Master Thesis

Marine spatial planning in the Russian arctic.

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Summary.

Change has come to the Arctic regions with high speed. While ice is melting away, regions that formerly seemed barren and inaccessible are now slowly but steadily turning into areas filled with new opportunities. The Arctic Ocean near Russia and the adjacent Russian Arctic seas is one of the regions in the Arctic that is now looked at with increased interest.

Increased pressure and industrialization of the oceans and seas is not just limited to the Russian arctic but is a global phenomenon. A growing world population, higher consumer demands and technological improvements are causing an increased use of the marine space, causing conflicts between different users and the environment. To mitigate or even eliminate these conflicts Marine Spatial Planning (MSP) has been developed. This planning concept has been created to plan the most heavily used marine areas and create solutions for the conflicts that arise between functions and with the environment.

Although the pressure on marine space in the Russian arctic is currently not extremely high, a large amount of changes is expected to take place in the near future. In this thesis the goal is to find an answer to these two questions;

- How would the MSP process look like for an area such as the Russian arctic?
- How could the end-result of an MSP in the Russian arctic look like?

To find the answers to these questions the first step is to find out how an MSP is done and how the process looks like. The following has been found; typically,

- Before an MSP should be started, it should be established if an MSP is desirable for the area and the general goal of the MSP should be stated. This general goal should centre on the principles of sustainability.
- The most important conventions and laws in the legal framework are; National laws, United Nations Convention on the Law of the Sea, Convention on Biological Diversity, agenda 21, and the World Summit on Sustainable Development. These laws and convention contain not only

rules to which an MSP should comply but also provide a legal justification for the creations of a marine spatial plan.

- Scale, depended on the circumstances the scale ranges from the whole EEZ of a country to local plans.
- Ideally ecosystem boundaries would be used and the whole of the coastal zone would be included. In praxis administrative boundaries are being used.
- The timeframe ranges between 10 and 25 years, review period of 5 years is recommended.
- The process exists out of 8 steps. 1, determine goals and objectives. 2, identify issues and collect information. 3, analyze information and generate options. 4, evaluate options. 5, prepare spatial plan. 6, examination of plan. 7, adopt plan. 8, implement, monitor, and review. Stakeholder agreement should be an iterative activity during the whole process.
- The information needed to conduct an MSP are; the characteristics of the area, functions in the area, the licensing system, the legal framework, and the planning system and traditions.
- The functions that should be researched are; transportation, strategic. Minerals and energy, living resources, waste disposal, leisure and recreation, education and research, conservation, and coastal engineering.

To find out how the general theory can be used and what adaptations are necessary for an MSP in the Russian arctic, this thesis presents the first three steps of the marine spatial planning process; Determine goals and objectives, identify issues and collect information, and analyze information and generate options.

Beside a large number of similarities between the theory and the case study a few differences arise.

- The fact that the motivation for an MSP in this region is expected growth in pressure instead of already existing pressure makes the study area an atypical candidate for an MSP.
- Because of the aforementioned point, an MSP in this area should be more proactive and review periods are of a greater importance.
- While it is very difficult and unpractical and to implement all principles of sustainability into the general goal the the precautionary principle, the polluter-pays principle and the preventive principle are left out. A spatial plan might not be the best tool for the implementation of these principles.
- While not all functions exist in the study area, a selection could be made. It is also found that although some activities do take place in the area they might have no significant spatial impacts. It is advisable that before information is gathered a small inventory is made of functions located in the study area.

These findings show that only small adaptations are needed to make MSP a very useful instrument to prevent problems that might occur in the future in the Russian arctic.

Besides recommendations about the planning process, the three scenarios that are created in the analysis and options generation phase provide also information of how a marine spatial plan for the Russian arctic might look.

- Due to the large size of the study area it will be more practical to divide the area up and create several MSPs, an overall strategic plan can help coordinating the different plans
- Not all areas of the Russian arctic are in need of an MSP, most activities are likely to take place in the Barents Sea and to a lesser extend in the Kara Sea. the Laptev Sea, the East Siberian Sea, and the Chukchi Sea are more likely to stay relatively undeveloped, in these regions are not yet in need of an MSP.

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Chapter 1. Research proposal.

1.1 Introduction.

In the recent years change has come to the Arctic regions with high speed. While ice is melting away, regions that formerly seemed barren and inaccessible are now slowly but steadily turning into areas filled with new opportunities. But climate change is not the only factor that is influencing the region. Pressure from the outside the region is growing and a high world population growth, an increased standard of living, and technological improvements have increased the need for more food, more energy and more trade which has turned the regions natural resources into high sought after commodities. (Smith, 2000) The region is increasingly viewed as a place where natural resources are abundant, and it seems that with just a little bit of risk taking and effort, huge profits can be made in a short period of time. Carefully the first steps into exploitation of the far north have been set and the pace of industrialization in the polar region is expected to rise. But the arctic isn't a blank area ready for exploitation, but instead a place with its own history, inhabitants and a fragile environment. To prevent long-lasting or even permanent damage, development in this region should therefore be well-considered and done with caution.

The Arctic Ocean near Russia and the adjacent Russian Arctic seas is one of the regions in the Arctic that is now looked at with increased interest. Shipping companies see new possibilities for shipping routes and oil companies are taking a look at the large amount of natural resources present. Meanwhile environmental groups are predicting a large and devastating impact of human induced climate change and industrialization on the fragile ecosystem. Increased usage of the Russian Arctic waters can lead to two different kinds of conflicts. The first is user vs. user conflicts, where different uses are incompatible with each other and have to compete for space. Secondly user vs. environment conflicts is where the cumulative impact off all different uses has a negative effect on the environment. (Douvere & Ehler, 2009) To accommodate growing

number of different and often conflicting claims on space in a sensitive environment a new approach is needed.

In the recent years experimentation with a new spatial planning instrument called marine spatial planning has started. (Also called integrated management, marine spatial management, integrated maritime planning, and ocean zoning, the terms are still being used inconsistently. (Douvere, 2008)). This instrument was used in the past primarily as an instrument for the development and management of marine protected areas, thus primarily focusing on the user vs. environment conflicts. Recently a number of counties such as Belgium, the Netherlands, and Germany took marine spatial planning one step further, and created what the European Union named maritime spatial planning or integrated maritime spatial planning. (Douvere &Ehler, 2009) Besides avoiding or mitigating user vs. environment conflicts the avoiding of user vs. user conflict where also incorporated into the plan. Maritime spatial planning is defined by the European union as; a *tool for improved decision-making. It provides a framework for arbitrating between competing human activities and managing their impact on the marine environment. Its objective is to balance sectoral interests and achieve sustainable use of marine resources.* (European Commission, 2008, p. 2)

The countries that are now taking the lead in marine spatial planning all got in common that their seas are heavily used by a large number of different industries and stakeholders. Using this instrument for the Russian Arctic Ocean will take marine spatial planning yet another step forward. In this case it will not primarily be aimed at resolving existing conflict such as in the traditional plans, but marine spatial planning in this region will have to be aimed more towards planning expected development in such a way that conflict will be avoided in the future.

1.2 Research objective & questions.

In this thesis I will create with the help of marine spatial planning, a number of scenarios for how the waters of the Russian Arctic ocean could be organized in the future with a minimization of the damage to the area and an optimal as

possible efficiency for the industries that are likely to use the region. By using the first steps of the marine spatial planning process to create these scenarios I hope to reach two goals, one that focuses on the process and one that is oriented on the outcome of the process. The first goal is to find out how an MSP for a unique area such as the Russian arctic would look like and how the process might differ from MSP elsewhere. Secondly, with the help of MSP I would like to find out how the end-result of the planning process might look like for the study area.

In order to get enough knowledge about marine spatial planning and the characteristics of the region to reach the research goal, first a few sub questions have to be answered.

About the marine spatial planning;

- What is the purpose of a marine spatial planning?
- What scope and scale should be used?
- What steps should be taken?
- What should be the end result?

With the help of these questions I hope to learn enough about spatial planning and the accompanying process to be able to perform the first three steps of the planning process for the study area.

About the region;

- Is an MSP useful for the study area?
- What are the area characteristics?
- What are the current uses in the area?
- How are the current uses likely to change in the future?

By first studying how an MSP should be performed in theory and consequently performing an MSP partially for the study area, I hope to reach both my aforementioned goals.

1.3 Theoretical framework

For this study the main emphasis will be put on marine spatial planning, and how this process may look like for an area such as the Russian Arctic. Marine spatial planning in his thesis will not be limited to only user vs. environment conflicts

but will also encompass user vs. user conflicts. Thus will be based upon the more recent trend to incorporate all the major uses from all sectors that are in need of space in the ocean, not only focusing on marine protected areas. This thesis will build upon scientific, corporate, and governmental sources that write about the reasons for incorporating marine spatial planning, how the process of marine planning is likely to be shaped, as well as a number of recent examples of best praxis.

