has changed from the period of the government doing everything to decentralized and privatized governance<sup>5)</sup>.

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2) The World Bank (2013). Myanmar Overview. Downloaded on 1st November, 2013.

<http://www.worldbank.org/en/country/myanmar/overview>

3) Brooks, M.R., and Cullinane, K.(2007). Devolution, port governance and port performance (1st ed). *Research in Transportation Economics* Vol.17

4) Cullinane, Kevin and Wang, Teng-Fei (2007). Port Governance in China. In Devolution, Port Governance and Port Performance. *Research in Transportation Economics*, Vol. 17. 331-356.

5) Song, D-W and Lee, S-W. (2007). Port Governance in Korea. *Research in Transportation Economics*, Vol. 17, 357-375.

Together with the port governance, comes the role of the port authorities. Many studies pointed out that port authorities have to develop the strategic intent for increased competition, more autonomy and increased accountability for economic performance, but they have to continue as hybrid organizations, incorporating public characteristics and public goals<sup>6)</sup>.

Port governance started with reform programs in the 1980s and structure has changed from time to time in accordance with the government policies such as devolution, regulatory reform and newly imposed governance models<sup>7)</sup> and most of the studies have focused on the evolution of the port governance. The authors identified the drivers of port reform that brought changes in port governance as “globalization of trade, new public management philosophy, technological innovations, which contributes to new government opportunities, which in turn adds to port reform program”.

Most studies have focused on finding the appropriate governance model for the ports. Accordingly, port governance models/research begins with the World Bank Port Reform Toolkit typology. The World Bank (2007, p.81) stated that the port administration models depend on the socioeconomic structure of a country (market economy, open borders), historical developments (for example, former colonial structure), location of the port (urban area or in isolated regions) and types of cargo handled (liquid and dry bulk, general cargo, or containers). In addition to the port reform process, the World Bank typology focuses on the role and activities of port authorities for port governance. However, the World Bank typology was confirmed by Brooks and Cullinane (2007, p.434) study that ‘the models are oversimplified, cannot be validated and do not reflect the hodgepodge of “infinite variety” implemented in today’s highly competitive port environment’. Also, it was criticized not to focus on the lines of accountability, appropriate governance structure or responsibilities by Brooks and A. Pallis (2012). Anyway, the trend in port governance is that devolution has been the practice of government in the past 20 years (Brooks & Cillinane, 2007a).

Other models to study port governance were developed by Baird (2000) based on the varying degrees of emphasis in the public-private provision of port functions. A detailed review can be found in Brooks & Cullinane (2007a). The said authors, based on the World Bank typology and Baird’s models, developed five ownership and management combinations to find groupings of regulatory, managerial and operating activity, including capital investment and cost recovery requirements.

A new approach to the port governance can be found in ESPO Fact Finding Report (2010), where port governance is approached from a new conceptual background which takes into account the evolution of ports, as well as the new perspectives on the role of port authorities. Based on this survey data, the quantitative study of Verhoeven and Vanoutrive (2012) identifies the elements that may explain the governance diversity in European Seaports. A number of governance-related factors are identified which includes the power balance with government, the legal and statutory

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6) Van der Lugt, L., Dooms, M., and Parola, F. (2012). The applicability of strategy concepts for hybrid organizations: the case of the port authority. *Paper presented at International Maritime Economists (IAME) Conference*, 2012, Taipei.

7) Brooks, M.R., and Cullinane, K. (2007). Devolution, port governance and port performance (1st ed). *Research in Transportation Economics* Vol.17

framework, the financial capability, and management culture. Distinct factor unlike other regions is the supra-national level of the European Union which can help set an independent legal and policy framework for the port.

Most of the studies from literature confirm that there exist different types of port governance in the world (ESPO Fact Finding Report, 2010; Brooks & Cullinane, 2007 etc). Also, they highlight that there is a trend of renewed interest in the role of port authorities brought about by pressure from different stakeholders following socio-economic changes in the port landscape.<sup>8)</sup> The theory of the Matching Framework, developed, any appropriate fit models will depend on the environment (including cultural and political components) and the strategies and structures (governance models) employed in implementation. So far, there continues to be little consensus on what governance models are most appropriate.

### 3. Port Governance Structure

#### 3.1 Administration

Changes in shipping patterns and the globalization of operators and increase of ship sizes effected Myanmar Port regime. The flexibility and versatility that the private sector provides, not to mention capital and competition leverage, have rendered its involvement to port development and operations as desirable. Generally, Myanmar ports can be divided into inland ports, coastal ports and international ports. Inlands ports are mere ports and the operations and management is under another major department of Ministry of Transport (MOT) called Inland Water Transport Department, a State Owned Enterprise. The ports are located along the western and southeastern coast line of the country, namely Yangon, Sittwe, Kyaukphyu, Thandwe, Pathein, Mawlamyine, Dawei, Myeik, and Kawthaung.

The Yangon port is recognized as the only international port as ever with the rest being reportedly small coastal ports with limited port handling capabilities. It handles about 90% of the country's normal exports and imports to date. The cargo volume handled by the Yangon port has been increasing annually. The coastal ports Sittwe, Kyaukphyu and Thandwe are under the administration of the port officer of Rakhine State, Pathein Port, under the Port officer of Ayeyarwady Division and Dawei, Myeik and Kawthaung, under the port officer of Taninthari Division respectively (Figure 1).

Throughout history, the administrative body and the name of Yangon Port has changed from time to time. In 1852, Marine Chief Officer took charge of the Yangon port. In 1876, the Port was handed over to the committee of the River bank. In 1880, when the country was under the colony of the British, the administrative body was "Commissioners of the Port of Rangoon"; in 1954, Board of Management for the Port of Rangoon. In 1879, Yangon Port Commissioners Act was enacted on demand of the traders. Gradual development of the Yangon Port was seen from 1880 to

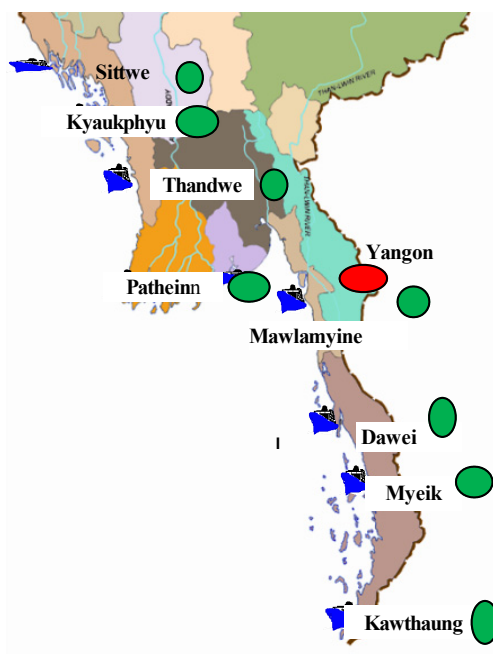
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8) ESPO Fact-Finding Report. (2010). European Port Governance Structure.



1940, under the British Ruling. In 1905, the Yangon (Rangoon) Port Act was enacted and it came into force on 15th July 1905, some sections (section 6, 43, and other 5 sections) of which were amended in 1958, 59, and 2006 respectively. In 1908, the Ports Act was enacted with amendments in 1962 and 2007. However, the port administration was primitive and the amendments were not significant for decentralization and in 1972, Burma Port Corporation was formed and from 1989 onwards, the administrative body was renamed as “Myanma Port Authority (MPA)”. Since 1972, MPA has become the sole authority to manage all ports in Myanmar i.e. international as well as coastal ports. Although the Outports Act was enacted for the coastal ports, in 1914 the administration is under the Myanma Port Authority.

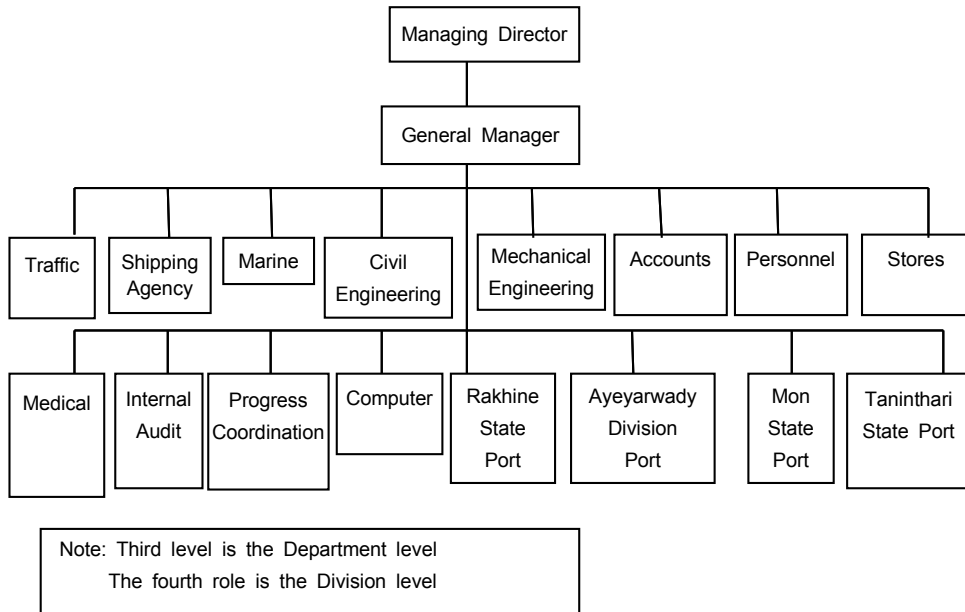
**Figure 1.** Yangon port and coastal ports



Source: Myanma Port Authority

The organization structure of Myanmar Port Authority is illustrated in figure 2. The structure includes total eight departments and four divisions and the division for controlling each State port in the coastal areas.

**Figure 2.** Organization Structure of MPA



### 3.2 Management and operations

Similar to China, the port development policy of the Yangon Port reflects the changes in national economic policy. Over 60 years ago, it is well known that Myanmar practiced centrally planned economy. In 1995, the government started privatization process in line with the policy of centrally directed economy to market-oriented economy. In a report by Tun (n.d), the need to privatize was mentioned that the state owned enterprises were facing problems such as losses that affected deficits in the state budget, shortages of funds for expansion, heavy debts, operating problems and inability to realize their full production capacity. The private sector regained role in the nationally controlled economy under the State Peace and Development Council's ruling in the 1990s as legislative and administrative reforms swept away many of the restrictions and discriminations imposed on the private sector in production, trade and services, which were said to be imposition under socialism<sup>9)</sup>. Thus, it can be said that the reform of port in Myanmar came together hand in hand with the process of privatization and decentralization as the privatization of Yangon Port can be traced back in the late 1990s. Before 1995, all the terminals had been operated under the only management and ownership of MPA. MPA was the sole responsible body for port operations, management and port planning under the auspices of Ministry of Transport. Strategic port development decisions were done by MPA as a government body, and as policy regulator under the direction of Ministry of Transport. In 1995, Myanmar government

9) Than, T.M.M. (2007). State dominance in Myanmar: the political economy of industrialization. *Institute of Southeast Asian Studies Publishing*: Singapore. p.388.

started to launch privatization scheme including port development plan with several scheme of fund raising from the private sectors as shown:

- (a) 100% National investment
- (b) 100% investment under Build Operate Transfer (BOT) basis by Foreign and/or local investors
- (c) Joint-Ventures between MPA and Foreign and/or local investors
- (d) Grant aids or soft loan financed by international financial institutions, in accordance with the requirements of Foreign Investment Law (1998), Myanmar Citizens Investment Law (1998) and Myanmar Companies Act (1914) subject to the approval to the Myanmar Investment Commission.

The earliest privatization of port to private sectors was found in terminal operations of Myanmar International Terminals Thilawa (MITT) and Asia World Port terminal in 1997. Privatization, meanwhile, came in two pictures: one being the national/domestic private sector participation and another being foreign sector participation. In the MITT case, it is a private multi-purpose container terminal owned and operated on a BOT basis by Hutchison Port Holdings, one of the top 10 Global Container Terminal Operators. Although, it is not clear whether the change is due to the willingness of the government's privatization or not, at least it could be sure that port authorities are increasingly confronted with the globalization of new public management in terminal operations, since the 1990s was the period when a number of terminal operators and major shipping lines merged to invest in and take control of a large number of terminals all over the world<sup>10</sup>). Thus, after 1997, the governance structure of Yangon Port has split into public terminal operators i.e. the terminals managed and operated by MPA, and private terminals (Foreign and National) such as MITT, Asia World Port Terminals and others.

Figure 3 illustrates the administrative structure of Ports in Myanmar. As has been stated, Ministry of Transport administers Myanma Port Authority. The latter not only administers other international and national terminal operators but also operates the terminals itself. However, due to government policy to privatize rather than accommodating the question of efficiency, most of its terminal operations are being privatized recently. Thus its role on later years seems to be just the administer supporting the government i.e. the Ministry of Transport in policy making. It seems decentralization in this matter is less likely to occur.

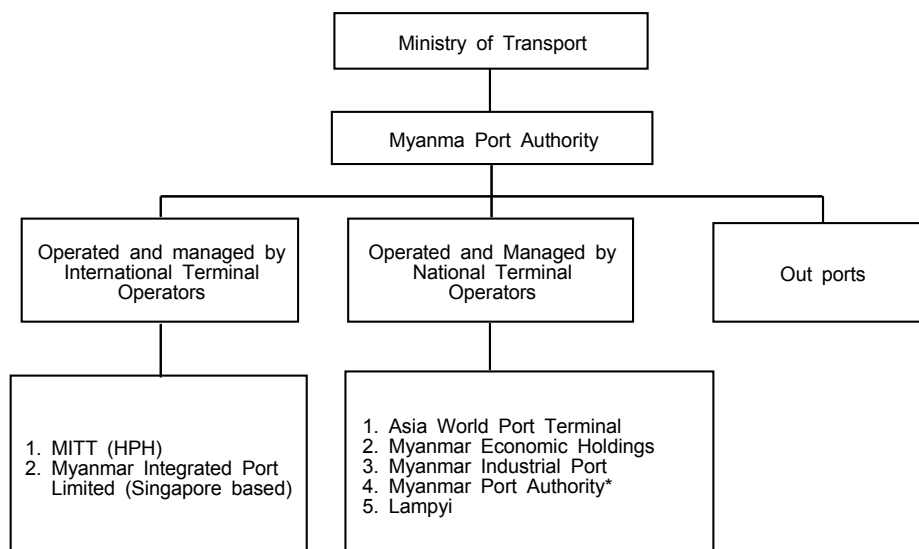
Putting into the World Bank (2007) Port management models, Yangon Port management model can be divided into two categories: before 1997, it would fall under the categories of "public service port", but after 1997 onwards, it can be said to be a "landlord" port (Table 1). There are also indications that privatization is likely to occur more in the port management and functions.

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10) The World Bank (2007). Port reform toolkit: module 3: Alternative port management structures and ownership models. Author, Wahsington.

**Table 1.** Basic port management models

Type	Infrastructure	Superstructure	Port labor	Other functions
Public service port	Public	Public	Public	Majority public
Tool port	Public	Public	Private	Public/private
Landlord port	Public	Private	Private	Public/private
Private service port	Private	Private	Private	Majority public

**Figure 3.** Port administrative structure of Yangon Port

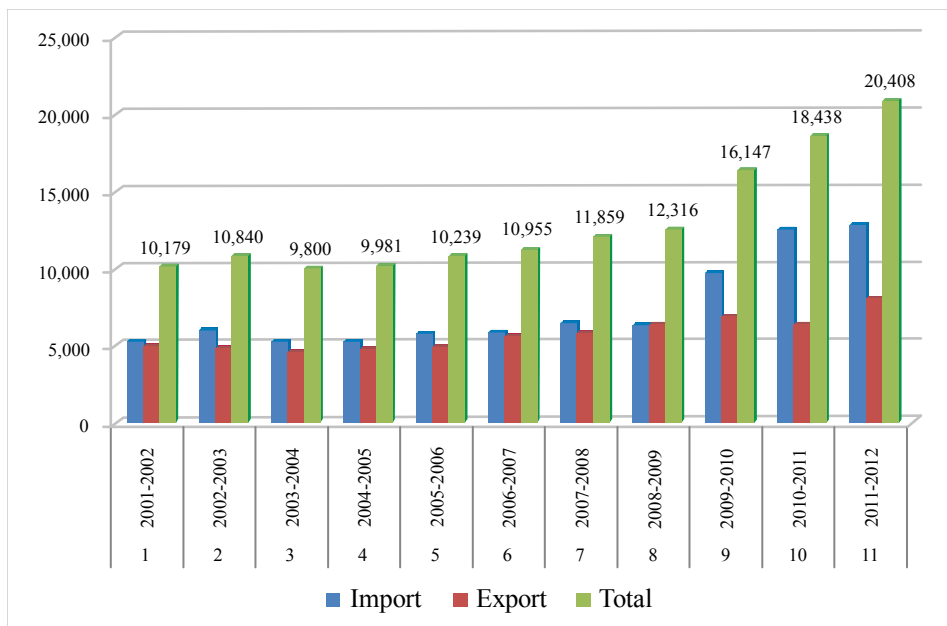
Briefly describing Figure 3, Ministry of Transport directs Myanmar Port Authority, which makes policy, owns, manages and operates some terminals of its own. At the same time, MPA administers, owns, manages and operates the out ports in coastal areas. The port authority leases the land to the private terminal operators either national or foreign companies and the latter manage and operate the terminals on BOT basis.

