

KMI International Journal of Maritime Affairs and Fisheries

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Road Initiative

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among Korea, China and Japan

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Legal Analysis on the ABS of Marine Genetic Resources in ABNJ
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Connecting Korea to Europe in the context of the Belt and Road Initiative

Paul Tae-Woo Lee*

ABSTRACT

There are three ways to connect Korea to Europe, i.e., existing south-west bound maritime routes, railway by Trans-China Railway and Trans-Siberian Railway, and Polar Silk Road (Arctic Silk Road). Although China has not explicitly mentioned Korea in the BRI documents, recent policy and local governments have begun to touch upon the Korean peninsula in association with BRI. In addition, talks among the two Koreas and US have been progressing, despite its uncertainty. Having considered this circumstance, it is worthwhile to investigate the impacts of the Belt and Road Initiative (BRI) on connecting Korea to Europe. This article aims to discuss some key points to make connectivity between Korea and Europe efficient in the context of the BRI and draw its implications for logistics providers and transport carriers.

Keywords: Belt and Road Initiative, Trans-China Railway, Trans-Siberian Railway, Polar Silk Road, Economic Corridor.

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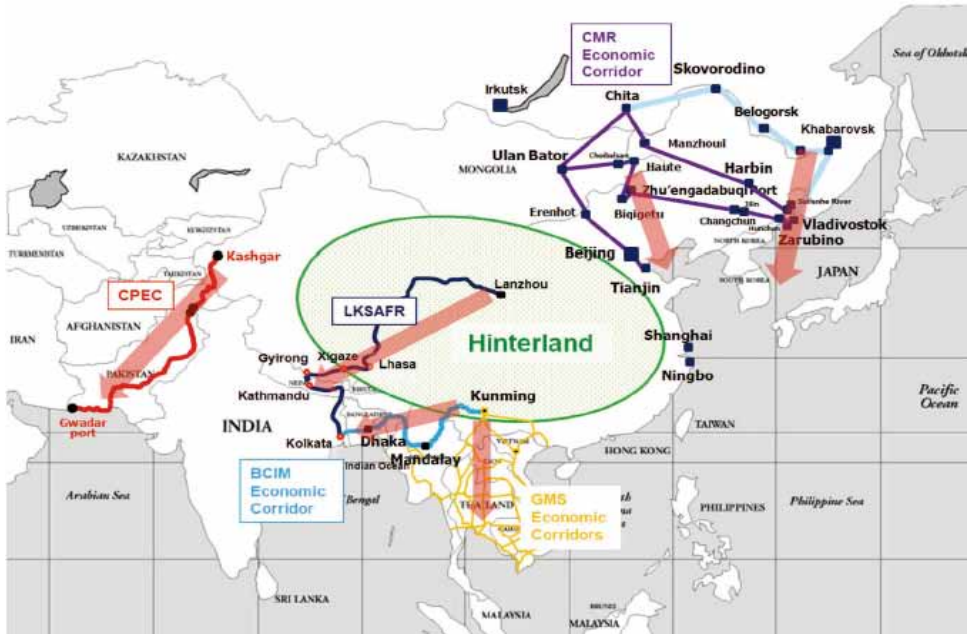
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1. Introduction

Five years have been passed since Chinese President Xi Jinping announced main idea of the Belt and Road Initiative (BRI) in 2013. Its more concrete contents and directions have been addressed in the “Vision and Actions on Jointly Building Silk Road Economic Belt and 21st-Century Maritime Silk Road” published on 28 March 2015 (National Development and Reform Commission: NDRC et al. 2015). This initiative has been accelerated by the establishment of the Asian Infrastructure Investment Bank (AIIB) in 2016 when its members reached 57 countries, comprising of regional members and non-regional members as of December 2016. The document consists of Preface and eight chapters, i.e. “Background, Principles, Framework, Cooperation Priorities, Cooperation Mechanisms, China’s Region in Pursuing Opening-up, China in Action, and Embracing a Brighter Future Together”. Some key words related to connectivity issue can be drawn from it, among others, China’s inland region, connectivity, economic corridor, transport corridor, city cluster, pilot free trade zone, marine economy development demonstration zone, marine economy pilot zone, core area, bay area, infrastructure, and financial mechanism Lee et al., 2018a; Chhetri et al., 2018). Out of the above key words, the most important item for this article is economic and transport corridors. Figure 1 and 2 shows a summary of the corridors as follows:

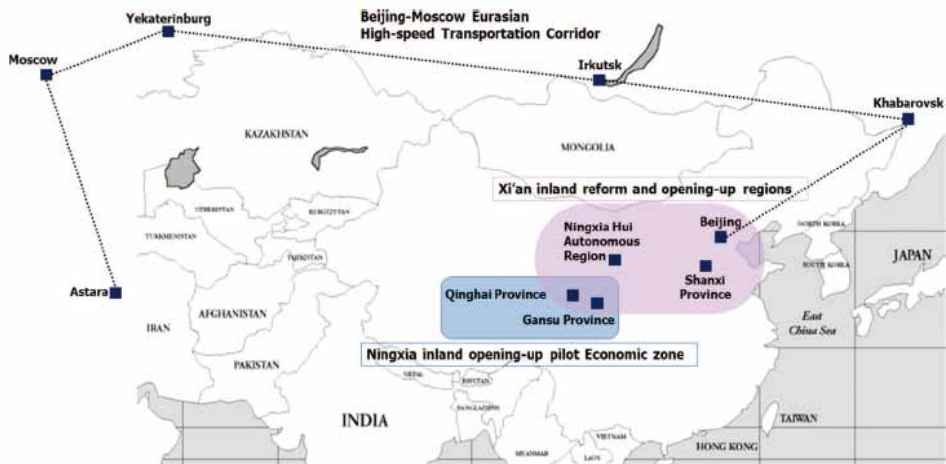
- China-Pakistan Economic Corridor (CPEC): Kashgar (Xinjiang Uygur autonomous region)—Gwadar port (Pakistan)
- Bangladesh-China-India-Myanmar Economic Corridor: Kunming (Yunnan province, China)—Mandalay (Myanmar)—Dhaka (Bangladesh)—Kolkata (India)
- Four sub-corridors in Greater Mekong Sub-region Economic Cooperation (GMSEC)
- China, Mongolia, and Russia Economic (CMR) Corridor: Heilongjiang Silk Road Belt
- Beijing–Moscow Eurasian high-speed transport corridor: Beijing (China)—Khabarovsk (Russia)—Irkutsk (Russia)—Yekaterinburg (Russia)—Moscow (Russia)—Astara (Azerbaijan)
- Lanzhou–Kathmandu South Asia Freight Rail (LKSAFR).

Figure 1. Summary of corridors in the Belt and Road (B&R).



Source: Lee et al. (2018, p. 293).

Figure 2. Beijing–Moscow Eurasian high-speed transport corridor.



Source: Lee et al. (2018, p. 286)

The expected impacts of the corridors are multi-dimensional such as change of energy supply chain, Chinese global port chain development, dry ports development in inland China, inter-port competition, infrastructure development and so on (Lee et al., 2018; Wei et al., 2018; Chen et al., 2018). In particular, CMR economic corridor is interrelated to Korea's "New Northward Policy", Russia's "New East Asian Policy",

and maritime logistics connectivity of ports and shipping networks in the East Sea Economic Rim in the context of the BRI, in which development of trade transit transport corridor is critical in northeast Asian region (Lim et al., 2017; Lee et al., 2018c). All the above are interwoven in the BRI context in the northeast Asian region.

Chinese government has announced the Polar Silk Road (PSR) in January 2018¹⁾, which is similar to Arctic shipping routes comprising of Northeast Passage, Northwest Passage, and Central Passage. As a result of global warming, the PSR is likely to become an important transport route for international trade. Therefore, there are three ways available for China/Korea to connect them to Europe, i.e., existing south-west bound maritime routes, railway by Trans-China Railway (TCR) and Trans-Siberian Railway (TSR), and the PSR. China's interest in developing the PSR arises from her desire to establish a comprehensive Belt and Road as the "three Silk Roads," referring to the joint promotion of land (One Belt), sea (One Road), and the Arctic. Out of the six economic and transport corridors as shown in Figure 1 and Figure 2, which are connected to Europe through seaports or by railway, the China, Mongolia, and Russia Economic (CMR) Corridor: Heilongjiang Silk Road Belt and Polar Silk in tandem with the PSR is more closely related to logistics providers and carriers. Having considered this circumstance, it is worthwhile to investigate the impacts of the BRI on connecting Korea to Europe. This article aims to discuss some key points to make connectivity between Korea and Europe efficient in the context of the BRI and to draw its implications from the Korean perspective.

1. Key factors for efficiently connecting Korea to Europe in the context of the BRI

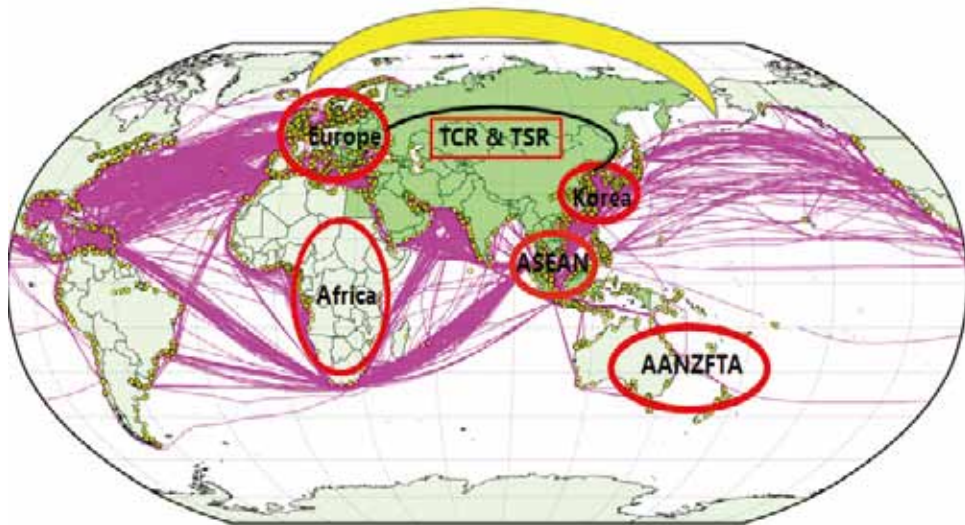
As discussed in the previous section, there are three possible routes to connect Korea to Europe. Figure 3 shows existing shipping route, railways by TCR and TSR, and Arctic shipping routes (so-called the Polar Silk Road). The current shipping routes have been well established for the Korean logistics providers and carriers. The discussions about the Arctic shipping routes show that they are too early to

1) The document has the following contents:

- ① The Arctic Situation and Recent Changes,
- ② China and the Arctic,
- ③ China's Policy Goals and Basic Principles on the Arctic,
- ④ China's Policies and Positions on Participating in Arctic Affairs
 - Deepening the exploration and understanding of the Arctic
 - Protecting the eco-environment of the Arctic and addressing climate change
 - Utilizing Arctic Resources in a Lawful and Rational Manner
 - Participating Actively in Arctic governance and international cooperation
 - Promoting peace and stability in the Arctic Conclusion. (Source: The State Council Information Office of the People's Republic of China, 2018, *China's Arctic Policy*, Beijing.)

commercially implement the service for the stake holders, although its feasibility and economic benefits are positive (Fu et al., 2018; Lee and Song, 2014; Lindstad et al., 2016; Liu and Kronbak, 2010; Meng et al., 2017; Tseng and Cullinane, 2017; Vavrus et al., 2012; Verny and Grigentin, 2009; Zhang et al., 2016; Zhu et al., 2018). A series of denuclearization talks among the two Koreas and US have been progressing, despite its uncertainty is envisaged. Having considered this circumstance, it is worthwhile for this article to investigate the impacts of the BRI on connectivity between Korea and Europe, focusing on railway mode.

Figure 3. Global network connecting Korea to Europe



Note: The width in pink color indicates the amount of ship traffic flows.

Source: Author modified the picture based on Hu, Z-H (zhhu@shmtu.edu.cn).

The discussion on railway mode to connect between Korea and Europe in this article requires a pre-requisite assumption that the railways are connected within the two Koreas and then connected to existing TCR and/or TSR. The first point to consider arises out of capacity of the railway and demand for the service. This is also interrelated to modal competition between the railway service and shipping service in terms of freight and service quality. This aspect can be inferred from a Chinese cost comparison case as shown in Table 1.

Table 1. Freight time and cost comparison between shipping routes and China Railway Express

	Yu-Xin-Europe	Rong-Europe	Zheng-Europe	Han-Europe	Su-Man-Europe
Original city	Chongqing	Chengdu	Zhengzhou	Wuhan	Suzhou
Domestic freight time (days)	12	5	4	5	0
Shipping time (days)	25				
Total freight time (days)	37	30	29	30	25
Frequency	At least 7 per week				
Inland freight costs (USD/FEU)	645	1,126	443	258	-
Shipping cost (USD/FEU)	1,500USD/FEU (A.P. Moller-Maersk A/S (MSK)'s freight)				
Total costs (USD/FEU)	2,145	2,626	1,943	1,758	1,500

Source: Jiang, Y. (2018). "Evolution of Hinterland patterns between China Railway Express and Seaborne Container Shipping under the B&R Initiative", 2019 IAME Conference, Mombasa, Kenya, 11-14 Sept. 2018.