1.4 Research Methodology

In order to obtain enough knowledge about how a marine spatial should be shaped and executed and about the characteristics of the studied region, research has to be done. The first four research questions mentioned here in the sub-chapter research objective & questions will be handled in the second, theoretical chapter of the thesis. This chapter will mainly focus on the what and how in marine spatial planning. To acquire this information a number of scientific articles and books will be used as well as professional literature.

The last 3 sub-questions are more oriented at the research area instead of the actual planning itself. These questions will be answered in chapter three, to find answers in this chapter, scientific literature will also be studied, and next to that a number of Russian government papers, corporate papers, and internet sources will be used.

In the fourth chapter the scenarios for the study area will be created. These scenarios will be the end-result of the third, and for our case study also the last step in the MSP process. While the goal of our scenarios is to explore options for the future and analyze what would happen in the region if certain policies would change, forecasting scenarios will be used. This type of scenarios is usually used for exploratory researches whereas normative, backcasting scenarios are more suitable for decision support. (Van Notten et al, 2003) While forecasting scenarios are being build up from the current situation and explore the future from that starting point, a clear view is first needed on what the current situation looks like, therefore the first action in the scenario building process will be

creating a map of current uses. While the goal marine spatial planning is to create a spatial plan where compatible uses coexist and conflicting uses are separated, the scenarios should be based upon this theory. Consequently, the next action in the process will be to create an overview of what functions can coexist peacefully in the study area and which ones are better separated. After the creation of the map of current uses and an overview of compatibility of functions the scenarios can be created.

Three scenarios will be made; one 0+ scenario where the current policies are maintained and development will proceed as usual, one where natural protection is prioritized and industrial development takes second place, and in the last scenario the industrialization will be prioritized and natural conservation is put on the second place.

For the final chapter an analysis of all gathered information in the previous chapters will be necessary to come to a final conclusion,

1.4 Area delineation.

The complicated boundaries and the large number of disputed areas in the Arctic make it necessary to define the research area clearly. The area that will be analyzed in the thesis will be the undisputed Russian part of the Barents Sea, the Kara Sea, the Laptev Sea, the East Siberian Sea, the Russian Part of the Chukchi Sea, and the undisputed Russian Part of the Arctic Ocean. Further the research area will include a small portion of the Russian shore and the Arctic islands, especially to find out

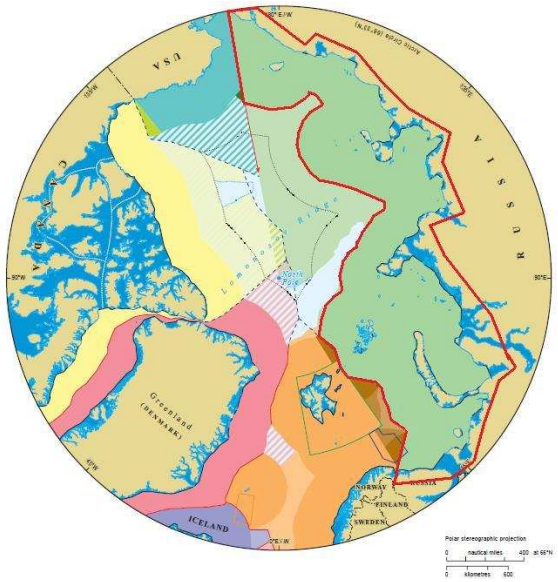


Figure 1, Maritime jurisdiction and boundaries in the Arctic region (international boundaries research unit, Durham University, 2010)

where the relevant infrastructure for marine activities such as ports and pipelines are located. The reason why only the undisputed Russian areas have been chosen is while it is unlikely that Russia will plan and implement a marine spatial plan in these areas. Such an action can be seen as quite hostile to the countries with which Russia has a dispute with over jurisdiction. To maintain good relations with these countries the disputed part will not be planned. Figure 1 above displays the research area within the thick red lines.

Chapter 2. Marine spatial planning.

In this chapter the theory of marine spatial planning (MSP) will be studied. Knowledge will be gathered to answer the first 4 sub-questions of the thesis:

- What is the purpose of a marine spatial planning?
- What scope and scale should be used?
- What steps should be taken?
- What should be the end result?

To find the answer to these questions a number of subjects will be handled. First a closer look will be taken to what the purpose of an MSP is. Next the legal framework will be discussed. Further the scope and timeline will be handled and conclusively the process of an MSP will be discussed in further detail. At the end of the chapter a summary will be made with the most important findings of this chapter. In the conclusion this summary will be compared to the summary of chapter 3 where the case study will be preformed.

2.1 Purpose of a marine spatial planning.

The world oceans and seas are under pressure, high population growth, technological improvements, and consumer demands have increased the need for food, energy, and transportation. And an increasingly large share of these demands rely ocean resources. (Douvere & Ehler, 2009) The reason for increased pressure on ocean space can be divided into three causes (Schultz-Zehden et al, 2008). First, longstanding sea uses are becoming more intense. This is phenomenon is caused foremost by the growth of the world population and higher consumer demands. Secondly, a multitude of new functions and new forms of functions are starting to appear in the marine areas. Aquaculture, wind energy, and wave energy can be viewed as some of these new emerging uses. These new functions are usually arising from improvements in the technique. Finally, environmental change puts additional pressure on the marine areas, climate change and sea level rise are changing the environment and thus the uses that are possible in certain regions.

Increasing use of the seas does not only lead to the possibility of conflicts, but is also causing an increasing number of rules and regulations. These are more and more needed to mitigate the impact on the environment and to avoid conflicts. Recently another instrument has been introduced for the managing of the seas and oceans; maritime spatial planning. Rules and regulation for seas and ocean have been existing for a long time .The first regulations for the marine area date back as far as the 6th century when the Romans created the first laws for the Mediterranean. (Encyclopædia Britannica, 2010) Even spatial plans for seas are not a new phenomenon, since the creation of the Law of the Sea (UNCLOS) nations have the right allocate areas to functions such as shipping lanes. So what is the added value of a marine spatial plan (MSP)? And, how does it differ from conventional regulations?

The most important characteristic of conventional regulations and plans is that they are predominantly designed only for a particular sector. Marine protected areas, shipping, military zones, and a number of other sectors each have their own regulations and additional spatial zoning. (Douvere, 2008) The lack of an integrated spatial plan can lead to a number of negative consequences. Douvere (2008) distinguishes;

- Conflicts caused by spatial and temporal overlap in non-compatible activities. This encompasses both user-user conflicts as well as user-environment conflicts.
- A lack of connection between authorities responsible for planning of different sectoral activities
- A lack of connection between offshore and onshore activities.
- A lack of conservation of sensitive marine areas
- A lack of investment certainty for marine developers and user of ocean resources.

Instead of focusing on the management of different sectors, MSP is instead an area-based approach and focuses on an area, its ecosystem, and all the activities that are affecting it. (Douvere 2008) By providing such an area-based approach MSP integrates all different uses.

Integration of different sectors is not the only characteristic of an MSP. According to Gilliland & Laffoley (2008), MSP is a holistic approach that addresses social, economic, and environmental objectives in order to help achieve sustainable development. In this definition we can find, besides the aforementioned element of integration, also the element of sustainable development. This is the second major point in which MSP further distinguishes itself from conventional instruments. MSP's are usually focused on accommodating not only current uses but also the expected growth of these uses and the new uses that might develop in the area in the future. By focusing not only on the present but also looking further into the future, MSP is providing a strategic and proactive approach. (Gilliland & Laffoley, 2008)

By combining integration with a proactive approach, MSP distinguishes itself from conventional instruments. It is now viewed as a keystone to the management of a growing and increasingly competing maritime economy, while at the same time safeguarding biodiversity. (Douvere & Ehler, 2009) The European Commission (2006) Describes Marine Spatial Planning as a means to

- Provide financial security for investment decisions
- Provide tools for the management of increasing and often conflicting uses of the ocean.
- Manage competition among various uses
- Develop a stable regulatory environment that ensures better and simpler regulation toward the location of an economic activity
- Ensure that individual decisions on activities, taken at a national or regional level, but affecting the same ecosystem or cross-border activities are dealt with in a coherent manner
- Ensure consistency between land and marine systems
- Ensure that the future development of offshore activities is consistent with the need to evolve multilateral rules.
- Coordinate the spatial implementation of off-shore renewable energy with other activities.

Even though these means are written especially for the European Union, these principles are universal and thus can also be used for MSP's in other countries.