## 4. Port Deveopment and Recent Economic Changes

As a river port, Yangon Port has very limited in port expansion and development. Limitations on draft of about 9 meters for the vessels and obsolete cargo handling equipment and limited land have hindered the port development. The only area that port expansion can be made is in Thilawa Port, a part of Yangon Port, where the land area has been leased to MITT. MITT was meant to cater for the handling of containers up to the annual capacity of 500,000 TEUs and edible oil bulk terminals with 37 plots of water front land (15 hectares), each measuring quay length of 200m and 750 landward. The terminal is designed to accommodate the berthing of

18,000-20,000 DWT vessels. In 2009, additional national private investors participated in the Thilawa port area for the tanker port/fuel oil terminals. As have been stated in section 3, the private terminal operators invested in the port for bulk terminals are MIPL and MEC. MIPL also invested in bulk terminals and MIPL is a Singapore based company.

**Figure 4.** Seaborne trade of the Yangon Port (including Thilawa) (2001-02 to 2011-12)(M.ton in thousands)



Source: Central Statistical Organization (2010)

Despite port privatization, in the hope that the port traffic would grow, international reactions to military governments imposing sanctions on trade especially with Europe and North America had affected the international trade consequently to port traffic. As can be seen from Figure 4, the port traffic had been flat before 2010. The port facilities are obsolete and management is bureaucratic. Port improvements and modernization project were financed by the World Bank Loan in 1983. Through this loan, container yard with reefer points and container freight stations, strengthening of wharves, procuring some cargo handling etc. were accomplished. However, taking into account of the containerization age, the container traffic is rather low and the port facilities are not sophisticated enough to handle cellular ships. Table 2 and 3 show that the container cargo is less than 30% of the total cargo handled by the port that includes both general cargo in bulk and in container, and bulk cargo.

However, as the cargo handled at the port has started to increase since 2010, the year when the political reforms initiated and given the limitations in Yangon port expansion, MPA fully aware that there is a need to develop a modernized port. The favorable geographic location of the country also presents an attractive location

to develop port facilities. Some studies have shown the potential of its coastline to become an alternative international trade route to Asia<sup>11)</sup> instead of the longer route through the Straits of Malacca. Currently, the deep sea ports are to be developed in Dawei in the southern part near Thailand and in Kyaukphyu in the north of the coastline.

**Table 2.** Volume of Container Handled in Port of Yangon (including Thilawa)

No	Year	Import	Export	Total (TEU)	Total (M.T in thousand)
1	2006-2007	99.942	97.337	197.279	3148.324
2	2007-2008	115.267	111.236	226.503	3462.489
3	2008-2009	133.712	130.294	264.006	3937.131
4	2009-2010	152.077	151.333	303.410	4372.025
5	2010-2011	175.315	171.327	346.642	4571.902
6	2011-2012	207.540	200.503	408.043	5594.589

Source: *Myanma Port Authority*

**Table 3.** Container in Metric Tonnes as a percentage of total cargo handled

Year	Total MT in container Thousands	Total cargo handled	Container as a percentage of total
2006-2007	3148.324	10955	0.29
2007-2008	3462.489	11859	0.29
2008-2009	3937.131	12316	0.32
2009-2010	4372.025	16147	0.27
2010-2011	4571.902	18438	0.25
2011-2012	5594.589	20408	0.27

*Foreign Direct Investment and Special Economic Zones*

Foreign direct investment in Myanmar has been permitted only since 1988. Reportedly, however, economic sanctions imposed by the United States and the European Union resulted in multinational corporations (MNCs) pulling out investments from Myanmar<sup>12)</sup>. Figure 5 shows the status of the FDI inflows to Myanmar from 1990-2009. The report highlighted that the growth of FDI inflows in 2011 and 2012 since the new Government of Myanmar's opening up policies and economic reforms. According to official statistics, the country attracted over US\$ 46 billion in foreign investments for the financial year 2012-2013<sup>13)</sup>. Experts have commented that the

11) Yang, X, M.W. Low, J and Tang, L.C (2011). Analysis of intermodal freight from China to Indian Ocean: A goal programming approach. *Journal of Transport Geography*, Vol. 19, No.4, pp. 515-527.

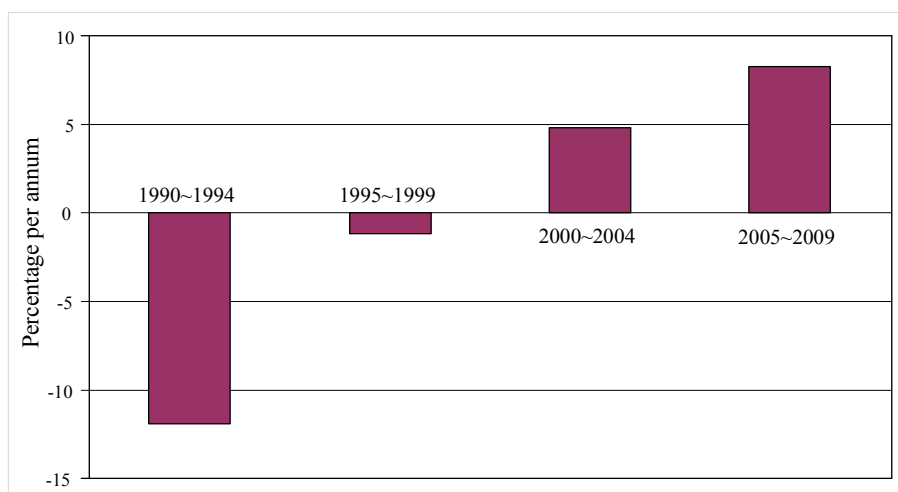
12) UNESCAP (2012). Myanmar: opening up to its trade and foreign direct investment potential. Trade and Investment Decision Staff Working Paper 01/12.

13) Directorate of Investment and Company Administration (2013). Data on foreign investment, local investment and company administration. <http://www.dica.gov.mm/dicagraph.htm> viewed on 2014-04-22.

more diversified the sources of the FDI inflows, the greater will be the benefits in Myanmar. Still, the government's FDI volume is still relatively low<sup>14</sup>).

After a new foreign investment law which replaces the Myanmar Foreign Investment Law of 1988, was signed on 8 May 2012, by the President of Myanmar and enacted on 2 November 2012, a managed-float exchange rate system has been officially adopted. It has brought expectation that a better environment for the investment in port will also be likely. Under the new investment law, the most concerned issued of old investment law has been revised, resulting in dividing three types of foreign investment that can be (1) a 100% foreign owned company; (2) a joint venture with a Myanmar investor; and (3) a foreign investor operating in a contractual relationship with a local investor.

**Figure 5.** Annual growth of FDI inflows to Myanmar, 1990-2009



Source: UN ESCAP(2012), Myanmar: Opening up to Its Trade and Foreign Direct Investment Potential, Trade and Investment Division, Staff Working Paper 01/12, p.5

Like many other Asia countries, for instance China and Korea, Myanmar is following the line of export based economic strategies. In order to overcome infrastructure bottlenecks and promote foreign direct investment, Special Economic Zones (SEZs) have been created. Major SEZ projects includes:

- (1) Dawei Special Economic Zone in the southern Taninthayi region
- (2) Kyaukphyu Economic and Technology Zone in the western Rakhine state
- (3) Thilawa Special Economic Zone near Yangon
- (4) the port industry and the international trade

14) Steinbock, D (2013). "Myanmar's quest for foreign investment". Accessed 2014.04.20  
<http://mmbiztoday.com/articles/myanmar-s-quest-foreign-investment>

These three SEZs are, of course, as with its intention, situated near the ports to be developed. In a way, they are intended to support the international trade presenting private sector opportunities both domestic and foreign investors. The SEZ law, enacted in January 2011, has undergone revision and the revised SEZ law was enacted in January 23, 2014 in order to promote the development of the economy of the state. According to this law, foreigners may be allowed to own 100% of an investment business or to invest in a joint venture with a citizen<sup>15)</sup>. The law also provides incentive scheme for the investors that investment business in a special economic zone shall have the right to enjoy the income tax exemption for the first 5 years from the date of commencement of commercial operations; reduction of the income tax create by 50% for the second 5 years etc. With regard to land use, the management committee may allow the developer or investor to lease land or use land for up to 50 years upon payment of the land lease fee or land use fee with the optional extension of additional 25 years<sup>16)</sup>. In brief, the investment law and special economic zone law are the result of promoting for the economy of the country and can provide a sound opportunities for private sectors both foreign and domestic except that there are some unclear provisions, for instance, it is not clear whether the extension of lease will be an absolute right exercisable by the investor, or whether the extension will be at the discretion of the State authorities. In addition, foreign ownership of land seems unlikely in the foreseeable future.

In the future, thus, the port governance structure of Myanmar is positively to be improved and the transparent procedures are expected to be seen. Also, as many have been identified, there are a lot of advantages of investing in Myanmar. For example, ASEAN membership offers regional trade benefits; strategic location between China and India; rich supply of natural resources; abundant agricultural recourses; high potential for tourism; and attractive demographic profile of the labor force, providing one of Asia's lowest labor costs. Once export grows, the trade will also grow and ultimately the port business will also grow. According to Asian Development Bank (2014), the economy is forecast to post higher growth of 7.8% in both FY 2014 and FY 2015. For the port authority, with liberalization and openness to international market, and the government's encouragement of foreign investment in port industry, it should be prepared for the intensity of the increasingly strong competition from counterparts in neighboring countries. The competition will be the most intense if the port development is meant for the hub port, as this will be in competition with the world's best hub port "Singapore", noticing that location is not the only factor that derermine for the port choice for the shippers and carriers.

Meanwhile, caution needs to be considered, as there are differences in the timing of changes. Some experts have reminded that Myanmar is a late comer in industrialization that it would be able to depend solely on export-oriented growth strategy. It is because traditional external market conditions have changed since the global financial crisis in 2008-09<sup>17)</sup>.

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15) Special Economic Zone law. The Pyidaungsu Hluttaw Law(Article15, chapter 6). No.1/2014

16) Special Economic Zone law. The Pyidaungsu Hluttaw Law (Article 79; Chapter 17) No.1/2014

17) Lin, H and Yamada, Y (2012). Economic Reforms in Myanmar: Pathways and Prospects. BRC Research Report No.10, Bangkok Research Center, IDE-JETRO, Bangkok, Thailand.



## 5. Conclusion and Implications

As have been evidenced in many ports, ports in Myanmar have been moving away from the public model. Myanmar's economy has been deteriorated since the socialist age. It could not enjoy the benefits of globalization like other many regional countries due to the isolation and sanctions of international community until 2010. However, the change in government's policy from closed to open market economy in the 1990s has brought private participation concept including in the port sector. The event was also coincided with the spread of the Global Terminal Operators in the international arena.

So far, a lot of economic reforms by the government have been initiated. They appear to support the port industry, for instance, developing the Special Economic Zones near the port realm, enacting the SEZ law and foreign investment law. It has also been under pressure of investment and financing issues. However, to the best of authors' knowledge, nothing is heard about the amendment or revision of port law, nor anything port related regulations, perhaps the matter will be come up at a later stage of reform measures. Port privatization has been witnessed in the late 1990s. Port decentralization can be expected to become lessen with the government's political reforms. Port authority should be prepared to be able to cope with the upcoming competition. It should also promote competition among the operators creating same level playing field, for example, transparent and accountability will be more demanded.

The study also has implications for the Port Authorities of Yangon Port. So far, the port strategies themselves are necessary to be set up in the socio-economic context. Then, governance-performance links should be examined and governance models tested against performance outcomes for varying port strategies.<sup>18)</sup> Then, the options for devolution should be examined in consistent with the objectives.

As with the international ports, investment and financing issues have imposed limits on options available to the government. Thus, for the port development planning in Dawei will require the Port Authority engaging in a variety of coordination or cooperation with the regional countries. Finally the port authority should, continuously review rather than relying on ad hoc arrangements, the effectiveness of their concession policies in accordance with the market trends and advances in the legal framework.

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18) Baltazar, R., & Brooks, M.R. (2001). The governance of port devolution: A tale of two countries. *World Conference on transport research*, Seoul, Korea, July.

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# Historic Waters Regime: A potential Legal Solution to Sea Level Rise

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## ABSTRACT

The legal principle articulating that “the land dominates the sea”<sup>1)</sup> constitutes a fundamental legal principle under general international law, which requires coastal states to have sovereignty over the land, from which all of their maritime rights stem. Under current international law of the sea, this principle constitutes the most challenging legal obstacle for coastal states to maintain their entitlement over their maritime zones in the event of losing their territories due to sea level rise. In departing from the current international law of the sea, the author explores the possibility of using the doctrine of historic waters as a legal basis for coastal states to safeguard their sovereignty and sovereign rights over their maritime zones as they stand nowadays, regardless of the disappearance of their landmass. It briefly assesses the doctrine of historic waters and recent international practice, particularly the case law of the International Court of Justice and the United States of America. It identifies the relevant legal requirements that coastal states would have to fulfill in order to be able to claim in the future an historic title<sup>2)</sup> over their maritime zones that would have been previously governed by current international law of the sea.

**Keywords:** Historic Waters, Sea level Rise, International Law of the Sea, the Land Dominates the Sea, Disappearance of Land Territory, Sovereignty, Sovereign Right, International Court of Justice, Maritime Zones, Climate Change, Stability of the Oceans.

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1) *North Sea Continental Shelf*, Judgement of 20.2.1969, ICJ Reports 1969, 3, para. 96.

2) For the purpose of this paper the author will not deal with the continental shelf regime.

# 1. Introduction

Few modern law of the sea commentators have reflected on the subject of historic waters, mostly because the doctrine of historic waters has been overtaken by the current international law of the sea regime, considering it “as relics of an older and by now largely obsolete regime”<sup>1)</sup>. However, it is the view of the author that historic waters might have found its way back to the spotlight as a potential solution to the legal challenges posed by the rising sea level. This view has been explored in the past very lightly and abandoned very quickly<sup>2)</sup>. The present article intends to review some of the considerations that would have to be taken into account in order to consider the historic waters regime as a viable solution.

The principle “the land dominates the sea” constitutes a well- recognized principle by the International Court of Justice (“ICJ”). In the *Qatar v. Bahrain* case, the ICJ stated that the “maritime rights derive from the coastal State’s sovereignty over the land” and “[i]t is thus the terrestrial territorial situation that must be taken as a starting point for the determination of the maritime rights of a coastal State”. More recently, in the *Nicaragua v. Colombia* case, the ICJ emphasized that “[t]he title of a State to the continental shelf and to the exclusive economic zone is based on the principle that the land dominates the sea”, and that “the land is the legal source of the power which a State may exercise over territorial extensions to seaward”. The implications of this fundamental principle would militate against those States that would lose their territory due to sea level rise, as any claim of those States that is not based on a coastal front would be unfounded.

Over 70 years ago, Gidel stated that a coastal State which makes the claim of historic waters is asking that they should be given exceptional treatment; “such exceptional treatment must be justified by exceptional conditions ...”<sup>3)</sup>. Yet, what is more exceptional than the disappearance of the territory of a State? Should a long-standing exercise of sovereignty and sovereign rights over maritime zones be suddenly invalidated in the future due to the disappearance of the land mass? Would that be in conformity with the principles of general international law and the preservation of the international order and stability of the Oceans? The author considers that the answer is in the negative. Maritime boundary disputes are a substantial source of international conflict, if coastal states could challenge settled limits and boundaries on the basis of any shift of the coastlines due to sea level rise, the potential for

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1) Blum (1986), “The Gulf of Sidra Incident”, *American Journal of International Law*, 80, pp. 668-677, at p.671

2) See A.H.A. Soons (1990), “The effects of a Rising Sea Level on Maritime Limits and Boundaries”, *Netherlands International Law Review*, Volume XXXVII, para. 4.2.4. Professor Soons basically rejected this approach because under his view the doctrine of historic waters (1) causes a great measure of uncertainty with respect to the situation between the shifting of the baselines and the coming into existence of a new legitimate title (time factor); (2) the issue of sea level rise differs too much from the original issue for which the doctrine of historic waters was developed and (3) the predictability of the effect of sea level rise calls for a development of a general rule which in similar cases can be applied by all coastal States. *Ibid.*

3) Gilbert Gidel (1934), “Le Droit International Public de la Mer”, Vol. III, p. 635.

conflict would be enormous, not least because of the unfairness of the situation for those countries, particularly small developing countries.

This article will examine the potential application of the doctrine of historic waters as a legal basis for safeguarding the sovereignty and sovereign rights of States over their maritime zones as they stand nowadays, regardless of the disappearance of their landmass.

The doctrine of historic waters has been viewed as a deviation from the general rules. Nevertheless, general criteria on the legal requirements for its application exist. The three legal requirements that compose the historic waters doctrine will be briefly explained below: 1) formal claim, 2) effective and continued exercise of the relevant jurisdiction, and 3) international acquiescence. It will be seen that in order for a State to benefit from this regime it would have to comply with these traditional requirements. The author will suggest, when explaining each legal requirement, the potential approach that a coastal State could adopt in order to be able to rely on this doctrine to maintain their pre-existent maritime zones. The article concludes by acknowledging the potential use of the historic waters regime in benefit of those States that have lost territory due to sea level rise.

