



## **Master Thesis**

**Log 953 – Petroleum Logistics**

**“Analysis of infrastructure and factors  
influencing the operational environment of the  
Northern Sea Route and their future impact  
on possible transit”**

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## **1. Introduction**

Nowadays the Arctic region with its natural resources such as water-ways, oil and gas (hydrocarbons) and various living marine resources plays a significant role for commercial usage. Due to socio-economic, industrial, geopolitical and climate-change factors the necessity of Arctic exploration becomes more and more important (Arctic Council, 2009). Not without reason the 21<sup>st</sup> century is now called an “Arctic Century”.

These reasons are:

1. the importance of natural resources in the Arctic region has increased,
2. realization of the sensitivity of the environment is higher than before
3. the geopolitics' return relates to the region.

The forecasts concerning Arctic and operation with the natural resources became the reason of the fever pitch in 2000s. Scientists had great hopes for offshore operations and for the oil and gas reserves exploitation. The countries related to the region and the EU formulated an Arctic strategy (making international collaboration more strength and stimulation sustainable development of Arctic region).

The Arctic, especially the Russian Federation and Norway, have a chance to develop into Europe's largest investment area. Norway has nowadays active investment activity in services, infrastructure and research (Arctic Council, 2009). We can say that the Northern Sea Route (NSR) is a demanding navigation route, so if there is no formal transit system, transit here can be classified as hazardous.

In recent years the role of the NSR in the Arctic paradigm is quickly gaining importance for the international trade, economics and shipping industry. It happened due to political changes regulating its usage. Of course, it is important to point out that maritime

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activity along the route has been constrained by harsh climate, sub-zero temperatures and ice-cover (Rahman, Saharuddin, Rasdi, 2014).

More than that, the special necessity of the NSR becomes a reason for a challenging legal and geopolitical situation in the Arctic countries. Strategic interests of different states concerning transit and commercial usage of the route often come into collision (Arbo P. – Iversen A. – Knol M. – Ringholm T. – Sander G., 2013). That is due to the potential benefits for cargo shipping through the NSR. For many trade flows it can cut sailing distance and shipping costs compared to traditional communication sea lines such as Panama and Suez Canals.

As for infrastructure, the NSR has to be renovated. Lack of refueling and repairing bases, shortage of trained and good qualified staff and high icebreaker's exploration costs pose a lot of problems (Arctic Council, 2009). Nowadays the Russian government begins development of Western part of the NSR, but eastern part still remains the same.

## **1.1 Motivation for the topic choice**

Not long ago a joint Norwegian-Russian scientific and educational project «Logistical and environmental management of natural resources development and transportation in the Arctic area (Arctic Logistics)» has started. Molde University College is the main partner institution from the norwegian side. I decided to take part in this project because such knowledge will help me to understand all issues concerning this region.

In addition, petroleum industry is very attractive for me. I worked a lot in oil and gas companies which directly interrelated with the Northern Sea Route. More than that, nowadays the Arctic region draws attention of many countries and Norway is not the exception. Norway is located in proximity to the Arctic region, so, the analyses of factors seems to be very relevant for the norwegian industry.

All above mentioned is the motivational basement to write my thesis about factors which influence the operational environment of the Northern Sea Route.



## **1.2 Objective of the study and Research question**

As it was mentioned earlier, global warming leads to the melting of the sea ice and the opened sea makes possible the commercial shipping. The literature on this issue led to the idea that soon the Arctic routes will inevitably attract a lot of traffic. But there are doubts about the potential of the Northern sea lanes ([www.bigenc.ru](http://www.bigenc.ru)).

Maritime strategy is one of the most important parts of the government's efforts to make stronger the competitiveness of Norwegian companies and make it easier and more profitable to do business in the country. Norwegians want that the maritime industry maintains the competitive position in the world market. The government focuses on how the Norwegian industry can react to the future possibilities and challenges ([www.regjeringen.no](http://www.regjeringen.no)). Growing interest also have other non-Arctic countries - Korea, China, Japan, Singapore.

The information shows the relevance of investigating the Northern Sea Route. Additionally, the high focus on maintaining competitiveness helped me to find a more precise approach on how to investigate the Northern Sea Route. Shipping companies all over the world face the same possibilities to navigate via the NSR ([www.regjeringen.no](http://www.regjeringen.no)). The knowledge might position companies differently and affect on their abilities to seize potential possibilities.

So, I identified the following research questions:

- What are the main advantages of navigating via the NSR?
- What challenges can companies face sailing through the NSR?
- What circumstances are needed, so that the NSR becomes a viable option for sailing?

- Which factors influence the operational environment of the NSR?

To answer these questions, the following factors will help us:

- Counterarguments that say that transport competition through the Suez Canal and Panama is impossible and therefore NSR will never become a truly big business
- Counterarguments that speak about the wish of some representatives of some countries to reduce Russia's participation in international economic relations and thereby deprive / undermine its political influence.

Such an analysis will allow us to come to the conclusion how necessary the development of the NSR is and for whom it plays such a great role. Moreover, we will find out the answer to the question - what awaits us all in the future?

In my research I decided to use a PESTEL and SWOT framework to find out and analyze the exogenous factors which influence the sailing situation in the NSR. A PESTEL framework is the approach, where environmental, political, social, economic, legal and technological problems of the given object are analyzed systematically.

I will also analyze different risks such as political, economic, technological risks, operational risk level, etc. Also, it is necessary to draw attention to navigational aids, which icebreakers are used along the NSR and maritime infrastructure – for example, ports.

### **1.3 Thesis structure**

The thesis has the following structure. I divided it into 8 parts.

Section 1 consists of introduction part and problem definition. The chapter gives the reader an understanding of the thesis' topic.

Section 2 contains a survey of literature relevant for the research topic. I analyzed research papers in which different issues regarding to the NSR were examined.

Section 3 deals with the methodology applied for this problem. I will argue my research design choice, determine the difference between primary and secondary data, describe which data I used: qualitative or quantitative. One more important question in this chapter will be – how the information was collected. It is necessary to mention that the data was collected in accordance with standards, which guarantee validity of my thesis.

Section 4 is dedicated to the overview of the world and Norwegian shipping industry. Also, I will characterize the Arctic region, mention its' owners, analyze port infrastructure and try to find the answer to the question: will the climate affects the shipping industry or not?

Section 5 considers the analyses. The collected information helps to provide SWOT and PESTEL framework of the Northern Sea Route. In addition, various risks will be described in this section in order to give the clear understanding of possible challenges for Norwegian companies which want to operate in the NSR.

In section 6 the main conclusions according to my thesis will be given.

Section 7 provides information sources which are used for the problem.

Section 8 contains all the appendices.



## 2. Literature review

The NSR is interesting for a wide range of research topics.

Botnaryuk M.V. (2004) analyzed the perspectives of future development of the NSR. He characterized briefly Arctic area. All in all, the author concluded that increase in the cargo turnover in the Arctic region will only be possible with development of NSR infrastructure and significant investments. Moreover, it will be necessary to work on legal frameworks and federal programs and maybe even create special cluster that will solve all route problems effectively.

Margaret Blunden (2012) worked on analyses of geopolitics and how it will influence the NSR. From year to year transit voyages to the north which are made just for experiments are breaking horizons and the NSR already plays a significant role for raw materials' export. It is important to mention that nowadays Russia has not the only focus on security but has increasing national and business interests which are driving the policy. Government of the Russian Federation has great development plans for the route. The author tells that if Russian government wants to accelerate regular transit through the Northern Sea Route which has serious problems now it should pay attention to balance interruptions, overloads. In spite of imposing impediments to the regular transit, non-Arctic states governments don't want to risk and fight for the influence in the region. Russian, Canadian and the EU or non-Arctic trading states' interests are different about North-East Passage. It is mentioned that Russia and Canada want to keep their exceptional jurisdiction in respect of sea lanes in their waters.

Hans-Petter Bjørkli (2015) analyzed in his article the NSR's effect on the Arctic governance. He used classic theories of International Relations and answered the research question with data from various expert interviews and a document base. His findings show that liberalist values triumph realism, and that the route doesn't have a chance to break the current institutionalized and international political

environment of Arctic region. On the contrary, it can be so that conflicts in other countries may destroy the well-being of international shipping through the NSR because of spillover effects.

Yu-Ting Chang, Dung-Ying Lin (2018) analyzed the problem of freight assignment and routing for liner shipping which was applied to the NSR planning problem. The study was based on real case of the Europe-Asia line of Company X. In this research, the authors made general mathematical formulation which is based on the time-space network. To solve this problem, they proposed a decomposition algorithm based upon the Lagrangian relaxation that makes easier network features. After empirical analyses Yu-Ting Chang and Dung-Ying Lin concluded that there are several main factors that influence commercial feasibility of the NSR. They are bunker price, cargo volume, service commitment, penalty for delay and navigation skills. For all these factors the researchers made sensitivity analysis. According to results, navigation across the Suez Canal is still the most profitable for carriers. In spite of the fact that the Northern Sea Route can't fully replace the SCR in virtue of restrictions, carriers may use the NSR when the accessibility is better. Although the authors got promising results, this research has some limitations. For example, they did not take into account voyaging speed, risk of navigation in the Arctic region and constraints on port operations. More than that, the liner shipping stochastic demand was not considered in model formulation because the demand can change due to the global economy.

Stein Ove Erikstad, Sören Ehlers (2015) presented decision-support models for operating NSR transport possibilities. The models are made to identify viable ice class for liner vessels. In this model are used some uncertain parameters (time-dependent duration of roundtrip periods, navigation season, capital and operational costs and fuel price). Moreover, models' sensitivity is based on the ice length.

Olivier Faury, Pierre Cariou (2016) analyzed competitiveness of the Northern Sea Route for different oil tankers. This research offers a decision model for ship-owners who consider advantages of sailing south through the Suez Canal Route or north across the Northern Sea Route during transportation of oil goods from the Russian Federation to Asia. Such decision is based on possible transit time and cost savings that vary monthly due to navigation conditions in the region along the Northern Sea Route. The study is used for the 1A Ice-Class Panamax tanker vessel that sails via the NSR compared with the Panamax vessel that goes via the Suez Canal Route. It deduced that the Northern Sea Route has competitive benefits from August to November when suppositions on higher bound ice conditions are deliberated for ice thickness level along the route and from July to November when lower bound is estimated.

Hill et al (2015) proved that the Northern Sea Route will be used in the nearest future. He points out not only that even with significant barriers dominating along the NSR, the route makes the trade route and international shipping process easier, but it also allows local Arctic economies. Even without paying attention to the fact that sea ice decreases, the Arctic route will develop fast.

Jacob Kronbak, Miaojia Lio (2009) in their research are concerned about the climate change in the Arctic Ocean. They made forecasts which demonstrate that ice cap decrease will be a chance to explore natural resources and will open new possibilities for maritime transportation. The authors tried to compare NSR with the Suez Canal, paying attention to such factors as speed of ships, class of vessels, navigation risks and service of ice breakers. The goal of such research was to explore the economic potential of Northern Sea Route as a route connecting Asia and all Europe. They applied 3 scenarios for fees, bunker prices and seafaring time.

V. C. Khon, I. I. Mokhov, M. Latif, V. A. Semenov and W. Park (2010) found prospects two main northern routes in the 21st century: of the NSR and NWP. The



possibility to simulate the length of ice season in Arctic due to climate models, navigation season and last changes on routes near North American and Eurasian coastlines is estimated by the usage of sputnik observations for 1980-2007. The authors told that simulated average duration of the ice season is widely used for satellite observations and historical forcing is used to simulate changes in the 20th century. This gives confidence to widen analysis to forecasts for the 21st century. The conclusion is that navigation season will soon rise considerably. By the end of 21st century models forecast season extension with free pass from 2 to 4 months for the Northwest Passage and a little more (from 3 to 6 months) for the NSR. So, that means that transit from Western Europe to Far East will be 15-17% more favourable and profitable if we compare it with transit through Suez Canal.

Komkov N. I., Selin V. S., Tsukerman V. A. (2008) made the scenario forecast of the Northern Sea Route development. For the period up to year 2030 they create extensive scenario forecast of cargo flows through the Northern Sea Route, relying on conjuncture changes of the world's major energy markets.

Taedong Lee, Hyun Jung Kim (2015) analyzed various barriers of voyaging through the Northern Sea Route. The authors tried to find answer to the question: What are perspectives for shipping companies if they use NSR? They told that due to the climate change, new opportunities and risks appear. Companies compete to develop the region. The goal of this research is to find out the external, internal and economic barriers and drivers from shipping companies' perspective. As for methods, they use analysis of documents and interviews. The result was that the difference between companies are connected with perception of economic possibilities and other internal factors.

I was really impressed by the article of Olersky V. A. (2006) - «The NSR as a blood vessel of the Arctic». It was written with original thinking, interesting set of verbal turns. It is about creation of uniform transport infrastructure and vehicles supply for



the Arctic area. Olersky V. A. compared the Northern Sea Route with other traditional route. He tried to forecast which countries in the future would use the NSR as a transit route.

Platonov S.A. (2004) created port organization system which implies the process of engaging investments in the NSR development. He looked through the port activities and experience of other countries related to the route. Platonov identified important operation measures for Arctic ports to make them be more attractive for foreign customers.

Cariou Pierre, Faury Olivier (2015) examined the relevance of the NSR for bulk shipping. They tried to prove that even if nowadays market circumstances at present are in favor of the NSR, there are lots of benefits of using Suez Canal. The number of bulk ships that go through the NSR is very limited. In this research it is mentioned that it is necessary to pay attention to the spot freight rate to fuel ratio which controls decisions of ship owners about the speed of sailing. Vessels' speed on the SCR is very low but possible savings of fuel are limited to be an alternative. The authors also argues that in opposition to many studies, internalizing of environmental benefits makes Northern Sea Route only marginally attractive.

Plisetskiy E.E. (2006) explained development priorities in strategic planning and management. He analyzed main socio-economic indicators of 10 entities of the Russian Federation through which the NSR passes. The research of existing strategic management system for the NSR development gives us a chance to draw a conclusion that it is important to establish a single management body for the Northern Sea Route (development institution) that would coordinate and monitor activities implemented by commercial organizations and state structures (or expand the powers of the current NSR Administration). There is a necessity for development of a complex development Strategy and corresponding state program that will determine objectives, long-term goals, timeframes (stages) of realization up to 2025-

2030, taking into account the interests of coastal regions, financing, priority development areas, responsible performers.

Pavlov K., Selin V. (2008) made a study about problems of freight traffic development. The commodity exchange volume is permanently growing up in the world economy, and therefore, there is need for accelerated transport systems development. At the same time, maritime transport is now considered to be the most economical in the future, the turnover is more than half of all world freight traffic and it presents dynamic. In the medium-term and in strategic perspective (beyond 2030), the most probable is the large-scale rise of Arctic shipping, including the Northern Sea Route. The authors state that the most important factors defining these scales will be the rate of demand growth for hydrocarbons in the rapidly growing Asian and Pacific market, the processes of climate change and the development dynamics of offshore fields in the Arctic. It is important to support the construction of the ice fleet and modernize port infrastructure.

Claes Lykke Ragner (2015) pays attention to infrastructure and cargo flows. He analyzed current situation and made trends for the future. The author assessed economic necessity of the route but as transit area between Asia and Europe. He is sure that the NSR is one of the main export routes for oil and gas industry. The report contains review of previous and present flows of cargo. Ragner summarized types and volumes of cargo which goes along the route. In the report there is a survey of infrastructure (ports, ice-breakers and ice-class cargo vessels). He made calculations of future requirements for infrastructure that were based on approximate cargo potential. He compared it with approximate capacity for the purpose to find out main bottlenecks for operations along the NSR. The information is mainly collected from INSROP data (1993 – 1999), but significant updates were made using current data and statistics.

Shatalova N.V. (2016) identified not only the potential of the Northern Sea Route in the Russian Federation, but also development strategy. She point out that there is tendency of growing in transportation volumes. Because of oil and gas fields development the Northern Sea Route becomes more important. The author said that Russia widens the Arctic influence at the legislative level. She analyzed the Strategy of development of Arctic area and the trade navigation law, forecasted future cooperation with countries. Shatalova considered the most necessary development factors.

Huijeong Son (2017) tried to answer if developing of the NSR for international shipping is economically and politically viable or not. He analyzed nowadays NSR conditions and recent historical background. His research gives reasons in support of the necessity of the following: Russian Federation political ambitions in the Arctic region (since the 2000s) in changing security in the Arctic, developing cargo shipping but mainly for domestic transportation and territorial disputes of jurisdictional requirements over resources and control of the Northern Sea Route.

In contradistinction to Huijeong Son, Satya Savitzky (2016) examines factual and potential developments nearby the NSR in the Russian Federation area. He checked out the ways how geopolitics, geophysical processes and geo-economics come into collision in “Anthropocene Arctic region”.

Vladimir S. Selin (2016) described problems of development of the NSR. The author looked through the prospects and trends of the NSR. There is a problem that many factors influence such a complex system, often they are contradictory and difficult to predict.

Veera Pauliina Suvanto (2016) identified various international actors and their interests in the Arctic region, so she uncovered possible problems that need to be solved in the future. Veera established theoretical framework for interpreting the

geopolitics concept, the Arctic was analyzed not only geographically, but politically. In her research she explained the most important international legal instruments that belong to the region and international actions in this region.

Yiru Zhang, Hua Wang, Qiang Meng (2018) made an empirical analysis based on discrete choice models to answer the question - what impact on the Suez Canal Route will the opening of the NSR have? After state preference review the authors found choices in various situations and industrial preferences. According to results of modeling, scenario analyse is made to forecast choices of companies in difference cases and, so, the policy insight is proposed. The data were used to evolve discrete model of choices that disclosed significant factors and captured choice action. For general cargo, oil or bulk shipping, there are no dominating factors that define the route. Big companies are more conservative than medium. Results present that it is impossible for big companies to use the NSR, when medium can easily switch.

Yiru Zhang, Qiang Meng, Liye Zhang (2016) make an analyses on the topic is the NSR attractive to companies or not. They found insights from latest traffic data. Current use by shipping industry was still neglected at the time, when the media energetically try to demonstrate historic NSR and when researchers propagate the viability of the route. In this study current ship traffic was analyzed. Authors used port call and transit data. They come to conclusion that ships can only navigate 5 month per year, the majority of customers are Asian countries. The route is more attractive for shipping of general cargo, liquids and bulk. Activities are still internal. The study provides true statistics that adds significance to viability analysis. In addition, the research demonstrates trade NSR pattern, shows key transit players. Such information can attract interest of many shipping companies all over the world.

### **3. Metodology**

I will begin this chapter with a brief description of the research design. In addition, I will determine the difference between primary and secondary, qualitative and quantitative data and describe how I collected the information.

The biggest part of my research in this field will be based on empirical observation. The significant part of “best-practice”, methods development and guidelines in such a quickly changing field will be result of working with organizations.

#### **3.1 Research design**

There are two types of research design: conclusive and exploratory. The goal of the first one is to examine or test special phenomenons, relations. That can be done by using structured researches. The information for this research should be clearly indicated. Representative samples are widely used there and the information is found for the quantitative analysis.

As we speak about exploratory research, the goal is to give an idea of the phenomenon. All in all, we use such researches when it is impossible to measure realistically the quantity or describe specific qualities. We can also use exploratory researches when we need to identify special actions or insights. In other words, when an accurate definition is needed. When the needed data can be easily defined and where not a special hypothese, but a research question is formed, it is better to use exploratory method.

Each project can consist of multi-method design. It means that in one project we can use both methods, if we have to solve several goals. To examine the topic of my thesis, I used both methods. A descriptive design is used to describe the Norwegian



shipping industry and analyze the Arctic area and the NSR. The data for these parts is secondary.

I used mostly the exploratory research in my thesis. That was due to the fact that knowledge level on this thema is very limited. Moreover, I tried to understand the Norwegian companies' thoughts and believes about the NSR. So, it was impossible to collect the data through the conclusive research. In addition, my thesis is loosely structured, because I started with the development of understanding of the problem.

My research is based on analysis of geopolitics and infrastructure of NSR. More than that, I use SWOT and PESTEL frameworks to characterize the relevant external factors connected with technological, political, economic, environmental, social and legal premises which affect cargo shipping through the NSR.



## **3.2 Data collection**

If we talk about data collection, there are several classifications of how to define the information. However, the widely used classification distinguishes secondary and primary data. In my research I used both types to conduct more complete analyses. I will describe these methods in this chapter.

### **3.2.1 Primary data**

If the data is collected from the first-hand experience – it means that it is primary data.

Primary information can be quantitative and qualitative. A qualitative data has usually explorative design. The goal is to give a complete understanding of the situation. If we analyze a quantitative method, there we usually use statistics or different forms of measurement. If we combine both types of data, the method will be called - mixed.

There is a wide range of secondary information for my problem. But I decided to find primary data also. The primary data on this topic is so specific, that no similar information exists nowadays. I used some research papers as source of primary information, which was received from authors. Another articles and research papers will play function of “fuel” for my thesis.

To analyze Norwegian shipping industry and to understand attitude of companies to the NSR, I made a questionnaire in which mixed method was used. The questionnaire contains both quantitative and qualitative questions. In addition, I made interviews, which were also qualitative.

The information which was collected before for another goals, which is published in newspapers, internet, magazines is called secondary data (www.businessdictionary.com).

If we compare it with primary information, secondary data is easily accessible and is not so expensive. However, the correctness of such data can be limited, because it was gathered for another purposes. The researchers have to evaluate the information – if it is new or not, useful or not, from which source it was taken.

Documentary data in my research contains promotional material, newspaper and magazine reports, annual reports, website data, parent company information, published case descriptions, white papers. Other secondary data sources is found from scientific databases such as ProQuest, Science Direct, Ebrary, etc.