While every sea and ocean has its own characteristics and while every country and its people have different values, an MSP will always differ from region to region. Thus, every MSP will have its own specific objectives and purpose on top of the general means that were compiled by the European Commission. The exact purpose of each MSP should be determined and stated before the planning process is started. And is thereby the first step that has to be set towards an MSP.

According to Gilliland & Laffoley (2008) the overall purpose of every MSP should centre on the creation of sustainable development. This entails that the MSP should be build upon a number of principles

- Achieving sustainable development
- Implementing an ecosystem approach
- Adopting the precautionary principle, preventive principle and the polluter-pays principle
- Facilitating the co-ordination and integration of activities
- Delivering better regulation
- Enabling compliance with international, regional and national obligations.

2.2 International Framework.

In this part an overview will be given of the most important conventions and laws concerning MSP's. These conventions not only provide rules and regulation. Due to expanding number of functions that claim space in the marine area and a growth of the traditional functions that already existed in the seas and oceans, in the last years international environmental laws for marine areas have expanded significantly. A number of these laws can provide a solid framework for marine spatial planning. The most important are the United Nations Conventions on the Law of the Sea (UNCLOS), the Convention on Biological Diversity (CBD), Agenda 21, and the World Summit on Sustainable Development Plan of Implementation. (Douvere & Ehler, 2009)

2.2.1 United Nations Convention on the law of the Sea

UNCLOS III is seen by many as the most important international law for marine areas. Created in 1982 and signed and ratified by the most important seafaring nations, the UNCLOS provides an important framework for rules and regulations at oceans and seas. The UNCLOS however does not work alone a number of other resolutions and provisions also created by the IMO (international Maritime Organization) provide an additional framework. This section and the section 2.2.2 will cover the UNCLOS and the additional resolutions will be handled in section 2.2.3.

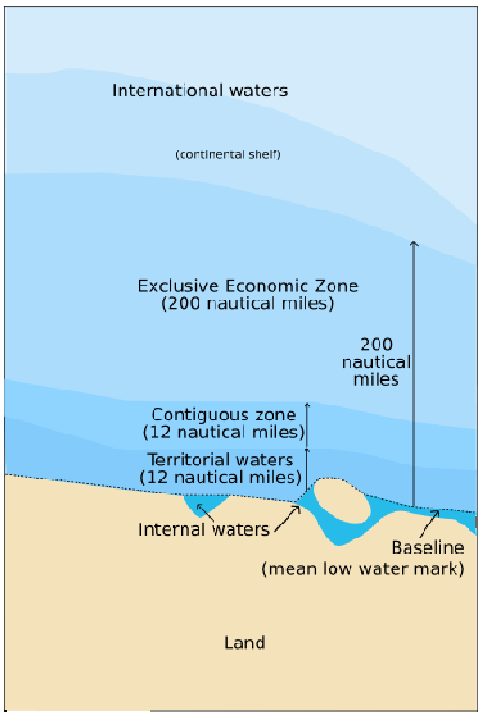
Although the UNCLOS itself only makes references in a number of articles to sea management it does not mention MSP as a management instrument. What the UNCLOS provides is the international legal basis for exploitation of the seas and thereby it is a foundation on which the management plans can be build upon. (Maes, 2008) UNCLOS encompasses the allocation from marine space to states and the right to allocate activities and the obligation to protect the marine environment in these spaces. The Law of the Sea also introduced the concept of the EEZ (Exclusive Economic Zone) and defined the limits of the territorial seas, the contiguous zone, the continental shelf, and the high seas. Besides delineating the boundaries in the sea, and thereby also the maximum area covered by an MSP, it also provides regulations that might have an impact on the MSP. These include the right to transit passage, the freedom of navigation, fishing, and the laying of submarine cables and pipelines. (Douvere & Ehler, 2009)

Interestingly, it also provides a framework for a possible joint MSP by states that share an enclosed or semi-enclosed sea. The Convention states that these nations should cooperate and coordinate management, conservation, exploration and exploitation of living resources. Further they should implement their rights and duties with respect to the protection and preservation of the marine environment. And finally they should coordinate and cooperate regarding scientific research policies. (Maes, 2008)(UNCLOS, 1982, art 123) Although cooperation between states is already praxis in various parts of the world. (Maes, 2008) Until now MSP's do lack an international perspective. (Douvere &

Ehler, 2009) The next section will handle the rights and duties in different zones according to the UNCLOS in further detail.

2.2.2 Zoning and jurisdiction according to the UNCLOS.

The UNCLOS distinguishes nine different maritime zones where states have different jurisdiction and rights. Internal waters, archipelagic waters, territorial seas, contiguous zones, continental shelves, exclusive economic zones, fishing zones, the high seas, and the Area. While not all zones will have an influence on MSP's a number of them will not be covered in this section. Contiguous zones do not contribute to MSP's if compared with the larger EEZ where the contiguous zone is located within. Further, our study area, the Russian arctic does not encompass any archipelagic waters and therefore this subject will also not be studied in further detail. The high seas and the Area will also not be covered while no state can claim sovereignty in this area and thus no state will have a legal ground to make an MSP in this area. (Maes, 2008)(UNCLOS, 1982) figure 2, gives an overview where which zone is located.



Wikipedia,

Internal waters can be seen as a part of the normal territory of a state and thus a country has complete jurisdiction over these waters. The only exception is that states have to grant right of innocent passage to foreign ships in a small number of cases. (UNCLOS, 1982, art 8.) However, internal waters usually do not play an important part in an MSP while the majority of these waters are not considered to be a part of the ocean or sea, and therefore only play a limited role in. Internal waters that are relevant to MSP's include single state bays, estuaries, coastal harbours and waters enclosed by straight baselines. (Maes, 2008)

The sovereignty of a coastal state extends beyond its land territory and internal waters to and adjacent belt of sea. This sovereignty extends to the air space over territorial sea as well as to its bed and subsoil. (UNCLOS, 1982, art 2.) This part of the sea is called the territorial waters. Every state has the right to establish the breath of their territorial sea up to a limit not exceeding 12 nautical miles, measured from the baseline. (UNCLOS, 1982, art 3) In this zone a coastal state has full jurisdiction for zoning and the spatial marine planning. The only limitation is as seen before within in the internal waters, the right of innocent passage. This right however, exists in the entire territorial water zone and is not limited to only a few exceptional cases. While passing vessels do have to comply with the law of the coastal state, it does have power to regulate innocent passage. Maes (2008) listed the topics on which states are allowed to adopt laws and regulations.

- Safety of navigation and regulation of maritime traffic
- The protection of navigational aids and facilities, as well as other facilities and installations
- The protection of cables and pipelines
- The conservation of living resources
- The preservation of the environment of the coastal state.

For the MSP it is very relevant that the UNCLOS also allows the state to designate or prescribe sea lanes and traffic separation schemes for the safety of navigation. (Maes, 2008)

By the planning of sea lanes the state does have to take into account; recommendations of the IMO (international Maritime Organization), any channels customarily used for international navigation, the special characteristics of particular ships and channels, and finally the density of traffic (UNCOS, 1982, art 22)

The exclusive economic zone (EEZ) has to be proclaimed explicitly by the coastal state. The EEZ which is extending no further than 200 nautical miles from the baseline was introduced by the UNCLOS, and thereby changed areas that formerly belonged to the international high seas into part of an EEZ. Included to the EEZ is the seabed, the subsoil and the waters above the seabed. In contrast

to the territorial seas it does not include the air space above the water. When a EEZ is claimed the state has the rights for exploring and exploiting, conserving and managing of natural resources. These natural resources include both living and non-living resources. (Maes, 2008)

Relevant for the MSP is the exclusive right to construct, authorize and regulate the construction and operation of artificial islands, installations and structures for the purpose of economic exploration and exploitation. The coastal states shall have exclusive jurisdiction over such artificial islands, installations and structures. To ensure safety, Coastal states are permitted to establish reasonable safety zones around such islands. Such a zone should not exceed a breath of more than 500 m. unless they are authorizes by the IMO. (UNCLOS, 1982, art 60) relevant examples of installations that fall under this law are oil and gas platforms. Besides artificial islands and installations the coastal state are also allowed to plan routeing schemes for ships. In order to prevent accidents which might cause pollution of the environment, states are can adopt routeing systems. Before states can prepare a routeing scheme the measures must be required for recognized technical reasons in relation to the oceanographic and ecological conditions. Further, before such a system can be implemented in the EEZ the IMO has to adopt or amend the system, and thereby making it official for international use. It is recommended that the IMO is involved in the creation of the routeing scheme from the start. (UNCLOS, 1982, art 211) There are nine ships' routeing measure that are important to the MSP; traffic separation schemes, traffic lanes, separation zones, roundabouts, inshore traffic zones, recommended routes, deep-water routes, precautionary areas and areas to be avoided. These routeing schemes do not necessarily have to apply to all ships but the state can also exclude certain ships or classes of ships. (Maes, 2008)