## 2. Sea level rise and the loss of territory

Under the provisions of the United Nations Conventions on the Law of the Sea (hereinafter “LOSC”), coastal states may claim a twelve nautical mile territorial sea<sup>4)</sup> (hereinafter “TS”), a twenty-four nautical mile contiguous zone<sup>5)</sup> (hereinafter “CZ”), and a two-hundred nautical mile exclusive economic zone<sup>6)</sup> (hereinafter “EEZ”) and continental shelf. These maritime zones are measured from baselines<sup>7)</sup> located at land, which under the LOSC, are of an ambulatory nature<sup>8)</sup>. In turn, it is only

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4) LOSC, article 3.

5) LOSC, article 33, (2).

6) LOSC, article 57.

7) See the following articles of the LOSC: article 5 normal baselines; article 6 reefs; article 7 straight baselines; article 9 mouth of rivers ; article 10 bay closing lines; article 9 river closing lines; article 13 low tide elevations; article 47 archipelagic baselines.

8) There are only exceptions addressed in LOSC, deltaic baselines and the limits of the outer continental shelf, leading to the conclusion that in general the others maritime zones are of an ambulatory nature. Most of the Commentators agree that under LOSC baselines (normal baselines) are of an ambulatory nature. See David D. Caron (1990), “When Law Makes Climate Change Worse: Rethinking the Law of Baselines in Light of a Rising Sea Level”, 17 *ECOLOGICAL L.Q.* 621, 634; A.H.A. Soons (1990), “The Effects of a Rising Sea Level on Maritime Limits and Boundaries”, 37(2) *NETH. INT’L L. REV.* 207, 216-18; Rosemary Rayfuse (2012), “Sea Level Rise and Maritime Zones: Preserving the Maritime Entitlements of ‘Disappearing’ States”, in *Threatened Island Nations: Legal Implications of Rising Seas and a Changing Climate* (M.B. Gerrard & G.E. Wannier eds., forthcoming); José Luis Jesus (2003), “Rocks, New-born Islands, Sea Level Rise and Maritime Space”, in *Negotiating for Peace- Liber Amicorum Tono Eitel* 599, 602 (Jochen Frowein et al. eds., 2003); Clive Schofield & I Made Andi Arsana (2010), “Imaginary Islands? Options to Preserve Maritime Jurisdictional

logical to anticipate that a considerable rise in the sea level would have a direct impact on baselines and the outer limits of maritime zones. For example, if a feature that generates maritime zones is submerged it would result in the change of status of that feature. A maritime feature that now falls under the “islands” regime or “low-tide elevation”<sup>9)</sup> regime can be reclassified into one of the categories of insular formation from which only restricted maritime claims can be made, such as a “rock”<sup>10)</sup>, or even a fully submerged feature that cannot be used to generate any maritime claim.<sup>11)</sup>

In the face of sea level rise and the gradual disappearance of land territory, some authors and States have suggested different approaches that could be adopted by coastal states in order to safeguard their rights and sovereignty over such territory. Although this paper does not intend to analyze the nature of baselines or the maritime zone’s outer limits under the LOSC, a quick overview of the approaches involving baselines that have been suggested so far to solve this situation will serve as a background to the argument for historic waters in the search of a possible legal solution to challenges posed by the rising sea level.

Some coastal states consider that artificial conservation of features or the coastline might offer a solution to counter the legal and practical effects of the sea level rise. For example, the Government of Maldives built a 3m high gabion seawall around Malé. Even though it might be true that building artificial infrastructure around features capable of generating maritime zones or reinforcing coastlines could protect from the effects of sea level rise and avoid the reduction or loss of maritime zones, its viability is questionable and might simply not be enough. Artificial conservation constitutes a costly solution, which might be reasonable for developed countries that have the financial and technological means to put it in practice and maintain it; but for Small Island States who are in fact the most affected, the cost of such project would constitute an unbearable task. Clearly, another reminder that small developing countries bear the brunt of climate change despite their marginal contribution to the situation.

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Entitlements and Provide Stable Maritime Limits in the Face of Coastal Instability”, 6th IHO-IAG ABLOS Conference, 25-27 October 2010, available at [http://www.iho.int/mtg\\_docs/com\\_wg/ABLOS/ABLOS\\_Conf6/ABLOS\\_Conf6.htm](http://www.iho.int/mtg_docs/com_wg/ABLOS/ABLOS_Conf6/ABLOS_Conf6.htm) ; Moritaka Hayashi (2011), “Sea-Level Rise and the Law of the Sea: Future Options”, in *The World Ocean in Globalisation* 187 (Davor Vidas & Peter Johan Schei eds., 2011). See also the International Law Association Committee on Baselines under the International Law of the Sea, which stated that: “the normal baseline is ambulatory, moving seaward to reflect changes to the coast caused by...sea level rise” (available at <http://www.i-la-hq.org/en/committees/index.cfm/cid/1028>)

9) “A low-tide elevation is a naturally formed area of land which is surrounded by and above water at low tide but submerged at high tide. Where a low-tide elevation is situated wholly or partly at a distance not exceeding the breadth of the territorial sea from the mainland or an island, the low-water line on that elevation may be used as the baseline for measuring the breadth of the territorial sea.”, article 13 (1) LOSC.

10) See article 121 (3), LOSC.

11) Julia Lisztwan (2012), “Stability of Maritime Boundary Agreements”, Vol. 37:1, p. 161 (*footnote omitted*).



Another suggested approach<sup>12)</sup> has called for the development of rules under international law concerning baselines in anticipation of sea-level rise. For example, the development of a customary rule that would allow for these States to continue having rights over those maritime zones and resources. It is well known, that for a customary rule to be recognized as such it has to fulfill the traditional criteria; a) there should have been sufficient State practice and b) that this should have been accompanied by *opinio juris/opinio juris sive necessitatis*.<sup>13)</sup> The downside of this proposal is that the establishment of “a general recognition among States of a certain practice as obligatory”<sup>14)</sup>, could be as challenging as a decision among States parties to the LOSC, a revision of the LOSC or the adoption of an implementation agreement or supplementary treaty to this effect, all of which have been suggested at some point.

More importantly, even if a new customary rule of international law emerges this would not necessarily provide a legal answer to coastal states that would lose their entire territory. This situation arises out of the fact that both customary law of the sea and the LOSC contain as a basic rule the *Principle of Domination*. This means that if a coastal State loses the totality of its territory, under the current law of the sea it would not be able to maintain its baselines from which to measure the breadth of its maritime zones and would not have any entitlement at all over its pre-existing maritime zones, as any claim of a State without a coastal front would become unfounded. Therefore, if existing provisions were applied as they now stand<sup>15)</sup>, the surviving population would be left without any resources.

Furthermore, the pre-existing maritime zones of a coastal State would become part of the high seas, leaving it open for exploration and exploitation by other nations, particularly those developed nations that dominate offshore exploration and exploitation of marine resources. This in turn only adds to the already unbalanced state of things when it comes to the sharing of resources and makes the loss of territory and resources a particularly unjust and inequitable result for some States, such as small island developing states.

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12) Another possible approach is the adoption of maritime boundaries agreements between coastal states with opposite or adjacent coasts. The stability given by boundary agreements between states is well recognized by the jurisprudence of the ICJ, which might be enough to counteract geographical changes or the disappearance of land territory (eg.: “when two countries establish a frontier between them, one of the primary objects is to achieve stability and finality.” (Temple of Preah Vihear (Cambodia v. Thai.), Merits, 1962 I.C.J. 6, 34 (June 15)).”

13) Hugh Thirlway (2014), “The Sources of international Law”, First Edition, Oxford University Press p. 56-57.

14) Ian Brownlie (2008), “Principles of Public International Law”, Seventh Edition, Oxford University Press.

15) Sea level rise was not generally foreseen when formulating the existing rules of international law. During UNCLOS III not only “[t]he prospect of sea-level rise and its effect on maritime space and borderlines [were...] not specifically addressed by the 1982 Convention...” but “this was not a major concern.” See more at Jose Luiz Jesus (2003), “Rocks, New-Born Islands, Sea Level Rise and Maritime Space”, in Negotiating for Peace—Liber Amicorum Tono Eitel 601 (Jochen Abr. Frowein, Klaus Scharioth, Ingo Winkelmann & Rudiger Wolfrum eds., 2003).

This dim scenario raises some important legal questions and provokes the search for other legal solutions to allow those States that might be affected by the loss of their territory to continue claiming their maritime zones and resources therein. In this respect, it is the view of the author that the doctrine of historic waters might offer such a possibility. Below the author describes briefly the concept of historic waters along with its legal requirements.

### 3. Historic waters

In the absence of a codified definition of historic waters, it is necessary to rely upon customary international law, and the opinion of jurists and judicial bodies. In this regard, Bouchez has defined historic waters as “waters over which the coastal State, contrary to the generally applicable rules of international law, clearly, effectively, continuously, and over a substantial period, exercises sovereign rights with the acquiescence of the community of States”<sup>16</sup>). The definition made by Bouchez reflects the legal requirements of historic waters: effective and continuous exercise of sovereign rights and international acquiescence. Over two decades ago, Professor Soons also defined historic waters as “waters over which the coastal State, in deviation of the general rules of international law, has been exercising sovereignty, clearly and effectively, without interruption and during a considerable period of time, with the acquiescence of the community of States”<sup>17</sup>). The elements of the definition made by Prof. Soons are the same as the ones expressed by Bouchez and have been supported by other commentators.<sup>18</sup>) More recently, these requirements have also been recognized by the Bureau of Oceans and International Environmental and Scientific Affairs of the United States of America in its document “Limits in the Seas No. 143 “Maritime Claims in the South China Sea”<sup>19</sup>).

The United Nations, in its “Juridical Regime of Historic waters including bays” (hereinafter *UN Juridical Regime*)<sup>20</sup>) upheld these legal requirements, which suggest a general consensus regarding the elements for the establishment of a historic title over maritime zones. The *UN Juridical Regime* summarizes the background of the

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16) L.J. Bouchez (1964), “The Regime of Bays in International Law”, published by A.W. Sythoff, at p. 281. See also Gilbert Gidel (1934), “Le Droit International Public de la Mer”, Vol. III, p. 623.

17) A.H.A. Soons (1990), “The Effects of a Rising Sea Level on Maritime Limits and Boundaries”, *Netherlands International Law Review*, 37, para. 4.2.5

18) L.J. Bouchez (1964), “The Regime of Bays In International Law”, pp. 200-201. (Leyden: A.W. Sijthoff). See also P.C. Jessup (1927), “The Law of Territorial Waters and Maritime Jurisdiction”, p. 382. (New York).

19) (1) open, notorious, and effective exercise of authority over the body of water in question; (2) continuous exercise of that authority; and (3) acquiescence by foreign States in the exercise of that authority. For more see Limits in the Seas No. 143 (December 5, 2014) China “Maritime Claims in the South China Sea” United States Department of State, Bureau of Oceans and International Environmental and Scientific Affairs (footnote omitted).

20) Juridical Regime of Historic Waters, including Historic Bays, Document: A/CN.4/143, 09 March 1962. This document was prepared by the Codification Division of the Office of Legal Affairs at the request of the International Law Commission.

concept of historic waters in a description that would very much fit a situation such as the one under study, that is, a State losing the entirety of its territory, and as a consequence, its maritime zones. According to *UN Juridical Regime* the key element in the development of the notion that waters could be claimed under a historic title, is the fact that States continued to claim and effectively maintained sovereignty over an area that was considered “vital” for their national interests despite the evolution of the law towards other completely opposing notions.<sup>21)</sup>

As to the character of the historic waters regime, the ICJ remarked in the *Tunisia/Libya* case the absence within the LOSC of any concept or rules on historic waters and therefore concluded that “[...] the matter continues to be governed by general international law which does not provide for a single regime for historic waters or historic bays, but only for a particular regime for each of the concrete, recognized cases of historic waters or historic bays”<sup>22)</sup>. Traditionally, the term historic bays has been more frequently used than historic waters and therefore the case law on the former has been developed, in contrast to the virtually non-existence case law on the more general term of historic waters. However, this reference to the nonexistence of a single regime seem to imply that the doctrine of historic waters is not limited to claims of historic bays, suggesting that there are no reasons for which a State could not claim a historic entitlement over other maritime areas besides bays. <sup>23)</sup> Furthermore, the United Nations Memorandum on “Historic Bays”<sup>24)</sup> (hereafter the “UN Memorandum of 1957”) clarifies that the application of the theory of historic bays “is not limited to bays” and that “[i]t tends to be applied [...] to the various areas capable of being comprises in the maritime domain of a State”<sup>25)</sup>. For its part, Sir Gerald Fitzmaurice also noticed that despite the fact that in practice there seem to be more states claiming historic bays, there would be no rule opposing the possibility of claiming other waters on a historic basis.<sup>26)</sup>

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21) The Historic waters idea “has its root in the historic fact that States through the ages claimed and maintained sovereignty over maritime areas which they considered vital to them without paying much attention to divergent and changing opinions about what general international law might prescribe with respect to the delimitation of the territorial sea”, *UN Juridical Regime* p.7, para. 38

22) ICJ Reports (1982), at pp. 73/74 para.100. Symmons considers that the source must be found within international customary law because of the lack of treaty law on the doctrine, leaving the formal source to the limited State practice concerning historic waters, supplemented by discussions in the UN documents, US case law (for example *Alaska v. US* (2005)) and in the works of commentators (for example “Historic Waters in International Law, with Special Reference to the Arctic” Pharand, XXI *Toronto Law Journal* 1(1971). For more see Symmons p.8, para.2.2

23) See *UN Juridical Regime* p.2, para. 8. In fact, the only reason why the UN Memorandum of 1957 did not put more emphasis on others maritime areas was because the purpose of the memorandum was “to shed light on the concept of “historic bays”... and historic claims to other waters were dealt with only incidentally”.

24) Memorandum by the Secretariat of the UN, “Historic Bays”, Volume I (Preparatory Documents), A/CONF.13.1, September 30th, 1957, available at [http://legal.un.org/diplomaticconferences/lawofthesea-1958/docs/english/vol\\_I/4\\_A-CONF-13-1\\_PrepDocs\\_vol\\_I\\_e.pdf](http://legal.un.org/diplomaticconferences/lawofthesea-1958/docs/english/vol_I/4_A-CONF-13-1_PrepDocs_vol_I_e.pdf)

25) *Ibid.*, para. 199.

26) *British Year Book of International Law* (1954), Vol. 31, p. 381.

If the doctrine of historic waters could also encompass other maritime zones, such as the TS, CZ and the EEZ, in the view of this author it would be conceivable to suggest that in the future, coastal states that lose their territory would be able to rely on this doctrine to safeguard their rights over maritime zones. However, entertaining the possibility of this regime as a basis for States wishing to continue enjoying their rights over those areas would also entail to require these States to comply with the requisites of the doctrine of historic waters.

## 4. Legal Requirements

These stipulations contemplate the making of a formal claim, the continuous and effective exercise of relevant jurisdiction and international acquiescence.<sup>27)</sup>

### 4.1 Formal claim

A formal claim must be understood as an action that “must emanate from the State or its Organs”<sup>28)</sup>. It must be public and must have the notoriety proper of an act of a State. Additionally, in order to be able to claim a historic title over the maritime zones the actions of the coastal State shall be of an authoritative nature, i.e. exercise of sovereignty or sovereign rights over the relevant areas.<sup>29)</sup>

Any claim should be made without inconsistencies otherwise those inconsistencies could affect the alleged historic title. There should be consistency in the period of time and area of the claim. This issue was raised in the Tunisia/Libya case, in which Libya argued that the historic rights claimed by Tunisia were contradicted by the numerous changes undergone by the enacted legislation over a period of time, contradicting the supposedly ‘immemorial’ recognition of such rights.<sup>30)</sup> The legislation enacted by Tunisia, such as a 1951 decree and a 1963 law regarding the Gulf of Gabes, showed important discrepancies affecting the size of the area claimed, the methods for establishing that size and other points of interest that made it impossible for Libya to acquiesce the claim of Tunisia <sup>31)</sup>. Similarly, in the *US v. Florida* case, there were also arguments against the geographical inconsistency based on the different treatment given to the area by geographers and cartographers over time because the area being claimed by the State of Florida was not always constantly treated as a bay.<sup>32)</sup>

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27) This article is based on the assumption that the Coastal State will continue to exist as State under international law even after the disappearing of their territory. For further reading on this subject see Rosemary Rayfuse (2010), “International Law and Disappearing States: Utilising Maritime Entitlements to Overcome the Statehood Dilemma”, Univ. N.S.W. Faculty of Law Research Series, Paper 52. The statehood dilemma is beyond the scope of this article.

28) See footnote 16 at Symmons p.120.

29) UN Juridical Regime p.13, para. 85.

30) Libya Counter-Memorial, p.194 para. 120 available at <http://www.icj-cij.org/docket/files/63/9523.pdf?PHPSESSID..>

31) Symmons p.134 (footnote omitted).