### **3.2.3 Design of the Questionnaire**

A questionnaire is the way to obtain the data. The questionnaire is a number of questions made to generate the information which is needed to accomplish the goals of the research. There are three specific objectives in the questionnaire. To begin with, it is necessary to develop research questions on which participants want and can answer. It is highly necessary that such questionnaire give the desired data. In addition, questions should motivate and encourage to give answer. Moreover, we have to minimize the errors - the answers which can be misinterpreted (Malhotra, Birks and Wills, 2012).

If we want to develop the questionnaire, we should follow the next steps. (Dr. Kelly, Cardiff Business School, 2010)



(Dr. Kelly, Cardiff Business School, 2010)

If the researchers follow these recommendations, they can easily minimize the risk of errors and compile a questionnaire which will be interesting for participants. I decided to choose the questionnaire design because, to my mind, it is less time consuming than the alternative method - an interview. More than that, if the number of respondents is too big, it'll be difficult to analyze and systemize the information. In my questionnaire I have two types of questions: with fixed and open answers. I used them to get the better understanding of the participants' attitude.

### **3.2.4 Limitations of interviews**

In spite of the fact that my research was good prepared, it has some cons and limitations. First of all, because of the reason that challenging to contact with respondents, I made e-mail interviews and used phone calls. Telephone calls were limited by time, so the questions were short and the majority of participants answered briefly.

There are also disadvantages of e-mail interviews - the respondents have a lot of time to answer and they can not respond spontaneously. We should not forget about the willingness to answer. However, I suppose that I gained a lot of useful and detailed information according to my research.

When I started to write my thesis, my objective was to collect and analyze the attitude of companies in the shipping via the NSR. I interviewed participants of different institutions. It was the hard working process. The most challenging was to break contact barriers and try to get in touch with representatives to get relevant information.

## **4. Shipping Industry review**

### **4.1 The Shipping Industry**

Delivery has become an important part of the world economy. During many years it provides transportation services to all parts of the world. Nowadays more than 1.5 million of seafarers from different countries control the world fleet. We can easily say that it has become an international industry ([www.balticexchange.com](http://www.balticexchange.com)).

Industry has a long history. Let's just remember the Christopher Columbus and Vasco da Gama journeys. Their journeys were a start point for development of this industry. They opened world sea routes given us the chance to deliver goods to every part of the world. Nowadays we modernize tankers, container ships and other vessels to make the process of delivery easier, faster and more safety ([www.unctad.org](http://www.unctad.org)).

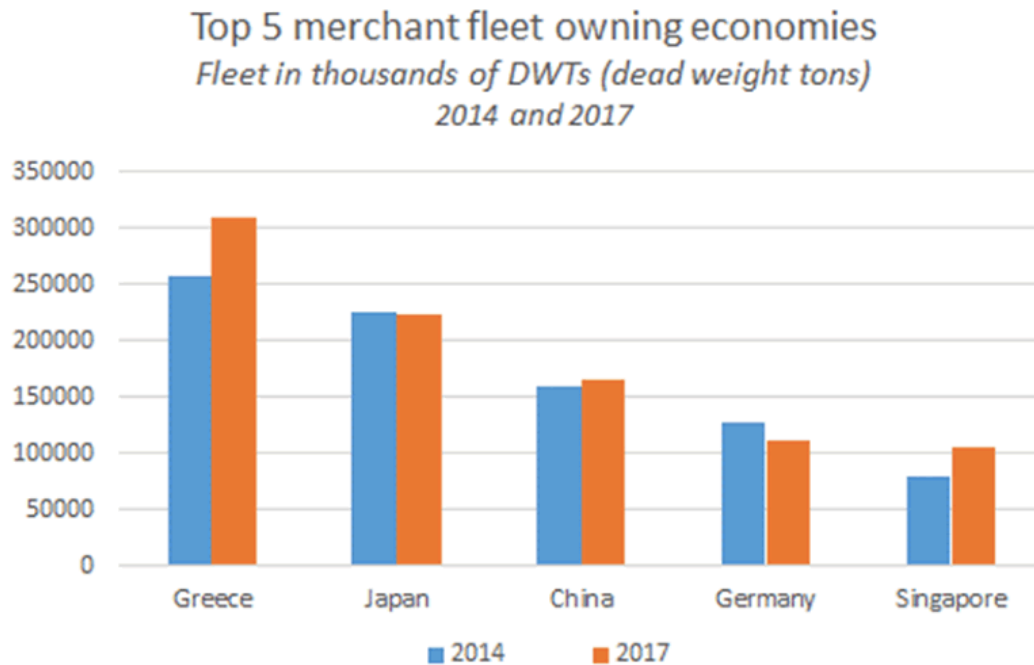
3 quarters of the world is covered by water. So, it is clear that shipping plays an important role in trade. The industry affects everything: the food which we eat, clothes, home, cars, etc. We can't imagine our life without delivery ([www.ics-shipping.org](http://www.ics-shipping.org)).

In other words, ships move the international trade. The modern life will be impossible without import and export. Approximately 89% of goods are transported by ships. So, sea transport is an important strategic trading part and its value should not be overemphasized (Arctic Council, 2009). The competitiveness of all countries depends on the effective access to port networks and international delivery services. Sea shipping is the most economical, effective and environmentally friendly variant for most cargoes.

In 2017 the fleet growth grew up scarcely to 3.3%. However, compared to the last years, it was still at a lower level. Trend in different countries vary significantly.

For example, China and Greece are planning to increase rapidly their fleet, but Japan has limited changes ([www.hellenicshippingnews.com](http://www.hellenicshippingnews.com)).

*Graph: Top 5 merchant fleet owning economies, fleet in thousand of DWTs*

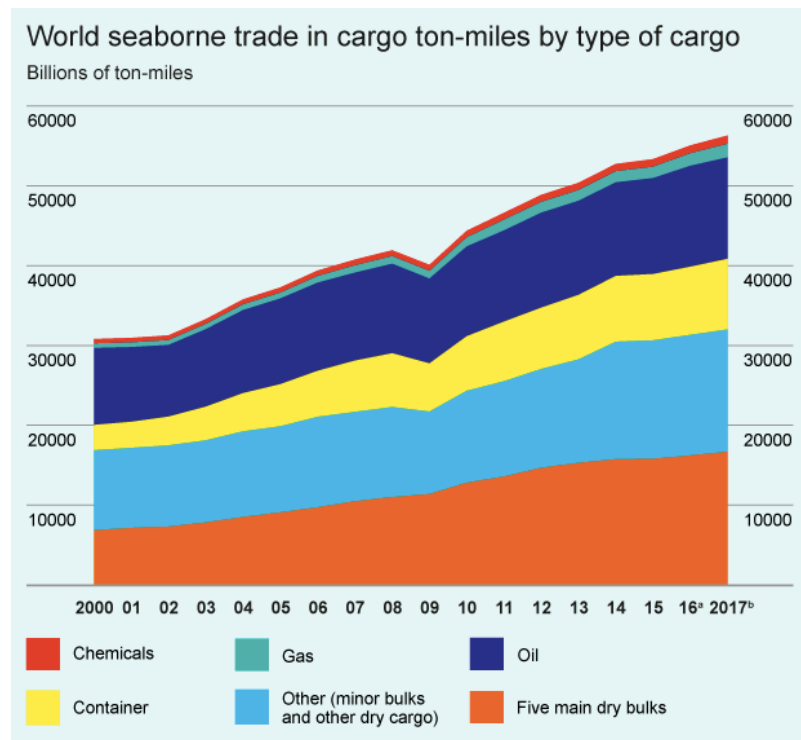


([www.unctad.org](http://www.unctad.org))

As we see, Greece, China, Japan, Germany and Singapore were the biggest fleet owners in 2017. They have 49.5% of market share together ([www.unctad.org](http://www.unctad.org)).



*Graph: World seaborne trade in cargo ton-miles by type of cargo*



([www.ics-shipping.org](http://www.ics-shipping.org))

The population is growing rapidly. The countries with emerging economy continue to enlarge the requirements for transported cargo. From the graph we can see that the world trade volume, which is carried out by sea, has been increasing for the last several years ([www.innovasjon Norge.no](http://www.innovasjon Norge.no)).

## 4.2 The Norwegian Shipping Industry

Nowadays about 5 million people live in Norway. However, it is one of the leading economies in the world. In terms of value the fleet in the country is the 5th largest. It has the 8th place because of tonnage. More than that, more than 93% of vessels act outside the country ([www.regjeringen.no](http://www.regjeringen.no)). In 2016 ship equipment turnover was about NOK 62 billion.

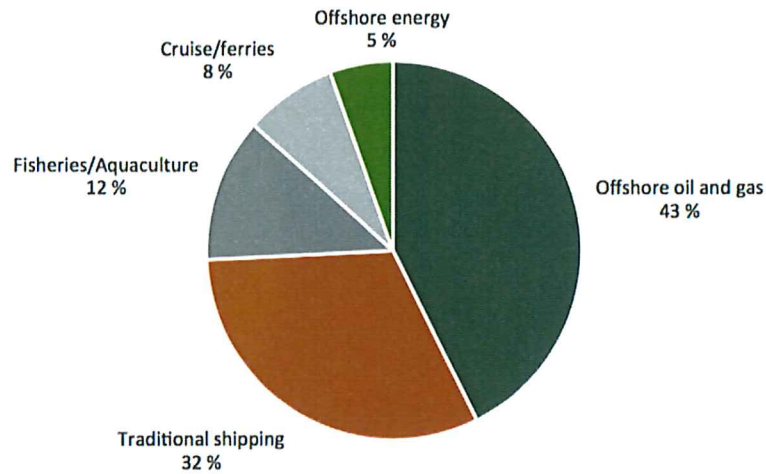
In 2017 106,000 Norwegians were working in this sector ([www.rederi.no](http://www.rederi.no)). In Norway almost 11% of the total value is covered by the marine industry. Also, the industry is of great importance for creation of working places in Norway.

Unlike countries that have special strengths in one or two industry areas, Norway covers the majority of areas: products, expertise and services. The Norwegian maritime system has a lot of shipyards, large commercial fleet and modern equipment ([www.innovasjon Norge.no](http://www.innovasjon Norge.no)).

Innovation emphasis and interdependencies among actors made the maritime industry a dynamic cluster. Now norwegians has good knowledge that helps to demonstrate the possibility to develop this cluster. One of the reasons why Norwegian maritime cluster is so successful is that companies have a great increase in productivity - they can produce more products with fewer staff. That is why norwegians have growing wage and high productivity levels ([www.norskindustri.no](http://www.norskindustri.no)).

Norwegian ship equipment producers are known world-wide for innovative solutions and quality of goods. Norway remains a leading maritime nation. The ship equipment market is international. 2/3 of the equipment is sold every year to foreign organizations and courts.

*Graph: Share of maritime turnover from different market segments, 2017*



([www.norskindustri.no](http://www.norskindustri.no))

During the last 15 years, Norway has focused on the offshore oil and gas market. As we see, the biggest turnover (43%) is related to petroleum market. The second place in 2017 had traditional shipping. I want to point out that the same figures have been remaining for 2 years.

## **5. Evaluation of the transport infrastructure**

The Northern Sea Route is the transport axis of the Russian Arctic, one of the main elements of the Naval Doctrine of the Russian Federation for the period until 2020. Internal communication of the Arctic zone of Russia is low due to the rare network of cities, the high cost of air and land transport and poorly developed infrastructure. In these conditions, for many Arctic regions, sea transport has become the only means of ensuring the mass movement of goods.

For Russia, the integration of the NSR into the world transport system as an independent Euro-Asian transport corridor means strengthening the situation in the world economic system (<https://nsportal.ru/ap/library/>). On the routes of the Northern Sea Route and the Arctic rivers, there are reports of indigenous minorities of the North, as well as the delivery of various cargoes necessary to ensure the vital activity of the population.

At the beginning of the 20th century, the systematic development of the Northern Sea Route began. The Arctic icebreaker fleet, transport ships, seaports, radio centers were built, navigation and hydrographic and hydrometeorological support systems were created.

Until the 90s of the last century, the infrastructure of the Northern Sea Route met the requirements of ensuring safe conditions for navigation. After the collapse of the USSR in 1991, the infrastructure of the Northern Sea Route decreased, some of its elements ceased to meet modern requirements. But on the whole it was saved.

At present, interest in Arctic routes has increased significantly, which is due to the beginning of development of Arctic offshore deposits, global warming of the climate and development of shipping in the Arctic region. And it's not just about freight, but

also about passenger transportation. World tourism companies are showing increased attention to the development of new routes in the Arctic. In this region, it is possible to further develop cruise shipping, although it has its own specific requirements ([www.vestifinance.ru](http://www.vestifinance.ru)).

In 2010, traditional shipments of Norilsk Nickel, Ob Bay and North Shipment, including transportation of petroleum products to Chukotka, export of hydrocarbons from Murmansk to China and the transit of iron ore concentrate from Norway to China, were added to the east. Last September a French broadsheet “Le Monde” published an article headed “The Northern Sea Route will not become an international road”. But, already realized projects show that the route is relevant not only for Russian Federation but also as an international transit corridor. The most important ports of the Northern Sea Route are: Murmansk, Dudinka, Dickson, Tiksi, Uelen (<https://nsportal.ru/ap/library/>).

The Murmansk Commercial Sea Port was founded in 1915. Right after its creation, the warm water Murmansk port acquired strategic importance for the country and became one of the main Russian ports providing foreign trade operations. In 1930s, large reclamation of the Arctic began, and Murmansk became the base port for dispatching scientific expeditions and ensuring cargo communications with Arctic coast ports. During the Great Patriotic War, under constant bombing, workers of the Murmansk port took and unloaded caravans of ships with weapons and food from the USA and England, repaired destroyed berths and equipment that was damaged. The port was reborn after the war (<https://nsportal.ru/ap/library/>). Thanks to the development of Kola Peninsula natural resources, new cargo flows came through the port: iron-ore and apatite concentrates, products of the Kandalaksha aluminum plant. By 1980, the port of Murmansk had become one of the country's five largest ports for cargo handling.



The Murmansk Port is an ice-free port. The following sea cargoes are transported through it: machines and equipment, coal, building materials, metals, wood, oil and its products, chemical cargoes, food, etc. The total turnover of sea cargoes in the Murmansk port exceeds 7 million tons. The port is well equipped with machinery for loading and unloading goods. There is a fishing port and a shipyard.

The Port of Arkhangelsk, which is Russia's oldest port in the North, begins its history in 1584. At various times it was one of the key strategic transportation hubs in Russia. The Arkhangelsk Port has always been and remains an alternative to St. Petersburg as a base for transshipment of import and export cargo, remaining one of the main funds for the development of the Arctic region. Today the port of Arkhangelsk is the third largest port in the northwest of the Russian Federation.

Dudinka, as the whole of Norilsk, started from scratch. During its first years Dudinka didn't have berths. Barges, lighters, tugs and scarce passenger ships were moored offshore unloading immediately. When normal movement began along the Dudinka-Norilsk light narrow-gauge railroad, some cargoes right from the board fell at the railroad platforms ([www.taimyr24.ru/dop\\_Dud](http://www.taimyr24.ru/dop_Dud)). The other part of the cargo was left for storage at Dudinka warehouses. River vessels were unloaded manually; mobile conveyors and some belts – smooth and scraper – were used. The same procedure was used to load Norilsk coal ships. Ships couldn't get close to the shore. Tugboats brought barges to these vessels: they moored to both sides, ship's cranes delivered cargoes from tugs and decks. Sea ships were bunkered with Norilsk coal from barges. It was difficult, time-wasting work of the valuable time of navigation (<https://nsportal.ru/ap/library/>).

Port Dickson is on the Northern Sea Route. The Russian northmost port is located on the Kara Sea coast. It was founded in 1915. The Continental part was built later on the island. The port is situated in the south-eastern part of the Kara Sea at the entrance to the Yenisei Bay. The temperature in January is  $-25^{\circ}$   $-28^{\circ}$  C, in July +

3- 8<sup>0</sup> C. The port is functioning only in the summer navigating period. However, if there is a constant flow of cargo, year-round navigation is possible along the Arkhangelsk-Murmansk-Dickson line and between other ports of the Northwestern basin. Turnover bulk consists of general cargoes including large-tonnage containers, equipment, automobile equipment, roundwood, coal, gravel, sand. Nearest railway station: the port is not connected to Russian railways. River communication of the Yenisei Dickson is connected with the cities of Dudinka and Norilsk.

The Tiksi Seaport (North-Eastern Maritime Administration) is the largest port of the Arctic Ocean. It is located near the delta of Lena in one of the most inaccessible parts of the Northern Sea Route. It is the main base for supplying and navigating all sea cabotage in the eastern part of the Russian Arctic. The port is functioning only in the summer navigating period of 90 days (<https://nsportal.ru/ap/library/>). In general, they import food, industrial goods and equipment, as well as export wood. The port is well equipped technically. There are 11 berths in operation, 2 of them are auxiliary. Total length of the berth's front is about 1.5 km.

Tiksi is a settlement where more than 12 thousand people lived, and in Tiksi there were not literally several hundred inhabitants. The population has decreased by half for now. The history of Tiksi is connected closely with the history of Northern Sea Route creation and development (<https://nsportal.ru/ap/library/>). The settlement arose during the development of this very promising route at the beginning and in the middle of the 20<sup>th</sup> century.

The seaport of Pevek is located in the Choun Bay of the East Siberian Sea. The date of its birth was April 1951, because it was then that the Administration of the Arctic Port Pevek, that is also part of the Dalstroi system, was set up. During this period, the port was the only mooring line of four cumulus wharves which was 429.5 meters long. The Pevek naval arctic port was transferred to the Far Eastern Shipping

Company of the Ministry of the Navy in October 25, 1957 by the decision of the Council of Ministers of the USSR (Armstrong, 1999). In the same year, the work on the construction of hydraulic structures, industrial buildings and housing for port workers started. New port equipment was purchased. The beginning of the 1960s and all subsequent years are characterized by the reconstruction, expansion and establishment of the port.

The construction of sheet piles began in the Arctic for the first time. In the period from 1961 to 1969 four new berths with concrete were built, the total length of the embankment was 499 meters. 12 portal cranes worked on the berthing line, two portal cranes served the rear warehouses, a small mechanization park was added to the port, expansion of storage areas began, parking lots were built and garages were repaired. In the 1970s and 1980s, the work on reconstruction and technical re-equipment of the port started.

### **5.1 Analysis of historical infrastructure deployment**

In accordance with the federal law "On the Inland Waters", the Northern Sea Route is a national transport link located in inland sea waters, including routes suitable for ice navigation. The routes are limited in the west by western entrances to the New Zemlyanskie Straits and the meridian running northward from Cape Zhelaniya, and in the east in the Bering Strait parallel to 66 degrees' north latitude (<https://maximillienr.livejournal.com/33187.html>).

The first navigation in the direction from east to west along the NSR was carried out by the Hydrographical Expedition of the Arctic Ocean under the direction of B.A. Wilkicki in 1914-1915. From 1923 to 1931, ten voyages were carried out to deliver cargo from Vladivostok to the north-east of the Arctic. They were conducted without ice support or ice reconnaissance, but contributed to the creation and development of the first components of the system of scientific and technical navigation on ice



along the NSR. Navigation began to provide hydrographic services. The necessary meteorological service for shipping was arranged in Murmansk (1921) and the New Port (1923). The Russian Scientist N. Roze developed the first forecast of the state of ice in the Kara Sea. The flow of goods and the average duration of the navigation period increased (<https://maximillienr.livejournal.com/33187.html>).

The transport fleet was replenished: in 1936 it was delivered by the ship of the ice class "Arctic" and the cargo ship "The Volga", in 1938 - by Nenets and Yukagir tankers, Anadyr and Igarka ships, Dezhnev and Levanevsky icebreakers.

During the Great Patriotic War (1941-1945) German submarines and the Admiral Scheer battleship pirated in the western part of the Arctic. Industrial goods and food products were transported through the SNR to the enterprises of the North and the population of Yakutia, Chukotka, Kamchatka and Magadan (Armstrong, 1999). The icebreaker fleet continued to consist of obsolete icebreakers of the Ermak type (it was built at the end of the 19th century), Krasin and Lenin with a steam power plant with a capacity of up to 10,000 horsepower and an icebreaker Fedor Litke. Icebreakers "North Wind" and "North Pole", received from the United States, worked on the Northern Sea Route in 1944-1945. They participated in the evacuation of garrisons from the islands, conducted ships to fire at enemy positions, deployed submarines in combat posts.

In 1957, the world's first nuclear icebreaker, Lenin, appeared on the track. Comparing the parameters and technical data of the world's first icebreaker "Ermak" and the first nuclear icebreaker "Lenin", it can be concluded that "Lenin" has a displacement of 2 times more, the power plant is almost 5 times more powerful, the speed is 1.5 times higher and the capacity is almost 2.5 times more (<https://maximillienr.livejournal.com/33187.html>).

The fleet of the class "reinforced ice" (RI) and "reinforced Arctic ice" (RAI) was replenished at a fast pace. In the 1960s diesel-electric icebreakers "Moscow", "Leningrad", "Kiev", "Murmansk" and "Vladivostok" (with a capacity of about 20 thousand horsepower) entered service (Armstrong, 1999).

Thus, the need for the development of navigation in the Far East and the expansion of Russia's foreign trade arose after Russia became a great sea power in the time of Peter the First. Therefore, since the first half of the eighteenth century, active research has been conducted on the coast of Eurasia from the White Sea to Kamchatka.

In the pre-revolutionary period in Russia, significant progress was made in studying and developing the NSR. However, the problem of its rational economic use was indeed resolved only after the revolution, for which hydrographic services, icebreaking and transport fleets were established. As a transcontinental highway, the Northern Sea Route (NSR) was established in the USSR in the mid-1930s. The Kara Sea along the Northern Sea Route transported the most important cargo, for example, grain, Siberian timber for export and manufactured goods.