The continental shelf is considered to be a natural prolongation of the land territory and coastal states can exercise sovereign rights. Continental shelves can stretch up to 200 nautical miles from the base line or in case the continental shelf expands further, to its outer edge. The shelf shall not exceed 200 nautical miles or shall not exceed 100 nautical miles from the 2,500 m. isobaths. (UNCLOS, 1982, art 76) In this area a state has the rights of exploring and

exploiting mineral and other non-living recourses. However, only the seabed and subsoil is considered to be part of the continental shelf and the adjacent waters can't be claimed. A relevant rights of foreign states in the continental shelf is the laying of submarine cables and pipelines. Foreign states do need the consent of the coastal state for the delineation of the course of the cables and pipes. Although the coastal state can't impede in this activity it is allowed to take reasonable measures to prevent pollution. (Maes, 2008)

The last zone discussed in this section that was created by the UNCLOS and relevant to an MSP are the fishing zones. Coastal states are obliged to manage and conserve their marine living resources. by determining these zones but also zones a coastal state can determine where fishing is allowed and where fishing is prohibited or restricted. These zones can be established in the territorial waters as well as within the EEZ. Fishing does not fall under the innocent passage and foreign vessels have to comply with the coastal states rules. Foreign states are therefore dependent on agreement and arrangement between states. In practice it proves to be very difficult to enforce these regulations.

2.2.3 Additional resolutions from the IMO.

Besides defining different zones in the oceans and seas and what the rights and duties are in these areas through the UNCLOS, the IMO also provides additional regulations. A number of these are centered on particularly sensitive areas or PSSA's.

PSSA's are defined as an area which needs special protection through actions by the IMO because of its significance for recognized ecologic, socioeconomic or scientific reasons and which may be vulnerable to damage by international shipping activities. (IMO, 2001) before an area can be designated to PSSA it has to comply with at least one of the ecological, socioeconomic or scientific criteria mentioned in the resolution. Further, these attributes have to be endangered by international shipping practices. (IMO, 2005) Measures to protect PSSA's are limited to those that are approved or adopted by the IMO. Possible measures include; discharge restriction to vessels operating within the area, adoption of ships' routeing and reporting systems, declaring the area partly or completely to

be avoided by ships. Other measures might be possible too, as long as they have an identified legal basis. (IMO, 2005) Praxis shows that PPSA can be declared in different kinds of zones within the UNCLOS. PSSAs have been declared in territorial seas, EEZ and even in high seas. Up to 2008, twelve PSSAs were established in various parts of the world, most of these regions were already under some form of nature protection. (Maes, 2008) In our study area a PSSA has not been established so far.

2.2.4 The Convention on Biological Diversity.

The Convention on Biological Diversity (CBD) has as goal conservation of biological diversity and the sustainable use of its components. (Maes, 2008) The conventions program of work and the principles of the Jakarta Mandate cover aspects that are relevant to MSP. The CBD provides a framework for the creation of an integrated network of marine and coastal protected areas. These networks are build upon two kinds of areas; First protected areas where threats are managed but where extractive uses may be allowed. Secondly, so called representative marine and coastal protected areas where resource extraction is not allowed and where other significant human impacts are also minimized. The representative areas are designated in order to have a scientific reference area, to contribute towards environmental recovery and as well to act as an insurance against failed management. This network of protected areas should be located within the framework of a spatial planning in a larger marine and coastal area. These management practices should include general restrictions that are created for non-biodiversity purposes, and should have to be applied to either the complete planning area or just in certain specific locations within the area. (Douvere & Ehler, 2009)

Besides creating the aforementioned network, the program of work of the CBD also influences the MSP by; urging to the creation of trans-boundary protected areas, calling upon improvement of long-term and site-based area planning and management, and to prevent and mitigate the negative impacts of key threats to the protected area. An MSP is one of those instruments that can be used to create the aforementioned long-term and site-based area planning and is thus a

suitable instrument to help implementing the Convention on Biological Diversity. (Maes, 2008)

2.2.5 Agenda 21.

Agenda 21 from 1992 was one of the first UN summits on global warming, the outcome was a comprehensive blueprint on the actions that should be taken to reach sustainable development. Although the program only has a status of a soft law its principles, concepts and approaches are later on incorporated in international conventions. (Maes, 2008)

Chapter 17 of the Agenda is in particular interesting for MSP. This chapter sets out the framework of action aimed at protection and achieving sustainable development in the marine environment. (Douvere & Ehler, 2009) Chapter 17 contains the following program areas; (Agenda 21, 1992)

- Integrated management and sustainable development of coastal areas, including the EEZ
- Marine environment protection
- Sustainable use and conservation of marine living resources of the high seas
- Sustainable use and conservation of marine living resources under national jurisdiction
- Addressing critical uncertainties for the management of the marine environment and climate change
- Strengthening international and regional cooperation and coordination
- Sustainable development of small islands.

Chapter 17 states that the goal of that particular chapter is that states commit themselves to integrated management and sustainable development of coastal areas and the marine environment under their jurisdiction. (Agenda 21, 1992)

the integral characteristics of MSP and the fact that the overall purpose of an MSP should in centre around sustainability (Gilliland & Laffoley, 2008) makes MSP a suitable instrument to help reach the goals of Agenda 21, Chapter 17.

2.2.6 World Summit on Sustainable Development.

The World Summit on Sustainable Development (WSSD) was held in 2002 in Johannesburg, South Africa. The commitments made in this summit further influenced the development of MSP. Douvere and Ehler (2009) named what in their opinion are the most important commitments relevant to MSP. First, the need to improve efficient use of water resources. Secondly, the promotion of resource allocation among competing uses in a way that balances basic human needs with the preserving or the restoring of ecosystems. And finally, the establishment of representative networks of marine protected areas by 2012. These marine protected areas mentioned above are the same as mentioned in the convention on Biological Diversity.

Further the WSSD plan of implementation also called for the use of land use planning tools for coastal and watershed planning as a means to promote the management and conservation of ocean areas. (Douvere & Ehler, 2009) However this plan of implementation is not a legal document and thus creates no legal obligation for states. (Maes, 2008)

Although none of the international laws and declaration specifically names MSP as a instrument that can be used. Its characteristics do comply with the demands set by the agreements. These aforementioned laws and policies provide the basis for the development of MSP. (Douvere & Ehler, 2009)

2.3 Scope and timeline.

2.3.1 Scale

One of the first actions before the process of an MSP can start, is clearly defining the boundaries of the planning area. (Schultz-Zehden et al, 2008). It seems logical to include the whole of the particular UNCLOS zone in a marine spatial plan, and in praxis some countries also have done so. (Gilliland & Laffoley, 2008) Examples of countries that have done so, or are in the process of doing so are the Netherlands, Belgium, Germany, and the United Kingdom. These countries all performed their MSP for the whole of their marine area. (Douvere, 2008) However, planning might be appropriate at a different scale or with different

amounts of detail in certain circumstances. And in some areas no planning at all might also be appropriate. (Gilliland & Laffoley, 2008)

While different activities and their impact occur at different scales, it makes sense to make use of different scales in an MSP. This way an MSP can work optimally. (Schultz-Zehden et al, 2008) A hierarchical approach might be the best solution to the problematic of different scales. Using this method, each level provides the context for the level below. (Gilliland & Laffoley, 2008) Continuity however, must be insured so that plans from different levels will not contradict each other. To ensure coordination of such an approach, it is sensible that different administrative levels should work together. (Schulz-Zehden et al, 2008) The actual scales of an MSP will vary from country to country and will also be depended upon the characteristics of the area and how large the pressure is on a certain region. Gilliland & Laffoley (2009) recommend making use of a broad or regional scale for the integration of policies and comprehensive planning. And in addition to make use of a local scale in areas that are heavily used.