Moreover, the claim has to be made in clear and unequivocal terms or else it would be dismissed, as the Supreme Court of the United States did in the *Cook Inlet* case, by concluding that “given the ambiguity of the Federal Government’s position, we cannot agree that the assertion of sovereignty possessed the clarity essential to a claim of historic title over inland waters”<sup>32</sup>). The need for clarity in respect to the extent of the historical claim is essential in two ways; (1) it defines the area over which the State should enforce its jurisdiction and (2) it allows for the possibility of a State to acquiesce the claim.

The importance of these two aspects, international acquiescence and consistency of the claim, was highlighted in the Judgement rendered by the ICJ in the case concerning the Gulf of Fonseca between *El Salvador/Honduras*, where the Court took the opportunity to expand on its previous judgment in the *Tunisia/Libya* case <sup>34</sup>). The Court found that the historic nature of the Gulf was based on the “historic character of the Gulf waters, the consistent claims of the three coastal states, and the absence of protest from other States”<sup>35</sup>).

Now, a practical way to reinforce a claim includes not only the enactment of domestic legislation, but also the indication of the historic claims on a map and notification of the international community along with the accompanying chart. This was done by Italy when asserting its 1977 claim on the Gulf of Taranto and has been supported by commentators<sup>36</sup>). Both the issuance of domestic legislation as well as the notification to the international community on the claim could be considered as the fulfilment of the publicity aspect of the formal claim.

In the hypothetical scenario of the loss of territory, another option for making a formal claim - besides enacting legislation - could be the adoption of an agreement among the affected coastal states, giving them the opportunity to state in written clear terms their claims. This could be done at the regional level, for example among the members of the Alliance of Small Island States. <sup>37</sup>) As we will see below, the fact that the agreement would be among affected States not only reinforces their demands, because of their special interest, but also diminishes the need of the absence of protests.

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32) Report (1974), at p. 43. See Symmons p.134.

33) See footnote 61 at Symmons p.129

34) I.C.J. Reports 1982, p.73.

35) Judgment of the ICJ in the case concerning *The Land, and Maritime Frontier Dispute (El Salvador/Honduras: Nicaragua intervening)* para. 405.

36) For example, Bourquin argued that “[s]overeignty must be effectively exercised; the intent of the State must be expressed by deeds and not merely by proclamations”, Maurice Bourquin (1952), “Les baies historiques”, dans *Melanges Georges Sauser-Hall*, p.43.

37) See more at <http://aosis.org/>

## 4.2 *Effective and continued exercise of relevant jurisdiction*

### 4.2.1 Effective exercise of relevant jurisdiction

The formal claim requires an effective exercise of relevant jurisdiction over the maritime zones on the part of the claiming coastal State. In *El Salvador/Honduras* case, El Salvador very rightly observed in its Counter Memorial that “mere paper assertions do not establish rights and the absence of protest against them does not improve the position of the claimant [State]”<sup>38)</sup>.

One imperative element is that the claim should be in accordance with the exercised jurisdiction. In other words, “if the claimant State exercised sovereignty as over internal waters, the area claimed would be internal waters, and if the sovereignty exercised was sovereignty as over the territorial sea, the area would be territorial sea”<sup>39)</sup>. Following this logic, if the sovereign rights exercised were sovereign rights corresponding to those over the EEZ, the claimed area would be EEZ. This way the sovereignty or sovereign rights to be acquired would be commensurate with the actual exercise by the claimant State.<sup>40)</sup> Thus, the adoption of any legislation relating to historic waters may form a part of an effective exercise of sovereignty or sovereign rights over the maritime zones, but it also requires actual exercise on the ground. This could merely imply for the State to continue exercising and reinforcing that jurisdiction.<sup>41)</sup>

### 4.2.2 Continuity

The steadiness and repetition in time of the activity undertaken by the State is essential to sustain the claim of an existence of a historical title. However, that activity is not just any activity but it should be understood as an effective exercise of sovereignty.<sup>42)</sup> Moreover, the usage must “not only be effective but also prolonged. It must develop into a national usage”<sup>43)</sup>; as any sporadic enforcement of relevant jurisdiction over the maritime zones would not be sufficient for the claimant State to support the continuity of its formal claim. This notion establishes a link between the continuity of a claim and the effective exercise of the relevant jurisdiction over the area for a considerable time. The UN Juridical Regime undertook an extensive review of State practice, case law and academic studies, and determined that this link was the dominant view in order to prove the existence of a title to historic waters.<sup>44)</sup>

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38) Counter Memorial of the Republic of El Salvador (10 February 1989) p.264, para. 8.29 available at <http://www.icj-cij.org/docket/files/75/6587.pdf>

39) UN Juridical Regime, p.23 para.164.

40) UN Juridical Regime p.25, para.189.

41) See para. 32 below.

42) UN Juridical Regime p.15, paras.103.

43) UN Juridical Regime p.22, para.156.

44) UN Juridical Regime p.15, para.101.

In its reasoning in the Tunisia/Libya case the Court drew attention to the need for 'long usage'<sup>45)</sup>, but what does this term encompass? The main view is that there is no particular length of time to create a historic title, leaving it to judgment on a case-by-case basis.<sup>46)</sup> On the other hand, there have been suggestions that the claim should have at least existed for a 100 years.<sup>47)</sup>

In any event, it is important to note that the proposed time lapse becomes less relevant where a formal claim is indisputable and where international acquiescence is undeniable. In this regards, and as Judge Alvarez stated in the Fisheries Case, a comparatively recent usage might be of greater effect than an ancient's usage insufficiently proved.<sup>48)</sup>

In a situation where a State has lost its territory, the last two elements [indisputable claim and international acquiescence] should have more weight in the future than the length of time elapsed. Especially, in the hypothetical case where a regional agreement has been concluded between neighbouring affected States with special interest.<sup>49)</sup> Thus, the period of time will vary according to the particular conditions involved, and, in particular, upon the attitude of neighbouring States or States with special interest.<sup>50)</sup>

In relation to the critical date, for the time to start running the State must be already exercising sovereignty over the area in a public and effective way.<sup>51)</sup> In other words, there is a need to establish a critical date that connects the formal claim with the actual exercise of sovereignty, allowing the claimant State to ensure international reaction (acquiescence) and continuity of the claim to a moment in time.

In the case of coastal states that are parties to a regional group, the moment in time could be the date of the adoption of an agreement that declared their areas as historic waters once their land territory has disappeared. If the enactment of legislation has been the chosen option, then the critical date would be that on which the coastal State adopted the legislation. It would be also advisable for the coastal

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45) I.C.J. Reports 1982, p.73.

46) UN Juridical Regime p.15, para.104.

47) 'See also Alaska v. US (2005) where the Special Master stated that "[t]here cases suggest that a period of more than 100 years would suffice. In the Alabama and Mississippi Boundary case, the Court held that a continuous assertion of authority for 168 years made Mississippi Sound a historic bay [...] Special Master Walter E. Hoffman similarly concluded that 192 years was long enough for Vineyard Sound to become a historic bay. [...] Special Master Albert B. Maris said that 105 years would have sufficed for Florida Bay if other requirements had been met", available at [http://www.supremecourt.gov/SpecMastRpt/Orig128\\_033004.pdf](http://www.supremecourt.gov/SpecMastRpt/Orig128_033004.pdf). See more in Symmons, p.158-159.

48) International Court of Justice "Fisheries Case (*United Kingdom v Norway*), Judgment of 18th December 1951" Reports of Judgements, Advisory Opinions and Orders, p. 152. (Leyden, 1951).

49) See para.42 below.

50) See International acquiescence below.

51) UN Juridical Regime, p.18, para.124.

State to deposit its charts before the Secretary General of the United Nations together with the relevant domestic legislation on the declaration of their maritime zone as historic waters for future effect.

To strengthen the coherence between the claim and the effects of sea level rise, the coastal State should, right from the start of the regression of the baseline, continue to exercise sovereignty or sovereign rights in the concerned maritime zone, in the same way as it used to before the rise of the sea level.

The most important aspect of the points indicated above, independently of the adopted mechanism to establish the critical date, is to establish with clarity that the coastal State is declaring its maritime zones as historic waters<sup>52)</sup> in the face of the potential loss of territory.

It might be problematic to clarify this legal requirement fully at this moment in time. Especially since the historic waters regime will only become effective at the point of disappearance of the land territory in order to facilitate the continued exercise of the rights of a coastal State beyond that point.<sup>53)</sup> As Prof. Soons correctly stated, the qualification of 'historic' implies that the coastal State only acquires a legitimate title after the passing of a certain period of time since the changes in the baseline have occurred. Before that moment, it possessed a legitimate title but after that, a new title has to come into existence, i.e. historic waters regime.<sup>54)</sup> This approach shall not be considered as an absurd, especially because it is perfectly possible to foresee which countries will be most affected by the rise of the sea level and the potential legal mechanisms that could be implemented by them.

#### 4.2.3 International acquiescence

International acquiescence requires knowledge by third States, without which there can be no true acquiescence.<sup>55)</sup> The *Cook Inlet case* demonstrated that "[i]n the absence of any awareness on the part of foreign governments of a claimed territorial sovereignty over [a body of water] the failure of those governments to protest is inadequate proof of the acquiescence essential to historic rights"<sup>56)</sup>, thus international acquiescence of the community of States is required.

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52) Kenya claimed a retrospective historic title on Uganwana Bay. The Territorial Waters Act of 16 May 1972, revised in 1977, states, "Uganwana Bay (sometime known as Formosa Bay) shall be deemed to be and always to have been an historic bay." Kenya's claim was in order to safeguard the vital interests of the inhabitants of the coastal region and to confirm the practice which has always existed, which should not be understood far from the aim of Small Island States.

53) The application of the doctrine of historic waters will only become operational when the LOSC could no longer be applicable.

54) See A.H. A. Soons (1990), "The effects of a Rising Sea Level on Maritime Limits and Boundaries", Netherlands International Law Review, Volume XXXVII, para. 4.2.4.

55) For more see Symmons, p.213.

56) 422 US, p.200, reference available at [http://www.supremecourt.gov/SpecMastRpt/Orig128\\_033004.pdf](http://www.supremecourt.gov/SpecMastRpt/Orig128_033004.pdf) p. 132.



As has been indicated above, international acquiescence depends on an adequate publicity of the claim. In order to be considered as such, enough available evidences on the historic claim should exist. One mechanism that could be adopted by the coastal State is the publication of an eventual regional agreement or declaration on the historical character of their maritime zones, as well as the publication of relevant charts of the relevant maritime areas.<sup>57)</sup>

The acquiescence and the formality of a claim rely on the degree of international acceptance necessary to generate the international recognition, but how wide the degree of international acceptance must be to validate a historic title? Gidel makes two points; the first one is that an objection by one state would not nullify the claim<sup>58)</sup>; and the second one that not all objecting States have the same standing when raising their objections.<sup>59)</sup> Just as in the case of acquiescence, other elements are taken into account when evaluating an objection.

In a similar way, when it comes to customary international law it is observed that “if a sufficient number of States manifest their opposition to a developing rule –particularly if they include States with a special interest in the matter–the rule will not come into existence at all”<sup>60)</sup>.Correspondingly, in the case of historic waters it could be argued that where there is a sufficient number of States with a special interest in the matter, this could generate the necessary international acceptance for international recognition. Once again, the standing is not the same for those States that may not have a great interest and those that do have a great interest in the area, being the latter of greater importance in terms of support and opposition to the claim.

It seems conceivable then to conclude that the degree of international acceptance necessary to generate international recognition will focus on States with special interest in the matter and in the area. Even if other States strangers to the vanishing territories object, the historic titles of the disappearing States could succeed. As previously suggested a consented approach by a group of coastal states, such as the Islands in the Pacific, might constitute a strong recognition of the historical claims and will be of more weight in the face of potential dispute.

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57) See paras. 24-32 above. It is important to mention that the UN Juridical Regime seems to have adopted a more simplistic approach on this aspects, that is “*In any case, nobody seems to demand that the coastal State must formally notify each and all of the foreign States that it has assumed sovereignty over the area, before the time necessary to establish a usage will begin to run. If that is so, the notoriety of the situation, the public exercise of sovereignty over the area, would in reality be sufficient*”. See more in UN Juridical Regime, p.19 para.128.

58) There is no need for the total absence of opposition, UN Juridical Regime, p. 17 para.116 (footnote omitted).

59) *Ibid.*

60) Hugh Thirlway (2014), “The Sources of international Law”, First Edition, Oxford University Press p.86.

## 5. Conclusions

It is imperative for coastal states to protect their maritime zones in the face of climate change and sea level rise, as it will have serious impacts on their national security and economic activities, among others. This is essential for low-lying Islands, as any rise in sea-level will have substantial and profound effects on their economies and living circumstances; and particularly because of the potential for their complete territory to be submerged under water. Artificial conservation measures might not be a viable possibility for those small States or might not be enough for some low-lying Island States.

Despite the desirability of creating new rules to solve this problem, the slim possibility of that happening does not make it practical to count on that solution on the short term. As a consequence, the historic waters regime might prove to be an option for these States to continue enjoying their rights, without having to depend on the creation of new rules.

The author did not encounter any stipulation in international law that would render it impossible for this regime to be adopted by affected States. It might suffice to comply with the requirements for claiming a historic title over these waters. In practice, this could be done through joint action by neighbouring States or States with similar interests by signing a regional agreement or by enacting legislation in coordination, therefore proving acquiescence of other States. Their claim should be clearly stated and include proof that they have had sole possession over the claimed maritime zones. This possession shall be continuous, peaceful and should have been in place for a considerable period of time, by means of acts of sovereignty or sovereign rights in the form of official regulations over the areas.

Moreover, these States would even have the possibility to build artificial infrastructure in their maritime zones in order to manage their resources and security, without having to worry about the artificiality of the infrastructure, since the basis of their entitlements will be the historic title, and not land or a maritime feature.

The International Law Commission in its Report on the work of its twenty-ninth session concluded that “the topic [the juridical regime of historic waters] did not appear at that time to require active consideration by the Commission in the near future”. However, after 37 years, and especially after considering the future scenarios regarding the loss of territory, it seems that the time has come to study the potential of this regime to provide some legal solutions to these challenges. Even though Ambassador Tommy Koh referred to LOSC as a constitution for the oceans<sup>61)</sup>, the future reality will demand the international community to look beyond the Convention.

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61) Statements made on 6 and 11 December 1982 by Ambassador Tommy Koh at the final session of UNCLOS III, in M.H. Nordquist (ed)(1985), “United Nations Convention on the Law of the Sea 1982, A Commentary”, Vol.1, Center for Oceans Law and Policy, University of Virginia, p.11.

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# The Northern Sea Route: Strategic, Political and Economic Dimensions

## - Dimensions of the Northern Sea Route -

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### ABSTRACT

The overall situation in the Arctic has possibly entered a new stage. Unclear prospects for ice melting tempo and drop in hydrocarbon prices objectively slow down the aspirations of all actors and give Arctic the time for a necessary break. Northern Sea Route is critically important for Russia strategically, it is vital for maintaining livelihoods of two million Russians living and working in the North. No economic enterprise in Russian Arctic sector will be successful without maritime transportation support. Complex additional efforts are needed to create a safe and profitable maritime transit system in the Arctic connecting Europe with North-Eastern Asia. The Eastern sector of the Northern Sea Route is less developed and more challenging but providing attractive prospects for domestic and foreign business. A step by step approach, selection of optimal projects best suiting investors, authorities and local communities would be an appropriate way to start profitable business projects there.

**Keywords:** Northern Sea Route, Polar navigation, Northern Delivery, icebreakers

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# 1. Introduction

Since the turn of the centuries the Arctic has been attracting a lot of attention from politicians, transnational corporations, military and media all over the world. Judging from the flow of information from various sources devoted to Extreme North, one can think that Arctic affairs have become a matter of exceptional importance for the world, even that the very existence of a mankind depends on it.

Certainly, it is an exaggeration. The Arctic is just another region of the Earth rich with various kinds of resources but, at the same time which is very difficult for exploration. However, a number of objective and important factors justify this excessive attention to remote Polar Circle areas. Rapid melting of Arctic ice is probably the main contributing tendency.

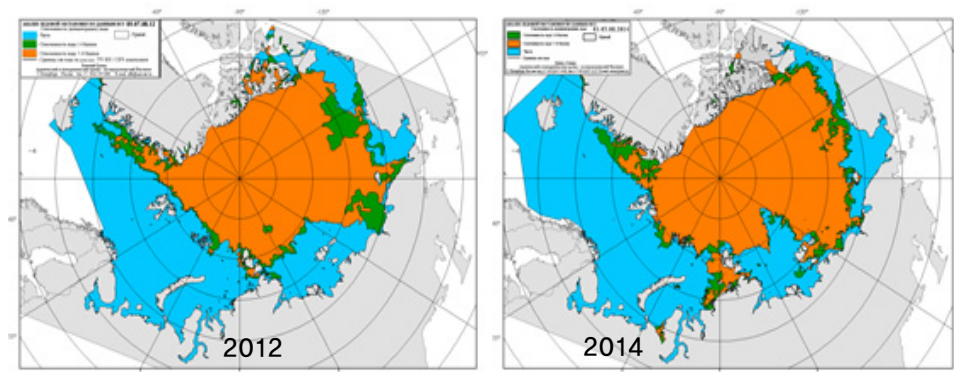
Russia and Republic of Korea are among the most active actors in Arctic domain, though their reasoning and priorities are different. But, both nations have managed not to confront each other in even the minor issues concerning the Arctic so far. It is remarkable in itself taking into account serious 'undercover' battles and sometimes harsh language in public addresses at various international events like Arctic Council, etc. And now it is time for the next step – to establish practical cooperation and collaboration in the Arctic where we can effectively complement each other for mutual benefit.