Significant for the Arctic navigation was 1959 - the beginning of a new era for the Soviet Navy. The fleet of the Murmansk Shipping Company included a new icebreaker "Lenin" with a nuclear power plant, launched in 1957. It was built in around five hundred different enterprises of the country.

Since 1961, a new area of marine ice science has been developing - the study of navigating ships on ice, which has contributed to improving the tactics of ice navigation of individual ships and caravans. Ice patrol service is a prerequisite for the operation of SIP. In the 1970s icebreakers "Ermak", "Admiral Makarov and Krasin" (with more than 30,000 horsepower) entered service. The icebreakers "Captain Sorokin", "Captain Nikolayev", "Captain Dranitsyn" and "Captain

Khlebnikov" were built to work in hard-to-reach areas. They had helicopters for ice patrol service (<https://nsportal.ru/ap/library/>).

Nuclear icebreakers of a new generation have been created: the Arctic, Siberia, Russia, the Soviet Union and Yamal to provide navigation on the Yenisei - Taimyr and Vaigach. The appearance of these icebreakers radically changed the tactics of ice navigation and greatly extended the duration of navigation. In 1970, navigation to Dudinka began almost all year round. At the end of 1990, the transport fleet had 63 units with an average ship age of 13.5 years.

A significant result of new methods of studying the Arctic is that on August 17, 1977, the Soviet nuclear icebreaker "Arctic" for the first time in the history of navigation was able to reach the North Pole on a surface ship (before that there was the American SSN-578 submarine in 1959 and the Soviet Union "Leninist Komsomol" in 1963). In 1978 - in the opening of a circular voyage on the line Murmansk - Dudinka and ensure on 1 "Siberia" the first flight to the highly professional "Captain Myshevsky" in the port of Vladivostok. In 1983 - in the rescue operation of ships, sandwiched in the eastern region of the Arctic. In 1990 - Russia's first trip to the North Pole with foreign tourists on board (<https://nsportal.ru/ap/library/>).

During the 1970s and 1980s, the Northern Sea Route was active, providing transportation for the Arctic zone of Russia, exporting goods to Europe, Japan and China, serving several industrial zones of the Soviet Union, ferrous metals, rare earth metals, precious minerals and hydrocarbons (Armstrong, 1999). These are areas of the European North, West Siberian oil and gas complex, Norilsk industrial junction, industrial complexes of the northeast of Russia.



Most of Russia is located in northern and north-eastern Eurasia. Therefore, the importance of the NSR grows, providing a shortcut linking North-West Europe with Southeast Asia, America, Canada.

The economy of Russia is almost 70% on the basis of the Ural and Siberian deposits of minerals. The development of the Far North, Yamal, the Timan-Pechora province and the shelf of the northern seas, the development of the ore deposits of the Urals requires a constant transport connection with the European part of the country. The polar route is a convenient route for large-scale redeployment of troops, the formation of special squadrons, the transport of military equipment, and the shipment of newly built ships for the Pacific Fleet. Therefore, NSR is of great strategic importance (<https://maximillienr.livejournal.com/33187.html>).

Murmansk, Vanino, Vladivostok, Nakhodka, Magadan, Petropavlovsk and Dudinka are open for work almost all the year round. The remaining ports operate from July to August until September-October.

As for ports, there are few ports in the Arctic Sea basin. Churchill port in Canada, Murmansk in Russia and Prudhoe Bay in the USA are the most important ports in terms of volume. As for the route, after going out the NSR from the West, Murmansk is the first major port (Abdul Rahman, N. S. F – Saharuddin, A. H. – Rasdi, R. - 2014). Totally, there are dozen ports along the route. Ports are usually poorly equipped, have small size and are in poor condition, because they were not renovated after the Soviet Union era (Armstrong, T. E. - 1999).

Table: NSR ports' characteristics

| Name            | Location                              | Capacity<br>(thousand<br>tonnes/year) | Navigation<br>season  | Power supply<br>(power net/plant)   |
|-----------------|---------------------------------------|---------------------------------------|---|---|
| Arkhangelsk     | Arkhangelsk<br>region                 | 11532,9                               | All year  | Arkhangelsk Pulp and Paper<br>Mill, Severodvinsk PP, line<br>220 kV (Northwest united<br>energy grid) |
| Mezen           |                                       | 132                                   | June -<br>September   | Autonomous power supply<br>(decentralized)  |
| Onega           |                                       | 261,5                                 | May -<br>December   |   |
| Vitino          | Murmansk<br>region                    | 11000                                 | All year  | Line 330 kV,<br>Knyazhegubskaya HPP,<br>Kola NPP  |
| Kandalaksha     |                                       | 1500                                  |   |   |
| Murmansk        |                                       | 25000                                 |   | Line 330 kV, Serebryansky<br>HPP, Kola NPP  |
| Dudinka         | Krasnoyarsk<br>region                 | 3500                                  | All year<br>except<br>20.05 –<br>15.06                        | Centralized power supply:<br>Norilsk PP; 2 HPP (Ust-<br>Khantaiskaya and<br>Kureiskaya)               |
| Dixon           |                                       | 120                                   | June -<br>October   | Autonomous power supply<br>(decentralized)  |
| Hatanga         |                                       | 95                                    | June -<br>September   |   |
| Igarka          |                                       | 58,9                                  | September -<br>May  |   |
| Varandey        | Nenets                                | 12100                                 | June -<br>November  | Autonomous power supply<br>(decentralized)  |
| Amderma         |                                       | 1,0                                   | July –<br>September   |   |
| Naryan -<br>Mar |                                       | 501                                   | June –<br>August<br>(until<br>November<br>with<br>icebreaker) |   |
| Tiksi           | The Republic<br>of Sakha<br>(Yakutia) | 67                                    | July -<br>September   | Autonomous power supply<br>(decentralized)  |
| Green Cape      |                                       | n/d                                   | n/d   |   |
| Anadyr          |                                       | 900                                   | July -<br>September   | Centralized power supply:<br>Anadyr PP, boiler house<br>«Anadyrморпорт»                               |
| Beringovskiy    | Chukotka<br>Autonomous<br>okrug       | 646                                   | October -<br>June   | Centralized power supply:<br>Anadyr PP, boiler house<br>«Anadyrморпорт»                               |
| Providence      |                                       | 18,5                                  | June -<br>November  |   |

|           |                                  |     |                 |   |
|-----------|----------------------------------|-----|-----------------|---|
| Pevek     |                                  | 330 | July - October  | Centralized power supply: Chaun PP; line 110 kV Bilibino NPP      |
| Egvekinot |                                  | 350 | June - November | Centralized power supply: Egvekinotskaya HPP                      |
| Sabetta   | Yamalo – Nenets Autonomous Okrug | 572 | All year        | Autonomous power supply (decentralized); portable aviation gas PP |

(Made by author after Arctic seminar)

In the near future, the most widespread activities in the NSR will be the development of oil and gas fields, the export of raw materials, as well as scientific flights on intergovernmental programs and tourism.

The development of energy resources in the Arctic zone of Russia stimulates the attraction of construction machinery and related products to this region. There is growing interest in the NSR from Western European ship owners and cargo owners. Now, a number of companies are considering the construction of oil tankers and gas carriers suited for the NSR (Arctic Portal, 2015). In conditions of competition in the struggle for the resources of the Arctic shelf, the significance of the Russian nuclear icebreaking fleet is substantially increasing, as the most effective instrument for ensuring transport and economic activity in the Arctic zone ([www.morvesti.ru/tems](http://www.morvesti.ru/tems)).

It should be specially noted that it was the Russian nuclear ship "Arctic" in 1977 that for the first time in the world reached the geographical point of the North Pole. According to scientists, the continental shelf of the Arctic may contain about 20% of the world's hydrocarbon reserves. On the shelves of the Barents and Kara Seas, unique gas deposits were discovered. Now, the Arctic provides about 11% of Russia's national income and 22% of the volume of all-Russian exports. In this region, more than 90% of nickel and cobalt, 60% of copper and 96% of platinum are mined (<https://nsportal.ru/ap/library/>)<sub>43</sub>



According to the director of the Institute of Oil and Gas Problems Anatoly Dmitrievsky, by 2030 Russia intends to produce up to 30 million tons of oil and 130 billion cubic meters of "blue fuel" on its Arctic shelf. Today, Russia continues to develop and use the NSR. The main users of the NSR in Russia today are «Norilsk Nickel», «Gazprom», «LUKOIL», «Rosneft», «Rosselp», the Krasnoyarsk Territory, Sakha-Yakutia, Chukotka.

The fate of the NSR largely depends on the development of the minerals explored in its zone: the Shtokman oil and gas field, the Timan-Pechora oil and gas province, the deposits of the North-Onega bauxite, polymetals and manganese in the Novaya Zemlya archipelago. The importance of the NSR has also recently increased in connection with the integration of the Russian transport system into international transport corridors ([www.morvesti.ru/tems](http://www.morvesti.ru/tems)).

According to expert estimates, the potential volume of transit cargo along the Northern Sea Route in the east direction in the coming years will be 5-6 million tons, and in the west - 2-3 million tons. The bottom of the Arctic Ocean hides at least 10 billion tons of oil and gas. According to the Russian Security Council, at present there are 233 billion explored oil barrels and 166 billion barrels unexplored oil in the Arctic (Abdul Rahman, Saharuddin, Rasdi, 2014).

The main obstacle is the lack of necessary infrastructure facilities or their non-compliance with modern requirements. To modernize the production base, investments and reductions in property and land taxes are necessary for ports that are the targets of the NSR ([www.morvesti.ru/tems](http://www.morvesti.ru/tems)).

For successful competition in the Arctic, it is necessary to develop and improve the nuclear icebreaking fleet and to control the Northern Sea Route. At the moment, more than 60% of the territory of Russia belongs to the regions of the Far North.

95% of gas, 75% of oil, 90% of tin, the bulk of gold and diamonds are mined here. 8% of Russians living in the Far North receive 1/5 of the national income and provide almost 2/3 of foreign currency earnings ([www.morvesti.ru/tems](http://www.morvesti.ru/tems)).

*Table: The volume of transportations along the Northern Sea Route taking into account transit cargoes (thousand tons) according to the data of the «Administration of the Northern Sea Route», the «Atomflot»*

|      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| 1933 | 1943 | 1953 | 1963 | 1971 | 1981 | 1986 | 1991 | 1996 | 2006 | 2011 | 2013 | 2014 | 2015 | 2016 |
| 130  | 289  | 506  | 1264 | 3032 | 5005 | 6455 | 4804 | 1800 | 1956 | 3111 | 3930 | 3982 | 5392 | 7265 |

([www.tass.ru/ekonomika/](http://www.tass.ru/ekonomika/))

According to the executive director of the Non-Profit Partnership for the Coordination of the Use of the Northern Sea Route (and former Head of the Administration of the Northern Sea Route) V. Mikhailichenko, by 2009, compared to 1980, the volume of traffic along the Northern Sea Route decreased from 6-8 million tons of cargo per year to about 5-6 million tons. And only in 2016 the volume of cargo transported by the Northern Sea Route surpassed the data of the 1980s, amounting to 7.26 million tons (+ 35% by 2015).

*Table: Transit shipments along the Northern Sea Route*

|   |      |      |      |      |      |
|---|------|------|------|------|------|
| Data  | 2010 | 2011 | 2012 | 2013 | 2016 |
| The volume of transit traffic, million tons | 0,11 | 0,82 | 1,26 | 1,16 | 0,27 |
| Number of vessels, units                    | 4    | 34   | 46   | n/a  | 25   |

([www.tass.ru/ekonomika/](http://www.tass.ru/ekonomika/))

The Northern sea route (NSR) connects Northern and far Eastern ports, Europe and Asia. By sea, you can navigate ships from Europe to Japan in 20 days, and the existing routes through the Suez Canal and around Africa - up to 50 days (Arpiainen, 2009).

The modern NSR is the only wide-ranging transport route in the European and Asian North through which goods from the Arctic regions are delivered. Petroleum products, wood, coal, industrial equipment, food products are transported through the NSR. NSR is “the only means of developing a rich Arctic shelf in which only estimated mineral reserves are 1.5-2 trillion Euro in monetary terms”.

The Northern sea route, being an internal route of Russia, plays an important role in the economic life of many regions of our country, which are connected with the Arctic ocean by such large rivers as Ob, Yenisei, Lena, Indigirka, Kolyma, Khatanga and others. These rivers carry their waters into the Arctic ocean and form a single transport system with the Arctic seas (ACIA, 2004).

Strategic factors related to the geopolitical and transnational values of Maritime navigation in the Arctic are particularly important. First of all, control over sea areas potentially rich in natural resources, the transit importance of the Northern sea route as an internal route between the North-Western and far Eastern regions of Russia, as well as opportunities for the growth of transnational transit traffic along the Northern sea route between European ports and ports of the Pacific region (Arctic Portal, 2015).

In the foreseeable future, the Northern sea route remains a key element of transport support for Russia's Arctic regions. Moreover, its role may increase significantly in the short term. New opportunities for the development of transport along this route are opened primarily in connection with the development of hydrocarbon deposits in the coastal areas and on the Arctic shelf (ACIA, 2004). There are also good prospects for the development of transit cargo of foreign charterers on the Northern sea route in the framework of the formation of a unified transport system between Europe and the countries of the Asia-Pacific region and the North Pacific coast States and Canada.



As a rule, the level of development of productive forces of economic and transport links corresponds to the periods of industrial development of the North. In this regard, the regions of the North-East, unlike, for example, the regions of the European North and North-West Siberia, are at an early stage of their development, which corresponds to seasonal waterways (river and sea), from which to mineral deposits, roads, usually in the form of roads and winter roads.

The importance of the Northern sea route as an independent Euro-Asian transport corridor is very high. This is due to the intensification of the development of the Russian Arctic oil and gas shelf with the growth of supplies of Norilsk metallurgical combine, one of the world's largest producers and exporters of non-ferrous metals.

The potential volume of cargo transportation along the Northern sea route by 2020 could reach 38 million tons, and by 2020 - more than 45 million tons per year. And foreign experts predict the growth of transit volumes in the East up to 6 million tons by 2020 and up to 3 million tons per year in the West ([www.morvesti.ru/tems](http://www.morvesti.ru/tems)). On behalf of the Chairman of the Government of the Russian Federation Vladimir Putin, in order to arrange commercial transit shipping on the Northern sea route, the Sovcomflot company conducted the experimental navigation with the use of large-tonnage vessels with a deadweight of 100 000 tons.

In order to ensure the safety of navigation on the forthcoming voyage and to carry out the work on cartographic surveying of high-latitude trails, modern measuring complexes for surface survey of the bottom relief at the specialized vessels of the Hydrographic Enterprise were acquired and installed, due to which it was possible to carry out deep survey along the proposed route.

The tanker left the Murmansk port on August 14 with a cargo of 70,000 tons of gas condensate destined for the port of Ningbo (China). The tanker was escorted through

arctic ice with icebreaking provided by atomic icebreakers "50 Years of Victory", "Russia" and "Taimyr". The convoy ran along the Northern Sea Route, 2500 miles in 10 days and 7 hours at an average speed of 10 knots.

The total travel time from the Russian port of Murmansk to the Chinese port of Ningbo was about 22 days, which even taking into account the experimental nature of the voyage is almost 18 days shorter than the southern route through the Suez Canal.

In 2009 two vessels went on a route between Europe and Asia through the northern waters of Russia. In 2011, this route has already been selected by 34 vessels (for comparison, 18,000 ships pass through the Suez Canal every year). It is estimated that traffic can increase by 10 times by 2019. And in the long term - twenty times, up to 560 million tons a year.

Experts believe that the modernization of the infrastructure of the Russian Arctic will require significant financial and labor costs. It will be necessary to improve the work of hydrographic and meteorological services, create an aerial reconnaissance system for ice traffic and create state structures responsible for environmental monitoring. It is necessary to increase the resources of the Ministry of Emergency Situations, improve the infrastructure of ports. According to some experts, not only Russia, but also a number of other countries consider the development of the Northern Sea Route to be its prerogative. First of all, we are talking about the main powers of the Asia-Pacific region - China and India. Interest is also shown by small but influential states, such as Singapore. A number of Russian officials believe that legislative norms governing the movement of maritime transport for foreign shipping companies are necessary ([www.morvesti.ru/tems](http://www.morvesti.ru/tems)). The situation, according to experts, can be complicated by the US position, which does not consider that the key directions of the Northern Sea Route are exclusively in the Russian jurisdiction. Moreover, there is no consensus on the legal regulation of the

highway, even in Russia. But there are lawyers who are sure that the Russian Federation has every right to manage the passage of ships along the Northern Sea Route thanks to the norms of the UN Convention on the Law of the Sea, established in 1982. Owners of vessels should apply for the use of the waters of the NSR in advance.

The Administration of the Northern Sea Route considers this and decides whether to grant or refuse permission. The NSR administration reviews the application for up to 10 working days and places its response (decision on whether to issue or not to issue a permit) on the official website.

According to some experts, the NSR should become a competing highway for the Suez Canal and other major objects of the world maritime infrastructure. According to some analysts, the maximum throughput of the NSR is about 50 million tons of cargo per year. The seamen themselves believe that the NSR will be more and more in demand every year, especially against the backdrop of the growing activity of oil and gas companies in the Yamal and the Arctic ([www.morvesti.ru/tems](http://www.morvesti.ru/tems)). Important role in the effective use of the highway, according to seafarers, should be played by private investors. The dynamics is quite optimistic: if in 2010 NSR transferred only 4 large vessels, then in 2011 there were 34, and in 2016 - 56. Experts believe that there is every reason to expect further growth in the activity of shipping companies in the water area of the Northern Sea Route - both foreign and foreign.



## 5.2 Options for the development of the NSR

There are several options for developing the Northern Sea Route: the development of the Eastern Port infrastructure and the development of the icebreaker fleet. Based on the first option - the development of such eastern ports as Dickson, Tiksi, Pevek and Uellen.

In general, it should be noted that the prospects for increasing freight turnover in the NSR are related to the increase in exports with a small share of transit and imports. Thus, the experts of the Council for the Study of the Productive Forces of the Ministry of Economic Development and the Russian Academy of Sciences and the Central Naval Research Institute in the joint monograph "Problems of the Northern Sea Route" give the following forecast for the growth of supplies.

*Table: Forecast assessment of marine Arctic traffic flows for the period up to 2020, million tons*

| The name of cargo transportation | Variant I | Variant II |
|----------------------------------|-----------|------------|
| Export, total                    | 10,450    | 16,045     |
| Transit, total (dry cargo)       | 0         | 250        |
| Import, total (dry cargo)        | 40        | 55         |

([www.tass.ru/ekonomika/](http://www.tass.ru/ekonomika/))

Transportation of NSR goods in some aspects looks much more difficult compared to the Suez Canal. There are important points that should be elaborated on:

- the need for additional investments in vessels for their adaptation to the conditions of the north (ice class vessels are needed);
- additional costs for icebreaking;

- the need to develop infrastructure, which in some cases is in an uncompetitive state (which means the development of port infrastructure, construction of an icebreaker fleet), etc.;
- unpredictability of delivery dates due to climatic risks, which under certain circumstances can deny all the advantages of the Northern Sea Route (Sakhuja, 2013);
- short navigation period (4 months).

Given these factors, it is necessary to understand that, probably, the NSR (if the climate in the Arctic does not change radically in the next decade) cannot become a full-fledged alternative to the Suez Canal. The Northern Sea Route can become a competitive transport corridor for certain types of cargo on certain routes. First of all, it concerns the transportation of Russian raw materials and hydrocarbons extracted in the Arctic region to the countries of East Asia.

### 5.3 SWOT analysis of the NSR

There are lots of disputes over the use of the Suez Canal versus the Northern Sea Route. Many companies prefer to choose the SC, because this route is used for a long time and is in high demand. However, theoretically, shipping along the NSR will be faster and save considerable amount of money. Lets analyze if it is so.

The first factor, which limits transit via the Northern Sea Route is the Polar Code. In the Code special requirements about ballast water, waste are mentioned. To ship along the NSR, the company need specific certificates. The second important factor is ice conditions (Sakhuja, 2014). Ships operating in the region need the ice-breakers' assistance. Organizations also use double acting tankers (DAT). The third factor – harsh weather conditions, make rescue operations challenging.

Due to above-mentioned reasons, I took the main transport destinations and tried to make comparative analyses of using both routes.

*Table: Analysis of the NSR and SC*

| Route              | Via NSR       |               |                 | Via SC        |               |                 |
|--------------------|---------------|---------------|-----------------|---------------|---------------|-----------------|
|                    | Distance (nm) | Speed (knots) | Duration (days) | Distance (nm) | Speed (knots) | Duration (days) |
| Busan - Rotterdam  | 7 432         | 13            | 23,8            | 11 159        | 14            | 33,2            |
| Chiba - Hammerfest | 5 844         | 13            | 18,7            | 12 802        | 14            | 38,1            |
| Chiba - Rotterdam  | 7 153         | 13            | 22,9            | 11 575        | 14            | 34,4            |
| Daesan - Rotterdam | 7 744         | 13            | 24,8            | 11 165        | 14            | 33,2            |
| Quindao - Murmansk | 6 425         | 13            | 20,6            | 12 592        | 14            | 37,5            |

(www.researchgate.net)



*Table: Analysis of the NSR and SC*

|                     | Routes           |                  |
|---------------------|------------------|------------------|
|                     | NSR              | SC               |
| Distance (nm)       | 7 356            | 11 585           |
| Journey time (days) | 18<br>(15 knots) | 32<br>(15 knots) |
| Piracy              | No               | Yes              |
| Transport costs     | Low              | High             |
| Cost savings        | High             | Low              |
| Fee                 | High             | Low              |

([www.researchgate.net](http://www.researchgate.net))

Lets find advantages of using NSR. To begin with, if we compare shipping from Hamburg (Northwest European port) to Yokohama (Far East) using both routes, we can see that NSR distance is 36% shorter. Moreover, in the Indian Ocean piracy risk is higher compared to the Arctic waters. This fact makes companies feel safe for their goods (Bendall, 2010).