Table 1 shows that China has five main railway service routes for Europe by origin city to use intermodal service. Their total freight costs range from 1500 to 2,626US\$ per forty equivalent unit container (FEU). The highest freight 2,626US\$/FEU by intermodal service is still higher than the lowest railway freight with subsidy by central and/or local governments in China, while the former's total transportation time is longer than latter's. Apparently, from the viewpoint of overall aspects of freight cost and service period between China and Europe, Chinese railway service is more competitive than shipping service, thanks to subsidy from central and local governments. However, we envisage the following questions regarding viability of Chinese railway service:

- How much subsidy can make Chinese railway service viable?
- How long will the subsidy by central and local governments last for Chinese railway service?
- How can China solve cargo imbalance between China and Europe?

The above Chinese case may raise some similar questions to Korean stakeholders, leaving aside technical issues related to railway operation. For example, is it possible for a Korean rail operator to provide competitive freight rate without subsidy compared to shipping service? Unlike Chinese railway service, the cargoes originated from Korea will take longer service time to Europe. It means that Korean railway service has less advantage in transportation days compared to Chinese railway. In addition, Chinese main five railways have weekly service with each block train having more than 42 wagons. It is questionable whether a Korean rail operator can arrange such block train with weekly service with enough cargoes. If he cannot, how can he make block train in collaboration with Chinese TCR operators? This article does not deal with TSR but TCR because it is concerned with the BRI. Moreover, if subsidy is necessary for Korean shippers to make the railway service feasible and competitive, who and how will provide such subsidy for the railway service? On top of that, subsidy for

railway service will cause Busan Port to face a severe competition with railway operators to capture cargoes to be generated from the same hinterland because shipping networks and connectivity is interrelated to port competition (Lam et al., 2018).

As can be seen in Figure 1, if all corridors are working well in the future, the size of the hinterland in the green circle would be encroaching against Shanghai and Ningbo Ports (Lee et al., 2018). As a result, it would cause more severe inter-port competition between Shanghai and Busan Port to capture transshipment cargoes with price competition (Anderson et al., 2008; Ishii et al., 2013; Dong et al., 2018).

The second factor we need to consider efficient connectivity by railway between Korea and Europe is to find a distribution center in the European region. Figure 4 shows a development strategy to connect China to Europe by establishing distribution center so-called “Great Stone” industrial park in 95km² in Minsk in Belarus²⁾, which was invested by China Merchants Group and is adjacent to Lithuania and Germany and Poland (On its location, see Appendix 1.).

Figure 4. A strategy connecting to China to Europe



The Great Stone aims to provide distribution service for cargoes coming from China by railway as well as accommodate block trains. The characteristics and advantages of the location are as follows:

2) This is based on author's field trip to Lithuania and interviews on 7-11 Oct. 2018: Meetings with Vice Minister of Transportation, Lithuania; Director of Klaipeda port and CEO of Free Trade Zone (FTZ); CEO of Kaunas FTZ; Interview with China Merchants Groups from Minsk, Belarus; Secretary-General of China International Freight Forwarders Association.

Block train service available between China and Belarus (e.g., Changsha-Great Stone Park in Minsk, Belarus). As discussed earlier, some rail routes subsidized by central and local Chinese governments.

- Lithuanian rail system is the same as Russia, China and other CIS countries, so that the rail way operator does not need to change boggy system of the wagons.
- Border crossing time between Lithuania and Great Stone industrial park in Minsk, Belarus takes 30 minutes for one block train; it is so-called “Shuttle train Viking”.
- Lithuania offers free economic zone in Klaipeda Port and Kaunas with tax incentive policies to attract cargoes from China. Once the cargoes complete customs clearance in the country, they do not need any more customs clearance within EU market because the country is a member of EU.
- Klaipeda Port expansion by CMG is under negotiation with MOU.
- Port infrastructure by central government and superstructure by terminal operators
- Major shipping lines are calling in Klaipeda, e.g., MSC and Yang Ming. COSCO is planning subject to China Merchant Groups’ investment decision.
- Minsk is expected to capture cargoes to and from the Scandinavia Peninsula through Klaipeda Port.

Despite the above advantages, China’s block train cannot be commercialized for Lithuania because Russia charges 3~4 times higher than normal usage rate of the Russian railway section for the direct block trains bounding for the Lithuanian territory from China.

Having recognized the above merits and strategic location of Minsk, Lithuania has set up global logistics hub strategy in the Baltic Region aiming to not only connect China by railway and seaport to Lithuania through Great Stone industrial park in association with free economic zones in Klaipeda and Kaunas but also capture cargoes to and from West Europe and Scandinavian countries. Therefore, the two countries are trying to together solve the higher usage rate issue of the Russian railway section because both can get benefits from the direct block train services. This is an exemplary of challenges why governments are able to intervene in removing obstacles to implement the BRI (Lee et al., 2018b).

The above Lithuania-China case also gives Korean stakeholders a couple of insights. First, the Korean rail operator needs to consider a strategic distribution center to cover Europe. Second, efficient railway service to connect Korea to Europe should rely on not only professional technical rail operation but also global logistics strategy in a comprehensive way. Last, the rail distance within the two Koreas is relatively very short in terms of origin to destination connecting Korea to Europe. In other words, it could be dependent upon the whole Chinese railway system up

to Europe, having a little portion of commercial benefits from the railway operation.

2. Concluding remarks

The Belt and Road Initiative (BRI) has still a short history of five years, which may not be enough to observe its formidable outcome. However, it can be said that its impact on maritime transportation, trade, global logistics pattern, and railway service development between China and Europe are potentially large. In addition, the “Belt and Road Initiative” has been carved in General Program of the Constitution of the Communist Party of China at the 19th National Congress of the Communist Party of China³⁾ on 24 October 2017. It implies that China has paved a solid way for the BRI to implement it for coming years. In this circumstance, Korean stakeholders need to consider two options: either “Connect Strategy” or “Being Connected Strategy”. The former is proactive, while the latter passive. Lithuania and Sri Lanka⁴⁾ follow the former. In November 2018, the two Koreas have agreed to carry out joint investigation of feasibility to connect railways within the Korean Peninsula. As we have seen the China and Lithuania case, we have noticed that there are several key issues to make the rail connectivity between Korea and Europe efficient and feasible. As far as rail connectivity service between Korea and Europe is concerned, we need to investigate railway service with or without subsidy for competitive edge against shipping service, establishment of railway cargo distribution center in Europe, and collaboration with TCR operators for operating direct block train service, leaving aside the technical issue of rail operation. The railway connection and development between the two Koreas requires social overhead capital as government infrastructure; therefore, the role of the central government is pre-requisite and essential as China and Korea did for container port developments (Ng et al., 2018; Lee and Lam, 2017; Lee and Flynn, 2011) unless the UN sanction on it is mandate.

3) Quoted from the Constitution. “The Party shall constantly work to develop good neighborly relations between China and its surrounding countries and work to strengthen unity and cooperation between China and other developing countries. It shall follow the principle of achieving shared growth through discussion and collaboration, and pursue the Belt and Road Initiative.”

4) On Sri Lanka case, see Ruan et al. (forthcoming), *Maritime Policy & Management*.

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Appendix 1. Transportation distance from Great Stone industrial park in Minsk to Baltic ports



Source: Port of Klaipėda (2018). Klaipėda Port Expansion: Business Opportunities. Klaipėda, Lithuania: Port of Klaipėda.

Analysis of potential e-commerce transit demand to maritime transport among Korea, China and Japan

Kiyoul Lee*

ABSTRACT

The global e-commerce (B2C) market is expected to grow at an average annual rate of 10%, reaching 2.3 trillion US dollars by 2018. The e-commerce market has been growing dramatically since 2010 and its growth has been outstanding especially in the Asia-Pacific region including Korea. The e-commerce market among Korea, China and Japan has also been growing rapidly. The growth of the e-commerce market among the three countries is expected to rise even further. As the e-commerce market grows the ports have been seeking ways to take advantage of such growth. In particular, the benefits of being able to shift the existing air-shipping services to the sea-shipping services. So far, there has been no detailed analysis of specific demand of the sea delivery in terms of the e-commerce products. Korea is located at the center of Northeast Asia and has Busan Port, which is the 6th largest ports in the world. Based on this advantage, it is necessary to establish an e-commerce logistics base in Korea. This will enable Korea to serve as the hub for e-commerce to China and Japan. Therefore, this study will analyze the expected e-commerce throughput among Korea-China and Korea-Japan in order to find out if there is any possibility to shift the current air-shipping deliveries to the sea-shipping deliveries. If so, this study will see how much of portion can be shifted to the sea-shipping deliveries. In doing so, this study will look at the throughputs by 2030.

Keywords: e-commerce, B2C, Asia-pacific region, shipping service, Korea, Japan, China

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1. Introduction

The e-commerce became familiar with us back in 1994 when the World Wide Web (WWW) began to spread. The initial e-commerce started from B2C (Business to Consumer) markets targeting consumers in general and afterwards, it has widened to B2B (Business-to-Business) markets. The B2B online retail market is expected to generate revenues of \$ 6.7 trillion by 2020 and this will be the double size of the B2C online sales (Frost official website, 2017).

The e-commerce market is rapidly growing in major countries around the world and its size is growing every year. The top four e-commerce sales recorded in 2015 were China, the United States, the United Kingdom, and Japan. In particular, the proportion of B2C e-commerce to the total retail market (amount) of the U.S. in the first quarter of 2017 reached 8.1% - this portion has been increasing from 3.5% since the first quarter of 2008. The most outstanding figure is that the overall retail market grew only by 5.1% while the e-commerce market grew by 15.4% from the period between the first quarters of 2016 and 2017(U.S. Department of Commerce official website, 2017).

The global e-commerce market in Korea, China and Japan is no exception. By region, the size of the e-commerce market in Asia-Pacific, including Korea, has surpassed North America in 2015. In particular, China's growth has been remarkable. During the period from 2012 to 2017, China's e-commerce market grew at an annual average of 56.5%. China has already surpassed the U.S. and became the world's largest e-commerce market. China has experienced a rapid growth of 35% while other countries has grown by 10%. Japan has also grown to become the fourth largest e-commerce market in the world. The B2C e-commerce market in Japan grew at an annual average of 13.2% between 2010 and 2014. It is expected that the e-commerce market in Japan will reach 25.6 trillion yen by 2021, doubling the size of 2014 (Lee, 2016). As of 2016, the size of e-commerce in Korea and China increased by 89.9% from the previous year and, the size of e-commerce markets in Korea and Japan increased by 27.1%. Especially, due to the expansion of e-commerce market in Japan, Korea's exports to Japan showed an annual average growth rate of 222.5% between 2013 and 2015. According to the Ministry of Economy, Trade and Industry of Japan, the e-commerce trade in China and Japan will triple the size of 2015. Considering that the Chinese consumers' preference for Korean products is high, China will become an important market to Korea.

In global e-commerce, the modes of transportation are inevitably necessary. There are two representative means of modes, which are air transport and maritime transport. Currently, the air transport is mostly used for the deliveries between Korea, China and Japan but there has been attempts to shift such mode of transportation to the sea service. Korea and China launched a ferry service for e-commerce in August 2015, and the POST Sea Express service is under operation for B2C e-commerce. Even though this shipping service adds on one extra delivery day, the delivery cost is 60% lower than the air delivery service. As a result, there has been an attempt to utilize global e-commerce in the port sector, but no concrete proposals until now.

Therefore, the purpose of this study is to estimate the possible conversion demand of global e-commerce in Northeast Asia (Korea - China, Korea - Japan) by analyzing the delivery type among the three countries. Based on the results, it aims to suggest any possible roles the ports can play as a mean of the e-commerce logistics base.

2. Status of e-commerce markets in Korea, China and Japan

2.1 Korea

Currently, Korea's global e-commerce market is growing at a double-digit rate. From 2014 to 2016, the size of the global e-commerce market (export and import) in Korea increased by 34.2% annually. In particular, the B2C transaction has grown rapidly since 2010.

The growth trend of global e-commerce in Korea shows that the overseas transaction (export) is leading the growth of the market in the country. In other words, foreign consumers' spending on Korean goods lead the e-commerce market in Korea. From 2014 to 2016, the export and import grew at an annual average rate of 83.3% and 7.6%, respectively. The export grew 11 times greater than the import.

Table 1. E-commerce market size in Korea

(100 Million Won)

Trade type	2014	2015	2016	CAGR
Total	23,262	29,558	41,904	34.2%
Export	6,792	12,544	22,825	83.3%
Import	16,471	17,014	19,079	7.6%

Source: Statistics Korea

As of 2016 China recorded as the top country which imports most of B2C goods (78.5%) from Korea. The B2C goods sold to China show a sharp increase every year. The U.S. and Japan were followed accounting 6.5% and 5.1%, respectively

Table 2. Destination countries for Korea's e-commerce goods (exports)

(Million Won)

Rank	Country	2014	2015	2016	Ratio
1	China	318,752	861,989	1,790,512	78.45%
2	U.S.	96,363	128,899	147,747	6.47%
3	Japan	90,187	83,537	116,077	5.09%
4	Asean	45,311	58,757	73,903	3.24%
5	EU	24,682	20,438	31,376	1.38%
6	Oceania	18,326	14,635	19,037	0.83%
7	Latin America	9,703	8,973	11,400	0.50%
8	Middle East	8,904	8,918	7,841	0.34%
9	Rest	66,900	68,210	84,559	3.70%
Total		679,128	1,254,356	2,282,452	96.3%

Source: Statistics Korea

2.2 China

Global e-commerce has emerged as a new growth engine for China's imports and exports, and has been growing at a rapid rate of 20% since 2010. From 2015 to 2020, China's global e-commerce trade is expected to increase by an annual average of 20.1%, reaching RMB 12 trillion by 2020. In addition, the proportion of global e-commerce in China's total trade is expected to increase from 19.5% in 2015 to 37.6% in 2020.