2.3.2 Boundaries

A threefold of boundaries have to be designed in order to create a planning area, Lateral boundaries, landward boundaries, and finally offshore boundaries. (Gilliland & Laffoley, 2008)

Lateral boundaries are located between different MSP regions. In principle meaningful ecosystem boundaries should be used as a starting point. This is however usually not the case in praxis and socio-political and administrative boundaries will be used for practical reasons instead. If possible a balance should be found and cooperation between different administrative regions is also an option. An additional challenge can be found in the inherent nature of eco-system boundaries not to follow straight lines, which can create difficulties delineating MSP regions. (Gilliland & Laffoley, 2008)

Landward boundaries usually have to be set for legal reasons and often create an artificial boundary within an ecosystem. While an MSP will be used to make decisions for licensing in the marine area it seems logical to include the whole of the marine environment, including the intertidal areas. However more practical

is to set the boundaries there where the spatial land planning ends. This way overlapping plans, which can lead to complicated legal situations will be avoided. Another second option is to change the boundaries of the spatial land plan, but this is usually more complicated. (Gilliland & Laffoley, 2008)

Defining the offshore boundary of an MSP is usually more obvious than designing the lateral and the landward boundaries. This boundary is usually determined by the limit of the national jurisdiction, including the continental shelf. (Gilliland & Laffoley, 2008)

An additional boundary can found if notion is taken of the inherent 3-dimensional nature of the ocean. While in spatial land planning usually only the land surface has to be taken into account, for MSPs it is customary that not just the sea surface will have to be considered, but also the water column beneath and the adjacent seabed. (COM, 2008)

2.3.3 Timeframe.

According to Schultz-Zehden et al. (2008) before the planning process starts not only the scope and the scale have to be considered but also the timeframe.

The characteristic of MSP to provide a strategic and proactive approach makes it suitable for long-term planning. AN MSP creates a vision of the desired look of the marine environment in the future and creates a pathway to how this goal can be reached. To be able to predict the future needs and conditions for this vision, the timeframe plays an important role. (Gilliland & Laffoley, 2008)

There exist no clear answers to how large the timeframe should be, there are initiatives that have a forward look of 10 years, such as the MSP in the Netherlands. (Douvere & Ehler, 2009) But an outlook of 25 years, as is the case for MSP for the Great Barrier Reef World Heritage Area is also one of the possibilities (Gilliland & Laffoley, 2008) In general however a timeframe of 20 years is recommended. (MSPP consortium, 2006)

In addition to the whole timeframe a review timeline can also be implemented to asses if a plan is still up to date or if changes are necessary. However a useful balance has to be found between keeping a plan current and leaving a plan long enough in place in order to realize its benefits. Gilliland & Laffoley, 2008) The

MSSP consortium (2006) sees review periods of 5 years to be the most appropriate. An additional adaptation of the review periods can also be made depended on the scale of the MSP. In this case small scaled, detailed plans can have a shorter review period than a larger scaled MSP. (Gilliland & Laffoley, 2008)

To assure that a plan will be current for a longer period of time, attempts should be made to future-proof a plan. This means that a look should be taken at the future in a larger timeframe and see if changes in the long-term might also have an effect on the area. (Gilliland & Laffoley, 2008)

2.4 Process.

If the goal of a particular MSP is identified, the legal framework studied, the area delineated, and if the timeframe has been defined the actual planning process can begin. As in the land spatial planning process, the marine spatial planning process also exist out of multiple, iterative steps. Figure 3 below shows how this planning process can be designed. The planning process however can vary. Schultz-Zehden et al (2008) for example show a number of different steps that have to be taken in order to come to a marine spatial plan. They divide the process in 8 steps

Step 1: Assessing the context and establishing a general framework for IMSP.

Step 2: Drawing up a guiding vision.

Step 3: Refining the stocktaking and mapping.

Step 4: Analysis: identifying issues and problems.

Step 5: Developing solutions for the problems identified.

Step 6: Drawing up a plan.

Step 7: Implementation.

Step 8: Evaluation.

We can see a number of similarities between the process as proposed by Schultz-Zehden et al (2008) and the process proposed by the MSPP consortium (2006) in figure 3.

In This thesis will use the process as proposed by the MSPP consortium (2006). This sub-chapter will discuss in further detail the most important steps that have to be taken in the planning process.

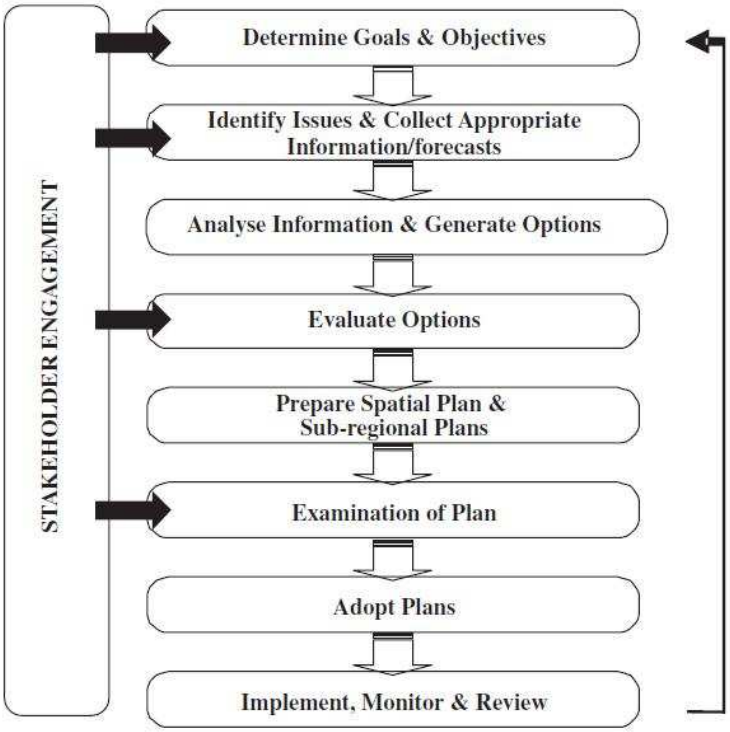


Figure 3, the Marine Spatial Planning Process (MSPP consortium, 2006)

2.4.1 Determining goals and objectives.

AN MSP should contain detailed objectives, these can be helpful during the further planning process by providing guidelines and in case of conflicting interest they provide for arbitration between different sectors. (COM, 2008) The goals and objective meant in this chapter are of a different nature as the goals mentioned in chapter 2.1. While the aforementioned objectives are statements concerning the whole of the MSP, the goals and objectives in this chapter will be formulated at a later stage and will contain more concrete economic, environmental, and social goals. (Gilliland & Laffoley, 2008) To come to these more specific goals, the initial broad objective stated for the whole of the MSP will be translated in a number of smaller goals. These will again be translated again in even more specific targets. These targets do not have to be thought of for the MSP alone, many already exist within sectoral documents and

agreements for example in environmental actions plans.(MSPP consortium, 2006)

Another option can be to create a vision for a certain area instead of formulating goals and objectives immediately. This vision can, like in the case of setting goals, also be derived from other document or it can be thought of especially for the area. Visions can also be made with the help of creating scenarios, this way an insight is provided on which futures may be possible. Different scenarios can help the decision what is desirable the future and thus what should be in the vision. Once agreement has been reach on a vision, the process will look like what is described above and the vision will be translated into concrete goals. (Schultz-Zehden et al, 2008)

2.4.2 Identifying issues and collect appropriate information.

The quality of a plan can only be as good as the information of which they are based upon. (Schultz-Zehden et al, 2008) Therefore it is important to gather enough high quality information on the subjects relevant to the plan or planning process. The amount of needed information is depended on the questionability of a project, if a project is highly uncertain and ambiguous more information will be needed in order to take a well considered decision. In case of an unchallengeable project of which the implementation seems logical and necessary to all, a decision can be build upon a smaller quantity of information. (MSPP consortium, 2006) Before large amounts of data on an area are collected it is useful to consider what kind of information is actually needed for the creation of an MSP. This process is called scoping. A closer look to the possible benefits an MSP can bring that was listed in chapter 2.1 can provide some information about what information is needed to reach those stated goals.

First of all, information has to be gathered about the relevant functions within the region. A good start can be identifying those relevant functions within the planning area. Smith (2000) identified the most important industrial uses of the world oceans. He distinguishes;

- Transport.
- Strategic.

- Minerals and energy.
- Living resources.
- Waste disposal.
- Leisure and recreation.
- Education and research.
- Conservation.
- Coastal engineering.

It should be noted that not all functions will be relevant in each case. A general knowledge and overview of the area can teach what functions are important in the region and need to be researched further, and what function can remain unstudied. Essentially MSP are about spaces, meaning that data with a special element will be needed, not only data about current needs but also forecast of potential needs in the future (Schultz-Zehden et al, 2008)

The second sort of information that needed does not concern the human influences but instead the characteristics of the area itself. Research about the different kinds of ecosystem present in the area and their characteristics should be performed in order to find out what their current state is and how sensible they are to impacts.

The next kind of information that has to be gathered is about the existing licensing system that exists in the study area. This is necessary while the current licensing system should be connected to the MSP, doing so will create clarity about what is allowed where and thereby the financial security of the investors will be improved.