If we pay attention to trasport cost, transportation via NSR will be < 1,123 (USD/TEU), but via Suez Canal - 1,299 (USD/TEU). TEO means 20-foot equivalent unit, used for bearing capacity.

The last but not the least point is cost savings. Of course, the cost analysis depends on price changes of shipbuilding, bunker oil, fees. So, delivery scenarios with sailing conditions are key factors for such an analyses. I suppose that in the future there will be great competition of the NSR and SC.

After analyzing both routes, it is possible to make SWOT analyses of the NSR, in order to understand with which problems shipping companies can deal using the

route.

*SWOT analyses*

| <b>Strengths</b>  | <b>Weaknesses</b>   | <b>Opportunities</b>   | <b>Threats</b>  |
|---|---|--|---|
| Hydrocarbons export from the Arctic region, especially from the Russian Federation  | Unfavorable market condition which leads to the economic recession  | Paramount task: sufficiently invest into infrastructure of the NSR | Unfavorable market condition which leads to the economic recession                          |
| In summer months the NSR is partly free from ice  | One-way transportation: reduced profits (practically all vessels move back without any cargo)   | NSR possibility to operate as a real shipping lane                 | If ice continues to melt at such a speed, the Arctic waters can become true shipping routes |
| If we increase navigation efficiency by cutting distances, more vessels will perform more transits. It will lead to high profit | The NSR is operable only several months per year  | Possibility of making new navigation lanes in the region           | Unfavorable market condition which leads to the economic recession                          |
| Ice-breakers support along the NSR  | Old infrastructure and lack of technical support. Ice shipping needs definite competences. It is necessary to understand the sailing characteristics, feel vessels behavior and be familiar with navigation in different ice conditions | Possibility to invest in technical support and infrastructure      | Shipping along the NSR means costs of ice-breakers' support                                 |
| Around 36% distance   | Sailing direction   | Higher profit because  | Incomplete geodetic   |

|                                      |   |   |  |
|--------------------------------------|---|---|--|
| savings compared with the Suez Canal | restrictions, extra crew training costs | of lower distance and opportunity of increasing traffic during the year | measurements lead to low reliability of sea charts. Harsh weather conditions, low temperatures, drifting icebergs can be the reason for malfunctions of ship details |
|--------------------------------------|---|---|--|

After making the NSR' SWOT analysis we can conclude that:

- the NSR can be used only in summer months
- navigation in the Arctic region is influenced by harsh weather conditions, lack of forecasting, bad infrastructure and drifting ice
- ice level will affect shipping traffic
- currently, the NSR can not be considered as a truly competitive shipping lane, especially if we compare it with the Suez Canal
- navigation along the NSR depends on economy and accuracy

Distance savings compared to the SSP via the Suez Canal are around 36%. According to that fact, navigation efficiency will be higher for vessels are able to make more voyages at the same time which will lead to higher profit. To make the NSR a major competitor, it is important to carry out decisive activities that guarantee best results concerning the cargo volume shipped via the NSR ([www.vestifinance.ru](http://www.vestifinance.ru)). In addition, significant investments into infrastructure should be made and the Russian Federation has to provide the shipping lane with sufficient number of ice-breakers, complete technical support and effective rescue and search services. Nowadays the NSR is a lane with limited transit.

If definite constraints concerning ice-breakers, unfavorable market conditions, ice thickness levels and service are reduced or solved, it will be possible to make the NSR a major export route (Sakhuja, 2013).

#### **5.4 The NSR' PESTEL analysis**

The idea of PESTEL analysis is to analyse external environment, that can not be controled, to avoid fails. Also, the analysis helps to define opportunities, that can be used as advantages.

These factors are: economic (fiscal policy, rate of unemployment, income of customers, market trend), political (goverment social policy stability, tax policy, anti-trust law), technological (level of technology, penetration, new innovations, infrastructure level), social-cultural (level of education, growth of population, position towards goods' quality, services), legal (protection of data, safety and health law, protection of consumers) and environmental (waste management, water and air pollution, renewable energy).

All in all, the PESTEL framework in my thesis will be used to think over how these macro environmental factors influence and form the Northern Sea Route shipping. I will try to give the full picture according to the present situation from the side of a Norwegian shipping company. What environmental forces can the company face choosing to transport its' goods via the NSR?



### **5.4.1 Political and Legal Factors**

#### *Political risks*

Due to the geopolitical situation (the Ukrainian crisis in 2014) the navigation along the NSR became quite challenging. Placed on the Russian Federation, economic sanctions were the result for considerable obstacles to the international cooperation. First of all, it is important to mention that legal and political factors are 2 absolutely separate factors (Aguilar, 2011). Both of them can affect the NSR in different ways. However, I decided to analyze their impact together, because their effect on navigation and, of course, on the NSR is intertwined. Legal and political environment have a great impact on any organization and shipping companies are not an exception.

Government influences not only the tax policy, but also the level of participation in different trading agreements, which, in its turn, have a great impact on the effectiveness and income of a company. Moreover, level of corruption, governmental stability level and regulations affect the environment in which this organization operates.

In addition, legal factors include international trade restrictions or regulations, employment laws. There is a difference between political and legal factors. Political factors contain not mandatory approaches, but legal consist of regulations and laws, which must be observed.

#### *Political Tension*

Another factor which must be considered about political environment is Russian and Norwegian relations. If between countries there is tension and Norwegian organizations want to use the NSR for transit, they would have to overcome barriers. The good relationship between Norway and Russia dates back centuries. The commercial, cultural and economic relations in the north were extensive. In the

Russian Federation about 115 Norwegian maritime companies were highly represented in 2015.

In 2014 Norwegian government characterized the relations with Russia and the High North region as a stable and constant political environment. A boundary agreement in the Barents Sea eliminated the main potential source of conflict and strengthened relations future cooperation between countries (Aguilar, 2011).

In view of increasing political tension between the rest of the world and Russia and current political situation between Ukraine and Russia, there is a question whether this cooperation still exists. Ukraine has not changed position in relation to Russia despite enormous international pressure. This led to the fact that the imposed on Russia economic sanctions were associated, in particular, with Norway and the EU. As Norway participated in Russian sanctioning, the Russian Federation banned import of some Norwegian products.

How the conflict develops will have a great influence on the Russian – Norwegian relations and will slow down the work of Norwegian shipping companies waiting to navigate along the NSR. The EU thinks that the long-term Russian investments are affected by violations. Commercial entities consider Russia as a very risky country and it will remain the same after the lifting of sanctions. Also, such situation will indirectly affect cooperations with Norway hereinafter.

In reviewing survey results, 58,15% of the participated companies responded that the Norwegian shipping industry and government should play an active role in the development of the commercial shipping in the NSR. More than that, Pierre Cariou, Professor at Kedge Business School, told in one interview that Norway is an evident candidate for leadership in the further development of the lane because of the knowledge to saile in extremely difficult conditions. However, this will require



active cooperation and readiness of both countries to work together to achieve common purposes.

In order to make it possible, it is necessary to resolve the political tension that currently characterizes the relations between two countries. The Norwegian government plays an active role in relation to the new rules in the Arctic (the Polar Code) through IMO. However, it will be difficult to affect directly in the NSR due to the fact that the NSR is controlled by the Russian Federation administration and starts from Murmansk. Nevertheless, the government of Norway and shipping industry of the country can play a significant role when it comes to navigation in the Arctic waters and the Polar Code (Sakhuja, 2014).

### *Corruption*

Transparency International conducts each year a survey in which they assess how corrupt the public sectors in countries are. The Corruption Perception Index is a reminder that in countries all over the world there are covert transactions, power abuse and bribery.

In 2017 the index rated 180 countries and territories by their public sector corruption levels using a scale from 0 (highly corrupt) to 100 (clean). On this index we find Russia rather far down on the list, with a score no higher than 28 they are ranked as number 127. The result was that more than 2/3 of countries has score below 50. Compared to last years, this low performance is not something new. Russia has score 29 and is on the 135 place. In comparison to Norway, such corruption level is too high. Norway takes the 3d position and is ranked with 85 points. Over the years the comparatively high corruption level is observed.

It is not a secret that corruption strongly affects political, economic and social life of each country. Also, corruption can lead to weakening of business development and inefficiency (Mauro, 1995). When resources are forged and used not in a proper

way, business performance may suffer. Moreover, corruption reduces investments and prevents economic growth.

All above mentioned factors can have a serious negative impact on the infrastructure development along the NSR. In addition, this can create problems for the Norwegian company wishing to use the route, as this can be difficult to deal with authorities and institutions that may be corrupt.

### *Jurisdiction and Regulation*

Shipping companies which operates in the polar region suffer from 4 regulatory frameworks: MARPOL, STCW, UNCLOS and SOLAS. IMO provided guidelines for vessels operating in the Arctic ice waters, but such guidelines are not mandatory. Nevertheless, the traffic in the Arctic area is going to enhance rapidly, so, new strict regulations and law are expected.

Nowadays, over the NSR Russian Federation has most of the jurisdiction. The United Nation has given the coastal state the power to enact and enforce environmental regulations and laws in exclusive economic zones where climate and ice can pose serious threats to shipping and harm the ecological balance ([www.arctic-lio.com](http://www.arctic-lio.com)).

In Russia, on the 15th of March 2013, «Administration of the Northern Sea Route» was established ([www.arctic-lio.com](http://www.arctic-lio.com)). That was due to the feeling of competitive external threats or potentially hostile to the Russian Arctic region ([www.huffingtonpost.com](http://www.huffingtonpost.com)). All ships passing the region depend on the certificate of the Northern Sea Route Administration, which allows to navigate along the route. To obtain such certificate, the vessel must document that it meets all Russian requirements. The NSR administration is an institution that receives and reviews all submitted applications and gives permissions to ship via the NSR ([www.arctic-lio.com](http://www.arctic-lio.com)).

This agreement gives the Russian authorities significant power, which can be overused. In 2013 and 2015, the administration of the NSR refused to give a transit permit for the Greenpeace ship «Arctic Sunrise» by the reason of the fact that it does not have the required ice classification.

The vessel was classified the “1A1” icebreaker, which is the 2d highest ice strength vessel nowadays. According to Greenpeace, Russian authorities have enacted regulations to prevent Greenpeace protest against Russian oil exploration in the Arctic region ([www.vestifinance.ru](http://www.vestifinance.ru)). This became a source of concern for the surveyed representatives of the Norwegian shipping industry. Some of the companies responded that they believe that relations with the Russian authorities are extremely uncertain and complicated.

In addition, the EU thinks that Russia call into question the credibility and authenticity of the Russian authorities and the potential to use strong position in their own interests.

During the survey the respondents on the question – «what are the main challenges and barriers for navigation along the NSR?», answered: Russian authorities, political and economic risks, political issues, etc. Moreover, one respondent wrote that his country is afraid that Russia can use them as a a dairy cow.

These results show a very negative perception of the Russian government, which prevail in the Norwegian industry. Moreover, such political misunderstandings are a serious challenge with regard to navigation in the NSR. If we talk about applicants who got a certificate from the NSR Administration, they also need to pay a predefined fee («icebreaker fee») to use the route. Such a fee covers the cost of using the obligatory support of icebreakers. Icebreakerk are used to make a lane and to provide safe navigation via the NSR. This fact gives serious size restrictions because of the rules in which is mentioned that the vessel should be smaler than the



icebreaker. This means that the ship can not have a beam more than 30 m. Such beam is equivalent to a ship of 50 000 dwt, which is much less than vessels allowed in the SC.

To limit all the costs, the rate for the icebreaking contribution has an upper limit (how much the company must pay for these services). More than that, the icebreaking requirements will depend on ice conditions. The Russians told that during summer vessels can be allowed to sail without ice-classification ([www.vestifinance.ru](http://www.vestifinance.ru)). Because the fact that there is currently a sufficient number of bulk carriers and container vessels that satisfy nowadays requirements for navigation through the NSR, the Russian government permit will reduce one of the main barriers that limit the route use. Currently, the NSR administration has about 720 applicants, 23 of them are on the Norwegian flag.

### *The Polar Code*

IMO started to develop a more advanced and appropriate obligatory International Safety Code for vessels operating in ice waters. Actually, Norway is number one in doing the work to create global rules. The International Code is «Polar Code». It includes the whole spectrum of construction, design, equipment, training, rescue, search, environmental protection, which are very important for vessels that will operate in the areas around the 2 poles. It is necessary to guarantee that the equipment suits operations in the Arctic region and that proper review of the environment is made (Sakhuja, 2014). The Polar Code will contain specific requirements for the seafarers training who will operate in the polar waters.

The Polar Code has not been completed yet because of the difficult task of making the code obligatory supplement to other legal frameworks, rather than replacing them. The Polar Code must conform to the old structures and must be adapted to them. Several respondents mentioned in the questionnaire that only one set of rules for every country must be approved at the international level. Each year IMO changes

some rules in the Polar Code. So, companies which are planning to use the NSR should be prepared for regulations changes in the next years (Sakhuja, 2014).

For vessels authorized to sail via the NSR have to be designed and equipped to withstand the challenges associated with ice loads, weather in the Arctic region and operating conditions. To guarantee that vessels are built in accordance with appropriate standards, the Polar Code includes an ice ship classification called the Polar Class (7 polar classes). The Polar Classes are included in the voluntary guideline submitted by IMO in 2002 ([www.imo.org](http://www.imo.org)).

*Table: Polar Class Description*

| <b>Polar Class</b> | <b>Ice description<br/>(based on WMO Sea Ice Nomenclature)</b>                        |
|--------------------|---|
| <b>PC1</b>         | Year-round operation in all polar waters  |
| <b>PC2</b>         | Year-round operation in moderate multi-year ice conditions                            |
| <b>PC3</b>         | Year-round operation in second-year ice which may include multi-year ice inclusions   |
| <b>PC4</b>         | Year-round operation in thick first-year ice which may include old ice inclusions     |
| <b>PC5</b>         | Year-round operation in medium first-year ice which may include old ice inclusions    |
| <b>PC6</b>         | Summer/autumn operation in medium first-year ice which may include old ice inclusions |
| <b>PC7</b>         | Summer/autumn operation in thin first-year ice which may include old ice inclusions   |

([www.imo.org](http://www.imo.org))

Vessels (from PC7 to PC1) have been designed for ice management and escort functions. They have dimensions and capacity that give possibility to perform aggressive actions in polar waters. Moreover, there is the designation ICEBREAKER attached to their classification. PC 1 vessels have the highest polar class. They are made for independent operations without restrictions. Vessels classified as PC 7, the lowest polar class, include general level of ship strengthening ([www.imo.org](http://www.imo.org)).



The choice of the class depends on the ice statistics analysis, the experience of owners, financial or economic review. The selection of the class is the balance between costs, ice conditions and operational requirements (www.imo.org).

#### **5.4.2 Economical Factors**

All economic factors shows a broader economy perspective than money put in a bank. Economic factors include unemployment rate, income of consumers, the rate of economic growth, fiscal policy, raw materials costs (bunker oil, exchange rates, level of inflation), stock market trends. All of them are very important for the shipping industry.

The economy shapes how suppliers, customers and organizational stakeholders act in the society. If the economy goes through a recession, there will be high unemployment, low purchasing power among customers and the level of trust of stakeholders will also be low. But, if the economy grows, the market experiences high purchasing power, low unemployment, and stakeholders will have high trust degree.

Shipping is essentially a main component of the world economy, therefore, world trade changes will significantly affect all industries. Economic conditions changes in internal or external markets will also have a great impact on the transport industry. The world population grows fast, so, raw materials and goods requirements are likely to enhance. It is expected that such a development will create more business for transport organizations (Sazonov, 2011).

On the other hand, it is important to mention that global economic growth slowed in the last years. In 2017 world GDP was 79.28 thousand billion US dollars, but in 2016 – 75.37 thousand. So, it increased by 4.9% which indicates a slowdown. According to such development, the growth of world commodity trade is also

decelerated. As a result, WTO expects that the growth rate in the next years will increase more quickly. (www.imf.org)

Above mentioned economic factors are more general for the whole global shipping industry. They are not under specific of the NSR sailing, but they are relevant. I will focus further on economic factors that affect the NSR.

### *Interest Rates and Investments*

The shipping industry is a high-intensity industry. In order to use the NSR, it is necessary to modernize fleet, which needs high capital expenses. Because of new requirements and difficult ice conditions, ships operating in "normal" waters can not have a chance to navigate through the NSR. As it was mentioned earlier, there are serious requirements for ship sailing in Arctic waters.

Therefore, new vessels must be built, which implies considerable investments. Also, it is important to pay attention to the usefulness year of vessels made for Arctic sailings. In this case it does not even matter if investments bring enough return or not. One of the respondents expressed his thoughts: "In our country we design ice class ships, we spend lots of money, but our vessels are NOT used for icy waters".

The prices on new ships are very variable. They are determined by demand and supply. Shipping companies are buyers in this case, the shipyards are sellers. If demand is high, that means that the ice-classed vessels market is experiencing a "boom". Lots of shipowners will compete for several berths, so, the prices will increase sharply (www.vestifinance.ru). But, the demand for new vessels depends on the efficiency in the industry. As the industry is fast changeable, it means that it is very difficult to forecast prices development.

Companies need finances to buy new vessels. Capital can be taken from loans from various banks, private investors and company equity. Usually, to finance vessels

companies use bank loans. Borrowers are provided with flexible and quick capital access, and borrowers are full owners of the vessel.

However, after the financial crises in 2008, traditional banks began to limit shipping industry financing. Now it is difficult to obtain financing for building new ships. Lenders became cautious and the vessels safety as assets weakened. Traditional financing can be available, but it will obey more strict regulations (UNCTAD, 2013). For example, up to 2019 the Basel III will be implemented little by little and will require new capital bank ratios ([www.vestifinance.ru](http://www.vestifinance.ru)). The main result of Basel III can be a considerable increase in capital requirements of the banking industry. It will need more shipowners' equity capital and increase the capital cost for them. Moreover, because lots of vessel acquisitions are financed by term loans valued at a floating rate, unexpected changes in interest rates can cause problems for shipping companies.

### *Bunker oil*

To my mind, the most significant macroeconomic factor affecting the costs of a voyage is the or bunker oil cost. Bunker oil is about 48 % of the total voyage costs. Although shipping organizations can not influence the price of fuel oil, they have a certain effect on fuel consumption.

When bunker price is very high, shipping organizations try to find new ways to reduce consumption of. To design fuel-efficient vessels lots of resources are used, but it leads to lower total consumption of fuel oil.

If we compare the Suez Canal and the NSR, a container vessel of 8.500 TEU, which sails through the NSR from Murmansk port to Busan port (South Korea), needs 2,795 fuel tons, but to go via the SC it needs approximately 4,420 tons. So, the economy will be 1,625 tonnes per trip. This fact indicates that if bunker prices increase, savings will also grow up. ([www.esi.nus.edu.sg](http://www.esi.nus.edu.sg)).



It is clear from the research that potential bunker oil savings and associated bunker costs are main benefits of shipping via the NSR. 64,21 % of the respondents answered that that were main benefits. It is the 2d frequent response after «short time or distance». In an interview some respondents answered that there are other benefits associated with saving fuel consumption such as insurance or transit fees. They are not sure whether saving fuel costs potential outweighs other costs growth.

### **5.4.3 Cultural and Social Factors**

Socio-cultural factors symbolize the society culture in which organizations operate. Such factors are the view of society on organizations, each other, demographic data, age, educational level, lifestyle, various opinions, advertising, customer attitude and publicity.

For Norwegian companies operating in the NSR the biggest problem associated with macroeconomic socio-cultural factors will be global and local public reaction to the use of the route (Sayer, 2000). As an example, there is an independent non-profit company, called Bellona, which solves climate problems through the identification and implementation of stable environmental solutions. The company concerns about the use of Russian nuclear icebreakers by Norwegian shipping organizations. And such company is not the only one. Negative advertising due to the NSR usage may be a subject for Norwegian companies to cancel future agreements of sailing through the NSR. Also, it can easily harm the image and reputation of companies.

We are working in the world with numerous standards of what make wrong or correct behavior. When there are lots of different standards, the judgment, whether actions are ethical or not, becomes a complex dilemma (Sayer, 2000). Companies must make trade-offs that may not be so good for all involved groups. As I have already mentioned, unfortunately, Russia is a country with a high corruption level. As previously mentioned, Norwegian shipping companies operating in the NSR will

have to pay various fees to the Russian authorities. For foreigners, this fact means that organizations provide a constant cash flow into a corrupt regime. So, this leads to a situation where Norwegian companies are under the public scrutiny.

The growing world trade is another socio-cultural factor affecting the NSR attractiveness. Along with the temperate world economy growth, the world trade volume is also growing. In August 2017, world trade grew up by 1.8 %. The main factor of the increase is the effect globalization. Nowadays international trade gives consumers all over the world the opportunity to use a wider range of products than if they have access only to domestic products. ([www.cpb.nl](http://www.cpb.nl))

One more necessary driver of world trade increase is the per capita income growth. As the total state revenue increases, consumers tries to transfer their expenses from basic products (food, clothes) to manufactured goods, which offer more opportunities for international trade.

It means that for shipping industry there is a need to ship more cargo. Nowadays, shipping industry is responsible for transporting 90 % of products, food and energy of the world. In addition, Asia has moved North America, the largest market for export in Europe, in the last 15 years. The world trade is supposed to double by 2020 ([www.vestifinance.ru](http://www.vestifinance.ru)). That shows the necessity and attractiveness of the NSR, as a shorter route, for Asia and Europe.

An increasingly significant problem of international shipping is the piracy threat against trade vessels. In 2017 there were 180 pirate attacks on merchant vessels, and 4 ships were captured worldwide (Bendall, 2010). Shipping between Europe and Asia via the Suez Canal is associated with a high political instability and piracy risk. Now there is a low possibility to meet pirates in the NSR. This is a beneficial element associated with the use of the NSR.