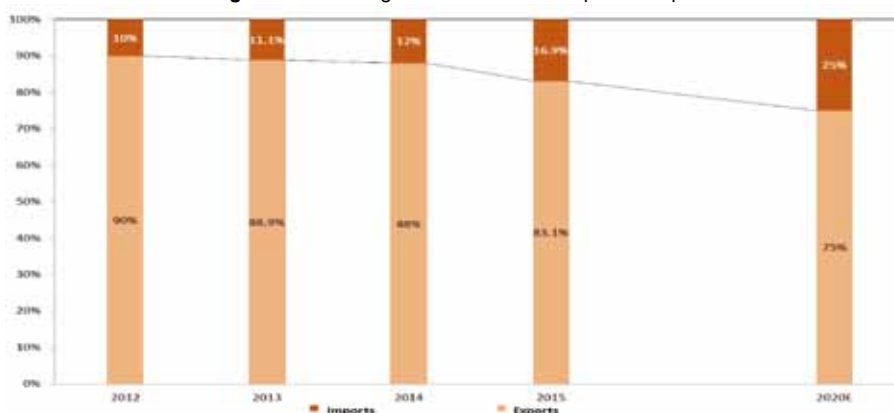
Figure 1. Volume of China's global e-commerce trade and import & export



Source: Ministry of Land, Infrastructure and Transport (Korea), 2016

In 2015, exports accounted for 83.1% of China's global e-commerce trade and this is about 4.9 times higher than of imports (16.9%). However, the size of imports will gradually increase in the coming years, and it will be expected to account for 25% of the total global e-commerce trade by 2020 (Ministry of Land, Infrastructure and Transport (Korea), 2016).

Figure 2. China's global e-commerce import & export



Source: Ministry of Land, Infrastructure and Transport (Korea), 2016

2.3 Japan

In 2015, the second largest global e-commerce (B2C) trading partners of Japan were the U.S. and China. The total volume of export to the U.S. and China was 6 times greater than the import. The export increased by 22% compared to the previous year – the export to the U.S. increased by 10.5% while it increased by 31.2% to China.

Table 3. Japan's B2C goods sold to the U.S. and China

(100 Million Yen)

Trading Country	Trading Type	2015	2016	2017	2018	2019	CAGR
U.S.	Import	5,381	6,081	6,822	7,614	8,451	11.9%
	Export	2,019	2,261	2,510	2,761	3,023	10.6%
	Total	7,400	8,342	9,332	10,375	11,474	11.6%
China	Import	7,956	10,788	14,305	18,568	23,359	30.9%
	Export	210	235	261	287	314	10.6%
	Total	8,166	11,023	14,566	18,855	23,673	30.5%

Source: Ministry of Economy, Trade and Industry (Japan), 2016

From 2015 to 2019, Japan's B2C goods sold to the U.S. is expected to grow at an annual average of 11.6%. In addition, Japan's B2C import and export to the U.S. is expected to grow at an annual average of 11.9% and 10.6%, respectively.

Moreover, its B2C goods sold to China is expected to grow at an annual average of 30.5%. Between 2015 and 2019, Japan's B2C import and export to China will grow at an average of 30.9% and 10.6%, respectively.

In 2015, Japan's major B2C import items were books/CDs/DVDs/video games (27%), cosmetics (21%), clothing and footwear (20%), and mobile phones (10%).

3. E-commerce delivery type in Korea, China and Japan

Currently, the air transportation is absolute means of international transportation mode for e-commerce goods between Korea, China and Japan. Because the express delivery service is used for the transportation of urgent goods, the air transportation has become to play the vital role. Moreover, the customs offices of each country operate a system for simple customs clearance for air express cargoes at a low tariff rate. However, in recent years, there have been attempts among these three countries to diversify the means of transportation mode for e-commerce goods – from the current air service to the sea service. Korea and China launched a ferry service for e-commerce goods in August 2015, and the POST Sea Express service is under operation for B2C e-commerce. Even though this shipping service adds on one extra delivery day, the delivery cost (i.e. logistics cost) is almost 60% lower than the air delivery service.

Furthermore, it turned out to be that there is demand to utilize Korean ports as transshipment hub for global e-commerce goods, mainly from China and Japan.

3.1.1 Korea-China

As a result of the efforts by both Korea and China's Customs Authority, the two countries currently provide maritime customs clearance and express sea shipping service for e-commerce goods (Korea Information Society Development Institute, 2016). This service is a sea shipping delivery method for global e-commerce goods using a ferry operating between Korea and China. In 1989, a direct route for container was established between Busan port and Shanghai port. In August 1990, Weihai port launched a direct ferry service between Incheon and China.

3.1.2 Korea-Japan

Japan has more than 70 airports nationwide, of which the main international airports are Narita, Haneda, Kansai, Fukuoka and Chubu International Airport. There are more than 100 ports and among them, the main ports are known as Tokyo, Yokohama, Osaka, Kobe, Fukuoka and, Moji ports. In addition, the ports of Komadomae, Hakodate, Aomori, Sendai, Niigata and Kitakyushu in Kyushu are used in connection with Busan port in Korea. It is common to use air delivery service for e-commerce goods between Korea and Japan. The general cargoes may be delivered by either air or sea shipping service.

4. Estimation of possible conversion demand of sea shipping service for e-commerce goods in Korea

In order to estimate the possible conversion demand of sea shipping service for e-commerce goods, this paper estimates the future size of global e-commerce in Korea, China, and Japan using existing statistical data. Once this is done, it estimates how much of current air shipping service can be shifted to the sea shipping service. This will be calculated based on the survey carried out.

4.1 *Size of global e-commerce in Korea, China, and Japan between 2016 and 2030*

4.1.1 Korea-China

In this study, the average annual growth rate derived from previous studies was applied to estimate the future size of e-commerce between Korea, China and Japan. Previous studies have estimated the international e-commerce market around 2020 and expect to grow at an average annual rate of around 25%. It is assumed

that the size of Korea-China, Korea-Japan e-commerce market will increase by 25% per year until 2020. After 2020, the market size of the e-commerce market to be decreased per year until 2030 considering the industrial life cycle.

Based on the data from the National Statistical Office, it is estimated that the market size will be 4.8 trillion won in 2020, 11.4 trillion won in 2025, and 19.5 trillion won in 2030.

It is estimated that the export transaction volume (B2C) will reach 17.7 trillion won in 2030, which will account for 91.1% of Korea-China e-commerce. The import transaction volume will be 1.7 trillion won (8.9%). It is expected that Korea-China e-commerce will occupy 2.8% of trade size, B2C exports will account for 4.4% of Korea's total exports, and B2C imports will account for 0.7% of imports.

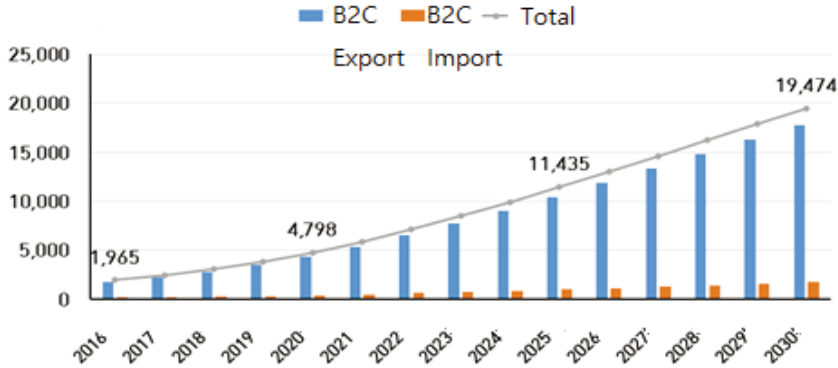
Table 4. Korea-China e-commerce market between 2016~2030

(Million Won)

Year	Trade		B2C Export		B2C Import		Total
	Export	Import	Total	Ratio	Total	Ratio	
2016	141,355,821	98,809,433	1,791,297	1.267%	174,162	0.176%	1,965,459
2017	149,824,764	108,706,863	2,239,121	1.521%	217,703	0.200%	2,456,824
2018	160,068,816	119,223,392	2,798,902	1.749%	272,128	0.228%	3,071,030
2019	172,349,361	130,984,219	3,498,627	2.030%	340,160	0.260%	3,838,787
2020	186,209,298	142,655,112	4,373,284	2.349%	425,200	0.298%	4,798,484
2021	199,455,611	154,205,635	5,379,139	2.697%	522,996	0.339%	5,902,135
2022	214,145,666	166,952,535	6,508,758	3.039%	632,825	0.379%	7,141,584
2023	231,291,732	180,047,196	7,745,422	3.349%	753,062	0.418%	8,498,484
2024	250,165,898	194,905,922	9,062,144	3.622%	881,083	0.452%	9,943,227
2025	271,751,090	209,130,664	10,421,466	3.835%	1,013,245	0.485%	11,434,711
2026	296,018,499	223,022,843	11,854,417	4.005%	1,152,567	0.517%	13,006,984
2027	323,714,535	237,810,820	13,336,219	4.120%	1,296,637	0.545%	14,632,857
2028	351,048,545	252,086,232	14,836,544	4.226%	1,442,509	0.572%	16,279,053
2029	379,339,395	268,408,845	16,320,198	4.302%	1,586,760	0.591%	17,906,958
2030	404,759,707	283,669,506	17,748,216	4.385%	1,725,601	0.608%	19,473,817
CAGR	7.80%	7.82%	17.80%	9.27%	17.80%	9.25%	17.80%

Source: Statistics Korea

Figure 4. Korea-China e-commerce market between 2016~2030



Source: Statistics Korea

4.1.2 Korea-Japan

In the case of Korea-Japan e-commerce, it is expected that the market size will be 0.6 trillion won in 2020, 1.3 trillion won in 2025, and 2.2 trillion won in 2030 when the size is estimated based on the data of the National Statistical Office. The sizes of the B2C export and import market by 2030 are estimated at 1.2 trillion won and 1.0 trillion won, respectively. This will account for 2.5% (B2C exports) and 0.9% (B2C imports) of Korea-Japan's total trade.

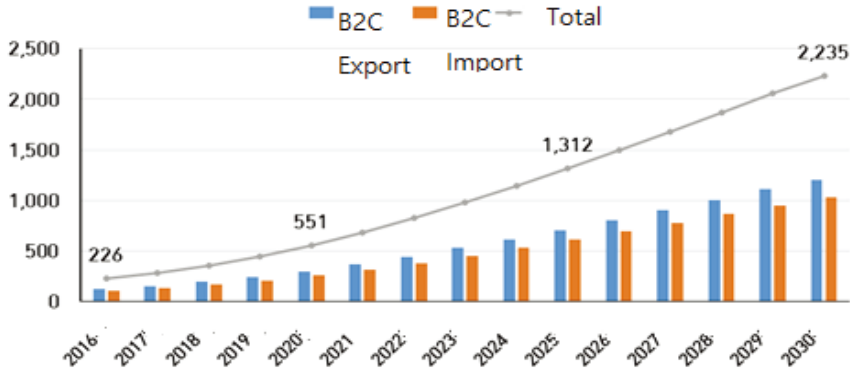
Table 5. Korea-Japan e-commerce market between 2016~2030

(Million Won)

Year	Trade		B2C Export		B2C Import		Total
	Export	Import	Total	Ratio	Total	Ratio	
2016	27,667,321	53,922,049	121,341	0.439%	104,196	0.193%	225,537
2017	29,070,300	57,823,362	151,676	0.522%	130,245	0.225%	281,921
2018	30,402,887	62,009,455	189,595	0.624%	162,806	0.263%	352,402
2019	33,062,737	66,987,436	236,994	0.717%	203,508	0.304%	440,502
2020	33,652,851	71,671,217	296,243	0.880%	254,385	0.355%	550,627
2021	35,120,084	76,504,521	364,378	1.038%	312,893	0.409%	677,272
2022	36,605,631	81,324,308	440,898	1.204%	378,601	0.466%	819,499
2023	37,919,260	85,599,197	524,669	1.384%	450,535	0.526%	975,204
2024	39,293,922	90,058,086	613,862	1.562%	527,126	0.585%	1,140,988
2025	40,630,124	94,421,350	705,942	1.737%	606,195	0.642%	1,312,136
2026	42,043,749	99,040,994	803,009	1.910%	689,547	0.696%	1,492,555
2027	43,519,540	103,738,611	903,385	2.076%	775,740	0.748%	1,679,125
2028	45,134,807	108,728,396	1,005,015	2.227%	863,011	0.794%	1,868,026
2029	46,818,410	113,487,411	1,105,517	2.361%	949,312	0.836%	2,054,829
2030	48,652,955	118,033,621	1,202,250	2.471%	1,032,377	0.875%	2,234,626
CAGR	4.11%	5.76%	17.80%	13.14%	17.80%	11.39%	17.80%

Source: Statistics Korea

Figure 5. Korea-Japan e-commerce market between 2016~2030



Source: Statistics Korea

This paper also examines the total trade volume (throughput) expected in the coming years. According to the National Statistical Office data, the total trade volume expected in 2020 for Korea-China e-commerce is 3,304 TEU while for Korea-Japan it is estimated to be 491 TEU in the same year. For 2030, 13,407 TEU (Korea - China) and 1,995 TEU are expected, according to the analysis.