What is the overall assessment of the situation around the Arctic and outlook for its further developments? Is it possible or feasible to create a commercial maritime transit system based on the Northern Sea Route (NSR)? Where and how the Korean industrial and technological power can be applied most efficiently to promote economic developments in various sectors of Russian Arctic? The goal of this paper is to address these challenging topics, at least partly, basing on the view from Russian 'Side of the Lake'. For practical reasons the research geographical framework will be limited to Russian Arctic sector and adjacent territories and seas of North-Eastern Asia.

## 2. Overall situation in the Arctic

To begin with, two principal economic aspects of the overall Arctic situation have to be evaluated: climate changes paving the way for ice-free polar navigation and situation with oil and gas prices. Both aspects are interdependent and critical for Arctic economic prospects. Tremendous hydrocarbon deposits attract powerful energy corporations all over the world. Maritime transport is the only means capable of providing all kinds of support for constructing and operating industrial facilities in the Extreme North. Additionally, transit cargo delivery by ships from North-Eastern Asia to Europe and backwards has recently become an attractive and profitable option for many economies in Asia-Pacific.

Fig. 1. Arctic ice situation (1st decade of August)



Source: Arctic & Antarctic Research Institute, Russia

The Arctic ice was steadily melting for two decades (*Rothrock et al., 2008*), and melting tempo in ocean areas adjacent to Siberia coast was much higher than in Canadian sector<sup>1</sup>). It is said that ice-free navigation via the NSR waterways became possible for three consecutive months in 2012. But, the ice situation in Laptev, East Siberian and Chukchi Seas became more complicated in 2013 and further deteriorated in 2014-2015 (see Fig.1). The real problem is that scientists today do not have a reliable model of climate changes on the Earth in general and in the Arctic in particular. This issue is sometimes over politicized and the anthropogenic impact on the process of global climate changes (*Corell, 2011*) tends to be exaggerated. In fact, natural factors, especially volcanic activity like the 2010 eruptions of Eyjafjallajökull in Iceland produce major quantities of greenhouse gas combined with massive ash outburst. Moreover, due to the insufficient number of research and monitoring sites in Polar Region several highly interesting natural phenomena influencing global climate are insufficiently explored. Among them, Lena River Estuary which is considered to be a primary natural Ozone generator in the Northern Hemisphere. As a result, over optimistic views regarding a possibility of ‘soon and risk-free’ unlimited shipping in the Arctic (*Ha YS, Seo JS, 2014*) may eventually lead to serious consequences.

Empiric experiences of Russian Arctic skippers who worked there since 1950’s contradict the hypothesis of a steady ice melting tendency. They insist that what we see now is a cyclic natural process. And, that with proper preparation and adequate support it is possible to organize a full scale commercial shipping via the NSR without waiting for the totally ice free routes. While it is not a valid scientific explanation it would be imprudent to ignore the empiric knowledge of this kind. Historically, the first attempt to start commercial transit operations with foreign ships via the NSR dates back to the late 1960’s. No satellite data was available for seafarers at that time, but the NSR operated as a well-tuned mechanism with more than 100 Soviet ships at sea in high season (*Pazovsky, 2001*). Unfortunately, this idea was rejected for pure political reasons. Soviet leadership decided not to compete with ‘ideologically friendly’ Egypt who was recovering from the 1967 war with Israel and

1) Canada is mentioned because it controls the North Western Passage – a natural competitor for NSR.

badly needed a flow of foreign currency for Suez transit.

The collapse of hydrocarbon prices that took place in 2014 may paradoxically contribute to stabilization of the situation around the Arctic. Cost of oil and gas extracted on the Arctic shelf was significantly higher than in traditional areas even in the “fat” years for oilers. Investing huge financial and material resources in the development of new hydrocarbon deposits in the basin of the Arctic Ocean becomes unprofitable or losing today, especially in a protracted global economic crisis.

Both tendencies will have a sobering effect on Arctic actors urging them to behave in a more rational way. All parties can realistically assess their economic interests, priorities and capacity for its implementation. Accordingly, the Arctic gets time for the required timeout. Otherwise the hastiness in the Great Arctic Race sometimes driven by ‘not-to-be-late’ maxim could well lead to serious consequences in security and environment protection fields.

### 3. Western sanctions and Russian Arctic enterprises

The permanently changing political and economic situation in the world adds uncertainties to the prospects of wide scale Arctic exploration. Western sanctions imposed on Russia in 2014 (*Amos, 2014*) pretended to hit the capacity to drill hydrocarbon deposits on Arctic shelf. Instead, it will hit major low temperature seabed drilling and ocean engineering equipment designers and manufacturers abroad since potential Russian orders from government supported companies covered most of this market. They will hardly get new contracts from pragmatic transnational energy corporations until hydrocarbon prices dynamics confidently reverse.

As for Russia, the already explored hydrocarbon deposits in the coastal regions of the Arctic Ocean are capable to fill the needs of the industry and foreign importers at least till 2030 (*Simoniya, 2013*). Northern Yamal Peninsula gas fields are of special importance<sup>2)</sup>. They are located in limited area close to the coast where the largest Russian seaport in the Arctic, Sabetta is in the final stage of construction. The building of Sabetta port complex has started in 2012 in the framework of the “Yamal LNG” project. Planned freight turnover of Sabetta seaport should reach 17 million tons per year after completion of the new terminal in 2017; it should increase to 30 million tons by 2020 and, eventually reach up to 70 million tons per year by 2030-2035 (*Maritime Journal, 2015*). Important to notice is that the export LNG deliveries from Sabetta seaport will take place regardless of the season both to Europe and Asia-Pacific. It will be delivered mostly by DSME built ‘NOVATEK’ class LNG carriers which is a perfect example of Russian – Korean economic cooperation.

‘NOVATEK’ class LNG carriers are capable of breaking 2.1 m thick ice and operate at -50° Centigrade. However they still need icebreaker support for the winter, at least at several problem spots along the NSR, like Kara Gates, Dmitry Laptev or Sannikov Straits. To provide it ‘NOVATEK’ has signed a multi - year contract with ‘ATOMFLOT’, the only acting operator of Russian nuclear icebreakers.

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2) Prospected gas deposits exceed 11 trillion tons; it stocks ‘fat’ natural gas with high percentage of gas condensate.



## 4. Icebreakers: still a magic wand for Polar navigation

The above subparagraph is important for better understanding the current economic situation and prospects for the NSR waterways.

*First*, round-the-year transit navigation is technically possible, but it demands the usage of high ice class ships and advanced system of ice monitoring and icebreaker support. Accordingly, the cost price for cargo transit will be much higher comparing to conventional commercial ships using standard shipping lines.

*Secondly*, Russian icebreaker fleet today is far from its optimal condition to maintain reliable support along the NSR waterways. Currently, 'ATOMFLOT' operates four nuclear powered icebreakers while 'Rosmorport' operates or charters six conventional icebreakers capable of conducting line escort operations in the Arctic waters. Service life for most of the fleet assets expires by 2018-2019 (diesel) and 2025 (nuclear powered) if a decision for costly SLEP repair is not taken. To replace the aging ships, three nuclear and three diesel powered icebreakers are in different stages of construction. There are plans for a more ambitious icebreaker construction program including 200.000 hp Super Icebreakers, but it looks unrealistic in present economic situation.

Basing on these estimations, regular transit shipping by the NSR will be limited by number of passing ships and period of navigation unless the ice melting tempo dramatically increases. Mobilization of foreign icebreakers to assist commercial shipping in high season will not have any sizeable effect for simple reason - neither the ships, nor their crews are prepared to conduct routine line operations like ice channel escort of large commercial vessels. Even the newest and technologically sophisticated Korean 'Araon' is good at research support, save and rescue missions but her performance as a line icebreaker does not match the industry standards.

## 5. NSR: current state and challenges

Next, about the current state of the NSR as a major transit route. Russia is sometimes accused that it wants to monopolize and militarize its Arctic sector, to impose domestic rules for all navigational and economic activities there (*Stratfor*, 2015). This issue needs clarification to avoid unnecessary suspicions and potential confrontation.

True, Russian Arctic efforts in the last five years look impressive but, they are still incomparable to the level of activities in the Soviet period. There is a simple explanation why the Arctic has always been of special importance to Russians.

Economically, it is a primary source of export goods since the Novgorod the Great Republic (X – XV centuries). Actually, only the list of principal export commodities has changed from ancient days with hydrocarbons replacing timber and whale-oil.

Strategically, the Northern Direction is a shortest way to attack Russia, the continental power, from the sea. It happened many times in the past with Nazi naval operations in Barents and Kara Seas in 1941-1942 being the latest and most



## 6. Balance between maritime and river transport

There is another less visible, but equally important dimension of NSR - based Arctic logistics system - internal water communications that supplement, co-exist and sometimes replace maritime means of transportation. For vast and almost uninhabited territories of Eastern Siberia and Far East of Russia, the rivers flowing to the Arctic Ocean were historically the principal logistics arteries, both in summer and winter times when rivers were frozen. The interconnection of the two water means of communication can be best illustrated by the unique Far Eastern / Eastern Arctic logistics system called the “Northern Delivery”.

It is a wide scale complex campaign to deliver all kinds of commodities to isolated coastal and island territories in the Far East and Eastern sector of Arctic financed both by federal and regional authorities. In Soviet period it usually lasted 4 – 5 months starting in July, but the preparations for it were conducted year round. The following logistic scheme was used. Commodities (everything from gasoline to fashion goods) were delivered by railway and accumulated in the seaports of Southern Primorye – Vladivostok, Nakhodka, Vostochny and Khabarovsk region – Vanino, Sovetskaya Gavan. With the start of navigation in the North all these goods were transported by ships to the port hubs – Petropavlovsk-on-Kamchatka, Magadan, Anadyr, Provideniya, Pevek, Tiksi. There the cargo was sorted, repacked and delivered to a number of smaller end points by lighters, sea / river barges, land vehicles and helicopters (*Luzin, Vasiliyev, 1998*). The exact data on the volume of cargo transported to Arctic coast and adjacent territories during the “Northern Delivery” operation may greatly vary depending on estimation methodic, Expertly it was somewhat about 1 – 1.5 million tons (military cargo excluded). At least twice this amount of cargo had to be delivered to remote provinces of the Far East. For example, Magadan Power plant alone consumes 260.000 tons of Siberian coal annually.

After the collapse of the Soviet Union the negative factors in economic, social and demographic situation in isolated territories of the Far East and Arctic coast caused a sharp decline in “Northern Delivery” scale. Due to seriously reduced cargo base the major domestic carriers like FESCO and PRISCO preferred to shift from this service to more profitable routes. As a result, greater part of the cargo is delivered to the Arctic coast by river transport today. The goods are unloaded from railway in Irkutsk region and then transported by river barges via the Lena River network to the port hub of Tiksi and to dozens of smaller river ports. This logistic chain is less versatile, more vulnerable and has a number of strict limitations on the commodities characteristics comparing to the combined maritime / river system.

Yana, Kolyma and Indigirka Rivers are also used in ‘Northern Delivery’ logistics scheme of today. Commodities are transported by smaller ocean ships to the estuaries of these rivers and reloaded to river barges there, or stored till winter when road transportation becomes available. But, this mode of transportation is risky and less reliable comparing to the usage of larger regional port hubs in Tiksi, Pevek, Anadyr and Magadan. Obsolete port infrastructure and lack of adequate dredging capacity create obstacles for entering river estuaries from the sea. Lena River Shipping Company is the only river operator in the Far East. It is limited with ship assets and has

recently become overloaded with contracts in support of 'The Strength of Siberia' gas pipeline construction (*REGNUM*, 2015). As a result, the Yakut regional government asked for 30 billion rubles as federal guarantee to local 'Northern Delivery' operators. Otherwise, the plans for cargo delivery to the North may fail in 2015.

The necessity to support expanding economic, military and research activities in the Eastern NSR sector demands resumption to a former 'Northern Delivery' scheme. However, introducing modern logistics technologies and utilizing commercial transportation for delivering state ordered cargo to the points of destination will reduce the costs and make the process more flexible and reliable. To lower the share of transportation costs in the end price of consumer commodities bound to the Arctic from present 70 – 90% to reasonable 40 – 50% should be regarded as primary and feasible objective.

## 7. Prospects for international cooperation

Here we see good prospects for collaboration with the North - East Asian partners. Cooperative activities can be best performed at several levels simultaneously: federal, regional, private business, NGO. For example, seaport infrastructure modernization should be conducted basing on government agencies decisions, while smaller sea and river port facilities modernization, dredging, road construction works could be more productive if done in cooperation with regional authorities of Sakha-Yakut Republic, Chukotka Autonomous District, Magadan, Kamchatka and Irkutsk Territories. Interaction with local authorities and NGOs is necessary to implement community level projects like land and water rehabilitation, metal scrap utilization<sup>3)</sup>, fish farming, aborigine culture preservation, energy saving houses and solar / wind power plants construction. Most settlements in the Eastern Arctic sector do not have access to modern communications and health care services. To solve this problem flexible 'community – business' and 'business-to-business' approaches are preferable.

Korea and other Asia – Pacific economies possess sophisticated technologies, industrial capacity and expertise needed for Arctic development. What is essential, it will not have to be charity or government sponsored programs only since many regional actors in the Russian Far East have accumulated substantial financial or natural resources. According to expert estimates, the regional / local market requirements for the above projects account for US\$1.5 – 2.5 billion annually.

The list of perspective commercial projects with international participation for the Eastern NSR sector may be rather wide, with the following as priority ones:

- Easy mounting storage (warehouses) constructions capable of year-round exploitation in severe climate;
- Port modernization projects (dredging, pier strengthening, navigational aids, communications) for Pevek, Tiksi, Yana / Lena / Kolyma / Indigirka River

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3) Mobile plants for 'clean' pressing or reprocessing of metal barrels are badly needed in coastal and island Arctic territories where the number of empty fuel barrels accounts for hundreds of thousands units. Ideally, such facility is accommodated in one standard 20 ft container and is fully autonomous.

- estuaries and 20 – 25 smaller port facilities in Yakut and Chukotka provinces;
- Energy efficient and environmentally friendly technologies for housing, garbage reprocessing, food production, distance medicine and education.

## **8. Conclusions and policy implications**

The overall situation in the Arctic has possibly entered a new stage. Due to unclear prospects for ice melting tempo and drop in hydrocarbon prices all Arctic states and Arctic – interested nations have got the time for a necessary break.

NSR is critically important for the success of any enterprise in Russian Arctic sector. It is strategically significant and vital for maintaining livelihoods of two million Russians living and working to the north from Polar Circle. Technically, NSR can become a basis for the international maritime transit system connecting Europe with North – Eastern Asia in the nearest future. Introducing advanced transport / logistics and management models [Jian Min Shou, 2014] as well as new ship designs can eliminate the organic shortcomings of Arctic transit and increase the navigational period to 6–8 months a year. However, complex additional efforts are needed to make it a safe and profitable business.

The Eastern sector of the NSR is more challenging but here we see the attractive prospects for domestic and foreign business. A step by step approach, selection of optimal projects best suiting investors, authorities and local communities would be an appropriate way to start doing real business there.

Finally, it would be imprudent and unreasonable for outside actors to engage in individual activities in the Arctic, without proper coordination with Russian side.

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# What caused the collapse of walleye pollock population in Korean waters?

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## ABSTRACT

Walleye pollock (pollock hereafter) in Korean waters was one of the most important fishery species economically, and the majority of population located in North Korean waters. Catch records have been changed dramatically since commercial fisheries begun in the early 20th century: the highest catch in 1930s, sudden decrease during 1940s~1960s, another boom in 1970s~1980s, and a continuous decrease in 1990s until they collapsed completely in 2000s. Three plausible hypotheses were introduced for such collapse: overfishing on pollock in high biomass period, warming of seawater, and changes in ecosystem structure and function. Those hypotheses reviewed would give us clues how Korean pollock population survive in ecosystem, and such theoretical backgrounds should be the basis for the establishment of conservation measures with precautionary concept when pollock return to Korean waters again. Intensive interdisciplinary collaboration between South and North Korea is recommended for predicting their re-visiting and for better management under changing environment.

**Keywords:** walleye pollock, fishery collapse, Korean waters, climate change, marine ecosystems

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# 1. Introduction

Walleye pollock *Gadus chalcogrammus* (pollock hereafter) is a semi-demersal species residing in cold and deep water of water column over the continental shelf and slope areas (> 200 m) along the Asian and North American coasts (NFRDI, 2010). In the northwestern Pacific, Korean Peninsular is regarded as the southern boundary of their distribution (Kim and Kang, 1998). Due to its enormous biomass, pollock is regarded as the most important fish species in North Pacific marine ecosystem ecologically. Pollock resource is frequently centered at marine foodweb, because they feed on zooplankton and small nekton, and many carnivorous predators such as Pacific cod, arrowth flounder, and stellar sea lion consume pollock (Incze et al., 1988; Kim and Gunderson, 1988). The statistics of the Food and Agriculture Organization (FAO) of the United Nations also indicates that commercial catch on pollock as a single species used to be the highest in the world (Kim, 1987).