#### **5.4.4 Technological Factors**

Technological factors relate to the new technologies, developments, innovations, information technology changes and how much money the government spends on research. Technological factors can be focused on digital problems, but it is necessary to remember that distribution, logistics, new production methods and material development also play an important role.

##### *The NSR Infrastructure*

The NSR attractiveness depends on Russian policy and public administration. The infrastructure along the NSR depends on Russia, since the vast part of the coastal line is the territory of the country. Russia started to improve infrastructure to increase export and to coordinate ships transit in the region. It is expected that during the next decade, 10 -12 new emergency and navigation centers will be built to enhance shipping traffic under Russian regulation.

There are a lot of debates concerning the question whether Arctic routes will be economically viable next years. There are worries about the cost level because the country must make significant investments to develop and maintain the required infrastructure (Gunnarson, 2016).

It is doubtful, whether only traffic increase will be enough to finance investments in the amount, necessary to improve infrastructure. Thus, the question will be, how strongly authorities of Russia desire to pay for initial investments as well as for the maintenance and operation costs.

##### *Satellites*

For vessels navigating in the NSR, satellites play an important role, because they provide ships with information about sea conditions, which allow ships to maneuver more effective and safe in ice-covered waters. The European Space Agency made Norwegian AIS satellite, the Canadian radar program. The Agency made huge

contribution to cost-effective marine monitoring in the Arctic region. The European satellite navigation program, called Galileo, and Earth Observation Program make possible safe traffic and help to improve search and rescue operations in the region.

Furthermore, IMO has begun modernization work on the Global Maritime Distress Safety System. This is an international system which provides security and safety for vessels. Nowadays, the GMDSS is not widely used in the Far North, but there are hopes for its further development in order to ensure the best coverage in the Arctic region.

Today satellite communication systems do not cover the territory north of 75 degrees. So, it is necessary to make good relations in the north, especially if relations affect broadband ship services. Communication satellites that rotate around the poles can easily solve this problem. Several countries which are interested in the Arctic region, have begun to explore solutions for satellite communications in the polar region. Unfortunately, they have not found viable solution. If we talk about Norway, the Space Center, which acts on behalf of the Ministry of Trade, Industry and Fisheries, tries to solve this problem.

### *Radar Technology*

Weather conditions in the High North are changing rapidly. They change every minute, and it can be very difficult to navigate only a few hours ahead. Ice floes and icebergs are the elements, which can easily impose significant threats to the crew and vessels. When a team operates in the fog and darkness, the possibility to collide with an iceberg is too high ([www.radartechnology.ru](http://www.radartechnology.ru)). Therefore, new secure technologies for detecting these objects play an important role in the safe navigation along the NSR. A large number of different companies work on the development of such technologies. One example is a Norwegian organization, called Radar Technology. Not long ago, it developed an ice detector ([www.radartechnology.ru](http://www.radartechnology.ru)).

This detector helps the ship's captain to see how the route looks like. It is equipped with an anti-icing parts that guarantee that radar is free of ice and works, even if all the vessel is covered with ice. Moreover, the transceiver is winter adapted. It can perform tasks even in harsh weather conditions. The system has an advantage – it can be controlled by an ice pilot, the display and the platform are similar to a navigation radar. That fact shows that there is no need for the ice pilot to be additionally trained, which also cut costs ([www.radartechnology.ru](http://www.radartechnology.ru)). The main problem for sailing along the NSR are harsh weather and ice conditions. This make navigation in the Arctic challenging. This emphasizes the necessity of safe and improved technologies for safe navigation in Arctic waters.

#### *Ship engines and structure*

There is a number of criterias for vessels that are going to navigate via the NSR. Ships must have a specific icebreaking capability level: a secure design, which means permissible rudder, hull and propeller safety against ice loads. Another challenge is engines. Navigation along the NSR is very severe for engines, motors failure can lead to serious threats. Therefore, special control and inspection measures must be developed. Also, new technologies are needed to prevent engine emissions.

It is very likely that in the coming years in accordance with the growing technological shipping requirements in the Arctic waters, extra technological means will be developed, in particular, environmental assessments regarding the NSR activities. Organizations, which are planning to operate in the Arctic, must follow such developments and be ready for constant updates in accordance with new requirements.



#### **5.4.5 Environmental Factors**

Environmental factors include climate change, weather conditions, waste management, laws on environmental pollution, regulations.

##### *Climate Change*

Change of climate and its impact are the biggest world challenges nowadays. There is a main, we can say, economical and political problem concerning reduction of CO<sub>2</sub> emissions. The growth in global average temperatures is associated with an increase of greenhouse gases for the last years (Guy, Lasserre, 2016). Climate is a global problem and can be resolved only within the international cooperation framework. The purpose of the United Nations is to reduce the temperature growth to less than 2° C in comparison to the pre-industrial level. This will require to reduce greenhouse gas emissions by 50-65% by 2030 compared to 2010.

Such reduction level can be possible if all the countries decrease considerably their emissions. This will need production growth of renewable energy sources, adoption of measures to increase energy effectiveness, reduction of deforestation and usage of fossil fuels (Guy, Lasserre, 2016). It is important to estimate greenhouse gas emissions in order to make such development realistic.

The shipping industry is now influenced by the global climate change. The final goal of the shipping industry is 0-0-0 rule: 0 life loss, 0 accidents and 0 pollution. To make this goal achievable, significant industry changes have to be expected (Sazonov, 2011).

##### *Emissions*

It is considered that shipping is the most environmentally friendly transport mode. It is usually measured in consumption of energy per ton-km. Nowadays, international transportation is 4% of global emissions. The problem is that

|           |                                  |     |                 |   |
|-----------|----------------------------------|-----|-----------------|---|
| Pevek     |                                  | 330 | July - October  | Centralized power supply: Chaun PP; line 110 kV Bilibino NPP      |
| Egvekinot |                                  | 350 | June - November | Centralized power supply: Egvekinotskaya HPP                      |
| Sabetta   | Yamalo – Nenets Autonomous Okrug | 572 | All year        | Autonomous power supply (decentralized); portable aviation gas PP |

(Made by author after Arctic seminar)

In the near future, the most widespread activities in the NSR will be the development of oil and gas fields, the export of raw materials, as well as scientific flights on intergovernmental programs and tourism.

The development of energy resources in the Arctic zone of Russia stimulates the attraction of construction machinery and related products to this region. There is growing interest in the NSR from Western European ship owners and cargo owners. Now, a number of companies are considering the construction of oil tankers and gas carriers suited for the NSR (Arctic Portal, 2015). In conditions of competition in the struggle for the resources of the Arctic shelf, the significance of the Russian nuclear icebreaking fleet is substantially increasing, as the most effective instrument for ensuring transport and economic activity in the Arctic zone ([www.morvesti.ru/tems](http://www.morvesti.ru/tems)).

It should be specially noted that it was the Russian nuclear ship "Arctic" in 1977 that for the first time in the world reached the geographical point of the North Pole. According to scientists, the continental shelf of the Arctic may contain about 20% of the world's hydrocarbon reserves. On the shelves of the Barents and Kara Seas, unique gas deposits were discovered. Now, the Arctic provides about 11% of Russia's national income and 22% of the volume of all-Russian exports. In this region, more than 90% of nickel and cobalt, 60% of copper and 96% of platinum are mined (<https://nsportal.ru/ap/library/>).



According to the director of the Institute of Oil and Gas Problems Anatoly Dmitrievsky, by 2030 Russia intends to produce up to 30 million tons of oil and 130 billion cubic meters of "blue fuel" on its Arctic shelf. Today, Russia continues to develop and use the NSR. The main users of the NSR in Russia today are «Norilsk Nickel», «Gazprom», «LUKOIL», «Rosneft», «Rosselp», the Krasnoyarsk Territory, Sakha-Yakutia, Chukotka.

The fate of the NSR largely depends on the development of the minerals explored in its zone: the Shtokman oil and gas field, the Timan-Pechora oil and gas province, the deposits of the North-Onega bauxite, polymetals and manganese in the Novaya Zemlya archipelago. The importance of the NSR has also recently increased in connection with the integration of the Russian transport system into international transport corridors ([www.morvesti.ru/tems](http://www.morvesti.ru/tems)).

According to expert estimates, the potential volume of transit cargo along the Northern Sea Route in the east direction in the coming years will be 5-6 million tons, and in the west - 2-3 million tons. The bottom of the Arctic Ocean hides at least 10 billion tons of oil and gas. According to the Russian Security Council, at present there are 233 billion explored oil barrels and 166 billion barrels unexplored oil in the Arctic (Abdul Rahman, Saharuddin, Rasdi, 2014).

The main obstacle is the lack of necessary infrastructure facilities or their non-compliance with modern requirements. To modernize the production base, investments and reductions in property and land taxes are necessary for ports that are the targets of the NSR ([www.morvesti.ru/tems](http://www.morvesti.ru/tems)).

For successful competition in the Arctic, it is necessary to develop and improve the nuclear icebreaking fleet and to control the Northern Sea Route. At the moment, more than 60% of the territory of Russia belongs to the regions of the Far North.

95% of gas, 75% of oil, 90% of tin, the bulk of gold and diamonds are mined here. 8% of Russians living in the Far North receive 1/5 of the national income and provide almost 2/3 of foreign currency earnings ([www.morvesti.ru/tems](http://www.morvesti.ru/tems)).

*Table: The volume of transportations along the Northern Sea Route taking into account transit cargoes (thousand tons) according to the data of the «Administration of the Northern Sea Route», the «Atomflot»*

|      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |
|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| 1933 | 1943 | 1953 | 1963 | 1971 | 1981 | 1986 | 1991 | 1996 | 2006 | 2011 | 2013 | 2014 | 2015 | 2016 |
| 130  | 289  | 506  | 1264 | 3032 | 5005 | 6455 | 4804 | 1800 | 1956 | 3111 | 3930 | 3982 | 5392 | 7265 |

([www.tass.ru/ekonomika/](http://www.tass.ru/ekonomika/))

According to the executive director of the Non-Profit Partnership for the Coordination of the Use of the Northern Sea Route (and former Head of the Administration of the Northern Sea Route) V. Mikhailichenko, by 2009, compared to 1980, the volume of traffic along the Northern Sea Route decreased from 6-8 million tons of cargo per year to about 5-6 million tons. And only in 2016 the volume of cargo transported by the Northern Sea Route surpassed the data of the 1980s, amounting to 7.26 million tons (+ 35% by 2015).

*Table: Transit shipments along the Northern Sea Route*

|   |      |      |      |      |      |
|---|------|------|------|------|------|
| Data  | 2010 | 2011 | 2012 | 2013 | 2016 |
| The volume of transit traffic, million tons | 0,11 | 0,82 | 1,26 | 1,16 | 0,27 |
| Number of vessels, units                    | 4    | 34   | 46   | n/a  | 25   |

([www.tass.ru/ekonomika/](http://www.tass.ru/ekonomika/))

The Northern sea route (NSR) connects Northern and far Eastern ports, Europe and Asia. By sea, you can navigate ships from Europe to Japan in 20 days, and the existing routes through the Suez Canal and around Africa - up to 50 days (Arpiainen, 2009).

The modern NSR is the only wide-ranging transport route in the European and Asian North through which goods from the Arctic regions are delivered. Petroleum products, wood, coal, industrial equipment, food products are transported through the NSR. NSR is “the only means of developing a rich Arctic shelf in which only estimated mineral reserves are 1.5-2 trillion Euro in monetary terms”.

The Northern sea route, being an internal route of Russia, plays an important role in the economic life of many regions of our country, which are connected with the Arctic ocean by such large rivers as Ob, Yenisei, Lena, Indigirka, Kolyma, Khatanga and others. These rivers carry their waters into the Arctic ocean and form a single transport system with the Arctic seas (ACIA, 2004).

Strategic factors related to the geopolitical and transnational values of Maritime navigation in the Arctic are particularly important. First of all, control over sea areas potentially rich in natural resources, the transit importance of the Northern sea route as an internal route between the North-Western and far Eastern regions of Russia, as well as opportunities for the growth of transnational transit traffic along the Northern sea route between European ports and ports of the Pacific region (Arctic Portal, 2015).

In the foreseeable future, the Northern sea route remains a key element of transport support for Russia's Arctic regions. Moreover, its role may increase significantly in the short term. New opportunities for the development of transport along this route are opened primarily in connection with the development of hydrocarbon deposits in the coastal areas and on the Arctic shelf (ACIA, 2004). There are also good prospects for the development of transit cargo of foreign charterers on the Northern sea route in the framework of the formation of a unified transport system between Europe and the countries of the Asia-Pacific region and the North Pacific coast States and Canada.

As a rule, the level of development of productive forces of economic and transport links corresponds to the periods of industrial development of the North. In this regard, the regions of the North-East, unlike, for example, the regions of the European North and North-West Siberia, are at an early stage of their development, which corresponds to seasonal waterways (river and sea), from which to mineral deposits, roads, usually in the form of roads and winter roads.

The importance of the Northern sea route as an independent Euro-Asian transport corridor is very high. This is due to the intensification of the development of the Russian Arctic oil and gas shelf with the growth of supplies of Norilsk metallurgical combine, one of the world's largest producers and exporters of non-ferrous metals.

The potential volume of cargo transportation along the Northern sea route by 2020 could reach 38 million tons, and by 2020 - more than 45 million tons per year. And foreign experts predict the growth of transit volumes in the East up to 6 million tons by 2020 and up to 3 million tons per year in the West ([www.morvesti.ru/tems](http://www.morvesti.ru/tems)). On behalf of the Chairman of the Government of the Russian Federation Vladimir Putin, in order to arrange commercial transit shipping on the Northern sea route, the Sovcomflot company conducted the experimental navigation with the use of large-tonnage vessels with a deadweight of 100 000 tons.

In order to ensure the safety of navigation on the forthcoming voyage and to carry out the work on cartographic surveying of high-latitude trails, modern measuring complexes for surface survey of the bottom relief at the specialized vessels of the Hydrographic Enterprise were acquired and installed, due to which it was possible to carry out deep survey along the proposed route.

The tanker left the Murmansk port on August 14 with a cargo of 70,000 tons of gas condensate destined for the port of Ningbo (China). The tanker was escorted through

arctic ice with icebreaking provided by atomic icebreakers "50 Years of Victory", "Russia" and "Taimyr". The convoy ran along the Northern Sea Route, 2500 miles in 10 days and 7 hours at an average speed of 10 knots.

The total travel time from the Russian port of Murmansk to the Chinese port of Ningbo was about 22 days, which even taking into account the experimental nature of the voyage is almost 18 days shorter than the southern route through the Suez Canal.

In 2009 two vessels went on a route between Europe and Asia through the northern waters of Russia. In 2011, this route has already been selected by 34 vessels (for comparison, 18,000 ships pass through the Suez Canal every year). It is estimated that traffic can increase by 10 times by 2019. And in the long term - twenty times, up to 560 million tons a year.

Experts believe that the modernization of the infrastructure of the Russian Arctic will require significant financial and labor costs. It will be necessary to improve the work of hydrographic and meteorological services, create an aerial reconnaissance system for ice traffic and create state structures responsible for environmental monitoring. It is necessary to increase the resources of the Ministry of Emergency Situations, improve the infrastructure of ports. According to some experts, not only Russia, but also a number of other countries consider the development of the Northern Sea Route to be its prerogative. First of all, we are talking about the main powers of the Asia-Pacific region - China and India. Interest is also shown by small but influential states, such as Singapore. A number of Russian officials believe that legislative norms governing the movement of maritime transport for foreign shipping companies are necessary ([www.morvesti.ru/tems](http://www.morvesti.ru/tems)). The situation, according to experts, can be complicated by the US position, which does not consider that the key directions of the Northern Sea Route are exclusively in the Russian jurisdiction. Moreover, there is no consensus on the legal regulation of the



highway, even in Russia. But there are lawyers who are sure that the Russian Federation has every right to manage the passage of ships along the Northern Sea Route thanks to the norms of the UN Convention on the Law of the Sea, established in 1982. Owners of vessels should apply for the use of the waters of the NSR in advance.

The Administration of the Northern Sea Route considers this and decides whether to grant or refuse permission. The NSR administration reviews the application for up to 10 working days and places its response (decision on whether to issue or not to issue a permit) on the official website.

According to some experts, the NSR should become a competing highway for the Suez Canal and other major objects of the world maritime infrastructure. According to some analysts, the maximum throughput of the NSR is about 50 million tons of cargo per year. The seamen themselves believe that the NSR will be more and more in demand every year, especially against the backdrop of the growing activity of oil and gas companies in the Yamal and the Arctic ([www.morvesti.ru/tems](http://www.morvesti.ru/tems)). Important role in the effective use of the highway, according to seafarers, should be played by private investors. The dynamics is quite optimistic: if in 2010 NSR transferred only 4 large vessels, then in 2011 there were 34, and in 2016 - 56. Experts believe that there is every reason to expect further growth in the activity of shipping companies in the water area of the Northern Sea Route - both foreign and foreign.

## 5.2 Options for the development of the NSR

There are several options for developing the Northern Sea Route: the development of the Eastern Port infrastructure and the development of the icebreaker fleet. Based on the first option - the development of such eastern ports as Dickson, Tiksi, Pevek and Uellen.

In general, it should be noted that the prospects for increasing freight turnover in the NSR are related to the increase in exports with a small share of transit and imports. Thus, the experts of the Council for the Study of the Productive Forces of the Ministry of Economic Development and the Russian Academy of Sciences and the Central Naval Research Institute in the joint monograph "Problems of the Northern Sea Route" give the following forecast for the growth of supplies.

*Table: Forecast assessment of marine Arctic traffic flows for the period up to 2020, million tons*

| The name of cargo transportation | Variant I | Variant II |
|----------------------------------|-----------|------------|
| Export, total                    | 10,450    | 16,045     |
| Transit, total (dry cargo)       | 0         | 250        |
| Import, total (dry cargo)        | 40        | 55         |

([www.tass.ru/ekonomika/](http://www.tass.ru/ekonomika/))

Transportation of NSR goods in some aspects looks much more difficult compared to the Suez Canal. There are important points that should be elaborated on:

- the need for additional investments in vessels for their adaptation to the conditions of the north (ice class vessels are needed);
- additional costs for icebreaking;

- the need to develop infrastructure, which in some cases is in an uncompetitive state (which means the development of port infrastructure, construction of an icebreaker fleet), etc.;
- unpredictability of delivery dates due to climatic risks, which under certain circumstances can deny all the advantages of the Northern Sea Route (Sakhuja, 2013);
- short navigation period (4 months).

Given these factors, it is necessary to understand that, probably, the NSR (if the climate in the Arctic does not change radically in the next decade) cannot become a full-fledged alternative to the Suez Canal. The Northern Sea Route can become a competitive transport corridor for certain types of cargo on certain routes. First of all, it concerns the transportation of Russian raw materials and hydrocarbons extracted in the Arctic region to the countries of East Asia.

### 5.3 SWOT analysis of the NSR

There are lots of disputes over the use of the Suez Canal versus the Northern Sea Route. Many companies prefer to choose the SC, because this route is used for a long time and is in high demand. However, theoretically, shipping along the NSR will be faster and save considerable amount of money. Lets analyze if it is so.

The first factor, which limits transit via the Northern Sea Route is the Polar Code. In the Code special requirements about ballast water, waste are mentioned. To ship along the NSR, the company need specific certificates. The second important factor is ice conditions (Sakhuja, 2014). Ships operating in the region need the ice-breakers' assistance. Organizations also use double acting tankers (DAT). The third factor – harsh weather conditions, make rescue operations challenging.

Due to above-mentioned reasons, I took the main transport destinations and tried to make comparative analyses of using both routes.

*Table: Analysis of the NSR and SC*

| Route              | Via NSR       |               |                 | Via SC        |               |                 |
|--------------------|---------------|---------------|-----------------|---------------|---------------|-----------------|
|                    | Distance (nm) | Speed (knots) | Duration (days) | Distance (nm) | Speed (knots) | Duration (days) |
| Busan - Rotterdam  | 7 432         | 13            | 23,8            | 11 159        | 14            | 33,2            |
| Chiba – Hammerfest | 5 844         | 13            | 18,7            | 12 802        | 14            | 38,1            |
| Chiba – Rotterdam  | 7 153         | 13            | 22,9            | 11 575        | 14            | 34,4            |
| Daesan - Rotterdam | 7 744         | 13            | 24,8            | 11 165        | 14            | 33,2            |
| Quindao - Murmansk | 6 425         | 13            | 20,6            | 12 592        | 14            | 37,5            |

(www.researchgate.net)



*Table: Analysis of the NSR and SC*

|                     | Routes           |                  |
|---------------------|------------------|------------------|
|                     | NSR              | SC               |
| Distance (nm)       | 7 356            | 11 585           |
| Journey time (days) | 18<br>(15 knots) | 32<br>(15 knots) |
| Piracy              | No               | Yes              |
| Transport costs     | Low              | High             |
| Cost savings        | High             | Low              |
| Fee                 | High             | Low              |

(www.researchgate.net)

Lets find advantages of using NSR. To begin with, if we compare shipping from Hamburg (Northwest European port) to Yokohama (Far East) using both routes, we can see that NSR distance is 36% shorter. Moreover, in the Indian Ocean piracy risk is higher compared to the Arctic waters. This fact makes companies feel safe for their goods (Bendall, 2010).

If we pay attention to trasport cost, transportation via NSR will be < 1,123 (USD/TEU), but via Suez Canal - 1,299 (USD/TEU). TEO means 20-foot equivalent unit, used for bearing capacity.

The last but not the least point is cost savings. Of course, the cost analysis depends on price changes of shipbuilding, bunker oil, fees. So, delivery scenarios with sailing conditions are key factors for such an analyses. I suppose that in the future there will be great competition of the NSR and SC.

After analyzing both routes, it is possible to make SWOT analyses of the NSR, in order to understand with which problems shipping companies can deal using the

route.