4.2 Potential transit to sea shipping service for e-commerce goods

In order to estimate the possible conversion demand of sea shipping service for e-commerce goods, this study applies ratios drawn from the survey and previous studies. This study estimates the demand for transshipment of marine transportation in Korea-China, Korea-Japan for e-commerce goods and selects ferries as a means of transportation mode. Ferries are regularly operated, and the delivery time can take up to an average of extra 1 day than the current air service while the shipping costs can be reduced by up to 60%. However, as a result of interviews with experts, it was found that the cost of e-commerce delivery using a ferry is about 70% cheaper compared to the air service. Therefore, this research estimates the conversion rate by dividing the shipping cost of sea service by 40% level and 70% level compared to the air transportation.

From the questionnaire survey carried out by the e-commerce customers in Korea, it was found that 32% of the respondents are willing to accept the one day delay in delivery if the shipping cost was 10% cheaper. On the other hand, 78.5% of respondents are willing to accept one day delay in delivery if the cost was reduced by up to 50%. Because the shipping time of the ferry is one day longer than the existing air transportation, the conversion demand is estimated based on the discount rate required by the delay of one day delivery. Based on the results of the survey and the shipping price of sea service, the expected conversion demand from air to sea delivery service for Korea-China e-commerce goods is 68.8% when the shipping cost was 60% (40% of the air service cost) lower than the air service. Furthermore,

if the shipping cost was 30% (70% of the air service cost) lower than the air 39.6% of the e-commerce goods are expected to be shipped by the sea.

When the same scenario is applied to Korea-Japan e-commerce goods 57.3% of goods are expected to be shipped by the sea if the shipping cost was 60% (40% of the air service cost) lower than the air while 36% of goods are expected to be delivered by the sea if the cost was 30% (70% of the air service cost) lower than the air.

Table 6. Potential transit demand to marine transportation for Korea-China and Korea-Japan

Trading	Cost of shipping for sea service	
	40% of air service	70% air service
Korea-China	68.8%	39.6%
Korea-Japan	57.3%	36.0%

Source: Author's analysis

4.3 Demand forecasted based on the analysis

The trade volume of e-commerce for Korea- China is expected to be up to 13,407 TEU by 2030, and for Korea-Japan it is expected to be 1,995 TEU. If the ratio of 40% (60% lower than the air service) is applied to these volumes, the possible throughput for Korea-China e-commerce goods to be shipped by the sea service is approximately between 219 and 2,273 TEU in 2020 and between 891 and 9,224 TEU in 2030. For Korea-Japan e-commerce goods it is expected to be approximately between 183 and 281 TEU in 2020 and between 741 and 1,143 TEU in 2030.

On the other hand, if the ratio of 70% (30% lower than the air service) is applied to these volumes the possible throughput by the sear service delivery is expected to be between 126 and 1,308 TEU in 2020 and 513 and 5,309 TEU in 2030 for Korea-China e-commerce goods. For Korea-Japan, the sea service demand will be around 115 ~ 491 TEU in 2020 and 465 ~ 718 TEU in 2030.

5. Conclusion

The e-commerce market size for Korea-China and Korea-Japan is expected to grow steadily. However, since the e-commerce main items are relatively small in size and expensive in price, there is more preference on the air delivery service by the customers. This is why the air delivery is mainly used for the e-commerce items. In addition, according to the results of this study, it was found that the demand for e-commerce items will not be secured enough to be converted to the sea shipping service.

For these reasons, the roles of ports are believed to be limited yet. Because the expected throughput is maximum of 9,224 TEU for Korea-China while it will be around 1,143 TEU for Korea-Japan it seems almost impossible to launch a new

ferry route for the deliveries of e-commerce goods between these three countries.

Nonetheless, the global e-commerce market is growing rapidly, and Korea is located at the center of Northeast Asia meaning it has a geographical advantage. Ports such as Busan and Incheon are believed to play a vital role as the logistics hub for e-commerce markets. By utilizing this point, it is possible to increase the trade volume of the global e-commerce by establishing a logistics hub in the port complex and by improving the logistics system connected with it.

Furthermore, in order to take advantage of the rapid growth of global e-commerce, it is important that the roles of ports should be realized and priority should be given to the establishment of a logistics system to convert the current air delivery service to the sea service in the coming future. Korea should work towards to facilitate such port roles as the e-commerce trade volumes continues to grow rapid with China and Japan. Korea has an opportunity to secure enough throughput for marine transportation for e-commerce goods in the future.

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A Justification of Proposals to Improve Shipping in the Bering Strait

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ABSTRACT

This paper presents the geographical features of the Bering Strait, the existing hydro meteorological and navigational conditions, the state of shipping and environmental aspects. Estimates of the probability of navigation accidents and possible oil spills are given. The systems for ensuring the safety of navigation, in particular, the ship's routing system, the ship's reporting system, the global maritime distress and safety system, as well as possible instruments for regulating navigation in this strait are presented. Based on the analysis performed and taking into account the expected explosive growth in the volume of freight traffic, proposals were developed for improving the organization of the regulation of shipping in the Bering Strait.

Keywords: Bering Strait, shipping, vessels, marine safety system, marine environment

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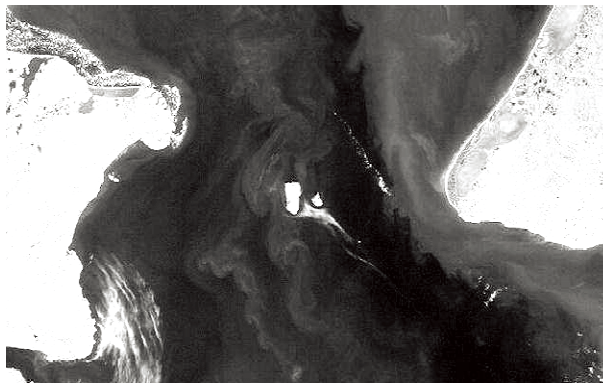
1. Introduction

Recently, the Arctic states, the media, various public organizations are paying great attention to the Arctic Ocean. The strategic importance of the Arctic is defined by three components: firstly, this region has huge reserves of natural resources, especially hydrocarbon raw materials. Secondly, there are several sea transport corridors leading from the Pacific Ocean to the Atlantic Ocean in this region. Thirdly, the Arctic is considered as a significant factor of geopolitical influence. In this sense, the Bering Strait is particularly important, as the only route leading from the Pacific Ocean to the Arctic Ocean and further to the Atlantic through the Northern Sea Route (NSR) or North-West Passage (NWP). From this point of view, this paper examines the geographical features of the location of the Bering Strait, hydro meteorological and navigational navigation conditions. The current state of shipping and the navigation systems operating in the strait are discussed. On the basis of the analysis done, taking into account the prospects for the development of Arctic cargo transportation, it is shown that the shipping organization system that currently exists should be improved in order to ensure an adequate level of navigation safety and protection of the unique biosphere in this strait.

2. Geographical features

The Bering Strait is located in the northern part of the eastern hemisphere and, on the one hand, connects the Bering Sea and the Chukchi Sea, and, on the other hand, it separates Russia and the United States (Fig. 1). The borders of the Bering Strait run along the coastal line of the Chukotka Peninsula (from the west) and the Seward Peninsula (from the east). From the north and south, the Bering Strait is limited by straight lines connecting, respectively, Unikyn Cape (Chukotka Peninsula) and the southern entrance Cape of Shishmarev bay (Seward Peninsula) and Novosyltsev Cape (Chukotka Peninsula) and York Cape (Seward Peninsula) (see below, Fig. 2).

Figure 1. The Bering Strait (satellite image)



Source: <http://komanda-k.ru>, access date 22 August 2018

The distance in the narrowest part of the strait between Cape Dezhnev in Chukotka and Cape Prince of Wales in Alaska is 47 nautical miles (86 km). Approximately in the middle between these capes are the islands of Ratmanov and Kruzenshtern, which are called the Islands of Diomedea. The border between Russia and the United States lies in the middle between these islands. Thus, the island of Ratmanova refers to Russia, and the island of Kruzenshtern refers to the United States. The distance between them is 2.3 miles (4.2 km). On the island of Ratmanov there is a Russian border post, and on the island of Kruzenshtern, in addition to the American military, there are also local residents. The island of Kruzenshtern is connected by regular flights with the city of Nome. Between the islands of Ratmanov and Kruzenshtern there is also a date change line.

In fact, the Bering Strait is a combination of three straits: 1) between Cape Dezhnev and Ratmanov Island; 2) between the islands of Ratmanov and Kruzenshtern and 3) between the island of Kruzenshtern and Cape Prince of Wales. The width of the first and third straits is about 22.5 miles, and the smallest depth is 36 m.

Directly within the borders of the Bering Strait, seaports that could take transport vessels (excluding port points) are absent both on the Russian and American coasts. On the coast of Russia, the ports of Provideniya and Igarka are closest to the Bering Strait, and on the coast of US - Dutch Harbor on the Aleutian Islands.

Thus, the Bering Strait, by virtue of its geographical location, is extremely important because it is the only shipping route that provides communication between the Arctic and Pacific oceans. All ships following the Northern Sea Route (NSR) or the Northwest Passage (NWP) inevitably pass through the Bering Strait. In the future, the importance of the Bering Strait and attention to it from the leading maritime powers will only increase.

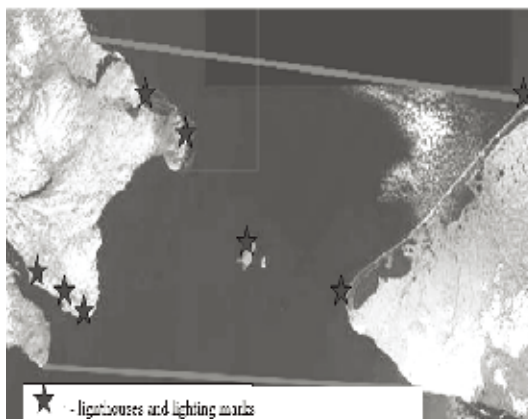
3. Hydro meteorological and navigation conditions

In the Bering Sea, including the Bering Strait, many hydro meteorological and other factors, especially storms, fogs, lowered temperatures, limited visibility, ice conditions and ship icing, have a significant negative impact on the safety of navigation. These and other factors important for navigation in a given area are determined by the following characteristics (NP 23, 2013):

- storm winds with a speed of up to 40 m/s can be observed up to 65 days in a year, they are especially frequent from November to March. In winter, northern storm winds prevail, in summer - southerly winds. From June to August, the frequency of storm winds is sharply reduced and usually does not exceed 2-3%. With storm winds, wave heights can reach 12 m;
- fogs are most frequent from May to August (on average 10-25 days per month), but in winter fogs are quite rare (1-3 days per month). Due to fogs and low clouds, limited visibility is observed 20-30% of the time in summer. In summer, the number of cloudy days can reach 25-28 per month, in winter - 11-18;
- in the period from late August-early September to mid-June, negative temperatures are observed in the strait, in winter, the air temperature in the strait

- can reach -25°C . The highest temperature ($8-11^{\circ}\text{C}$) is observed in July. Relative humidity is quite high and can reach 90%;
- precipitation, often in the form of snow, is observed up to 240 days a year. The number of days with blizzard is up to 100 per year;
- ice is observed in the strait up to 9 months a year. In some winters, the thickness of ice can reach 6 m, and some ice floes can occur even in summer;

Figure 2. Coastal AtoNs in Bering Strait



Source: NP 85, 2008

- icing is often observed from October to May (repeatability - up to 35%), occurs at negative air temperatures and strong winds (Fig. 3).

Most often icing occurs with northeastern and northwesterly winds blowing at a speed of 1–20 m/s and a wave height of 3–6 m. Icing can also be observed when supercooled precipitation falls, when a ship passes through supercooled fog and during sea soaring.

In addition to the heavy hydro meteorological conditions, the navigation situation in the Bering Strait is characterized by a number of specific features that impede the navigation of ships. One of them is related to the distance from traditional sea routes, ports and supply bases, search and rescue centers and ports of refuge. Due to frequent reduced visibility, astronomical observational capabilities are limited. Visual and radar observations are further hampered by a monotonous coastal landscape, a rare number of perceptible navigational landmarks. The situation is aggravated by a small amount of aids of navigation supporting (AtoN). Thus, according to navigational publications (NP 85, 2008), the entire coastline of the strait is equipped with only 8 lighthouses and light beacons (Fig. 2). Radar beacon-responders are absent at all.

From the point of view of currents, depths, tides, navigation does not cause any particular problems.