The fourth kind of data that is necessary concerns the planning system and tradition in the concerning country. While each country has its own tradition and habits, also in spatial planning, these should be taken into account in the planning process. An example of this can be public participation; this should be adapted to the local tradition of participation so that inhabitants are familiar with the process.

The final sort of information concerns the legal framework. Before a plan can be created it should be clear to which restraints consist and to how it can comply

with the rules and regulations. Both national and international laws should be integrated within the plan.

Gilliland and Laffoley (2008) compiled four key points concerning the collection of data that can be helpful during the stocktaking process,

- A distinction exists between collecting and collating data. Where collating means that data already collected by others are put together.
- There are alternative sources of information next to government, research institutions, and industry, namely knowledge from experience from sea users.
- Relevant data not only encompasses human activities and resources but also policies, legislations, and values.
- Much of the same data compiled for the MSP can also be useful for other uses.

A number of problems can be encountered while collecting and collating data. While data is often distributed over a large number of sources, gathering can become a time consuming task. A problem more difficult to overcome is the inaccessibility of information due to restrictions and unwillingness of institutions and companies to share their knowledge. The complete opposite of a lack of information can also turn out to be problematic difficulty to assess what data is useful can be complicated, especially in an early stage of the process. (Schultz-Zehden et al, 2008)

An additional process included in the gathering of data is forecasting. While an MSP will run over a longer period of time (between 10-25 years) it is necessary to predict the future needs and conditions. In order to be able to predict the magnitude of change, assumptions have to be made about the economy, technological change, climate change, and government policies. The assumptions about these parameters will have to be justified and stated explicitly. (MSPP consortium, 2006).

Once all the necessary data is collated, collected and forecasted, a map of current uses can be created, this will be an important input for the next phase; analysis and option generation. (Schultz-Zehden et al, 2008)

2.4.3 Information analysis and options generation.

The goal of this phase is to find where the conflicts are located, which uses are conflicting with each other, and to find options to resolve these conflicts. After the information is gathered they should be combined into a map of current uses in which all the data is summarized and an overview is created. The map of current uses but also expected uses and their spatial impact will have to be analyzed to see where problems occur now, or might occur in the future. An optional instrument that can be used to get a better overview into the problematics of the area is a vulnerability assessment (Schultz-Zehden et al, 2008)

Once the problems have been identified the creative process of finding options and strategies starts. In this stage the goals and objectives formulated in the earlier stages should be involved into the creative process. The MSPP consortium (2006) claims that consultation and consensus building are the two most important techniques in this stage. But the creation of scenarios and visualization are also helpful instruments. (Schultz-Zehden et al, 2008)

The scenarios that are created in this stage will be the end result for the MSP for the Russian arctic in this study. These scenarios will be created in chapter 4.

2.4.4 Prepare spatial plan & sub-regional plans.

The end product of the planning process should be a strategic policy document that will be easy to work with in the future. (Schultz-Zehden et al. 2008) The marine spatial plan will not just exist out of one map with uses, but encompasses a number of documents; (MSPP consortium, 2006)

- A statement of objectives.
- An explanation of the spatial framework and policies.
- A zoning map containing information where the general policies apply.
- A more detailed zoning map where specific policies apply.

In case the need exist for a more specific and detailed MSP for a certain location within the planning region, this should also be mentioned within the plan.

An essential tool for creating a marine spatial plan is zoning, this tool is used extensively in spatial planning and provides clarity about what where is allowed.

The three categories of zoning mostly used within a marine spatial plan are; (Schultz-Zehden et al, 2008)

- Priority areas, these are areas that are reserved for a particular use and all conflicted uses are excluded out of the area.
- Reserved areas, in these locations certain use (or uses) are given priority over others.
- Areas suitable for a particular uses, these uses are only permitted within that area and excluded from all others.

The created zoning should be in line with the set goals and objectives, policies, and international conventions and standards (Schultz-Zehden et al, 2008)

2.4.5 Stakeholder participation.

Involvement of the stakeholders supports the planning process, and will lead to a greater acceptation of marine developments. Experience from land-based spatial planning shows that it is recommendable to start stakeholder participation in an early stage of the process. (Gilliland & Laffoley, 2008)

The first step that should be taken in the participation process is the identification of relevant stakeholders. Individuals, institutions, and organizations that are affected by the plan or their representatives can be stakeholders in the process. Different levels of participation which can be used can be distinguished; (Schulz-Zehden et al, 2008)

- Stakeholder involvement; stakeholders are a part of the complete planning process and help creating the plan.
- Stakeholder consultation; stakeholders will be consulted and can provide feedback during certain stages of the planning process.
- Stakeholder information; stakeholders are only informed about the process but can't influence it.

Gilliland and Laffoley (2008) advise to make use of the highest level of participation, stakeholder involvement, although they do recognize that consultation in certain stages is more important than in others. Figure 3 displays these stages.

Participation can take shape in a large number of ways; stakeholders' forum, workshops, newsletters, exhibitions, flyers, websites, (Schultz-Zehden et al, 2008) one-on one meeting, reactive consultations, and in a number of other ways. (Gilliland & Laffoley, 2008) Methods can be chosen according to what is most suitable in the national planning culture and what kind of participation level is desired.

The next action in the thesis will be an analysis of how the knowledge about marine spatial planning that was gathered in this chapter can be put into praxis. For this, the theory will be applied to the study area; the Russian arctic. We will compare what the literature tells about MSP with how this applies to the study area and what kind of modifications will be necessary or advisable for an MSP in the Russian arctic seas.

2.5 Summary.

Table 1 below provides a short overview is given of the most important information that will be needed about MSP. This knowledge will be the foundation upon which the first three steps of the MSP for the Russian Arctic in the next chapter will be based. If it is possible the general theory will be applied in the MSP process, if this is not possible or impractical and deviation from the general theory is necessary this will be explained in the next chapter and in the conclusions.
At the end of the next chapter a similar table will be composed. This will create a clear overview of the differences between the general theory about the planning process in this chapter and how the process will look like for the case of the Arctic in the next chapter.

Subject	
Benefits MSP	- Provide financial security for investment decisions - Provide tools for the management of increasing and often conflicting uses of the ocean.

	- Manage competition among various uses - Develop a stable regulatory environment that ensures better and simpler regulation toward the location of an economic activity - Ensure that individual decisions on activities, taken at a national or regional level, but affecting the same ecosystem or cross-border activities are dealt with in a coherent manner - Ensure consistency between land and marine systems - Ensure that the future development of offshore activities is consistent with the need to evolve multilateral rules. - Coordinate the spatial implementation of off-shore renewable energy with other activities.
Specific goal MSP	Before MSP is started the goal what the MSP is supposed reach should be stated. This goal should contain elements of sustainability.
Legal framework	Important conventions and laws; - UNCLOS - CBD - Agenda 21 - WSSD - National framework
Scale	Ranges from whole EEZ to a more local scale, depended on circumstances such as the number of functions located in the region
Boundaries	Optimally located on the borders of ecosystems and taking the land inward from the coast also into account. However, in praxis administrative boundaries and the coast are used.
Timeframe	Between 10-25 years, review periods of 5 years are recommended
Process	Process exist out of 8 steps - Determine goals and objectives - Identify issues and collect information - Analyze information and generate options - Evaluate options - Prepare spatial plan - Examination of plan - Adopt plan - Implement, monitor, and review Stakeholder engagement should be an iterative activity during the whole process.
Functions to be included	Most important functions in the oceans; - transport - strategic

	- minerals and energy - living resources - waste disposal - leisure and recreation - education and research - conservation - coastal engineering

Table 1, summary chapter 2.

Chapter 3. MSP in the Russian Arctic.

This chapter has two goals; first, it serves as an input for chapter 4 where the analysis and scenario building will take place. Secondly answers will be sought for the last four sub-questions posed in chapter 1;

- Is an MSP useful for the study area?
- What are the area characteristics?
- What are the current uses in the area?
- How are the current uses likely to change in the future?

To answer these four questions the focus in this chapter will be put upon the study area and how the design of a marine spatial plan might look in this area. While it is not useful to perform a whole MSP due to lack in information and time, the goal is to perform as far as possible the first three steps in the MSP process; determining goals and objectives, Identifying issues and collect appropriate information, and information analysis and option generation. The first two of these steps will be executed in this chapter and the information analysis and option generation with the accompanying scenario building will take place in chapter 4. However, before we start with these steps the basis for this MSP will have to be discussed.

At the end of this chapter a similar overview will be given as in the previous chapter, in the conclusion these two tables will be compared. This will provide us with a clear overview of what the similarities are between MSP theory and an MSP for this particular case.