*SWOT analyses*

| <b>Strengths</b>  | <b>Weaknesses</b>   | <b>Opportunities</b>   | <b>Threats</b>  |
|---|---|--|---|
| Hydrocarbons export from the Arctic region, especially from the Russian Federation  | Unfavorable market condition which leads to the economic recession  | Paramount task: sufficiently invest into infrastructure of the NSR | Unfavorable market condition which leads to the economic recession                          |
| In summer months the NSR is partly free from ice  | One-way transportation: reduced profits (practically all vessels move back without any cargo)   | NSR possibility to operate as a real shipping lane                 | If ice continues to melt at such a speed, the Arctic waters can become true shipping routes |
| If we increase navigation efficiency by cutting distances, more vessels will perform more transits. It will lead to high profit | The NSR is operable only several months per year  | Possibility of making new navigation lanes in the region           | Unfavorable market condition which leads to the economic recession                          |
| Ice-breakers support along the NSR  | Old infrastructure and lack of technical support. Ice shipping needs definite competences. It is necessary to understand the sailing characteristics, feel vessels behavior and be familiar with navigation in different ice conditions | Possibility to invest in technical support and infrastructure      | Shipping along the NSR means costs of ice-breakers' support                                 |
| Around 36% distance   | Sailing direction   | Higher profit because  | Incomplete geodetic   |

|                                      |   |   |  |
|--------------------------------------|---|---|--|
| savings compared with the Suez Canal | restrictions, extra crew training costs | of lower distance and opportunity of increasing traffic during the year | measurements lead to low reliability of sea charts. Harsh weather conditions, low temperatures, drifting icebergs can be the reason for malfunctions of ship details |
|--------------------------------------|---|---|--|

After making the NSR' SWOT analysis we can conclude that:

- the NSR can be used only in summer months
- navigation in the Arctic region is influenced by harsh weather conditions, lack of forecasting, bad infrastructure and drifting ice
- ice level will affect shipping traffic
- currently, the NSR can not be considered as a truly competitive shipping lane, especially if we compare it with the Suez Canal
- navigation along the NSR depends on economy and accuracy

Distance savings compared to the SSP via the Suez Canal are around 36%. According to that fact, navigation efficiency will be higher for vessels are able to make more voyages at the same time which will lead to higher profit. To make the NSR a major competitor, it is important to carry out decisive activities that guarantee best results concerning the cargo volume shipped via the NSR ([www.vestifinance.ru](http://www.vestifinance.ru)). In addition, significant investments into infrastructure should be made and the Russian Federation has to provide the shipping lane with sufficient number of ice-breakers, complete technical support and effective rescue and search services. Nowadays the NSR is a lane with limited transit.

If definite constraints concerning ice-breakers, unfavorable market conditions, ice thickness levels and service are reduced or solved, it will be possible to make the NSR a major export route (Sakhuja, 2013).

#### **5.4 The NSR' PESTEL analysis**

The idea of PESTEL analysis is to analyse external environment, that can not be controled, to avoid fails. Also, the analysis helps to define opportunities, that can be used as advantages.

These factors are: economic (fiscal policy, rate of unemployment, income of customers, market trend), political (government social policy stability, tax policy, anti-trust law), technological (level of technology, penetration, new innovations, infrastructure level), social-cultural (level of education, growth of population, position towards goods' quality, services), legal (protection of data, safety and health law, protection of consumers) and environmental (waste management, water and air pollution, renewable energy).

All in all, the PESTEL framework in my thesis will be used to think over how these macro environmental factors influence and form the Northern Sea Route shipping. I will try to give the full picture according to the present situation from the side of a Norwegian shipping company. What environmental forces can the company face choosing to transport its' goods via the NSR?

## **5.4.1 Political and Legal Factors**

### *Political risks*

Due to the geopolitical situation (the Ukrainian crisis in 2014) the navigation along the NSR became quite challenging. Placed on the Russian Federation, economic sanctions were the result for considerable obstacles to the international cooperation. First of all, it is important to mention that legal and political factors are 2 absolutely separate factors (Aguilar, 2011). Both of them can affect the NSR in different ways. However, I decided to analyze their impact together, because their effect on navigation and, of course, on the NSR is intertwined. Legal and political environment have a great impact on any organization and shipping companies are not an exception.

Government influences not only the tax policy, but also the level of participation in different trading agreements, which, in its turn, have a great impact on the effectiveness and income of a company. Moreover, level of corruption, governmental stability level and regulations affect the environment in which this organization operates.

In addition, legal factors include international trade restrictions or regulations, employment laws. There is a difference between political and legal factors. Political factors contain not mandatory approaches, but legal consist of regulations and laws, which must be observed.

### *Political Tension*

Another factor which must be considered about political environment is Russian and Norwegian relations. If between countries there is tension and Norwegian organizations want to use the NSR for transit, they would have to overcome barriers. The good relationship between Norway and Russia dates back centuries. The commercial, cultural and economic relations in the north were extensive. In the



Russian Federation about 115 Norwegian maritime companies were highly represented in 2015.

In 2014 Norwegian government characterized the relations with Russia and the High North region as a stable and constant political environment. A boundary agreement in the Barents Sea eliminated the main potential source of conflict and strengthened relations future cooperation between countries (Aguilar, 2011).

In view of increasing political tension between the rest of the world and Russia and current political situation between Ukraine and Russia, there is a question whether this cooperation still exists. Ukraine has not changed position in relation to Russia despite enormous international pressure. This led to the fact that the imposed on Russia economic sanctions were associated, in particular, with Norway and the EU. As Norway participated in Russian sanctioning, the Russian Federation banned import of some Norwegian products.

How the conflict develops will have a great influence on the Russian – Norwegian relations and will slow down the work of Norwegian shipping companies waiting to navigate along the NSR. The EU thinks that the long-term Russian investments are affected by violations. Commercial entities consider Russia as a very risky country and it will remain the same after the lifting of sanctions. Also, such situation will indirectly affect cooperations with Norway hereinafter.

In reviewing survey results, 58,15% of the participated companies responded that the Norwegian shipping industry and government should play an active role in the development of the commercial shipping in the NSR. More than that, Pierre Cariou, Professor at Kedge Business School, told in one interview that Norway is an evident candidate for leadership in the further development of the lane because of the knowledge to saile in extremely difficult conditions. However, this will require

active cooperation and readiness of both countries to work together to achieve common purposes.

In order to make it possible, it is necessary to resolve the political tension that currently characterizes the relations between two countries. The Norwegian government plays an active role in relation to the new rules in the Arctic (the Polar Code) through IMO. However, it will be difficult to affect directly in the NSR due to the fact that the NSR is controlled by the Russian Federation administration and starts from Murmansk. Nevertheless, the government of Norway and shipping industry of the country can play a significant role when it comes to navigation in the Arctic waters and the Polar Code (Sakhuja, 2014).

### *Corruption*

Transparency International conducts each year a survey in which they assess how corrupt the public sectors in countries are. The Corruption Perception Index is a reminder that in countries all over the world there are covert transactions, power abuse and bribery.

In 2017 the index rated 180 countries and territories by their public sector corruption levels using a scale from 0 (highly corrupt) to 100 (clean). On this index we find Russia rather far down on the list, with a score no higher than 28 they are ranked as number 127. The result was that more than 2/3 of countries has score below 50. Compared to last years, this low performance is not something new. Russia has score 29 and is on the 135 place. In comparison to Norway, such corruption level is too high. Norway takes the 3d position and is ranked with 85 points. Over the years the comparatively high corruption level is observed.

It is not a secret that corruption strongly affects political, economic and social life of each country. Also, corruption can lead to weakening of business development and inefficiency (Mauro, 1995). When resources are forged and used not in a proper

way, business performance may suffer. Moreover, corruption reduces investments and prevents economic growth.

All above mentioned factors can have a serious negative impact on the infrastructure development along the NSR. In addition, this can create problems for the Norwegian company wishing to use the route, as this can be difficult to deal with authorities and institutions that may be corrupt.

### *Jurisdiction and Regulation*

Shipping companies which operates in the polar region suffer from 4 regulatory frameworks: MARPOL, STCW, UNCLOS and SOLAS. IMO provided guidelines for vessels operating in the Arctic ice waters, but such guidelines are not mandatory. Nevertheless, the traffic in the Arctic area is going to enhance rapidly, so, new strict regulations and law are expected.

Nowadays, over the NSR Russian Federation has most of the jurisdiction. The United Nation has given the coastal state the power to enact and enforce environmental regulations and laws in exclusive economic zones where climate and ice can pose serious threats to shipping and harm the ecological balance ([www.arctic-lio.com](http://www.arctic-lio.com)).

In Russia, on the 15th of March 2013, «Administration of the Northern Sea Route» was established ([www.arctic-lio.com](http://www.arctic-lio.com)). That was due to the feeling of competitive external threats or potentially hostile to the Russian Arctic region ([www.huffingtonpost.com](http://www.huffingtonpost.com)). All ships passing the region depend on the certificate of the Northern Sea Route Administration, which allows to navigate along the route. To obtain such certificate, the vessel must document that it meets all Russian requirements. The NSR administration is an institution that receives and reviews all submitted applications and gives permissions to ship via the NSR ([www.arctic-lio.com](http://www.arctic-lio.com)).

This agreement gives the Russian authorities significant power, which can be overused. In 2013 and 2015, the administration of the NSR refused to give a transit permit for the Greenpeace ship «Arctic Sunrise» by the reason of the fact that it does not have the required ice classification.

The vessel was classified the “1A1” icebreaker, which is the 2d highest ice strength vessel nowadays. According to Greenpeace, Russian authorities have enacted regulations to prevent Greenpeace protest against Russian oil exploration in the Arctic region ([www.vevstifinance.ru](http://www.vevstifinance.ru)). This became a source of concern for the surveyed representatives of the Norwegian shipping industry. Some of the companies responded that they believe that relations with the Russian authorities are extremely uncertain and complicated.

In addition, the EU thinks that Russia call into question the credibility and authenticity of the Russian authorities and the potential to use strong position in their own interests.

During the survey the respondents on the question – «what are the main challenges and barriers for navigation along the NSR?», answered: Russian authorities, political and economic risks, political issues, etc. Moreover, one respondent wrote that his country is afraid that Russia can use them as a a dairy cow.

These results show a very negative perception of the Russian government, which prevail in the Norwegian industry. Moreover, such political misunderstandings are a serious challenge with regard to navigation in the NSR. If we talk about applicants who got a certificate from the NSR Administration, they also need to pay a predefined fee («icebreaker fee») to use the route. Such a fee covers the cost of using the obligatory support of icebreakers. Icebreakerk are used to make a lane and to provide safe navigation via the NSR. This fact gives serious size restrictions because of the rules in which is mentioned that the vessel should be smaler than the

icebreaker. This means that the ship can not have a beam more than 30 m. Such beam is equivalent to a ship of 50 000 dwt, which is much less than vessels allowed in the SC.

To limit all the costs, the rate for the icebreaking contribution has an upper limit (how much the company must pay for these services). More than that, the icebreaking requirements will depend on ice conditions. The Russians told that during summer vessels can be allowed to sail without ice-classification ([www.vestifinance.ru](http://www.vestifinance.ru)). Because the fact that there is currently a sufficient number of bulk carriers and container vessels that satisfy nowadays requirements for navigation through the NSR, the Russian government permit will reduce one of the main barriers that limit the route use. Currently, the NSR administration has about 720 applicants, 23 of them are on the Norwegian flag.

### *The Polar Code*

IMO started to develop a more advanced and appropriate obligatory International Safety Code for vessels operating in ice waters. Actually, Norway is number one in doing the work to create global rules. The International Code is «Polar Code». It includes the whole spectrum of construction, design, equipment, training, rescue, search, environmental protection, which are very important for vessels that will operate in the areas around the 2 poles. It is necessary to guarantee that the equipment suits operations in the Arctic region and that proper review of the environment is made (Sakhuja, 2014). The Polar Code will contain specific requirements for the seafarers training who will operate in the polar waters.

The Polar Code has not been completed yet because of the difficult task of making the code obligatory supplement to other legal frameworks, rather than replacing them. The Polar Code must conform to the old structures and must be adapted to them. Several respondents mentioned in the questionnaire that only one set of rules for every country must be approved at the international level. Each year IMO changes



some rules in the Polar Code. So, companies which are planning to use the NSR should be prepared for regulations changes in the next years (Sakhuja, 2014).

For vessels authorized to sail via the NSR have to be designed and equipped to withstand the challenges associated with ice loads, weather in the Arctic region and operating conditions. To guarantee that vessels are built in accordance with appropriate standards, the Polar Code includes an ice ship classification called the Polar Class (7 polar classes). The Polar Classes are included in the voluntary guideline submitted by IMO in 2002 ([www.imo.org](http://www.imo.org)).

*Table: Polar Class Description*

| <b>Polar Class</b> | <b>Ice description<br/>(based on WMO Sea Ice Nomenclature)</b>                        |
|--------------------|---|
| <b>PC1</b>         | Year-round operation in all polar waters  |
| <b>PC2</b>         | Year-round operation in moderate multi-year ice conditions                            |
| <b>PC3</b>         | Year-round operation in second-year ice which may include multi-year ice inclusions   |
| <b>PC4</b>         | Year-round operation in thick first-year ice which may include old ice inclusions     |
| <b>PC5</b>         | Year-round operation in medium first-year ice which may include old ice inclusions    |
| <b>PC6</b>         | Summer/autumn operation in medium first-year ice which may include old ice inclusions |
| <b>PC7</b>         | Summer/autumn operation in thin first-year ice which may include old ice inclusions   |

([www.imo.org](http://www.imo.org))

Vessels (from PC7 to PC1) have been designed for ice management and escort functions. They have dimensions and capacity that give possibility to perform aggressive actions in polar waters. Moreover, there is the designation ICEBREAKER attached to their classification. PC 1 vessels have the highest polar class. They are made for independent operations without restrictions. Vessels classified as PC 7, the lowest polar class, include general level of ship strengthening ([www.imo.org](http://www.imo.org)).

The choice of the class depends on the ice statistics analysis, the experience of owners, financial or economic review. The selection of the class is the balance between costs, ice conditions and operational requirements ([www.imo.org](http://www.imo.org)).

#### **5.4.2 Economical Factors**

All economic factors shows a broader economy perspective than money put in a bank. Economic factors include unemployment rate, income of consumers, the rate of economic growth, fiscal policy, raw materials costs (bunker oil, exchange rates, level of inflation), stock market trends. All of them are very important for the shipping industry.

The economy shapes how suppliers, customers and organizational stakeholders act in the society. If the economy goes through a recession, there will be high unemployment, low purchasing power among customers and the level of trust of stakeholders will also be low. But, if the economy grows, the market experiences high purchasing power, low unemployment, and stakeholders will have high trust degree.

Shipping is essentially a main component of the world economy, therefore, world trade changes will significantly affect all industries. Economic conditions changes in internal or external markets will also have a great impact on the transport industry. The world population grows fast, so, raw materials and goods requirements are likely to enhance. It is expected that such a development will create more business for transport organizations (Sazonov, 2011).

On the other hand, it is important to mention that global economic growth slowed in the last years. In 2017 world GDP was 79.28 thousand billion US dollars, but in 2016 – 75.37 thousand. So, it increased by 4.9% which indicates a slowdown. According to such development, the growth of world commodity trade is also

decelerated. As a result, WTO expects that the growth rate in the next years will increase more quickly. ([www.imf.org](http://www.imf.org))

Above mentioned economic factors are more general for the whole global shipping industry. They are not under specific of the NSR sailing, but they are relevant. I will focus further on economic factors that affect the NSR.

### *Interest Rates and Investments*

The shipping industry is a high-intensity industry. In order to use the NSR, it is necessary to modernize fleet, which needs high capital expenses. Because of new requirements and difficult ice conditions, ships operating in "normal" waters can not have a chance to navigate through the NSR. As it was mentioned earlier, there are serious requirements for ship sailing in Arctic waters.

Therefore, new vessels must be built, which implies considerable investments. Also, it is important to pay attention to the usefulness year of vessels made for Arctic sailings. In this case it does not even matter if investments bring enough return or not. One of the respondents expressed his thoughts: "In our country we design ice class ships, we spend lots of money, but our vessels are NOT used for icy waters".

The prices on new ships are very variable. They are determined by demand and supply. Shipping companies are buyers in this case, the shipyards are sellers. If demand is high, that means that the ice-classed vessels market is experiencing a "boom". Lots of shipowners will compete for several berths, so, the prices will increase sharply ([www.vestifinance.ru](http://www.vestifinance.ru)). But, the demand for new vessels depends on the efficiency in the industry. As the industry is fast changeable, it means that it is very difficult to forecast prices development.

Companies need finances to buy new vessels. Capital can be taken from loans from various banks, private investors and company equity. Usually, to finance vessels

companies use bank loans. Borrowers are provided with flexible and quick capital access, and borrowers are full owners of the vessel.

However, after the financial crises in 2008, traditional banks began to limit shipping industry financing. Now it is difficult to obtain financing for building new ships. Lenders became cautious and the vessels safety as assets weakened. Traditional financing can be available, but it will obey more strict regulations (UNCTAD, 2013). For example, up to 2019 the Basel III will be implemented little by little and will require new capital bank ratios ([www.vesfinance.ru](http://www.vesfinance.ru)). The main result of Basel III can be a considerable increase in capital requirements of the banking industry. It will need more shipowners' equity capital and increase the capital cost for them. Moreover, because lots of vessel acquisitions are financed by term loans valued at a floating rate, unexpected changes in interest rates can cause problems for shipping companies.

### *Bunker oil*

To my mind, the most significant macroeconomic factor affecting the costs of a voyage is the or bunker oil cost. Bunker oil is about 48 % of the total voyage costs. Although shipping organizations can not influence the price of fuel oil, they have a certain effect on fuel consumption.

When bunker price is very high, shipping organizations try to find new ways to reduce consumption of. To design fuel-efficient vessels lots of resources are used, but it leads to lower total consumption of fuel oil.

If we compare the Suez Canal and the NSR, a container vessel of 8.500 TEU, which sails through the NSR from Murmansk port to Busan port (South Korea), needs 2,795 fuel tons, but to go via the SC it needs approximately 4,420 tons. So, the economy will be 1,625 tonnes per trip. This fact indicates that if bunker prices increase, savings will also grow up. ([www.esi.nus.edu.sg](http://www.esi.nus.edu.sg)).

It is clear from the research that potential bunker oil savings and associated bunker costs are main benefits of shipping via the NSR. 64,21 % of the respondents answered that that were main benefits. It is the 2d frequent response after «short time or distance». In an interview some respondents answered that there are other benefits associated with saving fuel consumption such as insurance or transit fees. They are not sure whether saving fuel costs potential outweighs other costs growth.

### **5.4.3 Cultural and Social Factors**

Socio-cultural factors symbolize the society culture in which organizations operate. Such factors are the view of society on organizations, each other, demographic data, age, educational level, lifestyle, various opinions, advertising, customer attitude and publicity.

For Norwegian companies operating in the NSR the biggest problem associated with macroeconomic socio-cultural factors will be global and local public reaction to the use of the route (Sayer, 2000). As an example, there is an independent non-profit company, called Bellona, which solves climate problems through the identification and implementation of stable environmental solutions. The company concerns about the use of Russian nuclear icebreakers by Norwegian shipping organizations. And such company is not the only one. Negative advertising due to the NSR usage may be a subject for Norwegian companies to cancel future agreements of sailing through the NSR. Also, it can easily harm the image and reputation of companies.

We are working in the world with numerous standards of what make wrong or correct behavior. When there are lots of different standards, the judgment, whether actions are ethical or not, becomes a complex dilemma (Sayer, 2000). Companies must make trade-offs that may not be so good for all involved groups. As I have already mentioned, unfortunately, Russia is a country with a high corruption level. As previously mentioned, Norwegian shipping companies operating in the NSR will



have to pay various fees to the Russian authorities. For foreigners, this fact means that organizations provide a constant cash flow into a corrupt regime. So, this leads to a situation where Norwegian companies are under the public scrutiny.

The growing world trade is another socio-cultural factor affecting the NSR attractiveness. Along with the temperate world economy growth, the world trade volume is also growing. In August 2017, world trade grew up by 1.8 %. The main factor of the increase is the effect globalization. Nowadays international trade gives consumers all over the world the opportunity to use a wider range of products than if they have access only to domestic products. ([www.cpb.nl](http://www.cpb.nl))

One more necessary driver of world trade increase is the per capita income growth. As the total state revenue increases, consumers tries to transfer their expenses from basic products (food, clothes) to manufactured goods, which offer more opportunities for international trade.

It means that for shipping industry there is a need to ship more cargo. Nowadays, shipping industry is responsible for transporting 90 % of products, food and energy of the world. In addition, Asia has moved North America, the largest market for export in Europe, in the last 15 years. The world trade is supposed to double by 2020 ([www.vestifinance.ru](http://www.vestifinance.ru)). That shows the necessity and attractiveness of the NSR, as a shorter route, for Asia and Europe.

An increasingly significant problem of international shipping is the piracy threat against trade vessels. In 2017 there were 180 pirate attacks on merchant vessels, and 4 ships were captured worldwide (Bendall, 2010). Shipping between Europe and Asia via the Suez Canal is associated with a high political instability and piracy risk. Now there is a low possibility to meet pirates in the NSR. This is a beneficial element associated with the use of the NSR.

#### **5.4.4 Technological Factors**

Technological factors relate to the new technologies, developments, innovations, information technology changes and how much money the government spends on research. Technological factors can be focused on digital problems, but it is necessary to remember that distribution, logistics, new production methods and material development also play an important role.

##### *The NSR Infrastructure*

The NSR attractiveness depends on Russian policy and public administration. The infrastructure along the NSR depends on Russia, since the vast part of the coastal line is the territory of the country. Russia started to improve infrastructure to increase export and to coordinate ships transit in the region. It is expected that during the next decade, 10 -12 new emergency and navigation centers will be built to enhance shipping traffic under Russian regulation.