The entire strait is in the zone of sufficiently reliable operation of the global navigation satellite systems (GNSS) GPS Navstar and GLONASS. In addition, the entire strait is covered by the radio navigation field formed by the Russian ground-based

radio navigation system "Chaika" and the similar American system Loran-C, which, however, has been removed from navigation use in recent years. The differential GPS (DGPS) stations, ensuring the accuracy of ship's fixing of 2-5 m, are currently absent in this region. However, the plans for the development of the NSR include the installation of two DGPS stations at Cape Dezhnev and at the Providenie port, which will cover almost the entire Bering Strait. This will provide an increase in the accuracy of ship's fixing several times (from 50-100 m to 2-5 m).

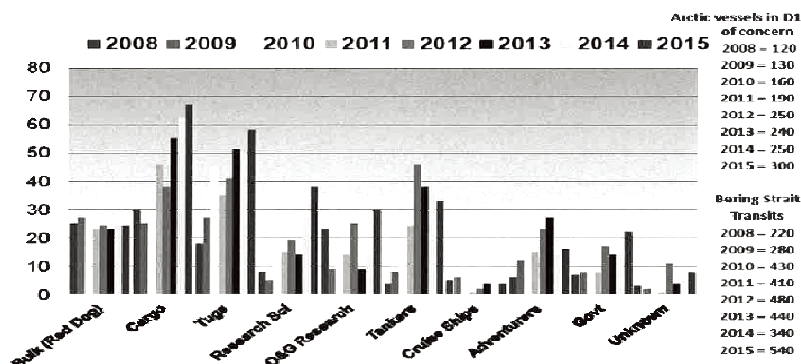
Thus, the hydro meteorological situation in the Bering Strait is quite complicated, especially in the autumn-winter period. The greatest problems are associated with reduced visibility, frequent storms and ice conditions. Navigation conditions of navigation are complicated by the difficulties traditional for high northern latitudes: problems with astronomical, visual and radar observations, an insufficient number of coastal AtoNs, remoteness from ordinary sea routes, supply bases and search and rescue centers.

4. Shipping situation

The total traffic of vessels in the Bering Strait is formed on the basis of the following components: a) transit transport vessels going by NSR in both directions; b) transit transport vessels going by the NWP in both directions; c) vessels carrying out the northern delivery of cargo from the seaports of the continental parts of Russia and the United States; d) fishing vessels; e) passenger and cruise ships; f) local vessels.

According to the analysis (Fletcher and Robertson, 2016), the Bering Strait passed in both directions: in 2009 - 239 vessels; in 2010 - 222 vessels; in 2011 - 222 vessels; in 2012 - 314 vessels; in 2013 - 349 ships. Some other data are presented in another paper (Preliminary Findings. Port Access Route Study: In the Chukchi Sea, Bering Strait, and Bering Sea 2016), which are shown in Fig. 3 (bottom right). However, these are numbers of the same order.

Figure 3. Distribution of total ship traffic by types of ships for the period 2008-2015.

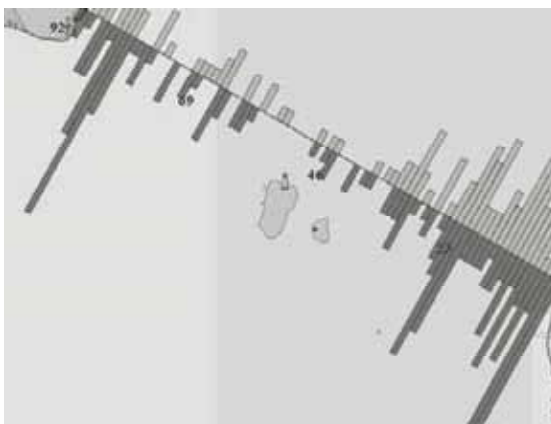


Source: Preliminary Findings. Port Access Route Study: In the Chukchi Sea, Bering Strait, and Bering Sea (2016)

The distribution of the trajectories of transit vessels across the width in the narrowest part of the Bering Strait according to the data of the automated identification system (AIS) for 2013 is shown in Fig. 4. As can be seen, the highest traffic density is observed along both sides of the strait, and the traffic flows that follow in the southern and northern directions are approximately equal.

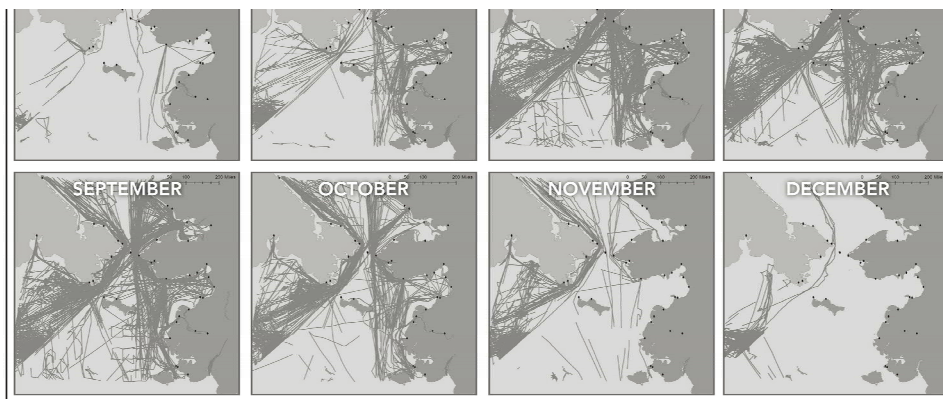
Distribution of total ship traffic in the Bering Strait by type of vessels for the period from 2008 to 2012 is shown in Fig. 3. Most part of the traffic was formed by tankers, cargo ships, tugs and bulk carriers. The distribution of the trajectories of the movement of various types of vessels for the period 2013-2015 is shown in Fig. 4. These data explain the large number of tugboat movements shown in Fig. 3: the overwhelming part of them is located in the waters adjacent to American territory.

Figure 4. Ship traffic distribution across the width of the Bering Strait (2013)



Source: Northern Economics, Inc. Feasibility Analysis: Port Clarence Support Base, 2014

Figure. 5. Traffic density in the Bering Strait by months according to AIS data for 2013-2015

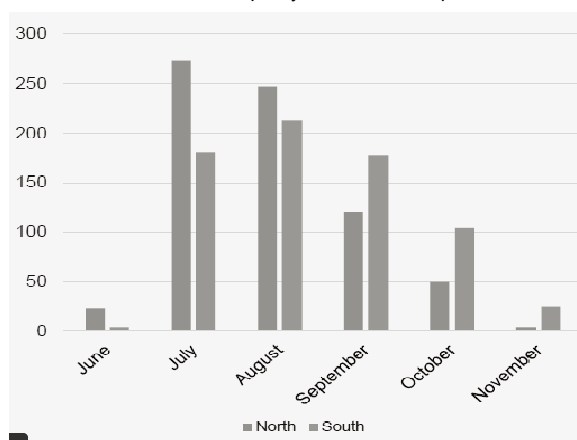


Source: Fletcher and Robertson 2016

The density of transit traffic in the strait depending on the time of year (month) is presented in Fig. 5. Data obtained from the reports of the AIS in the period 2013-2015. The greatest movement of vessels is observed in the period from July to October, while from January to March, the AIS system did not record transit vessels. This tendency is confirmed by the data presented in Fig. 6 (Northern Economics, Inc. Feasibility Analysis: Port Clarence Support Base, 2014). And in the summer (June-August) the number of ships following in the north direction exceeds the number of ships going to the south.

The situation observed in the Bering Strait during 2017 can be assessed using information from <https://www.marinetraffic.com> presented in Fig. 7. As in Fig. 5, the maximum traffic density is observed along the coasts of Alaska and Chukotka in the area of the Cape Dezhnev and the Cape Prince of Wales: in these areas it reaches approximately 20 ships per 0.4 square kilometers per year. Attention should be paid to the complete absence of transit vessels to the south of Ratmanov Island, and just three ships passed to the south of Kruzenshtern Island during the year.

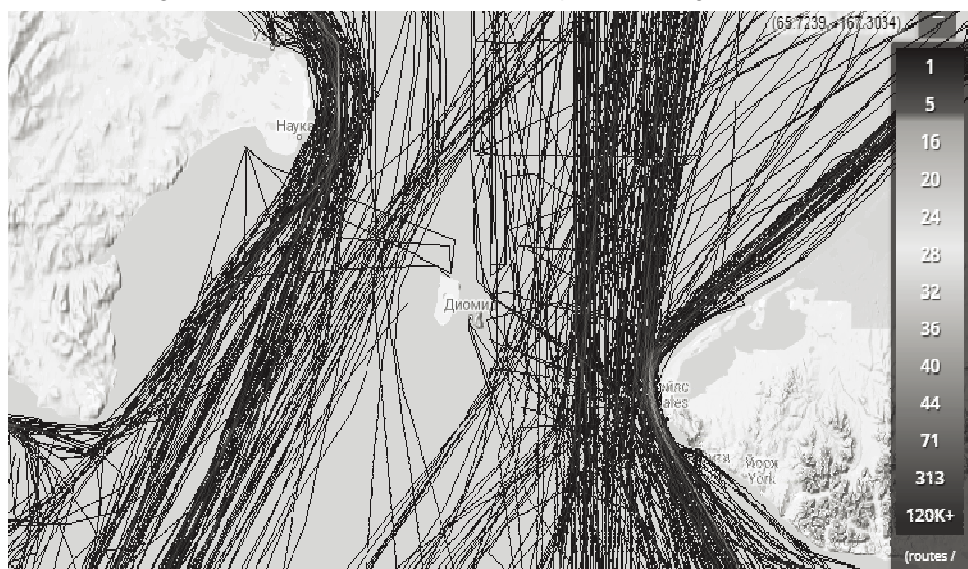
Figure 6. Distribution number of ships by months in the period from 2009 to 2013



Source: Northern Economics, Inc. Feasibility Analysis: Port Clarence Support Base, 2014

In general, in comparison with other areas of the oceans, the shipping situation in the Bering Strait is quite calm. However, the volume of freight traffic through the Bering Strait will increase dramatically in the near future: for example, according to the US Coast Guard, if in 2012 about 3 million tons of cargos were transported through the strait, that in 2020 the cargo traffic could increase to 50 million tons. (<https://seagrant.uaf.edu/events/2013/bering-strait-maritime>). Taking into account this factor, the general development of the Arctic region and the transformation of the Arctic by 2050 into the main center of offshore hydrocarbon production, an inevitable sharp increase in ship traffic in the Bering Strait and complications in the shipping situation should be expected.

Figure 7. Distribution of routes total flow of ships in the Bering Strait in 2017



Source: <https://www.marinetraffic.com>, access date 22 August 2018

5. Navigation accidents and oil spills

In the absence of offshore oil production in the Bering Strait at present, the main sources of oil products spills are ships in the strait that may be involved in a navigation accident. One of the largest was the oil spill in October 1997, when the tanker “Castrol” ran aground near the port of Nome, and more than 50 million gallons of engine oil spilled into the sea. More than 500 thousand birds, a large number of fish and seals suffered (<https://www.theonion.com>). The threat of oil pollution in the strait remains a permanent factor, and the source of pollution is not always known: there are regular reports of seabirds and mammals polluted with oil of unknown origin in this region.

Pollution by oil and petroleum products transported as cargo, occurs as a result of a navigation accident of transit tankers and tankers engaged in the northern delivery and local transportation. Vessels of all other types can be a source of contamination with marine fuel, lubricating oils, etc.

A large number of models have been developed for evaluating probability of navigation accidents, for example, the most well-known IWRAP program (IALA Waterway Risk Assessment Program - IAMA program for risk assessment on waterways), which is widely used to develop shipping control measures.

Approximately the probability of a major navigation accident can be estimated as follows. According to WWF data, the number of accidents with severe consequences for 10 years from 2005 to 2015 was from 0.028% to 0.04% of the total composition of the ships of the world fleet (<https://wwf.ru/upload/iblock/324/nir>). Consequently,

the probability of a major accident for each vessel over a period of 25 years of operation will be approximately 0.1%. For difficult conditions of navigation in the Bering Strait, this estimate can be increased by about 5 times. However, not every navigation accident is accompanied by an oil spill. Estimates of the probability of the occurrence of such a situation are different: it is quite acceptable to recognize the results presented in Journal of Navigation (Quon and Bushell 1994). Based on the analysis of statistical data in this work, it was shown that 15% of navigational accidents with tankers and barges carrying oil and oil products lead to real oil spills (cargo spills). Non-cargo oil spills (spills of ship fuel, oils, etc.) occur in 3-5% of navigation accidents with vessels that are not tankers and barges carrying oil.

For the northern part of the Bering Sea, a detailed analysis of the likelihood of various oil spill scenarios was made by Risk Informatics Company (<https://wwf.ru/upload/iblock/be7/otchetmodelrazl.pdf>). From the results of calculations it follows that the risk of exceeding the spill volumes of 500 tons may occur with a frequency of about 1.0×10^{-3} 1 / year, and the spill volume of 1500 tons is with a frequency of 2.3×10^{-4} 1/year.

As for oil spills in the Bering Strait, it should be noted that in the event of a real spill, only the crew of the emergency vessel can take response measures at the first stage, since coastal spill response resources are far enough away. For example, if the spill occurs in the area of Cape Dezhnev, then the nearest coastal resources are at port of Anadyr (260 miles, approximately 20 hours for a rescue vessel), the port of Pevek (560 miles, more than one and a half days of travel) and in the port of Petropavlovsk-Kamchatsky (1300 miles, more than three days of travel).