3.1 Benefits from marine spatial planning in the Russian Arctic.

Before a planning procedure in a certain region should be started, first a closer look has to be taken if spatial planning brings advantages for the specific regions. We will take a closer look at the advantages that can arise from an MSP and if it is probable that they will also arise in the study area, the Russian Arctic. For

assessing if an MSP will be useful we will consider the advantages mentioned before in chapter 2 and that were listed by the European Commission (2006).

- *Provide financial security for investment decisions*. This particular advantage will only be gained if a binding MSP will be linked to a licensing scheme. When this in implemented investors will have a clear view of what is permitted where and a guarantee that this will be the case for a number of years in the future too. At this moment Russia already has a licensing system for a number of uses such as resource extraction and shipping. Linking these to a binding MSP will provide a maximum security for investors and therefore this advantage could definitely be gained in the study area.
- *Provide tools for the management of increasing and often conflicting uses of the ocean.* The primary instrument that is used in MSP for managing uses is zoning. This instrument allocates particular uses to certain areas and is essential for spatial management. Not only can zoning allocate uses, but also state additional requirements of what rules apply in each region and thereby can influence how the different uses are executed. These zoning schemes will also be applied in case of the Arctic.
- *Manage competition among various uses.* To reach this objective conflicting and competing uses should be separated from each other and located in different areas. The zones in a marine spatial plan are designed to do just that. The three different kinds of zones; priority areas, reserved areas, and areas suitable for a particular use, provide tool for locating uses and avoid or mitigate conflicts and competition.
- *Develop a stable regulatory environment that ensures better and simpler regulation toward the location of an economic activity.* The nature of MSPs causes regulation to be simpler and more stable. By providing a single integrated plan for a region instead of a multitude of sectoral regulations, locating of a certain activity will be easier and the needed information will be more conveniently arranged. Additional, the long-term view and strategic nature of MSP will lead to more stable plans that will last for a

longer period of time. While this advantage is caused by the inherent nature of an MSP, this will also be gained in the Russian Arctic

- *Ensure that individual decisions on activities, taken at a national or regional level, but affecting the same ecosystem or cross-border activities are dealt with in a coherent manner.* This advantage is partly reached because of the integrated character of an MSP. While the MSP is created for a specific area and not for a certain sector, there is a clear overview what is allowed where for each level of the government that has to take decision. It is sensible that a higher level of the government makes global plans for a large area and large scale uses. Consequently, lower government levels can take this plan as a basis and if necessary they can add details for smaller scale uses. To ensure that coordination exist not only between different levels of the government but also between adjacent areas cooperation and communication between different governments is advisable. Ideally cooperation would also exist between different nations for ecosystems in the border region, this however will probably not happen in this region while Russia has a number of issues concerning ownership of marine areas with its neighbours. For the study area, coordination between different governments within Russia is something that will be strived after.
- *Ensure consistency between land and marine systems.* Ideally MSPs will take account of a whole ecosystem including coastal systems and marine-land relationships. In practice this goal is not always reached and more practical landward boundaries have to be drawn. Unfortunately that will also be the case in Russia, to prevent overlapping of spatial plans the MSP will limit itself to marine areas only.
- *Ensure that the future development of offshore activities is consistent with the need to evolve multilateral rules.* Before the planning process starts an inventory has to be done of the legal framework, and important part of this are the international laws and conventions. These regulations will form the basis on which the MSP will be build upon. This way the consistency with multilateral rules is ensured. The international legal framework shall also be researched in this case and will form the base for the rest of the MSP.

- *Coordinate the spatial implementation of off-shore renewable energy with other activities.* While off-shore renewable energy is not likely to develop in a area with a harsh climate such as the Arctic, this advantage is most likely not applicable to the Russian Arctic.

By taking a closer look to the possible advantages that can arise from an MSP above, it can be found that most of the advantages can be found back within the study area as well. Concluded can be that creating an MSP will probably be beneficial for the region as well as for the stakeholders.

3.2 Basis for marine spatial planning in the Russian Arctic.

Before the actual planning process can be started the basis should be determined. This means that first it should be determined for what reason this MSP will be executed, what is its general goal. Next the international legal framework will be discussed, research will be done after to what international conventions and laws the MSP should comply and what regulations give justification for the creation of an MSP. Finally the scope and timeline will be determined to a greater detail.

3.2.1 General goal setting.

The Russian arctic waters are until now relatively sparsely used with only a limited number of uses. Changes in the climate, technological improvements, and a larger demand for resources provide opportunity for new uses and an increase of uses already existing in this area. The goal of an MSP in the Russian arctic will therefore be more oriented toward guiding expected developments and avoiding possible conflicts that might occur in the future instead of solving existing conflicts. Therefore the goal of creating this scenario will be stated as; creating a vision for the Russian Arctic waters where room is given to new developments while the environment is protected.

Chapter 2 discussed that every goal general goal setting should contain elements of sustainability. For this project it will strive after the following principles of sustainability.

- Achieving sustainable development, this will be done by striving after a growth of developments while at the same time the environment will not be damaged.
- Implementing an ecosystem approach, by recognizing that all components in the study are interrelated and also stand in relation to the outside, will lead to a more complete and well-considered plan.
- Facilitating the co-ordination and integration of activities. Integration and coordination lie within the inherent nature of MSP and will be one of the main points in this study.
- Delivering better regulation. This goal will hopefully be reached by implementing an ecosystem approach by providing integrated planning.
- Enabling compliance with international, regional and national obligations. By studying the legal framework before the planning process itself begins, compliance with obligations is ensured.

Principles that will explicitly be taken into account are the precautionary principle, the preventive principle, and the polluter-pays principle. These three principles are extremely hard to implement in spatial plans and can implemented better and more efficient in other types of regulation then spatial planning.

3.2.2 Legal Framework.

Russia participates on a number of international agreements and signed laws that influences the marine environment. It signed and ratified the United Nations Convention on the Law of the Sea and the Convention and they are a party on the Convention on Biological Diversity, Agenda 21 and the World Summit on Sustainable Development. (United Nations, 2002) All these laws and agreements should be taken into account during an MSP. Beside international laws, national laws have to be incorporated as well. Regulations relevant for marine and coastal environments are; the Continental Shelf Law of the Russian Federation, Territorial seas and Adjacent Zone of the Russian Federation, The Water Code of the Russian Federation, and the Subsurface Law of the Russian federation, including the later added Amendments. (United Nations, 2002) Worth noting is that the Russia is a federation and is build up out of 46 oblasts, 21 republics, 9

krays, 4 autonomous okrugs, 2 federal cities, and 1 autonomous oblast. (CIA, 2010) These different governments all have their own jurisdiction and laws, and in the case of a republic the area even has its own constitution and president. (Constitution of the Russian Federation, 1993, art 5) In case of an MSP for the whole Russian arctic a cooperation has to be created between; the oblasts of Murmansk and Arkhangelsk, the autonomous okrugs of Nenetsia, Yamalia and Chukotka, the kray of Krasnoyarsk, and finally the republics of Karelia an Sakha. While exploring the Russian laws and the legal jurisdiction of different oblasts, krays, autonomous okrugs, and republics into detail goes beyond the scope of this study, we will limit our legal framework to the international agreements and legislations that were discussed in chapter 2.2

3.2.3 Area delineation and timeframe.

The area for which the scenario will be designed exist out of the entire undisputed Russian Arctic waters including the Russian continental shelf. This area contains undisputed Russian part of the Barents Sea, the Kara Sea, the Laptev Sea, the East Siberian Sea, the Russian Part of the Chukchi Sea, and the undisputed Russian Part of the Arctic Ocean. A study area this size can be helpful for scenario building, this way a better overview can be achieved and large scale developments can be placed more careful. However, for a legally binding MSP a smaller, regional scale is recommended. (Gilliland & Laffoley, 2008) In such a case an MSP per sea or in heavily used areas maybe even a local scale might be more appropriate. An additional and maybe more practical option is creating MSPs per republic, okrug, oblast and kray. This way complicated cooperation can be avoided. However, coordination between different MSPs is a must. While a scenario is not binding and is aimed at providing a vision for the future, a larger scale can be used in this case.

In a highly dynamical region such as the Russian Arctic changes happen quickly and forecasts have to be readjusted regularly. Consequential, review periods will be more important here compared to MSPs in other regions. After a period of 5 years the marine spatial plan will have to be readjusted to the new trends and forecasts. Although the plan is likely to be changed after a number of review

periods, the recommended timeframe period of 20 years (MSPP consortium, 2006) will be used. Focusing on a longer period of time, even when the plan is likely to be changed before the running period is over, will have the advantage that a more strategic and proactive plan will be created, Such a plan does not just look at the current situation but also includes expected long-term changes such as climate change, which play an important role within the study area.