There are a lot of debates concerning the question whether Arctic routes will be economically viable next years. There are worries about the cost level because the country must make significant investments to develop and maintain the required infrastructure (Gunnarson, 2016).

It is doubtful, whether only traffic increase will be enough to finance investments in the amount, necessary to improve infrastructure. Thus, the question will be, how strongly authorities of Russia desire to pay for initial investments as well as for the maintenance and operation costs.

##### *Satellites*

For vessels navigating in the NSR, satellites play an important role, because they provide ships with information about sea conditions, which allow ships to maneuver more effective and safe in ice-covered waters. The European Space Agency made Norwegian AIS satellite, the Canadian radar program. The Agency made huge

contribution to cost-effective marine monitoring in the Arctic region. The European satellite navigation program, called Galileo, and Earth Observation Program make possible safe traffic and help to improve search and rescue operations in the region.

Furthermore, IMO has begun modernization work on the Global Maritime Distress Safety System. This is an international system which provides security and safety for vessels. Nowadays, the GMDSS is not widely used in the Far North, but there are hopes for its further development in order to ensure the best coverage in the Arctic region.

Today satellite communication systems do not cover the territory north of 75 degrees. So, it is necessary to make good relations in the north, especially if relations affect broadband ship services. Communication satellites that rotate around the poles can easily solve this problem. Several countries which are interested in the Arctic region, have begun to explore solutions for satellite communications in the polar region. Unfortunately, they have not found viable solution. If we talk about Norway, the Space Center, which acts on behalf of the Ministry of Trade, Industry and Fisheries, tries to solve this problem.

### *Radar Technology*

Weather conditions in the High North are changing rapidly. They change every minute, and it can be very difficult to navigate only a few hours ahead. Ice floes and icebergs are the elements, which can easily impose significant threats to the crew and vessels. When a team operates in the fog and darkness, the possibility to collide with an iceberg is too high ([www.radartechnology.ru](http://www.radartechnology.ru)). Therefore, new secure technologies for detecting these objects play an important role in the safe navigation along the NSR. A large number of different companies work on the development of such technologies. One example is a Norwegian organization, called Radar Technology. Not long ago, it developed an ice detector ([www.radartechnology.ru](http://www.radartechnology.ru)).

This detector helps the ship's captain to see how the route looks like. It is equipped with an anti-icing parts that guarantee that radar is free of ice and works, even if all the vessel is covered with ice. Moreover, the transceiver is winter adapted. It can perform tasks even in harsh weather conditions. The system has an advantage – it can be controlled by an ice pilot, the display and the platform are similar to a navigation radar. That fact shows that there is no need for the ice pilot to be additionally trained, which also cut costs ([www.radartechnology.ru](http://www.radartechnology.ru)). The main problem for sailing along the NSR are harsh weather and ice conditions. This make navigation in the Arctic challenging. This emphasizes the necessity of safe and improved technologies for safe navigation in Arctic waters.

### *Ship engines and structure*

There is a number of criterias for vessels that are going to navigate via the NSR. Ships must have a specific icebreaking capability level: a secure design, which means permissible rudder, hull and propeller safety against ice loads. Another challenge is engines. Navigation along the NSR is very severe for engines, motors failure can lead to serious threats. Therefore, special control and inspection measures must be developed. Also, new technologies are needed to prevent engine emissions.

It is very likely that in the coming years in accordance with the growing technological shipping requirements in the Arctic waters, extra technological means will be developed, in particular, environmental assessments regarding the NSR activities. Organizations, which are planning to operate in the Arctic, must follow such developments and be ready for constant updates in accordance with new requirements.

### **5.4.5 Environmental Factors**

Environmental factors include climate change, weather conditions, waste management, laws on environmental pollution, regulations.

#### *Climate Change*

Change of climate and its impact are the biggest world challenges nowadays. There is a main, we can say, economical and political problem concerning reduction of CO<sub>2</sub> emissions. The growth in global average temperatures is associated with an increase of greenhouse gases for the last years (Guy, Lasserre, 2016). Climate is a global problem and can be resolved only within the international cooperation framework. The purpose of the United Nations is to reduce the temperature growth to less than 2° C in comparison to the pre-industrial level. This will require to reduce greenhouse gas emissions by 50-65% by 2030 compared to 2010.

Such reduction level can be possible if all the countries decrease considerably their emissions. This will need production growth of renewable energy sources, adoption of measures to increase energy effectiveness, reduction of deforestation and usage of fossil fuels (Guy, Lasserre, 2016). It is important to estimate greenhouse gas emissions in order to make such development realistic.

The shipping industry is now influenced by the global climate change. The final goal of the shipping industry is 0-0-0 rule: 0 life loss, 0 accidents and 0 pollution. To make this goal achievable, significant industry changes have to be expected (Sazonov, 2011).

#### *Emissions*

It is considered that shipping is the most environmentally friendly transport mode. It is usually measured in consumption of energy per ton-km. Nowadays, international transportation is 4% of global emissions. The problem is that



international trade growth will also enlarge emissions. In 2017 global CO2 emissions rose by 2% compared to the last year ([www.carbonbrief.org](http://www.carbonbrief.org)).

Such growing increase in global emissions has led to mitigation circumstances in all sectors. The international shipping industry is now under escalating research. Air pollution and climate requirements for maritime activities are not limited only in the polar regions. But efforts to solve global emissions problems will influence Arctic operations ([www.imo.org](http://www.imo.org)).

The Arctic atmosphere in winter is dry, cold and dark. It is the reason of how the emissions convert and spread. For a long time emissions in a stable high-pressure Arctic zone will remain unchanged. In the spring when the sun returns, reactions will begin. How reactions will look like – is very uncertain question. If we compare ship navigation in all parts of the world, certain conditions in the Arctic zone can be the result of more serious regulations concerning air emissions.

Fuel consumption and emission decrease are significant factors for the wider use of NSR as an intercontinental maritime transport route. Shipping along the NSR can lead to the total emissions decline during transportation. Considerably shorter travel distances lead to lower consumption of fuel. However, if marine traffic rises and icebreakers service is a bottleneck, waiting ships will exclude this plus.

#### *Pollution caused by accidents*

One problem associated with the growing traffic in the NSR is the accidental chemicals and oil spillage. Darkness, insufficient communication and map systems, harsh weather conditions and ice-covered waters are now a permanent problem. Of course, oil spills arising from accidents on ships occur all over the world, but complex operations in Arctic waters can enhance the accident risk.

In addition, Arctic areas are remote, so rescue, emergency and search reaction are complex and very expensive and can, therefore, enlarge the accidents severity (Guy, Lasserre, 2016). Due to the Arctic area peculiarities, it is necessary for organizations to pay attention on the accident risk reductions and to cope with such problems even faster than in other waters.

The above-mentioned accidents also affect other shipping aspect - insurance. The area remoteness and lack of sufficient methods for removing spills have to be considered about the insurance. If we analyze risky ice and weather conditions, it is understandable why an insurance premium for ships is too high.

Insurance against damages is the main industry service. It is true that without insurance commercial shipping in the polar region can not be viable. The shortage of statistics and data obstruct making assessments of risks for NSR navigation. In sum, insurance for ships operating in the polar region is carried out on a case-by-case basis and requires self-insurance.

#### *Waste management and endangered species*

For the present human activities has not influenced ecosystems in the Arctic Ocean. Pollution in the area is small, so, environmental conditions are, all in all, good. Unfortunately, outside the polar region activities have begun to affect systems. In fact, in the Arctic area the temperature of the air has grown twice more than the world average ([www.amap.no](http://www.amap.no)). Climate change has a great impact not only on the ice conditions, but the entire Arctic system too.

Carried to the polar area by wind pollutions endanger Arctic animals, especially, polar bears. Moreover, it is expected that the NSR traffic growth will threaten sea environment. Ships are the main carriers of foreign organisms and bacterias. Ships make noise which disturbs and frighten marine animals (Arctic Council, 2009).

Waste management is also problematic because of small amount of suitable port facilities. De-ballasted vessels expose unfamiliar organisms to the environment and it can cause lots of problems in the region. Owners of vessels will have to put expensive equipment to act in accordance to new rules for ballast water ([www.amap.no](http://www.amap.no)).

### *Influence of Norwegian Government*

Norwegian shipping organizations can meet problems because the purpose of the Norwegian government is to make maritime industry the best and cleanest in new solutions development.

The Norwegian government is trying to create global mechanisms and requirements for decreasing gas emissions. Due to the fact that it is necessary for Norway to make their industry the most environmentally friendly industry, their shipowners may meet more serious regulations. There can also be restrictions on the Arctic navigation, because the Arctic environment seems to be very vulnerable.

The Norwegian government is trying to create an action plan concerning green shipping. The plan will contribute to the wider use of LNG, especially in the merchant fleet. However, it will be difficult to use LNG because of the LNG cost compared to bunker oil. Moreover, there is not enough infrastructure and lack of LNG availability and plants for bunkering. According to these challenges, it is doubtful whether the LNG use will be the best protecting option for the Arctic environment.

### *Assessment of the Polar Climate Impact*

The Arctic region plays a significant role in the world climate. As it was mentioned before, polar climate is changing very fast. Because of request of the Arctic Council Minister, Arctic Climate Impact Assessment was made in 2004. ACIA's main goal was not only to assess and summarize knowledge on enhanced ultraviolet radiation



and climate change, but also to support processes of the policy development. ACIA deals with policy recommendations, social, environmental, cultural, health and economic issues. ([www.amap.no](http://www.amap.no)).

After analyzing the report of ACIA (2004), it is necessary to mention the main results about climate change influence on the Arctic:

1. Currently the climate in the Arctic region is warming quickly. More significant changes are forecasted.
  - 1.1 In the Arctic the average temperature is growing up 2 times faster than in other parts of the world and, of course, with some region changes.
2. Arctic warming, its influence on the region have global consequences.
  - 2.1 Ice in the Arctic is extremely reflecting. When it starts to melt, it opens land and water surface which is darker, so, it will be a result of enhancing of solar heat absorption and will lead to the faster planet warming ([www.amap.no](http://www.amap.no)).
  - 2.2 Also, the melt of icebergs adds more water to the ocean, changing composition of water and increasing the sea level (Bekkers, Francois, Rojas-Romagosa, 2015).
3. Areas of Arctic flora will change, which will lead to wide effects.
  - 3.1 It is expected that the line of trees will move to higher elevation in the north. Forests will replace a considerable tundra part. Vegetation of tundra will be in polar deserts.
  - 3.2 The vegetation will uptake more carbon, but decreased earth's surface reflectivity will overbalance it. So, it will be a reason for global warming.
4. The range of animal species, their distribution will be changed.
  - 4.1 Sea ice decrease will decline seabirds, seals and polar bears habitat. That will lead to species disappearance.
  - 4.2 Animals will move, so, animal illnesses can represent growing health risks for people.
5. A lot of coastal objects are influenced by the enhancing storm impact.

- 5.1 Higher sea level and ice decrease cause storms and high waves which can easily reach coasts.
- 5.2 Flooding risks
- 6. Access to the Arctic resources and marine traffic will grow up (Arctic Council, 2009).
  - 6.1 It will be easy to explore new natural resources.
  - 6.2 The NSR will be used all year, which makes shipments through the Arctic feasible.
  - 6.3 Environmental, sovereignty, political, cultural and security issues can appear.
- 7. Rising ground temperature will interfere infrastructure and cargo transportation.
  - 7.1 Global warming will destroy industry and transportation on land, especially, it will affect forestry and oil and gas industry. It will be impossible to get to the field, when roads and tundra are not frozen due to the swampy territory.
- 8. Local people meet severe cultural and economic results (Arctic Council, 2009).
  - 8.1 Indigenous communities can not live without seals, bears hunting, fishing.
- 9. High ultraviolet radiation level will have bad influence on nations, flora and fauna.
  - 9.1 Due to elevated radiation, people in our century will get a UV dose, which is 35% higher than in early years. That is why there lots of diseases, such as cancer, immune system and eyes problems (Arctic Council, 2009).
- 10. Such actions affect ecosystems and people all over the world.
  - 10.1 Problems: land changes, habitat breaking, chemical pollution, political misunderstandings ([www.amap.no](http://www.amap.no)).

**The PESTEL analysis summary:**

This table is based on all above-mentioned factors. It is a general review of the factors which can really affect the NSR usage.

| General factors   | Particular/separate factors, influencing the NSR  |
|-------------------|---|
| Legal / political | <ul style="list-style-type: none"> <li>✓ High political tension level</li> <li>✓ Infrastructure shortage</li> </ul> |

|                          |   |
|--------------------------|---|
|                          | <ul style="list-style-type: none"> <li>✓ The Polar Code regulations</li> <li>✓ Opportunity to abuse the power</li> <li>✓ High corruption level</li> <li>✓ Russian jurisdiction</li> </ul>   |
| <b>Social / cultural</b> | <ul style="list-style-type: none"> <li>✓ Damaged reputation of Russian government</li> <li>✓ Reactions due to the use of nuclear icebreakers</li> <li>✓ Public relation on corruption</li> <li>✓ Escalating goods demand</li> <li>✓ European export to Asia is increasing</li> </ul>  |
| <b>Economical</b>        | <ul style="list-style-type: none"> <li>✓ World trade development</li> <li>✓ Interest rate fluctuation</li> <li>✓ Fuel oil costs – savings if the NSR is used</li> <li>✓ Ice classed ships financing is very expensive</li> <li>✓ Difficult to to obtain financing</li> </ul>  |
| <b>Environmental</b>     | <ul style="list-style-type: none"> <li>✓ World Climate Change – severe industry regulation</li> <li>✓ Emissions control on ships</li> <li>✓ Ability to decrease fuel consumption by navigating via the NSR</li> <li>✓ Threat for endangered animals</li> <li>✓ Ecological consequences of the Arctic pollution - shortage of methods of gathering oil spills in polar waters – (expensive insurance)</li> <li>✓ Waste management</li> <li>✓ Influence of Norwegian Government –more severe rules for Norwegian ships</li> </ul> |
| <b>Technological</b>     | <ul style="list-style-type: none"> <li>✓ Satellites can not cover north areas of 75 degrees</li> <li>✓ Modern radar technologies should be performed</li> <li>✓ Developed requirements for engines and vessels construction</li> <li>✓ Extra control and support measures</li> <li>✓ Requirements to decrease emissions</li> </ul>  |



## 5.5 Risk analysis

In this chapter I will analyze risk factors, which are very important for organizations shipping via the NSR. I will find out how can such risks directly influence companies. Also, I will give classification of risks, show how to evaluate them and which methods to choose.

### *Price risks*

The main category of risks is price risk. Price risks relate to the cash flows uncertainties because there is a risk of price fluctuations that a firm have to pay for raw materials, labor costs (input prices) and a risk that a company may require for the commodity (sale prices). I will separate such risks into subcategories. It will be risks of transaction costs, interest and freight rates, operating and asset-price risks.

### *Freight Rate Risks*

Lets begin with freight risks. The risk of freight rates is one of the most considerable factors for a shipping organization. Freight rates are very unstable and have a great effect on the firms' profit. However, if we compare the NSR and the Suez Canal, the navigation via the NSR will not have higher risks of freight rate to a transport company than shipping along the Suez Canal. In the shipping industry the necessity of risk control in freight markets has been widely known, hedging techniques have been introduced in the daily activities of most industry companies. Thus, the risk of freight rates will continue to be high, but will not be higher according to the use of the NSR.

The Forward Transportation Agreement (FFA) is one of the widely used methods of hedging against the risk of freight rates. FFA is an agreement where the owner of a vessel or charterer negotiates with the agent to pay off the freight rate or the rental rate for shipment at a definite future time. The owner of a vessel can sell the agreement to protect the firm from a sudden freight rates decrease. The organization tries to protect freight revenues by hedging itself from freight rates decrease risks,

for the reason that, when freight rates reduce, the falling in freight earnings will be recompensed by a forward position rise in.

### *Risk of Operating costs*

Not only freight rates play an important role for shipping firms, costs changeability is another necessary factor. Consequently, the return rate depends on operating cost. Shipping along the NSR has a lot of consequences for single voyage' operating costs. The important operating cost factors are insurance and fuel costs, icebreakers' service and tariffs for transit.

### *Bunker costs*

Nowadays, bunker oil costs present a significant part of the operating costs of a transport organization. Usually, bunker costs are more than 50 % of total costs of the voyage. Consequently, bunker price fluctuations can have a significant influence on the operating profit. In order to ensure operating profit of a company, in the bunker market it is important to manage the exposure to changes.

Shipping organizations make bunker supply, forward contracts and bunker prices' options to limit fluctuation risks. A forward bunker contract is a contract between 2 groups, which means the bunker exchange of definite quantity and quality at the decided price at a definite agreed delivery time and place in the future.

Shipping through the NSR can diminish consumption of fuel by about 30 %. As a result, it can decrease the risk exposure, because for one voyage vessels will need less fuel to sail through the NSR than via Suez Canal. Unfortunately, there can be unexpected changes due to the harsh weather and ice conditions. The voyages can be delayed, so, ships will stay waiting, using fuel. This will decrease the benefit of the diminished consumption of the fuel and companies will expect the same risk level.

### *Icebreaker fees*

As it was already mentioned, to navigate via the NSR the organizations need to pay a fixed tax for using the route and for icebreaking service. Icebreaking service will be carried out by Russian icebreakers. The main support's goal is to make sailing safe for vessels. Now, the fee amount depends on the cargo weight, the ships ice classification and the length of the necessary icebreaker.

Nowadays, the risk of cost changes of icebreakers does not exist theoretically, but companies have doubts that the government of Russia will use the power in the NSR only in own interests. This can lead to an operating costs' growth. Cost-benefit ratio associated with the NSR operations is unprofitable in this case, so, it will lead to catastrophic scenarios.

### *Cost of insurance*

The NSR insurance premium can be compared with the Suez Canal. Insurance firms usually use the "wait" approach, because there is not a great number of insurance claims. However, it is expected that insurance organizations will enlarge the level of the insurance premium in order to react to the future possible emergency situations. For Norwegian shipping organizations this can be also a great problem, if they want to ship via the NSR.

In addition, despite of the fact that sometimes ships can navigate without the help of icebreakers, insurance organizations usually insist on icebreakers' accompaniment. Insurance firms require this to limit the risk that a small failure becomes a major claim. So, owners of vessels must pay for icebreakers, even if it is not necessary.

Insurance is also a type of hedging. To hedge such a risk, it is necessary for companies to know the factors which influence the insurance premium. First of all, it is necessary to have a highly qualified crew to navigate in the Arctic region. Moreover, if the owner of the vessel considers to order vessels with the higher



classification of ice, this fact will be an important signal for the insurance firm. In addition, this risk premium depends on the general risk of the industry and the firm. So, it may be useful for organizations to use strategy of the portfolio management to decline company's overall risks.

#### *Interest-rate risk*

The associated with interest rates risk is related to the firms' influence on interest rate fluctuations. As I said earlier, the shipping industry has a high level of capital intensity. Many vessels are maintained by loans. Therefore, interest rates' changes may have a significant impact on the firm's profit. Sometimes, unforeseen fluctuations can make problems with liquidity and cash flow, which means that the organization can no longer cover its debt.

To ship through the NSR, a company needs to renew the fleet, which is very expensive. In order to get bank loans, the company must show creditworthiness, financial capability, the size of fleet and reputation references. To control the firm's exposure to interest rate risks, hedging methods, for example, interest-rate futures, options and swaps are usually used.

#### *Asset-price risk*

The risks associated with the price of assets, which are based on the price changes of the company's assets, are a significant factor for shipping organizations that prefer to navigate through the NSR. As it was said before, passing through the NSR needs modernization of the fleet (Guy, Lasserre, 2016). The main asset for each transport company is the vessel's value. That is why the price's changeability influences the balance value of the organization. This can lead to a creditworthiness' decline and the ability of a firm to deal with debt obligations.

There is a high uncertainty level about the future NSR usage. So, the first risk can be, if a firm uses the NSR during main year's parts and it chooses an alternative -

"without ice class", the competitive position of such firm will be decreased. The second one: if the organization starts to invest money in ice-class vessels; the conditions of ice deteriorate; regulatory, political or trade elaboration does not develop enough, vessels will not be used for their goals, which means that the ships' cost will be considerably decreased (Guy, Lasserre, 2016). Such threats can seriously affect the company. The fleet modernization needs investments. So, if the firm does not cope with the investments, it can lead to great losses or even to bankruptcy.

A lot of shipping organizations decided to exclude risks of ship prices. They do not own ships, but try to take vessels into leasing or just to charter them. For transport organizations that prefer to ship via the NSR, the drawback of such solution is ice-class vessels' shortage in the industry (Arbnor, Bjerke, 2009). Investors will not have any income from vessel's assessments or from the gain of the capital. That is why, portfolio control is the best chance to regulate risks.

### *Credit risks*

Credit risk usually appears when there is an uncertainty of the fact whether for the transaction process a company / a person obliges financial obligations completely and on time. Credit risks appear because of the reason that many contracts or deals are made on so, that principles must honor the agreement. They rely on each other in such case. Losses related to credit risks may arise due to unfinished execution or delay.

Compared to the Suez Canal, if the owner of a vessel wants to navigate along the NSR, he will not be unprotected from credit risks. as compared to sailing through the Suez Canal. This is due to the fact that they are likely to deal with the same clients as when shipping in the SC. In the analysis of the company's performance such risks will be included. Shipping organizations will know which route to choose and which effect it will have on the their performance.



The results of the risk can be: probability of default and default loss. The risk of default is the risk when a company / a person fail to perform obligations. Loss-given default can be result of financial losses. The most challenging process is to measure risks and creditworthiness (Arbnor, Bjerke, 2009). It can be influenced by a number of factors which can quantitative or qualitative in nature.