Fast assistance from the US Coast Guard is also unlikely, since its main forces and assets are based south of the Ale Islands in more than 800 miles.

Thus, the level of navigation accidents and accordingly the risks from oil spills with the existing density of ship density in the Bering Strait cannot be considered critical. However, given the sharp increase in shipping volume in this region, one should expect an even sharper (accident rate depends in quadratic degree on the intensity of traffic) increase in risk from oil and oil products spills, which indicates the need for early development to reduce potential risks, including the creation of local centers for the elimination of emergency oil spills.

6. Maritime safety systems

Bering Strait falls within the area of three maritime safety systems (MSS) namely Ship's routing (SR), Ship's reporting system (SRS) and Global maritime distress and safety system (GMDSS). In reality, the coverage areas of different MSS may overlap partially or even completely. In this case situations arise when the vessel, following in any area, may be simultaneously in the zones of operation of several MSS.

Of all the possible elements of the SR system, at present, only recommended routes are operating in the Bering Strait, the directions of which are $215^{\circ} - 35^{\circ}$ (in the Pacific part of the strait) and $0^{\circ} - 180^{\circ}$, $136^{\circ} - 316^{\circ}$ and $147^{\circ} - 327^{\circ}$

° (that part of the strait, which is located in the Arctic Ocean) (Ship's Routing, 015). On the maritime navigation chart these routes are indicated by dotted lines with red or orange arrows (Fig. 8).

Figure 8. Recommended routes in the Bering Strait



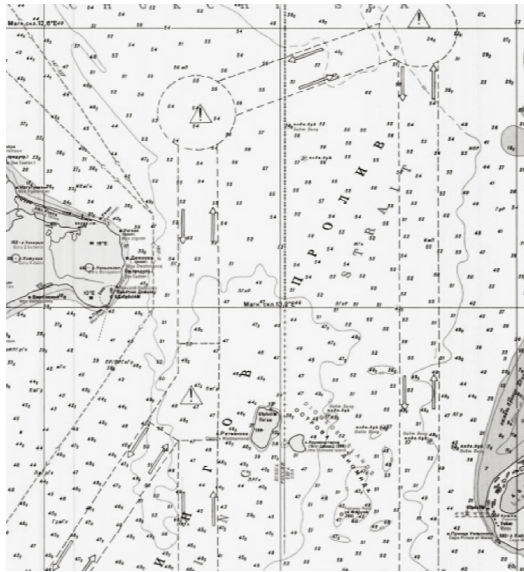
Source: marine chart No 60092

However, from 1 December 2018, the situation with regard to the SR system in the Bering Strait changes significantly. This is due to the fact that the IMO Committee for Maritime Safety (MSC) at its 99th session in November 2017 approved a joint Russian-American proposal to establish a new traffic scheme in the Bering Sea. The scheme proposed by Russia and the United States implies the establishment of six 4 miles wide, two-way recommended routes in the Bering Strait and on the approaches from the Russian and American sides, as well as the six precautionary area (PA), crossing or changing their direction (four two-way routes and three PA are directly in the Bering Strait) (Routeing Measures and Mandatory Ship Reporting Systems, 2017) (Fig. 9).

The paths of vessels are paralleled through the Russian and American parts of the Bering Strait, which will allow ship owners to choose the most convenient route for the passage, taking into account weather and ice conditions in the area, as well as the location of the ship's destination. The tracks are located at the maximum distance from the coast, and the depths along the entire length are more than sufficient for the safe passage of large-tonnage vessels. These routes are recommended for vessels with a gross tonnage of 400 tons and more.

In addition, off the west coast of the Bering Strait, in the territorial waters of Russia, there are two "marine mammal habitat areas", representing 12-mile zones around the Capes of Dezhnev and Inchoun. These areas are not included in the SR system, since they were introduced on the basis of Russian legislation. In these areas it is forbidden to stay ships, to give beeps and signals, to fly on aircraft below 4000 m, shooting, catch fish and other marine mammals and plants, and visit rookeries.

Figure 9. Two-way routes and precautionary areas in the Bering Strait



Source: Routeing Measures and Mandatory Ship Reporting Systems, 2017

As for such a MSS as the SRS, the Bering Strait (as indeed any part of the World Ocean) falls within the global SRS AMVER (Automated Mutual – Assistance Vessel Rescue System). The Operation Center of AMVER is managed by the US Coast Guard. With the help of special messages reception/transmission, the Operations Center ensures constant monitoring of the movements of the vessels registered in the system, as well as coordination of search and rescue operations, if necessary. Participation in AMVER is voluntary and free of charge.

Figure 10. Base AIS stations of MXAK company in Alaska



Source: http://www.mxak.org/vtrack/vtrack_intro.html

In the framework of the global maritime distress and safety system (GMDSS), the Bering Strait belongs to the sea area A3, the peculiarity of which is that ships operating in this area must have additional radio equipment onboard, the list of which is defined by "General requirements for ship borne radio equipments forming part of the global maritime distress and safety system and for electronic navigational aids, which were approved by IMO Resolution No. A.694 (17) on 6 November 1991. In accordance with the IMO work plan on GMDSS modernization this system is supposed to be supplemented with base stations of AIS, including the use of AIS for monitoring ships and using new types of messages [11]. In the Bering Strait, the AIS base station of the Marine Exchange of Alaska Company (MXAK) currently operates on a commercial basis (Fig. 10) (<http://www.mxak.org/>).

Thus, of all currently existing MSS in the Bering Strait, the SR system functions in the form of such elements as recommended routes, as well as four two-way routes and three PA (from 1 December 1 2018). Bering Strait is included in the marine area A3 of the GMDSS, there is one AIS base station in this strait. In this area also works global AMVER. In addition, in the northwestern part of the strait there are two habitats of marine mammals, the navigation of vessels in which is prohibited.

7. Environmental aspects

The peculiarity of the geographical location of the Bering Strait at the junction of two continents and two oceans determined the uniqueness of this area from an environmental point of view. The shores, islands and sea waters of this strait are characterized by the highest in the Arctic level of diversity and productivity of various species of birds, animals and fish. The strait is a critical area that provides habitat, reproduction, feeding and migration of many species of marine mammals, including large, walrus, ringed seals, beluga whales, and gray and bowhead whales which migrate twice a year through Chukchi and Bering seas. For a considerable part of the year, a huge number of seabirds inhabit the strait area, which nest and feed here, including such species as least and crested auklets, thick-billed murres, kittiwakes, thin-billed petrels, white and pink seagulls and at least thirty more numerous species of seabirds, sea ducks, geese and loons.. Here are the largest colonies of seabirds in the Arctic (up to 20 million).

The strait is the most important migration corridor and crossroads of birds, sea and land animals from various regions of the planet, which are part of the faunas of many countries. As a whole, the territory of Eastern Chukotka and the adjacent waters, including the Bering Strait, played an extremely important role in the formation and development of the biota of the Arctic and subarctic regions. The greatest number of marine animals in the strait is observed in the periods of formation and destruction of the ice cover.

In order to preserve the historical and cultural heritage, biological diversity, as well as improve the living conditions of the population living in these areas, preserve and develop the unique Bering Sea hunting culture of the indigenous population

(Chukchi and Eskimos), protect the biological diversity of rare and typical representatives flora and fauna, ensuring the natural state of the fragile Chukchi landscapes in this region, on January 27, 1993, the Beringia National Park was established with a total area of 3053.3 thousand hectares. This park received the status of a specially protected natural area (SPPA) of federal significance in 2013 in accordance with Russia government decree of January 17, 2013 No. 3 “On the establishment of the Beringia National Park in the Providensky, Chukotka and Iultinsky municipal districts Chukotka Autonomous Okrug”. The marine water area of the park makes up almost 20% of its total area (Fig. 11).

In accordance with the Federal Law of 14.03.1995 No. 33-FL “On specially protected natural area”, protected zones with a restricted nature management regime should be created in areas of land and water space adjacent to the SPPA. Within such protected zones, economic and other activities that negatively affect natural objects and SPPA complexes are prohibited.

The special ecological situation in the Bering Strait is also recognized internationally. For example, in November 2010, the International Union for Conservation of Nature (IUCN) and Natural Resources Defense Council (NRDC) held a seminar in which many experts from the USA, Canada and Russia took part. The workshop identified in the Bering Strait four so-called “super-EBSAs” (an environmentally and biologically area) based on criteria developed under the auspices of the Convention on Biological Diversity (CBD). The workshop identified the Bering Strait as the Arctic region, characterized by the highest productivity and diversity of marine nature. This region is a critical habitat for walruses, seals, fish, several species of whales, as well as a huge number of birds. It preserves the ancient history of human civilizations and the enduring cultural heritage that is of great importance for humanity in general and for local indigenous peoples in particular.

Figure 11. The approximate sea border of the park "Beringia" (red line)



Source: <https://wwf.ru/upload/iblock/>

In the Bering Strait, the greatest environmental risks are associated with shipping activities. These risks mainly are connected with possible spills of oil and oil products during ship navigation accidents (collisions and grounding). The extremely negative impact of such spills on the marine fauna and flora is widely known. However, even in normal operation, vessels in the strait have a negative impact on the environment in the form of the following factors: a) unauthorized or emergency discharge into the water of ship waste, oily and waste water, garbage; b) replacement of ship's ballast, when sea water is used as ballast; c) emissions of pollutants from ship engines; d) noise pollution from the work of ship propellers, engines and other devices, as well as noise resulting from the exploration and production of marine resources and from the work of naval hydroacoustic stations; e) unloading of cargo on the shore that is not equipped for such activity; f) use of fishing equipment that is harmful to the environment, as well as excessive by-catch.

Although all these factors are regulated by the relevant international regulatory documents, their negative impact on the environment cannot be completely excluded. Minimizing the negative impact of shipping-related factors is possible with the help of certain measures, some of which are presented in the next section.

8. Possible shipping regulatory tools

The main measures for the regulation of shipping by establishing a certain navigation regime in specific areas of the World Ocean are implemented within the framework of the IMO on the basis of the regulatory documents adopted by this organization. The most frequently used tools for this are the SR elements, which is mentioned in section 5.

In general, the purpose of the SR system is to increase the safety of navigation in areas where ship flows converge and in areas with high traffic intensity or where freedom of movement of ships is restricted by limited maritime space, obstacles, limited depths or adverse weather conditions. Depending on the specific factors, the negative impact of which must be neutralized, the establishment of the SR elements is carried out in order to accomplish one or more of the following tasks: a) separation of the ship's counter flows in such a way as to reduce the likelihood of collisions; b) reducing the risk of collision of vessels proceeding in established traffic lanes with vessels following courses crossing such lanes; c) simplify the organization of traffic in areas of convergence of ship flows; d) the organization of safe movement of vessels in areas of intensive research or development in the open sea; e) organizing the flow of vessels in or around areas where navigation of all vessels or certain classes of vessels is dangerous or non-desirable; f) reducing the risk of ship's grounding by establishing the special organization of the movement of ships in areas in which the depth is unreliable or close to the draft of the vessel; g) organization of vessel traffic at a sufficient distance from fishing areas or through fishing areas (Ship's Routing, 2015).

With regard to the Bering Strait, all these tasks should be considered relevant,

with the exception of the task of organizing the safe movement of ships in areas of intensive research or development on the high seas.

In addition to the elements mentioned in section 6 (two-way and recommended routes and PA), the SR system also includes traffic separation schemes (TTS), inshore traffic zones (ITZ), areas to be avoided (ATBA), which, in principle, can be used to regulate shipping in the Bering Strait.

However, the problem lies in the fact that, from a legal point of view, recommendations on navigation of vessels, established in various elements of an SR system, have the lowest priority among other regulatory requirements, in particular, the requirements of the International Regulations for Preventing Collisions at Sea in 1972 (COLREGS-72). For example, a ship following its own lane in the TTS is obliged to “make way” for the ship, observed on the right and following the crossing course just as in the open sea. Although the second ship violates Rule 10 of the COLREGS-72 wherein.

To solve environmental problems an effective measure is the introduction of mandatory SRS (see section 6), as well as vessel traffic service (VTS), which have precisely defined areas of operation.

All the above tools (SR, SRS and VTS) have the main purpose of ensuring the safety of navigation and, achieving this goal, they also solve environmental problems.

However IMO has a tool that is used to solve just environmental problems: the establishment of “Particularly Sensitive Sea Areas” (PSSA). A PSSA is “an area that requires special protection through actions by the IMO because of its importance to recognized environmental, socio-economic or scientific features, if due to such features it may be vulnerable to damage caused by international shipping.” (IMO Resolution A.982 (24)). Such areas are established by IMO on the basis of Resolution A.982 (24) “Revised guidelines for the definition and designation of particularly vulnerable marine areas” adopted on 1 December 2005.

Another tool for solving environmental problems is the establishment of a special area (SA), which is defined as “a sea area in which, for confirmed technical reasons related to its oceanographic and ecological conditions, as well as the specifics of shipping, it is necessary to adopt special obligatory methods of preventing pollution of the sea by oil, harmful liquid substances, wastewater or garbage, depending on the circumstances” (IMO Resolution A.1087 (28)). The SAs are established in accordance with the provisions of IMO Resolution A.1087 (28) “Guidelines for the Designation of Special Areas 2013 under the MARPOL Convention”, adopted on 4 December 2013.