Pollock is one of the important fish species culturally and economically in Korean history. Pollock has been an important seafood for Korean since the early 19th century (Park, 1978), and became a major commercial fishery from the early 20th century in Korean waters occupying two third of monetary value in total fishery production during the 1930s (Kang, 2009). Most fishing activities were carried out off the eastern coast of the North Korea until this time, but recent official catch records were only from the Republic of Korea (i.e., South Korea) due to the separation of political regimes after the completion of Japanese Imperialism in 1945. After the peak of pollock yield in the late 1930s, fishing activity was much depressed during the 1940s~1960s. Annual catches of pollock were increased again in 1970s, peaked in 1981 showing about 166 thousand metric tons (MT) of pollock production (Fig. 1). Mean pollock catch was 107 thousand MT during 1976~1985, which was equivalent to 44% of total fishery yield of the eastern coastal areas (Kang, Park, and Kim, 2013). The catch of pollock had shown a tremendous decline since the late 1980s through 1990s, and the pollock stocks were completely collapsed in Korean waters since 2000s.

Pollock was ubiquitous species in the East Sea, and maintained high biomass until the 1980s there. In general, about 7 million MT of pollock biomass were estimated in the entire East Sea during the early 1980s and the pollock biomasses as well as the fishery yields were higher in the western part than eastern one (Schuntov et al., 1993). The Wonsan Bay of North Korea was the most representative spawning ground in Korean waters (Fig. 2), and pollock fishery usually targeted on spawning population in winter actively. Areal distribution of pollock fishery in Korea, however, indicated that the strong fishing activity occurred even in the southern part of the Korean Peninsula during cold years such as 1980s. In the mid 1970s through mid 1990s when pollock resource was relatively high, the Korean government especially allowed fishermen to fish juvenile pollock (ages 1-2, called nogari or called small pollock in Korean statistics), and tremendous amounts of juveniles were caught in Korean waters during this period (Kang, Park, and Kim, 2013).

Biology and ecology of Korean pollock were not much investigated except some



basic information such as length-weight relationship, ageing, spawning and maturation (Park, Hue, and Kim, 1978 and 1979; Oh, Sakuramoto, and Lee, 2004). Due to the lack of quantitative analysis on feeding biology, ecology, growth rate estimation, and recruitment processes, the forecasting of stock condition was very limited. Only simple time-series analysis was carried out for the prediction of pollock catch (Park and Yoon, 1996). The investigation on ecological processes under changing environment is the essential part of fisheries oceanography to predict the year-class strength of future stocks.

Various sources of fishing information indicated that pollock stocks were much abundant in North and South Korean waters in 1980s (Schuntov et al., 1993; NRC, 1981; Kim and Kang, 1998). As mentioned above, pollock stocks were completely collapsed in 2000s, but no clear explanation on this collapse has been made. In this paper, therefore, we review the history and status of pollock fishery, and the distribution and migration patterns in the East Sea were speculated. Based on fisheries and ecological information, three hypotheses were introduced for explaining why pollock population collapsed in Korean waters recently. Reviewing such hypotheses would give us some clues how Korean pollock populations survive in ecosystem and how they interact with other species when they return to Korean waters again in the future.

## 2. Materials and methods

Fishery statistics and seawater temperatures from South Korea were analyzed using the data sets in the Korean Fisheries Yearbook and the Korea Oceanography Data Center of the National Fisheries Research and Development Institute, respectively. Additional information on local fisheries collected by the National Federation of Fisheries Cooperative was used for the temporal distribution of fishing areas in the western part of the East Sea. North Korean data reported to the FAO were excluded because of the reliability issue. The summary of biological characteristics of pollock was extracted from some early research papers that described the relationship between pollock catch, areal distribution and climate changes (Gong and Zhang, 1983; Kim, 1984; Kim and Kang, 1998). Note that most historic data and information were re-cited or re-examined from Park's pioneering works (Park, 1978).

## 3. Pollock in Korean history

Although there was no clear and precise description on pollock fishery in our history, it seemed to be started in the late Koryo Dynasty dating back to about 600 years ago, and the Korean's fishing history targeting on this species might be the longest in the world. Pollock has been called in different names in history books and folk tales. Mutaeco, which was thought as another name of pollock, was shown in 16th century history book, and the name Myung-Tae was shown in 17th century first time. The current official Korean name of pollock is Myung-Tae which appeared

firstly in history book, *Sung-Jeong-Won-Il-Gi*, published in 1652. The name Myung-Tae was originated as ‘fished by Mr. Tae in Myung-Cheon Province’ (Park, 1978). In Korean history for last 600 years, we could find some written records on presence/absence of pollock in a specific period. Pollock appeared in folk tales in 14th century, but no records were existed for 200 years (Fig. 3). Pollock has at least 20 different names and dialects currently, and various ways of cooking have been developed using all parts of pollock body (Kim, Kang, and Kim, 2014). Also, dried pollock is the necessity in memorial service for ancestors in ordinary family and for an exorcism by a shaman. Due to such a wide utilization of pollock in our common as well as dietary life, pollock became the intimate fish species for Korean in cultural aspects traditionally.

One history book (*Song-Nam-Jab-Sik* written by Jae-Sam Cho) indicated that pollock was shown in the Yellow Sea in 1858 (Park, 1978). Considering there are no pollock fisheries in the statistics from the Yellow Sea of the South and North Korea currently, we could infer that pollock moved into the Yellow Sea from the East Sea via off the southern coast of the Korean Peninsula. Even in our recent climate history over the Korean Peninsula, there were several events of ‘little ice period’ (Fig. 3). If the isotherms in ocean would move down to the south during these periods or the earlier period in the past, some fish species in the East Sea ecosystem might expand their territory to the Yellow Sea. In case of pollock, they became extinct due to possibly the unfavorable ocean environments or no suitable spawning and nursery grounds in the Yellow Sea, although Pacific cod, which is also the same gadoid group with pollock, is still important in the Yellow Sea fisheries. Fluctuation of fish biomass is a natural phenomenon, and the presence and absence of pollock resource has been repeated in Korean history books. On the other hand, climate over the Korean Peninsula also showed the alternation of cooling and warming phases over time. Figure 3 demonstrates the relationship between pollock resource and climate in Choson Dynasty (Kim, 1984). Roughly speaking, match and mismatch of catch record of pollock with climate variability indicates that cool temperature seems to provide a favorable condition for pollock stocks in Korean waters, and vice versa.

## 4. Distribution and migration of Korean stock

Pollock distributes the most coastal areas along the rim of the East Sea, and it is generally known that there are four major spawning stocks (Fig. 2) (Kim and Kang, 1998): the Tartar Strait (Russia), the Peter the Great Gulf (Russia), the western coastal areas off the Hokkaido and Honshu (Japan), and the Wonsan Bay (Korea). The spawning ground of the Wonsan Bay is regarded as the biggest among them. Different research, however, argued that three groups off the Japanese Islands and one in Korean waters consisted of pollock stocks in the East Sea (Oh, Sakuramoto, and Lee, 2004). Based on tagging experiment in 1932, on the other hand, the possibility of migration between the Wonsan Bay and the western Hokkaido was suggested, because 13 pollock out of 47,810 tagged from the Wonsan Bay were re-captured

off the Hokkaido coast later, and one pollock tagged from the Hokkaido was found near the Korean Peninsula (Gong and Zhang, 1983; Iwata, 1975).

It was speculated that pollock stock off the Korean Peninsula had two types of seasonal migration pattern: north-south and east-west migration. The north-south migration along the coastline indicates that they spawn at the Wonsan Bay during winter, and move up and down in north-south direction seasonally along the coast. Especially, the juveniles spawned at the Wonsan Bay during winter migrate into the southern waters for feeding and growth during spring through fall, and they return to spawning area in early winter. On the other hand, migration behavior of adults in the local areas off the South Korea showed the east-west migration which explains the spawning at coastal areas along the Korean coast during winter. After spawning, pollock spawners move to the deeper depth in open sea, and stay there until the next spawning period. However, it is believed that the population sizes of local stock would be small if there are some (Kang, Park, and Kim, 2013).

## 5. Three hypotheses for recent collapse

The collapse of pollock stock off the Korean Peninsula was one of the biggest disasters for Korean fisheries industry and fishers in the recent fishery history. Due to the practical difficulties to overcome the complicated political situation between the South and North Korea, there has been no intensive scientific investigations. Actually, the major spawning ground locates in the North Korea, and the limitation in oceanographic and fisheries surveys existed. Even there was no agreement on fisheries management and fishery data exchange between two regimes, so that no logical explanation on why Korean pollock population collapsed in recent years can be made. Here, based on observations from anthropogenic activity, environmental variability, and foodweb alteration, we introduce three plausible hypotheses for the collapse of pollock in 2000s: overfishing on pollock including juveniles and spawners in high biomass period, confined fishing areas with cold water mass off the coast in warm period, and changes in ecosystem structure and function.

### 5.1 *Overfishing on pollock*

Overfishing as an anthropogenic activity can deteriorate stock condition severely. One typical characteristic of the pollock fishery in Korea is the inclusion of immature juvenile pollock. Severe fishing pressure on juveniles was common during the 1975-1997 period, and therefore a large portion of pollock catch was juveniles. The proportion of juvenile pollock catch in weight was higher than 85~90% in the late 1970s, and it decreased continuously to 18% in 1988, then increased to 63% in 1990 (Fig. 4). The number of juvenile pollock caught from Danish seine and drift gill net fisheries during the same period, however, was 16 billion pollock occupying about 91.2% of total number caught (Kang, Park, and Kim, 2013). Such high fishing pressure on juvenile pollock might cause recruitment overfishing.

Because there was no bilateral agreement to protect straddling fish stocks between

the South and North Korea, no conservation measures were established for pollock stocks. In the North Korea, about half of total fishery production was from pollock fishery in the East Sea targeting on spawning adults to produce pollock roe. Pollock yields in the early 1980s reached at about one million MT with the peak of 1.8 million MT in 1983, and a sudden reduction to about 500 thousand MT was followed in the mid-late 1980s (Kim and Kang, 1998). Considering pollock yields from neighboring nations, overfishing on spawning stock seems to be obvious in the North Korea. Therefore, heavy fishing activities on juveniles and spawners in South and North Korea, respectively, might be one of the main reasons of pollock collapse.

## 5.2 Warming of seawater

Environmental variability is regarded as one of the major controlling factors for the distribution as well as the future recruitment of fishes. As we can see the appearance/disappearance of pollock species depending on climate conditions through Korean history (Fig. 3), recent warming trend of the East Sea might influence on pollock stock. Warming trend in the surface layer (0-50 m) was evident in winter (February) of the eastern Korea during the last four decades (1969-2008) (Seong et al., 2010). The increasing trend of sea surface temperature (SST) was clearly bigger in winter ( $0.047^{\circ}\text{C}/\text{year}$ ) than in summer ( $0.010^{\circ}\text{C}/\text{year}$ ) (Fig. 5a). Because pollock spawners move to shallow areas for spawning in Wonsan Bay, and eggs and larvae stay in the surface layer. Higher SST in main spawning season (i.e., winter) might affect the spawning behavior of pollock negatively. In Japanese waters, pollock decreased in abundance and the regions in which their abundance remained high became greatly reduced in extent during warm period (Tian et al., 2008). It has been frequently reported that the warming of the seawater temperature would be detrimental to stock's survival in the southern boundary of the species' distribution (Drinkwater et al., 2009; Rijnsdorp et al., 2009).

In Korean waters, there is a negative correlation between pollock catch and local seawater temperatures (Kim et al., 2007), which reveals that pollock as a coldwater species would have a difficult environmental situation due to warming of the East Sea. Although warming of the surface layer is conspicuous in the East Sea, deeper depth near the coastal areas where fishing activities on pollock were concentrated showed consistently low temperature forming a narrow cool band along the coastline (Chung, Kim, and Kang, 2014). Even, temperature at 100m depth showed a cooling trend in recent years (Fig. 5b), and pollock as a demersal species resides deeper than 100m. Therefore, the habitat temperature found in the coastal areas would be suitable for pollock regardless surface warming phenomenon during the last four decades. On the other hand, the fishing areas for pollock should be restricted to coastal areas apparently because pollock would avoid higher temperature in the open sea (Fig. 5c). Such narrow fishing zone may accelerate the depletion of remaining fishable pollock. For example, the spatial distribution of fishing areas on pollock varied depending on stock condition as well as water temperature. In 1970s, the period of high biomass and cool temperature, the fishing areas were spread over the relatively broad area, while those in 1990s and 2000s had been decreasing near the coastal areas as stock reduced and water temperature warmed (Fig. 6).

### 5.3 Ecosystem consideration

All life forms are linked by prey-predator relationship in marine foodweb. Climate change causes not only the changes in physical property of seawater but also the structure and function in marine ecosystems. Abrupt phase transitions of physical as well as biological components in marine ecosystem were frequently found in world ocean (Hare and Mantua, 2000; Hunt et al., 2011), and ecosystem function will be adjusted by the modification of ecosystem structure and productivity. In the North Pacific, there were two big climate regime shifts in 1976/77 and 1988/89, which resulted in changes of mixed layer depth (MLD), chlorophyll concentration, zooplankton biomass and fish abundance. Primary productivity in spring is determined by the relationship between the MLD and critical depth (Svedrup, 1953), and secondary productivity influence consequently on fish production through foodweb interaction, and the East Sea ecosystem also responded to those climate events (Kang, Kim, and Bae, 2000; Zhang et al., 2000).

Alternation of dominant fishery species had been reported from demersal species regime to pelagic one during the 1988/89 regime shift (Zhang et al., 2000). Historically, pollock and common squid have been important fish species in Korean waters and their catches showed oscillatory pattern of dominance related to water temperature (McFarlane et al., 2009; PICES, 2004). Roughly speaking, the combined catch of both species consisted of a half of total production from the eastern coastal fisheries (Fig. 7). For example, our estimation indicated that pollock catch accounted for 41.8% of total catch in weight during 1977-1986, while those from common squid only 10.6%. However, in 1987-1997, the proportion of pollock was dropped to 7.8%, but common squid became dominant species occupying 37.9% of total catches. Various ecological niches involve in ecosystem function, and the responses of marine populations including pollock to climate/environmental variability would be expressed by the trophodynamics in foodweb. Understanding the mechanism of this cyclic pattern in fish community, and the collapse and re-visiting of pollock population in Korean waters could be answered from the light of ecosystem changes.

## 6. Further consideration and suggestion

In order to predict stock condition and fishing availability with high precision, we need to improve our understanding on pollock ecology (de Young et al., 2010; Moloney et al., 2010). The recruitment mechanisms including vulnerability of pollock to climate change, prey-predator relationship and food availability under rapidly changing environmental conditions should be quantified through the process-orient and modeling works. As mentioned above, however, the different political regimes between South and North Korea hinder cooperative research at this moment. To improve ecological understanding on pollock, it is our hope that the political negotiation between South and North Korea can be achieved to utilize such valuable protein resource near future. Joint oceanographic research and data exchange in fisheries would be the first step toward this target. We also need a preparatory dialogue between policy-makers

ing and science groups in case of revisiting of pollock populations in Korean waters.

Currently, adult as well as juvenile pollock were rarely found in Korean waters. Korean government has operated 'Stock rebuilding program of fishery resources' over 10 years in Korean waters. For the recovery of pollock resources, we need to establish awareness programs for ordinary and fisherman urgently to protect large spawning pollock that can produce more eggs. Furthermore, if pollock could appear in Korean waters once again, we need to establish the early-warning system to prevent overfishing situation by applying the strict conservation measures and the declaration of moratorium until stock condition becomes stable. The intensive interdisciplinary researches among related subjects, the establishment of ecosystem-based fisheries management, and the reliable estimation of total allowable catch (TAC) through scientific investigation are necessary actions for better management of pollock resource.

In general, the favorable temperature condition for coldwater species would be cool temperature. In 1970s~1980s, cool temperatures of surface layer prevailed off the east coast of the Korean Peninsula, and high anomaly of pollock catches was common (Kim et al., 2007). On the other hand, pollock catch was much reduced and common squid, which prefers warm temperature, became dominant since the 1990s when warm temperatures appeared. The water temperature in the region might be too warm for pollock since the early 1990s, and such uncomfortable conditions would be the main reason of their collapse. When the temperature becomes suitable for pollock stock, they might visit to Korean waters again near future (Bulatov, 2014). However, no mechanistic explanation has been made on the relationship between seawater temperature and recruitment success of pollock and common squid. We observed frequently in the past ecosystem history that coldwater species used to be flourish in warm temperature unless water temperature exceeds to a certain range. For example, pollock in the eastern Bering Sea showed the very strong year-class in 1978 when the warm water temperature was observed (Mueter et al., 2006).

A large range of uncertainty arisen from model structure and ecological parameters will result in vague conclusion on the expected impacts on ecosystem productivity. The future climate should be clearly projected in fine scale using global circulation models (GCMs) to predict marine ecosystems including fish resources (Hollowed et al., 2013; Kim et al., 2014). Generally speaking, due to the global warming, we expect that the East Sea would be warmed-up in this century continuously, as recent observations indicated a rapid warming of Korean waters (Belkin, 2009). The trend of climate change over the Korean Peninsula should be refined, and the GCMs with a delicate downscaling technique provide credible projections for the spatial distribution of regional ocean temperature. The uncertainty in GCM outputs on and the physical characteristics such as seawater temperature and salinity of its surrounding water should be reduced especially for the predicting the destiny of Korean pollock populations.