Qualitative risk analysis is a number of factors which can not be directly measured. For example, the organization's reputation, ethics, management, their market place, financial or operational flexibility (Arbnor, Bjerke, 2009). Quantitative analysis is based on mathematical and statistical data to measure default probability. To measure default probability, companies usually ask rating agencies to help or use ratings.

In addition, to control credit risks it is recommended to use such methods. Security - a company that deals with credit risks requires some form of security. The contract can be changed if the creditworthiness of a party is declining. In the contract should be mentioned conditions, if it is default or unpaid compensation. Diversification of contracts of the company is also an important moment, which leads to minimization of the overall portfolio risk. Credit derivatives depend on the effectiveness of companies in the implementation of the agreement (for example, spread options).

### *Pure risk*

As a result of pure risk, potential liability can be so serious that will cause problems to the organization's viability. Pure risk is a risk of declining of business assets' value due to emergency situations, damages, technical malfunction and human mistakes.

A vessel passing the NSR can have a large number of risk factors compared to other routes. Navigation via the NSR is directly connected with high pure risks. Such factors as, ice, harsh weather conditions, technical mistakes, damages, crew failures

will be result of losses. Losses can be direct or indirect (Arbnor, Bjerke, 2009). Direct losses are physical property damages, for example, damages of equipment or raw materials. Indirect losses are associated with financial part. To limit pure risks, shipping companies have to make a distribution for happening frequency of every risk, analyze losses' severity and develop summary of losses per each year (Gupta, 2013).

Insurance contracts are widely used to control pure risks, because such risks are associated only with the loss' possibility; they do not give an opportunity to get any profit. To decrease pure risks' exposure, organizations can find other methods, such as crew training, modernization of technologies, ship design' control.

#### *Political risks*

The political risks are risks associated with uncertainties, which appear due to political conditions. For example, shipping organization can meet problems with unfinished agreements or contracts due to the fact that Russia or the country of the company can not fix misunderstandings. There can also be license abolitions for Russian permits in shipping via the NSR or environmental organizations' protests. Russia can easily change the rules, for example, about taxation system. More than that, there can be terrorism threat, although it is scarcely likely.

Each company can operate with lots methods to control political risks (Arbnor, Bjerke, 2009). For example, staff control, lobbying, various insurances, hedging, etc.

I will summarize all mentioned in the table, which gives complete overview of risk exposure. I tried to compare the NSR risks with risks of using other routes.

*Table: Level of exposure' risk*

| Type of risk         | Exposure level in comparison with other routes |
|----------------------|--|
| Price risk           | >  |
| Bunker cost risk     | <  |
| Icebreaker cost risk | >  |
| Insurance risk       | >  |
| Interest rate risk   | >  |
| Asset price risk     | >  |
| Freight rate risk    | =  |
| Credit risk          | =  |
| Pure risk            | >  |
| Political risk       | >  |

= - equal level

< - lower level

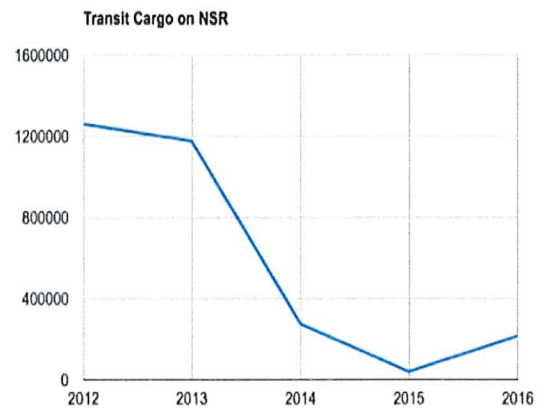
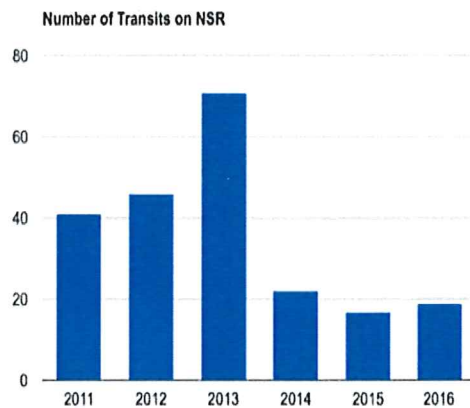
> - higher level

If we summarize all above mentioned, shipping company will meet such advantages and disadvantages, if it is planning to operate in the NSR:

| +   | -  |
|---|--|
| <ul style="list-style-type: none"> <li>✓ No or small chance of piracy</li> <li>✓ Time savings</li> <li>✓ Cost savings</li> <li>✓ Bunker oil savings</li> <li>✓ Shorter distance</li> <li>✓ Small emissions</li> </ul> | <ul style="list-style-type: none"> <li>✓ Old infrastructure</li> <li>✓ Political problems</li> <li>✓ Harsh ice and weather conditions</li> <li>✓ High investments</li> <li>✓ Serious requirements</li> <li>✓ Possibility of corruption</li> <li>✓ Uncertainties</li> <li>✓ Seasonal usage</li> </ul> |

In 2013 there was a peak of transits in the NSR. 73 ships went through the NSR with 1 200 000 tons of cargo. But after that year the number of transits fell significantly.

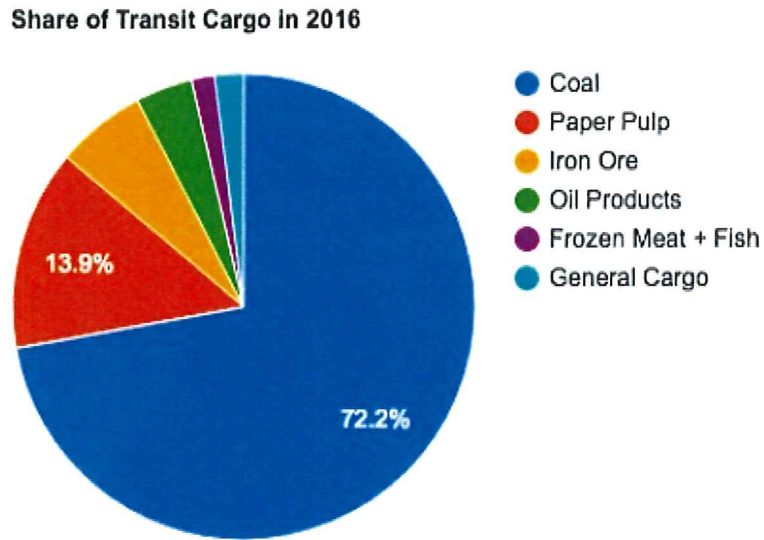
For example, in 2015 only 18 ships carried 390 000 cargo tonns, going from Asia to Europe and vice versa. In 2016 there was a slight increase of transit (19 ships), but in any case, transit traffic can not now reach results of 2013 year. Each year 3 vessels were from Norway.



([www.highnorthnews.com](http://www.highnorthnews.com))

If we pay attention to the data, about 72% of transited cargo via the NSR in 2016 was coal and oil products have only the third place. Shipping traffic in the Arctic region experienced considerable increase in 2017 ([www.highnorthnews.com](http://www.highnorthnews.com)). Compared to the year 2016, cargo volume increased by 40 %.

Graph: Share of transit cargo, 2016

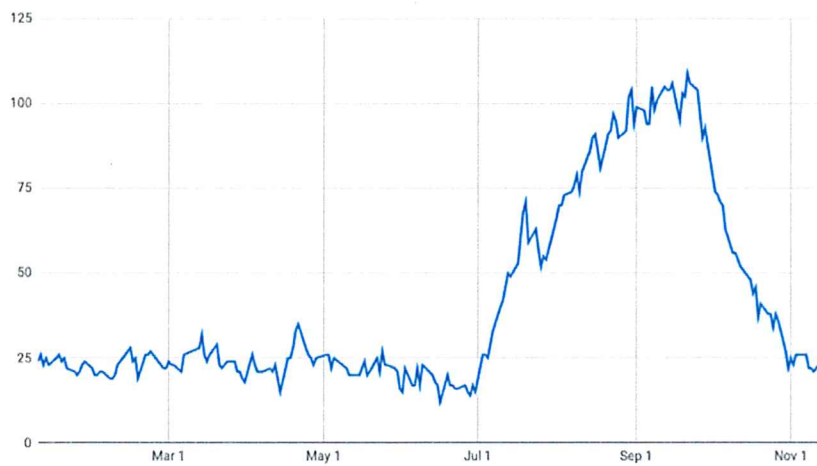


([www.highnorthnews.com](http://www.highnorthnews.com))

During 2017 the bulk shipping took place only during the 4 months: the beginning of July - the end of October. It was 72% of the NSR' annual traffic. The 21st of September was the busiest day: 109 ships operated on the route. But usually during the day operate around 15-20 vessels ([www.highnorthnews.com](http://www.highnorthnews.com)).



*Graph: Number of active ships on the Northern Sea Route*



([www.highnorthnews.com](http://www.highnorthnews.com))

The majority of ships were under the Russian flag and 75 ships operated with foreign flags. However, transit traffic was dominated by foreign companies ([www.highnorthnews.com](http://www.highnorthnews.com)). Only 6 vessels were Russian, 18 were foreign.

## 6. Conclusion

During my research I found both pros and cons of the NSR. Despite of the fact that the route is sufficiently attractive, many identified problems outweigh the pluses. However, if the Russian Federation pay attention on some necessary issues, the future of the route is going to be prosperous. The NSR has advantages for shipping organizations - short distance, cost savings, etc. But all pluses should be compared to lots of challenges.

According to all said above, we can conclude the following:

- 1) The role of NSR as national transport connections is that route is the most important segment of the economic complex infrastructure of the Far North and of the connection between the western regions of the country and the Far East of Russia. It unites the largest river waterways of Siberia into a single transport network. For certain areas of the Arctic zone (such as Chukotka, the islands of the Arctic seas and a number of settlements on the Autonomous Area of the Taimyr Coast (Dolgan-Nenets) ) - sea transportation is the only means of transporting goods and providing life support to the population.
- 2) The existing system for regulating the public support for northern territories, especially the Arctic zone, the Northern Sea Route and the entire Arctic transport artery, has come into conflict with economic conditions and federal relations at the current stage of development of the country. Traditional approaches to solving social and economic problems do not allow to effectively realize the natural-resource, production and transport potentials of this region, which are vitally important to the country.
- 3) As measures ensuring the development of the SME infrastructure, it is necessary:

- to accelerate the adoption of the state program on study and development of continental shelf of the Russian Federation for 2010-2039, which provides for the reconstruction of federal property in seaports;
- to develop a program for the future development of main ports in Naryan-Mar, Salekhard, Dudinka, Dickson, Tiksi, Pevek, Providence for deployment of navigational, hydrographic, hydrometeorological support systems, as well as for rescue at the front and for support services of various departments;
- to ensure implementation of a unified technical strategy for the creation and operating of dual-use facilities and systems;
- to ensure mobilization preparedness of the Arctic seaport infrastructure.

Some cases of transit navigation show the sensitive attitude of shipowners and insurance companies to conditions of navigation along the routes of the Northern Sea Route, including opaque rates and existing administrative barriers. Use of high-capacity ships places enormous demands on the state of the SME infrastructure and the arctic shipping organization.

In order to create favourable conditions for the construction of ice-class ships at Russian shipyards, the Ministry of Transport of the Russian Federation was developed a draft Federal Law "On Supporting the Shipbuilding Industry and Navigation". In accordance with the draft federal law it's required:

- 1) to create conditions for the elimination of technological backwardness of Russian shipbuilding industry, as well as for increasing innovation activity and competitiveness;
- 2) to create economic and legal conditions that stimulate the renewal of Russian fleet at Russian shipyards;
- 3) to increase attractiveness and effectiveness of Russian international shipping registry.

It is necessary to develop laws that protect interests of Russian industry and fleet, as well as protectionist policies with respect to Russian shipping companies and industrial enterprises that carry out their economic activities in the northern regions of Russia.

The main measures for development of the economy in the Arctic zone of Russia are strengthening of Russian priorities in the Arctic and restoration of partially lost transport and economic potentials consisting of scientific and practical development:

- main directions of government support for the restoration of the Trans-Arctic Northern Sea Route as a basis for promising domestic and international communications;
- the economic justification for "Murmansk Corridor" international maritime shipping of oil products and Yamal's liquefied gas from Russia's Arctic fields to solve energy supply problems in the North-West of Russia as well as Murmansk region, and for expansion of export of these products;
- program of action of federal executive bodies, authorities of northern regions - subjects of the Russian Federation and economic entities of the Arctic zone for the integrated use of the Northern Sea Route and its use on a commercial basis.

The development of transport market on the Northern Sea Route can be achieved by reducing transport costs, increasing reliability and timeliness of delivery, improving transport facilities, supporting manufacturers and transporters. This wide range of transport services can be achieved by developing and forming a single transport system in the Arctic zone of Russia, which ensures selection of optimal scheme for the delivery of goods; development of freight forwarding companies; carrying out anti-monopoly strategies by organizing tenders for supply and delivery of goods and the introduction of an information system for transport services on the Northern Sea Route.



To determine possible and optimal options for the formation and effective functioning of the Arctic maritime transport system, which is the Northern Sea Route, it is necessary to investigate the issues of investment, tariff policy, payment for services provided during navigation on the North Sea. Route, tax, customs and credit policies in the North Sea route and improvement of the whole control system as the main northern transport seaway of Russia, capable of providing a guaranteed and economically efficient shipping of growing volumes of goods in the shortest possible period of time, taking into account social, defense, environmental requirements, ensuring national security.

The government should perform the functions of state regulation and coordination of interests of all organizations and enterprises participating in navigation along the Northern Sea Route. It acts as a guarantor of legal, organizational and material support for the Northern Sea Route, which, under the control and control of the government, should generate income not only for commercial organizations, but also for the budget of the country and the northern regions, in particular, as in the operating of the Suez Canal and the Panama Canal.



## 7. Reference List

1. Abdul Rahman, N. S. F – Saharuddin, A. H. – Rasdi, R. (2014) Effect of the Northern Sea Route Opening to the Shipping Activities at Malacca Straits. *International Journal of e-Navigation and Maritime Economy*, Vol. 1, 85–98. doi:10.1016/j.enavi.2014.12.008.
2. ACIA (2004) Impacts of a Warming Arctic: Arctic Climate Impact Assessment. ACIA Overview report. Cambridge University Press.
3. Aguilar, F. J. (2011) *Scanning the Business Environment*. The Macmillan Company, New York, US.
4. Arbo, P. – Iversen, A. – Knol, M. – Ringholm, T. – Sander, G. (2013). Arctic futures: conceptualizations and images of a changing Arctic. *Polar Geography*, Vol. 36 (3), 163– 182. doi:10.1080/1088937X.2012.724462.
5. Arbnor, I. – Bjerke, B. (2009) *Methodology for creating business knowledge*. 2nd ed. Sage Publications: Thousand Oaks, CA.
6. Arctic Council (2009) *Arctic Marine Shipping Assessment 2009 Report*. Arctic Council: Tromsø, Norway.
7. Arctic Portal (2015) Arctic Portal Maps. <<http://arcticportal.org/maps/download>>, retrieved 2.12.2015.
8. Arlbjørn, J. S. – Halldórsson, A. (2002) Logistics knowledge creation: reflections on content, context and processes. *International Journal of Physical Distribution & Logistics Management*, Vol. 32 (1), 22–40. doi:10.1108/09600030210415289.
9. Armstrong, T. E. (1999) The Soviet Northern Sea Route. *The Geographical Journal*, Vol. 121 (2), 136–146.
10. Arpiainen, P. (2009) *The Northern Sea Route – A traffic Potential Study*. Publications from the Center for Maritime Studies University of Turku A 16.
11. Bekkers, E. – Francois, J. F. – Rojas-Romagosa, H. (2015) *Melting Ice Caps and the Economic Impact of Opening the Northern Sea Route*. CPB

Discussion Paper.

12. Bendall, H. B. (2010) Cost of piracy: A comparative voyage approach. *Maritime Economics & Logistics*, Vol. 12 (2), 178–195. doi:10.1057/mel.2010.1.
13. Gunnarson, B. (2016) Future Development of the Northern Sea Route. *Maritime Executive* 18.2.2016. <<http://www.maritime-als/future-development-of-the-northern-sea-route>>, retrieved 14.9.2016.
14. Guy, E. – Lasserre, F. (2016) Commercial shipping in the Arctic: new perspectives, challenges and regulations. *Polar Record*, Vol. 52 (3), 294–304. doi:10.1017/S0032247415001011.
15. Sakhuja, V. (2013) Sailing through the Northern Sea Route: Opportunities and Challenges. *Strategic Analysis*, Vol. 37 (4), 494–498. doi:10.1080/09700161.2013.802524.
16. Sakhuja, V. (2014) The Polar Code and Arctic Navigation. *Strategic Analysis*, Vol. 38 (6), 803–811. doi:10.1080/09700161.2014.952943.
17. Sayer, A. (2000) *Realism and Social Science*. Sage Publications, London.
18. Sazonov, K. E. (2011) Navigation challenges for large-size ships in ice conditions. Vol. 6 (3): 231–238. doi:10.1080/17445302.2010.548123.
19. [www.amap.no](http://www.amap.no)
20. <http://expert.ru/dossier/story/arktika/>
21. [www.businessdictionary.com](http://www.businessdictionary.com)
22. [www.taimyr24.ru/dop\\_Dud](http://www.taimyr24.ru/dop_Dud)
23. <http://russiancouncil.ru/inner/>
24. [www.norskindustri.no](http://www.norskindustri.no)
25. [www.highnorthnews.com](http://www.highnorthnews.com)
26. [www.bigenc.ru/geography/](http://www.bigenc.ru/geography/)
27. <http://ac.gov.ru/files/content/10406/neft-i-gaz-v-rossijskoj-arktike-pdf.pdf>
28. <http://oilgasnews.ru/news/77-dobyicha-nefti-v-arktike>
29. <http://www.odnako.org/almanac/>

30. <https://maximillienr.livejournal.com/33187.html>
31. [www.morvesti.ru/tems](http://www.morvesti.ru/tems)
32. <http://delonovosti.ru/analitika/3318-perspektivy-dobychi-uglevodorodov-v-arktike.html>
33. [http://forumtek.ru/press-centre/industry-news/industry-news\\_360.html](http://forumtek.ru/press-centre/industry-news/industry-news_360.html)
34. <http://russiancouncil.ru/common/upload/ArcticOilaAndGas-Policybrief8-ru.pdf>
35. <http://www.sciencedirect.com/science/>
36. <https://skemman.is/bitstream>
37. [www.vestifinance.ru](http://www.vestifinance.ru)
38. <https://nsportal.ru/ap/library/>
39. [www.slideshare.net/innovasjon norge/commercial-transit-through-the-northern-sea-route](http://www.slideshare.net/innovasjon norge/commercial-transit-through-the-northern-sea-route)
40. [www.hellenicshippingnews.com](http://www.hellenicshippingnews.com)
41. [www.unctad.org](http://www.unctad.org)
42. [www.innovasjon norge.no](http://www.innovasjon norge.no)
43. [www.tass.ru/ekonomika/](http://www.tass.ru/ekonomika/)
44. [www.rederi.no](http://www.rederi.no)
45. [www.doria.fi](http://www.doria.fi)
46. [www.regjeringen.no](http://www.regjeringen.no)
47. [https://narfu.ru/upload/iblock/647/06\\_selin.pdf](https://narfu.ru/upload/iblock/647/06_selin.pdf)
48. [www.radartechnology.ru](http://www.radartechnology.ru)

## 8. Appendices

### Questionnaire

1. Company's name:

2. How many vessels are operated by your company?

3. Activity sector:

RoRo

Bulk

Tanker

Container

General Cargo

—  
Other

Please, evaluate the statement:

5. Our company has a high level of knowledge about the Northern Sea Route.

Strongly disagree

—

Disagree

Neither agree nor disagree

Agree

Strongly agree



6. Do you think that the Northern Sea Route will become a viable option compared to the Suez Canal for navigation between Europe and Asia?

Yes

No

In 10-15 years

In 20-30 years

In more than 30 years

7. Does your company consider using the Northern Sea Route?

Yes

No

I don't know

Why/Why not?

8. What are the main advantages for navigating along the Northern Sea Route?

9. What are the main challenges for navigating along the Northern Sea Route?

10. Should the Norwegian government take an active role in developing of the Northern Sea Route?

Yes

No

I don't know

Why/Why not?

11. Did your company use the Northern Sea Route for commercial shipping?

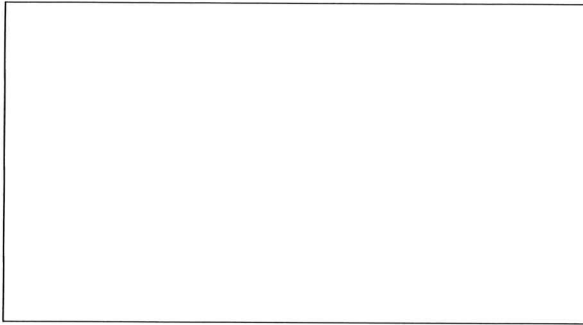
Yes

No

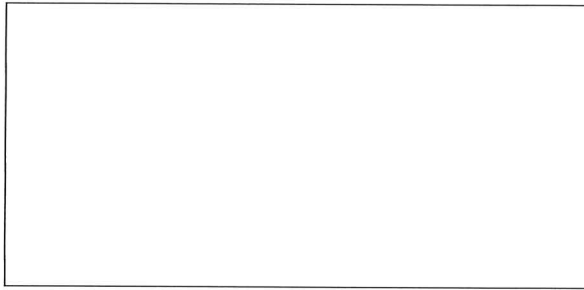
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12. What measures need to be taken to make the Northern Sea Route a viable navigation option?

**13. What are the main risks of shipping via the NSR?**



**14. Who should be responsible for the route development - only Russia or other Arctic countries?**



**15. Please, characterize the today's shipping industry in a few words?**