It should be noted that both the PSSA and the SA are provided with a higher level of protection than other areas of the oceans, including increased legal liability of vessels that are allowed to sail in such areas. This status has the marine space, occupying 3.2% of the oceans (<http://www.zaosi.com>). At present IMO has begun to explore the possibility of creating another SA in the Mediterranean Sea, where it will control emissions of sulfur generated during the burning of marine fuel (Sea Trade Maritime News, 2018).

9. Suggestions for improving shipping regulation

On the basis of the above analysis of the situation in the Bering Strait, as well as taking into account the prospects for the development of this region, it is possible to formulate the following proposals for regulating navigation as the main source of environmental threats.

1. Adapting of the existing recommended routes and the two-way routes introduced from 1 December 2018 because the existing recommended routes and the newly introduced two-way route in the south-western part of the strait are essentially duplicative of each other (see Fig. 9), which inevitably introduces an element of uncertainty and confusion when choosing a transit route. Solution of the problem: the cancellation of the recommended route $215^{\circ} - 35^{\circ}$ and the corresponding adjustment of the other recommended routes.
2. The establishment of the ITZ between the two-way routes and the coast of Chukotka and Alaska, which is the logical conclusion of the movement pattern in case of the adoption of the above proposal (proposal 1). Under the existing traffic pattern, the establishment of an ITZ along the Russian coast of the strait is impossible, since the recommended routes do not have an exactly defined width.
3. The introduction of the status of ATBA around the islands of Ratmanov and Dezhnev, which will lead to streamlining the movement of local navigation vessels (transit vessels near these islands are practically not observed (see Fig. 7)).
4. Considering the introduction of PSSA and/or SA status in coastal areas of the strait (or even throughout the strait) with increased environmental vulnerability.
5. Development and implementation of the mandatory regional SRS (named, for example, BERINGREP) in the northern part of the Bering Sea (by analogy with the existing SRS REEFREP in the Great Barrier Reef). The operational center of such SRS could be the nearest AIS base station in Alaska.
6. Installation of AIS base stations on the Russian coast of the Bering Strait (or in the northern part of the Bering Sea) and coordination of their work with AIS stations on the coast of American Alaska.
7. Organization of work on the justification and design of regional VTS: in the short term, as the intensity of traffic in the strait increases, such a VTS will be extremely necessary, since, as practice shows, automated VTS is the most effective means of organizing and controlling the movement of vessels.
8. Organization of studies on the need to introduce temporary (seasonal) navigation measures in the strait (for example, speed limits) associated with periods of maximum concentration of marine mammals and their type of life activity.
9. Strengthening rescue preparedness during the navigation period, for example, by sending to the area the grouping of forces and means for oil spill prevention and response.

Solving traditional navigation support issues, which for the Bering Strait are of increased importance, for example, expanding coastal AtoN, improving the quality of cartographic support, and improving the work of forecast services will also contribute to improving the safety of navigation in this region.

It seems expedient to study the question of introducing an ice patrol in this area (by analogy with the northwestern Atlantic), which operates in accordance with rule 6 of chapter 5 of the Annex to SOLAS-74.

Finally, the preliminary training of ship crews will also contribute to reducing environmental risks. The Bering Strait is within the scope of the Polar Code, so the commanding staff of all vessels operating in the area must receive appropriate training. The program of such training can include a section related to environmental risks. It is also possible to organize such training in a separate program.

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Legal Analysis on the ABS of Marine Genetic Resources in ABNJ under the UNCLOS and CBD : Intellectual Property

Ayoung Kim*

ABSTRACT

The objective of this memo is to analyze a draft text of an international legally-binding instrument under the United Nations Convention on the Law of the Sea(UNCLOS) on the Conservation and Sustainable Use of Marine Biological Diversity of Areas beyond National Jurisdiction(ABNJ)(resolution 69/292). The text will concentrate on access and benefit-sharing of Marine Genetic Resources(MGRs) and Convention on Biological Diversity(CBD) in order to recommend the applicable international legal framework for the sound governance of intellectual property claims, such as patents on inventions and copyrights on publications describing discoveries. The ultimate goal of this analysis is to accumulate perspectives and concerns raised by nations regarding protection of knowledge deriving from these resources using intellectual property rights and the implications of such protection in international law, including the rights granted by the UNCLOS, as well as regarding the access and benefit sharing obligations under the CBD and to present feasible and practical potentiality of a new IP regime to be discussed by the persons or nations concerned.

Key words: UNCLOS, MGRs, ABNJ, CBD, access and benefit sharing(ABS), IP, patent, copyright

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1. Introduction

There seems no appropriate regime, international law or legal instrument to answer whether marine genetic resources found in areas beyond national jurisdiction could be deemed as the common heritage of mankind. Whether they fall under the freedom of the high sea of UNCLOS Part VII, or whether marine bioprospecting could be regarded as simply marine scientific research that must be conducted for the benefit of all mankind, legal clarity is suggested as much as possible by applying the legal means that are already available, practical and promising. Feasible access to information on marine genetic resources found beyond national jurisdiction and benefit from them must be provided.

While bioprospecting potential assets, the appropriate management and protection of its intellectual property for inventions deriving from MGRs need to be considered as a prerequisite to promote research and innovation and their responsible proliferation for the equitable benefit of society as a whole.¹⁾ Licensing and patents could also promote and encourage private sector investment in research and development.

Nonetheless, the dissemination of IP over MGRs may raise the costs of conducting research with proprietary materials and research tools.²⁾ As a consequence, newly discovered MGRs may be locked up by patent monopolies³⁾ and it could lead to deterrence on further innovation. The latter may act as a deterrent for public sector non-profit research on these resources at the expense of promising research projects that could provide widely distributed benefits in the long-term.⁴⁾

In this context, consideration of a feasible and practical new IP regime using reliable and qualified methods of current IP structures will be initiated throughout this analysis.

1) Claudio Chiarolla, 2014, "Intellectual property rights and benefit sharing from marine genetic resources in areas beyond national jurisdiction: Current discussions and regulatory options", *Queen Mary Journal of Intellectual Property*, Vol. 4 No. 3.

2) Ibid.

3) Ibid.

4) Ibid.

2. Legal Implication

2.1. UNCLOS and CBD

MGRs are not regulated through a specific international legal instrument.⁵⁾ The UNCLOS aims to build legal framework in which all activities in the oceans and seas must be carried out;⁶⁾ however, marine genetic resources are not mentioned in any UNCLOS provision, and according to Article 133(a) of the UNCLOS, 'resources' regulated by Part XI of the UNCLOS are explicitly defined as mineral resources, meaning only non-living resources and not marine genetic resources.⁷⁾ Thus, it would be reasonable to assume that the benefit-sharing obligations under Part XI do not apply to marine genetic resources from BBNJ.⁸⁾ It is explained further that:⁹⁾

Both UNCLOS and the CBD provide the legal framework for activities related to MGRs from organisms found within national sovereignty (i.e. in the internal waters,¹⁰⁾ archipelagic waters¹¹⁾ and the territorial sea¹²⁾) or jurisdiction (i.e. the exclusive economic zone¹³⁾ and the continental shelf¹⁴⁾).

2.2.1 UNCLOS Article 136 : Common Heritage of Mankind

UNCLOS Part XI regulates the Area (the seabed and its subsoil beyond areas of national jurisdiction) and states that it and its mineral resources are the common heritage of mankind.¹⁵⁾ In particular, Articles 136 and 137 of UNCLOS establish that no state shall claim sovereign rights over these resources and that activities in the Area must be carried out for the benefit of mankind.¹⁶⁾

5) Ibid.

6) UNGA resolution 65/37A. "Oceans and the law of the sea." UN doc. A/RES/65/37A, of 7 December 2010. Preamble.

7) Thomas Greiber, IUCN, "An International Instrument on Conservation and Sustainable Use of Biodiversity in Marine Areas beyond National Jurisdiction, Paper 3, Option and Approaches for Access and Benefit-sharing" Chicago Journal of I.

8) Ibid.

9) M Vierros, C Salpin, C Chiarolla and S Arico, 'Emerging and Unresolved Issues: The Example of Seabed and Open Ocean Genetic Resources in Areas beyond National Jurisdiction', in S Arico (ed), *Sustainable Oceans in the Twenty-first Century*, Footnotes n 94 to 99 (UNESCO-Cambridge University Press, Cambridge, UK 2014 forthcoming)

10) UNCLOS, Article 8

11) UNCLOS, Article 49

12) UNCLOS, Article 3

13) UNCLOS, Articles 55 and 57

14) UNCLOS, Article 76

15) Heafey, Eve (2014) "Access and Benefit Sharing of Marine Genetic Resources from Areas beyond National Jurisdiction: Intellectual Property--Friend, Not Foe," Chicago Journal of International Law: Vol. 14: No. 2, Article 5.

16) Ibid.

Article 136 Common heritage of mankind

The Area and its resources are the common heritage of mankind

2.2.2 UNCLOS Article 87 & 89 : Freedom of the High Seas

According to Article 87 and 89 in UNCLOS, the high seas are open to all states and governed by the principles of freedom of the high seas. States' innate freedom within the high seas, including the freedom of scientific researches, must be exercised with due regard for other states' interests in their exercise of these same freedoms.¹⁷⁾

Article 87 Freedom of the high seas

1. *The high seas are open to all States, whether coastal or land-locked. Freedom of the high seas is exercised under the conditions laid down by this Convention and by other rules of international law. It comprises, inter alia, both for coastal and land-locked States:*

(a) freedom of navigation;

(b) freedom of overflight;

(c) freedom to lay submarine cables and pipelines, subject to Part VI;

(d) freedom to construct artificial islands and other installations permitted under international law, subject to Part VI;

(e) freedom of fishing, subject to the conditions laid down in section 2;

(f) freedom of scientific research, subject to Parts VI and XIII.

2. *These freedoms shall be exercised by all States with due regard for the interests of other States in their exercise of the freedom of the high seas, and also with due regard for the rights under this Convention with respect to activities in the Area.*

Article 89 Invalidity of claims of sovereignty over the high seas

No State may validly purport to subject any part of the high seas to its sovereignty.

2.2.3 Convention on Biological Diversity and Nagoya Protocol

According to Article 15.1 of the CBD and Article 3 of the Nagoya Protocol, the Convention on Biological Diversity(CBD) and its protocol and Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization(Nagoya Protocol) are only applicable to MGRs over countries that have sovereignty. It is further written that:¹⁸⁾

17) Heafey, Eve, supra n 16.

18) Vierros et al., supra n 2. Footnotes n 94 to 99.

As regards the components of biological diversity, the CBD's scope is set out in Article 4(a), which limits its application to areas within the limits of national jurisdiction. However, [.....] the CBD is also applicable to activities related to biological resources that are sourced from areas beyond national jurisdiction by virtue of Article 4(b). The latter provides that the CBD applies, in the case of processes and activities, regardless of where their effects occur, carried out under a Party's jurisdiction or control, within the area of its national jurisdiction or beyond the limits of national jurisdiction.¹⁹⁾ [.....] Ultimately, the scope of the Nagoya Protocol, as adopted, is limited to genetic resources within national jurisdiction

Article 4. Jurisdictional Scope

Subject to the rights of other States, and except as otherwise expressly provided in this Convention, the provisions of this Convention apply, in relation to each Contracting Party:

(b) In the case of processes and activities, regardless of where their effects occur, carried out under its jurisdiction or control, within the area of its national jurisdiction or beyond the limits of national jurisdiction.

Article 22. Relationship with Other International Conventions

2. Contracting Parties shall implement this Convention with respect to the marine environment consistently with the rights" and obligations of States under the law of the sea.

3. Lack of Legal Clarity and Uneven Distribution

3.1. Lack of Clarity and Certainty

Marine genetic resources in ABNJ are not regulated through a specific international legal instrument. The scope of the ABS regime established by the Convention on Biological Diversity (CBD) and its Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization (Nagoya Protocol) is limited to genetic resources over which States have sovereign rights (Article 15.1 of the CBD and Article 3 of the Nagoya Protocol). Therefore, marine genetic resources from ABNJ are not covered. The UNCLOS sets out the legal framework within which activities in the oceans and seas must be carried out,²⁰⁾ thus in theory also for ABS

19) United Nations 2006, Report of the Ad Hoc Open-ended Informal Working Group to Study Issues relating to the Conservation and Sustainable Use of Marine Biological Diversity beyond Areas of National Jurisdiction, UN Doc. A/61/65.

20) UNGA resolution 65/37A. 'Oceans and the law of the sea.' UN doc. A/RES/65/37A, of 7 December 2010. Preamble.

with regard to marine genetic resources from ABNJ. However, marine genetic resources are not mentioned in any UNCLOS provision, and 'resources' regulated by Part XI of the UNCLOS are explicitly defined as mineral resources, meaning only non-living resources and not marine genetic resources (Article 133(a) of the UNCLOS). Therefore, it can be argued that the benefit-sharing obligations under Part XI do not apply to marine genetic resources from ABNJ, but rather the freedom of the high seas. This freedom again is not unlimited, as indicated in Article 87.1 and 2, and Article 88 of the UNCLOS, but for example subject to the provisions on marine scientific research (MSR) which embody different forms of benefit-sharing. Yet there is no framework to specify, coordinate, promote and monitor the implementation of these benefit-sharing obligations. In sum, this leads to a lack of legal clarity and certainty which could be solved through a future international instrument on ABNJ under the UNCLOS.