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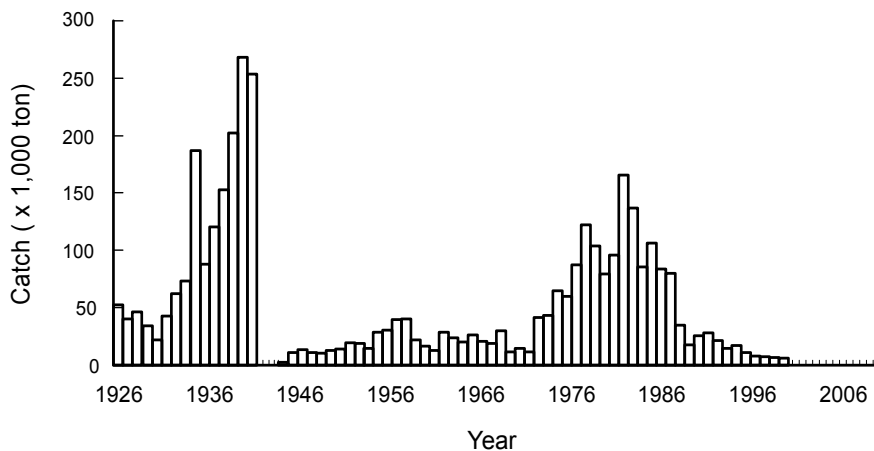


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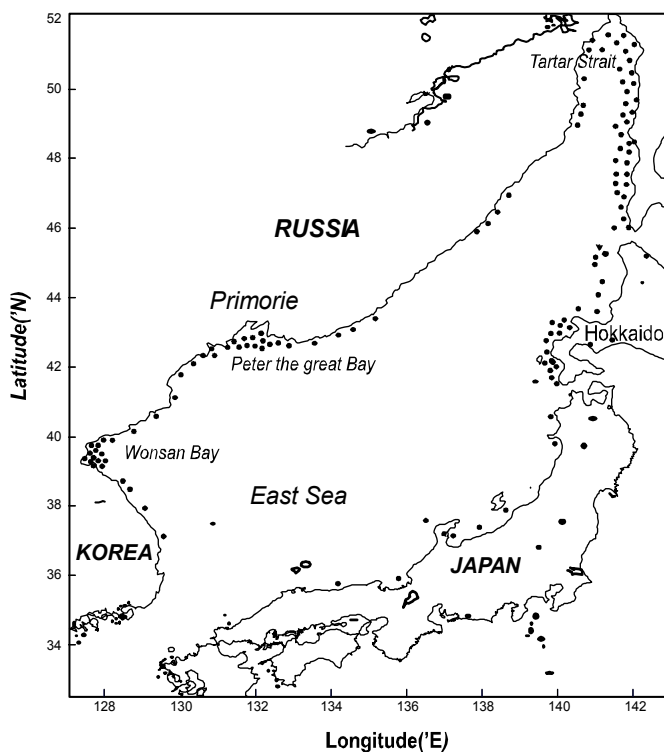
## Figure captions

- Figure 1. Catch of walleye pollock (1926-2014). Notice that pollock catches in the first part of the 20th century were mostly from the North Korean waters, while those since 1946 were only from the South Korean waters.
- Figure 2. Spawning areas of walleye pollock (*Gadus chalcogrammus*) in East Sea. Four major spawning stocks located in the Wonsan Bay, the Peter the Great Bay, Tartar Strait, and off the western Hokkaido, and several local stocks along the rim of the coast are indicated by dots (Kim and Kang, 1998).
- Figure 3. Pollock records in various history books and Cooling Index (i.e., frequency of cooling events) during Choson Dynasty. Pollock records were drawn based on Park (1978), and Cooling Index was from Kim (1984).
- Figure 4. Catch variability of walleye pollock adult and juvenile in Korean waters. (a) Relative catches in ton, (b) Relative catches in number, (c) Absolute catches in ton, and (d) Absolute catches in number (Kang, Park, and Kim, 2013).
- Figure 5. Warming trend in sea surface temperature of the East Sea since 1968. (a) Sea Surface Temperature in February, (b) Water temperature at 100 m depth, and (c) Spatial distribution of temperature at 100 m depth (Seong et al., 2010).
- Figure 6. Changes in fishing area of walleye pollock during 1970s~2000s.
- Figure 7. Changes in species composition of two major commercial species from the eastern coastal fisheries of Korea.

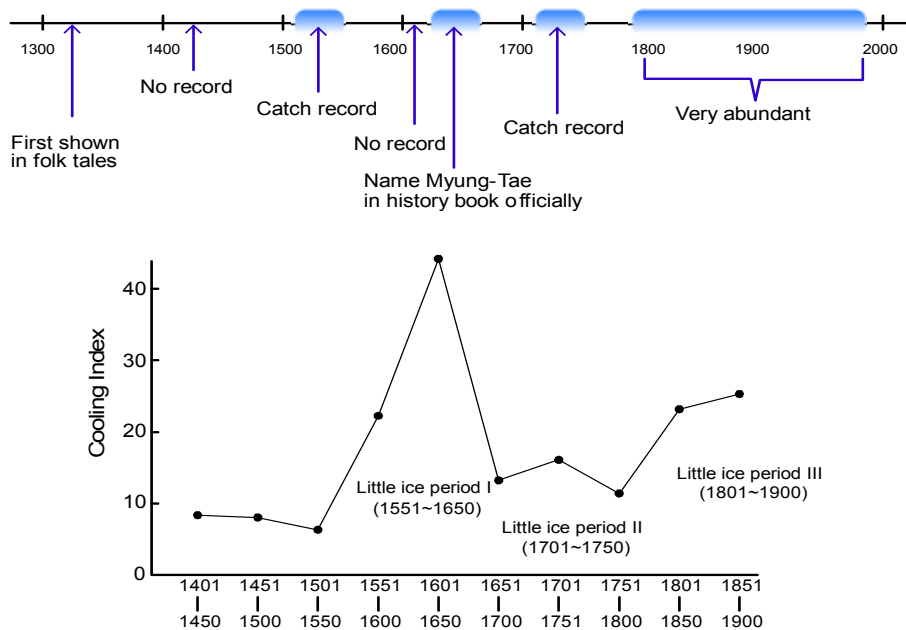
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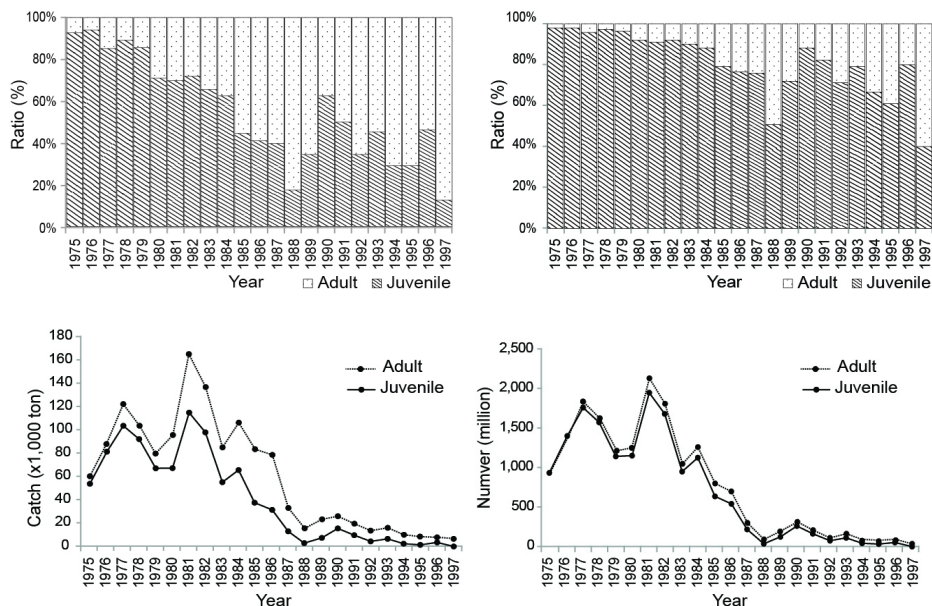
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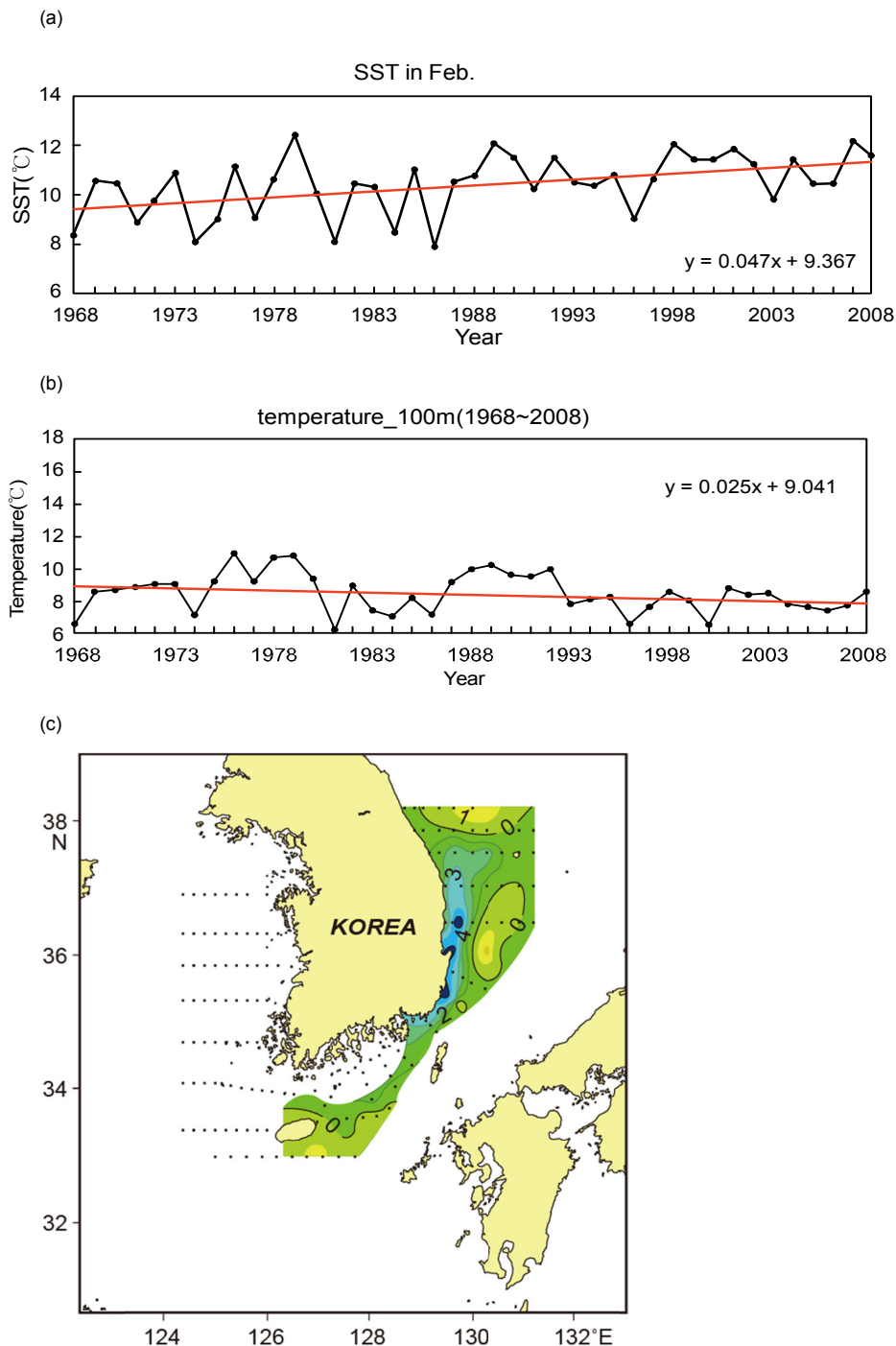
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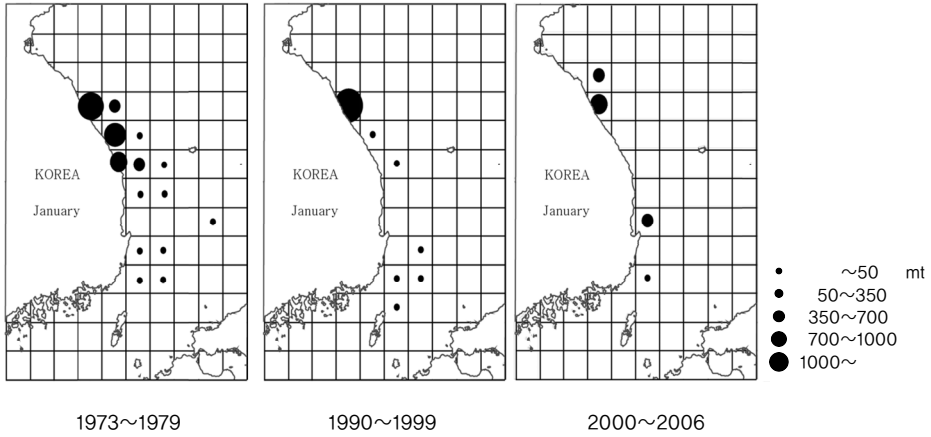
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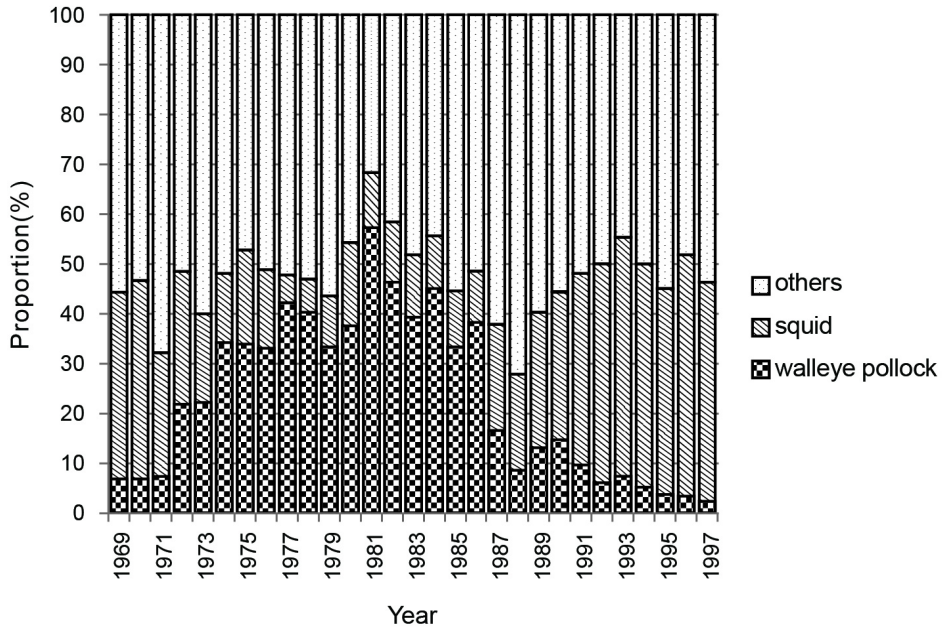
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**Figure 7.** Changes in species composition of two major commercial species from the eastern coastal fisheries of Korea



# The Effect of Ship Familiarization Program on Education Satisfaction and Career Awareness of Maritime University Students

Shwa Young Kim\*

## ABSTRACT

The aim of this paper is to find out factors that influence positively to satisfaction of education and career awareness of maritime university students. Especially, Mokpo Maritime University has been carrying out a ship familiarization using two training ships since 2006 and students join the program from freshmen. In this paper, we set three hypotheses and made a questionnaire including variables for verification through literature study and interview with experts. We carried out a survey to students of Mokpo Maritime University who participated in SFP(Ship Familiarization Program) in 2014. Also we analyzed data by statistical method. As a result, we extracted 18 questions and categorized 5 factors that administration, contents, instructors, facilities, and education effects of SFP. We found out the relationship between factors for students' education satisfaction and career awareness such as onboard training at junior, job recruiting. We found out the key factors that facilities and education effects of SFP that is a influence on satisfaction of education and plans after graduation by statistical analysis.

**Keywords:** ship familiarization program, education satisfaction, career awareness

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# 1. Introduction

In recent, safety is becoming more and more important. Especially, maritime safety has become an important issue since Sewol Ferry Tragedy in 2014. To prevent a similar tragedy, various maritime safety experience programs have been carrying out. For example, Korea Coast Guard is conducting maritime safety education program such as Badaro camp to students of primary, middle and high school. Also, they are carrying out safety experience education to visitors of beach in summer season. There are a number of safety education programs for seafarers as well as these educations for general citizens.

Especially, Mokpo Maritime University is well known with high quality of maritime education institute. They have been conducting a ship familiarization program(SFP) in compliance with internal regulations for freshmen since 2006. However it has not been surveyed about contents, education level and students' satisfaction for SFP so far.