3.2. Uneven Distribution of Technology and Expertise

Lack of sufficient R&D capacities, both intellectual and technological, limit many countries in benefiting from the scientific as well as commercial opportunities related to marine genetic resources. More than 40 countries possess offshore research vessels, but the majority of them belong to a small number of developed countries. The number of deep diving scientific submersibles is even more limited and operated by a subset of developed countries currently leading marine scientific research. Furthermore, the majority of leading marine biotech experts is located in developed countries, as indicated by the geographic distribution of marine biodiversity publications as well as patent claims for genes of marine origin.

4. New IP Regime

4.1. Current IP Protection

In this chapter, the main consideration will be regarding IP and a brief overview of international instruments that could help to interpret questions of ABS and IP issues. Understanding the various sources of international law of relevance to ABS and IP beyond the CBD and the Nagoya Protocol is the aim of this chapter based on information and logical framework.

4.1.1 Agreement on Trade-related Aspects of Intellectual Property Rights Agreement

As one of the agreements to which all Members of the World Trade Organization must adhere, the Agreement on Trade-related Aspects of Intellectual Property Rights (hereafter the TRIPS Agreement) has had a major impact on the scope of

intellectual property protection around the world. The TRIPS Agreement establishes minimum standards of protection for WTO Members over a variety of IP instruments including patents, copyrights, trademarks, geographical indications, industrial designs, plant variety protection, integrated circuit designs and undisclosed information. As such, it is considered an important reference point for international IP rules.²¹⁾

While incorporating many of the provisions of the Paris Convention for the Protection of Industrial Property, TRIPS requires that patents only be granted to inventions that are new, involve an inventive step and are capable of industrial application (Article 27.1).²²⁾ Under Article 28.1 of the TRIPS Agreement, patents are a public authorization that grants to the owner the right to preclude others from the acts of making, using, offering for sale, selling or importing a protected product or process for at least 20 years.²³⁾

The TRIPS Agreement does not itself define the contours of a copyright and instead incorporates the substantive provisions of the Berne Convention of 1971, including the term of protection as the life of the creator plus 50 years.²⁴⁾ Article 9 of the TRIPS Agreement does stipulate, however, that copyright protection extends to expressions and not ideas, procedures, methods of operation or mathematical concepts.²⁵⁾ TRIPS does guarantee copyright protection to computer programs (Article 10, TRIPS), and recognizes rental rights (Article 11, TRIPS) and the rights of performers, producers of phono grams and broadcasting organizations (Article 14, TRIPS).²⁶⁾

4.1.2 World Intellectual Property Organization Treaties

Established as a specialized agency of the United Nations in 1967, the World Intellectual Property Organization (WIPO) provides secretariat services for many of the substantive IP treaties and is also the venue for the negotiation of many new IP treaties. ²⁷⁾

WIPO serves as the treaty secretariat for the Berne Convention on copyrights. Copyrights take on significance with respect to the interface between ABS and IP as they have an impact on how certain substance may be treated. According to Article 2(1) of the Berne Convention;

21) The Convention on Biological Diversity and the Nagoya Protocol : Intellectual Property Implications, United Nations Conference on Trade and Development(2014)

22) Ibid n 31.

23) Ibid n 31.

24) Ibid.

25) Ibid n 31.

26) Ibid.

27) Ibid n 35.

“Every production in the literary, scientific and artistic domain, whatever may be the mode or form of its expression, such as books, pamphlets and other writings; lectures addresses, sermons and other works of the same nature; dramatic or dramaticomusical works; choreographic works and entertainments in dumb show; musical compositions with or without words; cinematographic works to which are assimilated works expressed by a process analogous to cinematography; works of drawing, painting, architecture, sculpture, engraving and lithography; photographic works to which are assimilated works expressed by a process analogous to photography; works of applied art; illustrations, maps, plans, sketches and three-dimensional works relative to geography, topography, architecture or science.”

WIPO is currently engaged in standard setting discussions on the interface between biodiversity and IP.²⁸⁾ In October 2000, the General Assembly of WIPO established the Intergovernmental Committee on Intellectual Property, Genetic Resources, Traditional Knowledge and Folklore (hereafter the IGC).²⁹⁾ The WIPO General Assembly has given a mandate to the IGC to conduct negotiations with the objective of reaching agreement on the text of an international legal instrument (or instruments) which will ensure effective protection of TK, traditional cultural expressions (TCEs)/folklore and genetic resources.³⁰⁾

4.1.3 International Union for the Protection of New Varieties of Plants (UPOV)

Article 27.3(b) of the TRIPS Agreement gives WTO members the option of providing patent protection for plant varieties or for setting up a sui generis system for plant breeders' rights, or some combination of the two.³¹⁾ The International Union for the Protection of New Varieties of Plants (UPOV) is a multilateral treaty that facilitates international protection of new varieties of plants through a sui generis system of plant breeders' rights for such new plants that meet certain minimum standards.³²⁾ It is therefore a treaty that is of interest to users who seek to commercialize a newly developed variety of a plant.³³⁾ The minimum standards that must be contained in national legislation differ depending upon whether a country has acceded to the UPOV treaty as amended in 1991 or an earlier version of the UPOV treaty.³⁴⁾

The interface of UPOV with the Nagoya Protocol and the CBD is similar to that for patents, in so far as the grant of a plant breeders' right to exclude others from the use of variety without a license, subject to a number of possible exceptions

28) Ibid n 35.

29) Ibid n 35.

30) Ibid n 35.

31) Ibid n 37.

32) Ibid.

33) Ibid.

34) Ibid.

(for example, the farmers' right to save seeds if contained in national legislation).³⁵⁾ According to Article 15(2), it contains an optional exception to the breeder's right, giving UPOV parties the opportunity, "within reasonable limits and subject to the safeguarding of the legitimate interests of the breeder, [to] restrict the breeder's right in relation to any variety in order to permit farmers to use for propagating purposes, on their own holdings, the product of the harvest which they have obtained by planting, on their own holdings, the protected variety."³⁶⁾ If this farmers' exception is implemented domestically, it often is restricted to small-scale farmers or coupled with a specific license fee system.³⁷⁾

4.2. *New IP Regime*

4.2.1 Open-source Licensing and Database Protection

We believe that a new method is needed to procure protection for MGRs and its patentable or copyrightable inventions deriving from BBNJ. Proliferation of them to be distributed for further inventions by society toward objectives of sound and more equitable access and benefit sharing, open-access scientific publishing and free and open resources software may contribute to the spread of marine biological innovations and the dissemination of MSR results.³⁸⁾ Open access to relevant scientific publications, data and software (to analyse this data) could be viewed as an important component of non-monetary benefit-sharing.³⁹⁾

One of the possible methods to be applied would be open-access policies that the main concept and structure are analogous to European Commission's Open Data package, concerning digital data that is co-shared, managed or produced with the support of public and common bodies.⁴⁰⁾ Since ISA is the main international scheme to broadly verify and control the researches and works related to MGRs so far, a pilot program could be designed within the frame of ISA which aims to be one of the concrete and promising ways of dealing with ABS concerns. Other experts have also considered these ideas elsewhere:⁴¹⁾

35) Ibid n 37.

36) Ibid.

37) Ibid.

38) C Chiarolla, Intellectual Property Rights, IUCN Information Paper prepared for the UN Intersessional Workshop on Marine Genetic Resources, May 2013, New York, <http://www.un.org/depts/los/biodiversityworkinggroup/documents/IUCN%20Information%20Papers%20for%20BBNJ%20Intersessional%20Workshop%20on%20MGR.pdf> (26 April 2018)

39) Ibid.

40) <https://ec.europa.eu/digital-single-market/en/european-legislation-reuse-public-sector-information> (26 April 2018)

41) European Commission, 'Open Data', <http://ec.europa.eu/information_society/policy/psi/index_en.htm> (accessed 26 November 2013). The entire package comprises: a Communication on Open Data, including data re-use policy; a proposal to revise the 2003 Directive on re-use of public sector information (Directive 2003/98/EC); and a revision of the Decision governing re-use of the Commission's own information.

Open-source licensing is a form of management of IP assets, initially developed in the software context, whose objective is to disseminate innovation in a non-proprietary fashion. An open-source approach may be preferable to straightforward publication when: (1) the inventor/developer has automatically vested IP rights in an intellectual asset; or (2) defensive disclosure through publication would still expose the author to the risk that others might seek ownership of the technology; or (3) it is preferable to set terms of use that exclude everyone who does not agree to make improvements available under the same liberal terms that apply to the core technology.

4.2.2 Multilateral System of Access and Benefit Sharing

Predecessors from other international organizations of their resolutions for Benefit sharing concerns could be quoted, such as the International Treaty on Plant Genetic Resources for Food and Agriculture (FAO Treaty) and the CBD.

FAO Treaty establishes, inter alia, a multilateral system to facilitate access to plant genetic resources for food and agriculture, which is regarded as a major component of sharing the benefits arising out of the use of these genetic resources in a fair and equitable manner.⁴²⁾

Under the Multilateral System of Access and Benefit Sharing (MLS), parties to the Treaty agree to make freely available genetic diversity and related information stored in ex-situ collections concerning, at present, 81 forage species from 29 genera and an undefined number of crop species from 51 genera (covering the majority of major plant crops that are important for human food security). The system is operationalized through a standard material transfer agreement (MTA).⁴³⁾

Through this system, recipients of MLS materials who commercialize a product that is a plant genetic resource for food and agriculture incorporating material accessed through the MLS pay to a trust account a share of the benefits arising from commercialization.⁴⁴⁾ These funds mostly benefit farmers who conserve and use plant genetic resources for food and agriculture in a sustainable manner.⁴⁵⁾

The method initiated by FAO through MLS seems to encourage private entities or persons to get more approachable chances to co-shared information while protecting patent. In addition to that, it also enhances capacity in some aspects.

Although former ABS systems are based on the circumstances that the sovereignty of those resources are within each national jurisdiction, some learn from it could

42) United Nations Conference on Trade and Development, *Supra* 21 n 24.

43) *Ibid* n 24.

44) International Treaty on Plant Genetic Resources for Food and Agriculture, art. 13(2)(d)(ii), available at <ftp://ftp.fao.org/docrep/fao/011/i0510e/i0510e.pdf> (26 April 2018).

45) *Ibid*.

ignite new possibilities, such as voluntary sign-up by patent owner to join these kinds of newly launched system and certain portion or all of its contribution from commercializing could be distributed to certain sectors to be supported, this routine of access and benefit sharing could also be deemed to achieve one of the objectives of UNCLOS, co-owning monetary and non-monetary benefits of MGRs deriving from beyond national jurisdiction.

5. Conclusion

Some important principles can be depicted as protection and enforcement of intellectual property rights. These should contribute to the advancement and transfer of technology while only granting the patent on new and useful inventions. Naturally occurring elements or merely discovered based on the statement by the TRIPS Agreement should not be included.⁴⁶⁾ Protection of patent and copyrights assures that inventors for MGRs related works have control over their inventions and are secured under the realm of legal clarity and stability, thereby facilitating collaborations which promote access and benefit sharing in transferring technology and strengthening capacity building.⁴⁷⁾ Collaborations would also maximize the scientific returns from MGRs related inventions available and reward society with its advantages. ⁴⁸⁾

In conclusion, fostering practical and feasible ways to protect access to information and benefits of MGRs found beyond national jurisdiction within the framework of international instruments at the beginning stage with the ideas of equitable sharing of the common heritage of mankind is necessary. By implementing a feasible and practical new IP regime using reliable and qualified methods of current IP structure, stability and clarity on patentable or copyrightable inventions or ideas can be encouraged and utilized for the benefit of more individuals.

46) Agreement on Trade-Related Aspects of Intellectual Property Rights, Art. 7, Apr. 15, 1994, Marrakesh Agreement Establishing the World Trade Organization, Annex 1C, 1869 U.N.T.S. 299, 33 I.L.M. 1125, 1197 (1994)

47) Heafey, Eve, *supra* n 16.

48) *Ibid.*

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- <https://ec.europa.eu/digital-single-market/en/european-legislation-reuse-public-sector-information>(26 April 2018)
- The entire package comprises: a Communication on Open Data, including data re-use policy; a proposal to revise the 2003 Directive on re-use of public sector information (Directive 2003/98/EC); and a revision of the Decision governing re-use of the Commission's own information. European Commission, 'Open Data', <http://ec.europa.eu/information_society/policy/psi/index_en.htm> (26 November 2013).
- International Treaty on Plant Genetic Resources for Food and Agriculture, art. 13(2)(d)(ii), available at <ftp://ftp.fao.org/docrep/fao/011/i0510e/i0510e.pdf> (26 April 2018).
- Agreement on Trade-Related Aspects of Intellectual Property Rights, Art. 7, Apr. 15, 1994, Marrakesh Agreement Establishing the World Trade Organization, Annex 1C, 1869 U.N.T.S. 299, 33 I.L.M. 1125, 1197 (1994)

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.

References. Citations within the text must include author name(s) and the data in parentheses [i.e., Smith, Jones, and Cutler (1993)]. Use *et al.* in the text only when four or more authors are cited. Do not use *et al.* in the references. Alphabetize the reference section and include all text citations. For more information, consult the *Chicago Manual of Style*. Follow these examples:

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.