In previous study, there was the research to analyze the problems about the onboard training program(Kim., 2009). He suggested that extension of the period of onboard training, possession of training ship and increase of number for military service privileges to solve the problems of onboard training program. Also, he proposed two plus one education & onboard training system to increase of the effect onboard training on maritime high school(Kim., 2008). Lim and Sin analyzed the education system on the training ship and suggested improvements(Lim, Sin., 2013). Park carried out the evaluation for effectiveness of onboard training for trainees(Park., 2006). Cho and Kim analyzed the difference between satisfaction and dissatisfaction for cadets of engine department(Cho, Kim., 1998).

However, there is no study to analyze the education effect of SFP for freshmen of Mokpo Maritime University who have not fully knowledge about ship since 2006. In this paper, we carried out a survey "What is the important factor of the familiarization program to students for education satisfaction and plans after graduation of university ?"

## 2. The state of ship familiarization program

### *2.1 Outline of ship familiarization program*

The SFP has been conducted to achieve practical education through studying of ship's function, particular performance for freshmen and sophomore of Mokpo Maritime University since 2006. In the recent 5 years, 2,153 students of whom 1,089 students are for deck cadet and 1,064 students are for engine cadet are completed the education course as shown Table 1.



**Table 1.** The number of students by taken of SFP

Year	Date	Total cadet	Deck cadet	Engine cadet
2010	2010.6.22~6.24	426	216	210
	2010.6.28~6.30			
2011	2011.6.23~6.26	418	210	208
	2011.6.26~6.29			
2012	2012.6.21~6.23	428	215	213
	2012.6.24~6.26			
	2012.6.25~6.27			
2013	2013.6.20~6.22	447	225	222
	2013.6.24~6.26			
2014	2015.2.23~2.25	434	223	211
	2015.2.25~2.27			
Total		2,153	1,089	1,064

## 2.2 Contents of ship familiarization program

The professors for SFP have educated practical knowledge to students during ship's navigation for a certain period of time. The training ships, Sae Nuri & Sae Yu Dal, have been utilized practical education through sailing in the coastal area. Students are encouraged the motivation of learning for nautical science or maritime engineering through a SFP and also can be prepared onboard training in junior. The Table 2 shows education contents for a SFP.

**Table 2.** An example of education contents for a SFP

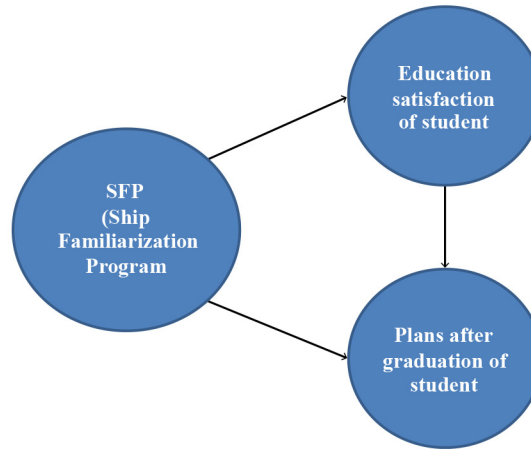
Classification	Deck department	Engineering department
Education contents	<ul style="list-style-type: none"> <li>- Responsibility of duty officer</li> <li>- Role assignment</li> <li>- Exchange of duty(watchkeeping)</li> <li>- COLREG</li> <li>- Chart, Publication</li> <li>- Navigational Aids</li> <li>- Navigational equipment</li> <li>- Fixing of ship's position</li> </ul>	<ul style="list-style-type: none"> <li>- Structure of ship</li> <li>- M/E, control equipment</li> <li>- Propulsion system</li> <li>- Generator, Boiler</li> <li>- Purifier system</li> <li>- Heating exchange system</li> <li>- Cooling system</li> </ul>

## 3. Model design

### 3.1 Setting of model and hypothesis

In this paper, we set up three hypotheses to verify the relationship between satisfaction of SFP and plans after graduation. Therefore, we assigned SFP as an independent variable and education satisfaction and plans after graduation of students as dependent variable in the Figure 1.

**Figure 1.** A model for study



Hypothesis 1(H1) : SFP will influence positive effectiveness to overall education satisfaction.

Hypothesis 2(H2) : SFP will influence positive effectiveness to onboard training and plans after graduation.

Hypothesis 3(H3) : Education satisfaction of participating students to SFP will positive effectiveness to career awareness such as onboard training, plans after graduation.

### 3.2 Configuration of questionnaire

In this paper, we made a questionnaire in the Table 3 through previous studies and brainstorming with experts to verify the hypothesis. The composition of questionnaire is 27 questions in which 5 questions for administration of education, 3 questions for professors and assistant and facilities respectively, and so on. We measured the value using a Likert scale about questions.

**Table 3.** A composition of questionnaire

Factors	Number of questions	Contents of question	Measurement
Education administration	5	The time of education, period of education, number of trainees, promotion of education	Likert scale
Education contents	3	Level of education, contents, methodology	
Instructor for education	3	Skill of education of professor, preparation	
Facilities	3	Proper place for education, facility, equipment and resource for education	
Education effect	4	Standard of understanding, clearness of education objectives, attitude of onboard training, career choice	
Education satisfaction	4	Administration system for education	
Career awareness (onboard training, plans after graduation)	6	Influence of onboard training and job, understanding of contents, coincidence of major, achievement of education objectives, benefit of education	Nominal scale
Population statistics	4	Sex, grade, major, 2nd major	

### 3.3 Analysis of model

We carried out a survey to verify the reliability and validity of factors. In this paper, the subject of investigation are 217 students embarked on training ship Sae Yu Dal who are freshmen and sophomores on the three departments of Mokpo Maritime University. The period of survey is from 23rd to 27th February 2015 and we used 217 answer sheets for data analysis. In this paper, we used SPSS statistics program for data analysis such as frequency analysis, factor analysis, t-test, and multiple regression.

## 4. Empirical analysis

### 4.1 Characteristic of sample

We conducted a frequency analysis for characteristic of the subject of investigation. As a result, it's consisted of 194 male students(89.4%), 23 female students(10.6%) and occupied 211 freshmen. According to a department, occupied 117 deck cadet(53.9%) and 100 engine cadet(46.1%) in the Table 4.

**Table 4.** The result of demographic characteristics

Classification	Contents	Persons	Percentage(%)
sex	Male	194	89.4
	Female	23	10.6
Degree	Freshmen	211	97.2
	Sophomores	6	2.8
Department	Deck	117	53.9
	Engine	100	46.1

### 4.2 Analysis of reliability and validity

In this paper, we carried out an exploratory factor analysis to verify the reliability and validity among SFP, satisfaction of education and career awareness. Especially, we measured the value of Cronbach's alpha for verification of reliability. The reliability means variance of measured value when checked value about same concept repeatedly, and the standard without an error(Cha., 2001). According to the result of factor analysis, the averaged variance extracted(AVE) of factors are higher than value of 0.4. Therefore, we can consider that the measurement factors are divided well.

#### 4.2.1 Factor analysis of SFP

We made a questionnaire with 18 factors such as administration, contents, instructors, facilities, and so on. And we conducted an extraordinary factor analysis

with a Varimax method. When a KMO(Kaiser-Meyer-Olkin) coefficient is close to 1.0 or higher than 0.5, the factor analysis is reasonable(Chae., 2008).

In this paper, the correlation has meaning between factors obtained a KMO coefficient(0.747) and p value(0.000) by analysis. And a reliability coefficient of 18 factors is higher than 0.5 in the Table 5. We use a Cronbach's alpha value for analysis of reliability. As a result, the value of administration of education is 0.720, contents(0.677), instructors(0.617), facilities(0.621), effects of education(0.685). Therefore, the reliability of defined factors was verified.

**Table 5.** The result of factor analysis for SFP

Factors	Variable of factors	Cronbach alpha value
Administration of education	1. The season of SFP is reasonable	0.720
	2. The total time of SFP is reasonable	
	3. The composition of group for education is reasonable	
	4. The trainee number of each group is reasonable	
	5. The SFP is well promoted to student in advance	
Contents of education	1. The contents of SFP is proper level to me	0.677
	2. The composition of contents is well arranged	
	3. The execution of contents for SFP is well carried out by plan	
Instructors (Professor and assistant)	1. The teaching ability of professor and assistant is excellent	0.617
	2. The practical teaching skill of professor and assistant is reasonable	
	3. The preparation of professor and assistant for SFP is excellent	
Facilities	1. The place for SFP is reasonable	0.621
	2. The facility and equipment for SFP is well fitted	
	3. The resource and training equipment for SFP is well fitted	
Effects of education	1. My basic knowledge and understanding of ship is elevated by SFP	0.685
	2. My objective of seaman is elevated by SFP	
	3. The time of familiarization education is reasonable	
	4. SFP gave help to me for ship's officer(engineer) or career awareness	

KMO=0.747, Bartlett sphericity test : 198.391, p=0.000

#### 4.4.2 Factor analysis of satisfaction and career awareness

We conducted an extraordinary factor analysis including principle component analysis and Varimax methodology to check the satisfaction and career awareness by SFP. In the satisfaction of education, the correlation between factors has meaningful by a KMO coefficient(0.824) and p value(0.000). In addition, we checked a Cronbach alpha value, and got 0.868, thus the reliability was verified. According to a result of factor analysis for career awareness, a KMO coefficient is 0.815 and p value is 0.000 with correlation, and a Cronbach alpha value is 0.745. So, the reliability was verified.

**Table 6.** The result of factor analysis for satisfaction and career awareness of SFP

Factors	Variable of factors	Cronbach alpha value
Satisfaction of education	1.Overall, satisfied to SFP	0.868
	2.The administration system of SFP is satisfied	
	3.Satisfied to professor and assistant for SFP	
	KMO=0.824, Bartlett sphericity test : 447.371, p=0.000	
Career awareness (onboard training, plans after graduation)	1.SFP will give help to me for onboard training and job recruiting in future	0.745
	2.I understood to contents of SFP	
	3.The contents of SFP is coincide with my major	
	4.The contents of SFP will give help to me for my major	
	5.I think to achieve the objective of SFP	
	KMO=0.815, Bartlett sphericity test : 412.670, p=0.000	

### 4.3 Hypothesis test

#### 4.3.1 Hypothesis 1 test

Hypothesis 1(H<sub>1</sub>) is SFP will influence positive effectiveness to overall education satisfaction, and we carried out a multiple regression to verify proposed a hypothesis 1.

In this paper, we used the tolerance to investigate multicollinearity among variables in the Table 7. The tolerance that influence to satisfaction of education are in the range of 0.598 ~ 0.896, and the VIF value of independent variable is lower than 5.0. So there is no problem to multicollinearity and F value and significance level is 38.100 and 0.000 respectively. Therefore, we confirmed the statistical significance about regression model to verify a hypothesis 1. The significance independent variables are contents, instructors, facilities, effects of education with strong relationship.

**Table 7.** The verification result of hypothesis 1

	Independent variable	Dependent variable	Unstandardized coefficients		Standardized coefficients	t	Significance probability	Collinearity	
			B	Standard error	$\beta$			Tolerance	VIF
H <sub>1</sub>	Constant	Satisfaction of education	-.294	.324		-.906	.366		
	Administration		.036	.057	.033	.633	.528	.896	1.116
	Contents		.224	.071	.205	3.171	.002**	.598	1.673
	Instructors		.210	.076	.167	2.744	.007**	.673	1.485
	Facilities		.383	.062	.380	6.231	.000**	.670	1.492
	Effects of education		.177	.071	.133	2.476	.014*	.862	1.160

R square : 0.474, Adjusted R square : 0.462, F-value : 38.100, \* p < 0.05, \*\* p < 0.001

#### 4.3.2 Hypothesis 2 test

Hypothesis 2(H<sub>2</sub>) is SFP will influence positive effectiveness to onboard training and plans after graduation, and to verify a hypothesis 2, we used a multiple regression

method same as hypothesis 2. The tolerances appeared from 0.598 to 0.896 and all of the VIF are lower than 5.0. In addition, F value is 9.812 and significance level is 0.000, and we checked statistical significance of hypothesis 2. Especially, it's analyzed the independent variables with strong relationship are facility, effect of education in Table 8.

**Table 8.** The verification result of hypothesis 2

	Independent variable	Dependent variable	Unstandardized coefficients		Standardized coefficients	t	Significance probability	Collinearity	
			B	Standard error	$\beta$			Tolerance	VIF
H2	Constant	Satisfaction of education	1.063	.302		3.517	.001		
	Administration		.080	.503	.100	1.524	.129	.896	1.116
	Contents		.058	.066	.071	.885	.377	.598	1.673
	Instructors		-.039	.071	-.042	-.553	.581	.673	1.485
	Facilities		.163	.057	.216	2.848	.005**	.670	1.492
	Effects of education		.250	.067	.251	3.757	.000**	.862	1.160

R square : 0.189, Adjusted R square : 0.169, F-value : 9.812, \* p < 0.05, \*\* p < 0.001

#### 4.3.3 Hypothesis 3 test

Hypothesis 3(H3) is education satisfaction of students who participated in SFP will positive effectiveness to career awareness such as onboard training and plans after graduation. We carried out a simple regression to verify a hypothesis 3. Also, we checked F value as 30.533 and significance level was 0.000 to test the statistical significance. As a result of analysis, there is statistical significance between satisfaction of SFP and career awareness such as onboard-training, plans after graduation.

**Table 9.** The verification result of hypothesis 3

	Independent variable	Dependent variable	Unstandardized coefficients		Standardized coefficients	t	Significance probability	Collinearity	
			B	Standard error	$\beta$			Tolerance	VIF
H3	Constant	onboard training and plans after graduation	1.811	.176		10.649	.000**		
	Satisfaction of education		.265	.048	.353	5.526	.000**	1.000	1.000

R square : 0.0.124, Adjusted R square : 0.120, F-value : 30.533, \* p < 0.05, \*\* p < 0.001

#### 4.3.4 Summary of hypothesis test

In this paper, we carried out hypothesis test by using a regression method, and found out hypothesis with statistical significance as shown Table 10.

**Table 10.** The Summary of adopted hypothesis

Classification	Adopted hypothesis
H1	The education contents of SFP will influence to positive effectiveness of satisfaction of education.
	The instructor of SFP will influence to positive effectiveness of satisfaction of education.
	The facility of SFP will influence to positive effectiveness of satisfaction of education.
	The effect of SFP will influence to positive effectiveness of satisfaction of education.
H2	The facility of SFP will influence to positive effectiveness of career awareness (onboard training and plans after graduation)
	The effect of SFP will influence to positive effectiveness of career awareness (onboard training and plans after graduation)
H3	The satisfaction of SFP will influence to positive effectiveness of career awareness (onboard training and plans after graduation)

## 5. Conclusion

The aim of this paper is to find out factors that influence positive effectiveness to satisfaction of education and career awareness such as onboard training and plans after graduation through questionnaire survey for students. Ultimately, we want to improve the SFP through this study. We set up three hypotheses and made a questionnaire with variables for verification through literature study and interview with experts. We carried out a survey to students who were participated in SFP in 2014 and analyzed data by statistical method.

Firstly, we extracted 18 questions and categorized 5 factors that administration, contents, instructors, facilities and effects of SFP, and got higher Cronbach alpha than 0.6 through a reliability analysis.

Secondly, according to a result of hypothesis1 test, we found out those contents, instructors, facilities and effects of SFP have closely connected with satisfaction of education. In case of hypothesis2, facilities and effects of SFP have been related with career awareness such as onboard training, plans after graduation. But, three factors which administration, contents and instructors has not been an influence on career awareness. So, the improvement of administration, practical contents and instructors' teaching method for enhanced SFP are required. In hypothesis 3, the satisfaction of education and career awareness have been related strongly. Therefore, it is need to be managed a SFP consistently for onboard training and job recruiting.

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# Notes to Contributors

**Manuscript.** Submissions should be clear and concise. Manuscripts will be accepted with the understanding that their content is unpublished and not being submitted for publication elsewhere. All parts of the manuscript, including the title page, abstract, tables and legends should be typed in English. Allow margins of at least 3cm on all sides of typed pages. Pages must be numbered consecutively throughout the paper.

**Title.** Must be as brief as possible and consistent with clarity (6 to 12 words). Authors should also supply a shortened version of the title suitable for the running head, not to exceed 50 character spaces.

**Author Affiliation.** Include the full names of authors, academic and/or professional affiliations and the complete mailing address of the author to whom proofs and correspondence should be sent.

**Abstract.** Each paper should be summarized in an abstract of not more than 150 words. Avoid abbreviations, diagrams and reference to the text.

**Key words.** Authors must supply three to five keywords or phrases which identify the most important subjects covered by the paper.

**Mathematical Notation.** Use only essential mathematical notation as it is costly to typeset and may limit readership. Where mathematical notation is essential, keep it simple and in conformance with conventions of the profession.

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Journal Koenig, E. F. (1984) Fisheries Regulation Under Uncertainty: A Dynamic Analysis. *Marine Resource Economics* 1(2):193-208.

Book Heaps, T., and J. F. Helliwell. (1985) *The Taxation of Natural Resources Handbook of Public Economics*, Vol. I, A. J. Auerback and M. Feldstein (eds.), pp.21-72. Amsterdam : North-Holland.

**Data and Documentation.** Data sources, models and estimation procedures are expected to be documented to permit replication by other researchers. Data used in the analyses should be made available to other researchers for replication purposes. Submission of appendices, model documentation and other supporting materials is encouraged to facilitate the review process.