3.3 Determine goals and objectives.

The first step into the actual process of an MSP is the determining of the goals and objectives. In an MSP these will have to be translated further into concrete aims and numbers. While not enough knowledge and time is available here to set concrete and specific goals, and while it concerns in this case of a scenario instead of a legally binding MSP more general goals will be sufficient here. The overall goal of this MSP; creating a vision for the Russian Arctic waters where new developments are encouraged and the valuable environment is protected, will be translated in a number of smaller goals.

- Enhancing protection of environmentally valuable areas that are already part of a protection scheme.
- Safeguard vulnerable areas that are not yet protected.
- Locating new locations for gas and oil exploitations away from environmentally sensitive areas.
- Providing space for shipping in the northern sea route.
- Protect the fish stock by minimizing fishing in crucial areas.

In the case of conflicts between different uses that are both wanted in the area according to the objectives stated above, priority will have to be given to one of the functions. In this study priority will be given in case of conflicts to environmental protection.

In how far the goals can be reached in reality will in praxis not only depend on the management of the Russian arctic but will also largely depend on technological improvements and climate change. To be able to assess how far, and in what way these goals can be realized within one plan the next will have to

be executed; the collection of information and identifying issues.

3.4. Identifying issues and collect appropriate information.

The information gathering and research phase will be particularly important in this case, not only information and forecasts are necessary for the functions that make use of the area, but also for the climate change and expected technological improvements that will make new uses possible. Before issues can be identified and information can be collated, the most important information about the region has to be identified. In the last chapter we identified the 5 most important data that has to be gathered for an MSP; Functions, natural characteristics, licensing system, planning culture, and legal framework. While a detailed research into all of these subjects will be to time-consuming and beyond the scope of this thesis, only three of these will be handled in further detail;

- Natural characteristics of the region.
- Functions.
- (International) Legal framework.

These three has been chosen while access to information will be the easiest and in my opinion have the largest influence on the outcome of a planning process. The factor of the licensing system is likely to have mostly legal implication instead of influencing the creation of a scenario and planning culture will most likely influence the way the planning process will be shaped. Further, finding data on these two subjects will be largely challenged due to a language barrier. Data on the legal framework will remain focused on the international rules and regulations, in this case they have already been researched before the actual planning process has been started.

For the factor functions additional clarity has to be created on which factor will be researched. Smith (2000) identifies the most important industrial uses of the world oceans. He distinguishes; transport, strategic, minerals and energy, living resources, waste disposal, leisure and recreation, education and research, conservation, and finally coastal engineering. While not all uses play an equal large role in the Russian arctic or have an equal amount of spatial impact, a

selection can be made of the most important functions. Uses that will not be included in the study will be; Leisure and recreation, while this function only plays marginal role in the region in the form of a small number of cruise ships. Education and research will also be not included while this function does not have a clear spatial location and can coexist without problems with other functions. Further coastal engineering will not be taken into account while these are largely based on land and only have a small spatial impact on the Russian seas. Functions that will be researched are;

- Shipping. (the northeast passage)
- Nature conservation.
- Minerals and Energy. (oil and gas exploitation)
- Living resources. (fishing)
- Strategic.
- Waste disposal.

In this section information will be gathered as far as possible and available about the areas characteristics, all the aforementioned functions and their spatial impacts. Out of all this information that will be gathered a map of current uses will be compiled in the next chapter. This map will be the input for the creation of the scenarios in the next stage.

3.4.1 Area characteristics.

There are many characteristics which distinguishes the Arctic or even more specifically the Russian arctic. Below the geography, the socio-economic situation, the environment, and the sea ice in the region will be discussed.

3.4.1.1 Geography.

The project area is located in the north of the Russian federation and is except the White Sea, entirely located above the polar circle. The Arctic Ocean and its adjacent shelf seas are located between the Atlantic and the Pacific Ocean. Characteristic is that this Ocean is the smallest of the 5 oceans that are distinguished. Because of its enclosed nature the ocean that has only a limited water exchange with adjacent bodies of water. Especially the connection with

the Pacific Ocean is small. The only connection between these two oceans is the shallow and narrow Bering Strait that only measures 85 km across and has a depth of 30-50 m. (Arctic Council, 2009)

Remarkable is that the continental shelf of the Arctic Ocean is much more extensive than in the other oceans. It reaches a maximal extend of 1.200 km for the coast of Siberia. Consequence of this large shelf is the existence of a large number of islands that rise up before the coast, and thereby creating a multitude of shelf seas that can be distinguished. (Icelandic Ministry for Foreign Affairs, 2006) The largest and most important shelf seas that can be distinguished within the project area are the Barents Sea, the Kara Sea, the Laptev Sea, the East Siberian Sea, and the Chukchi Sea. While these seas are at least partially ice-free in summer time most Arctic marine activity, such as fishing, offshore oil and gas exploitation and shipping takes place in these coastal seas. In average the depth in these seas varies between 100 and 200 m depth, although closer to the islands it can be considerable less. (Arctic Counsil, 2009) An example of extreme shallowness can be found in the straits between the Laptev Sea and the East Siberian Sea. The two straits connecting these seas, the Dmitry Laptev Strait and the Sannikov Strait do not exceed a depth of respectively 8 and 13 m. (Liu & Kronbak, 2010) Beyond the Arctic shelf at a depth of 300-500 the continental slope begins leading into the depths of the Arctic Ocean. Compared to the other oceans the Arctic is relatively shallow but it still reaches an average depth of 1050 m with a max of 5160 m. (Arctic Council, 2009)

It should be noted that caused by its harsh climate and inaccessibility the Arctic Ocean is the least sampled ocean in the world and many locations still exist where the surroundings have not been recorded appropriately. Due to that fact the area often lacks basic marine information and charting for navigation in the Arctic. (Arctic Council, 2009)

3.4.1.2 Socio-economic situation.

The vast area of the Russian arctic has been inhabited by the indigenous peoples of the North for a long time. These peoples were traditionally nomadic and their daily needs were satisfied by means of hunting, fishing, reindeer herding, and

harvesting wild plants. (RAIPON, 2010) Much has changed during the Soviet era, much of the population was forced to abandon their traditional nomadic lifestyle and the population grew because of migration from other areas, forcing the indigenous peoples of the North into a minority position.

The population in the Russian Arctic was 7.1 million in 2003, compared to the population of 7.9 million in 1995 the number of people in the region has fallen with a high speed. Although such rapid decline in population is expected to be related to a failing economy, in the Russian north the GPD per capita is higher than the national average. This is mostly caused by the considerably higher GPD in the Khanty-Mansi region and the Yamalo-Nenets region compared to the rest of the arctic. These two regions are both located near the Kara Sea, where the Yamalo-Nenets region is located directly on the coast and the Khanty-Mansi region is located further inland. In the other parts of the Russian north the GPD per capita is only slightly higher than the national average. (Glomsrød & Aslaksen, 2006)

In northern Russia much of the regional income is based in natural resource extraction. Figure 4 shows how much of the GPD is based in different natural resources.

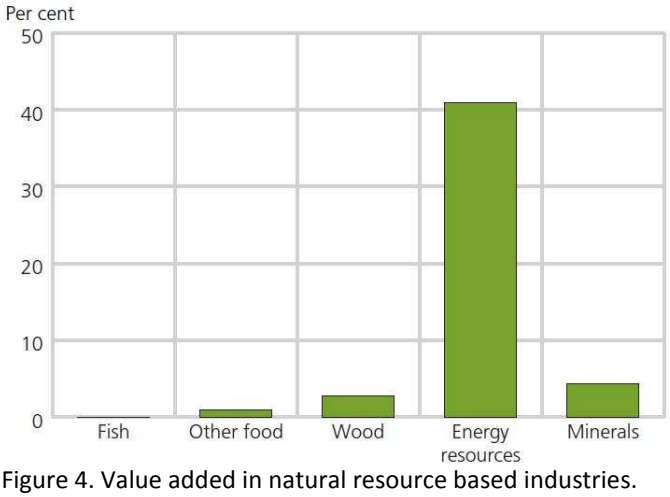


Figure 4. Value added in natural resource based industries. Arctic Russia. 2002. Per cent of regional GDP (Glomsrød & Aslaksen, 2006)

The high regional GPD per capita is mostly caused by a very oil and gas extraction industry in the region. In 2002 the fuel industry accounted for 36% of the regional income. The transportation of petroleum added an additional 7.3% to the GPD per capita. While around 55% of the complete Russian oil production takes place in the Khanty-Mansi region and 85% of the national gas production takes place in Yamalo-Nenets it seems logical that these areas have an extremely high regional

GPD per capita. It is however very doubtful that most of the money remains in these regions. (Glomsrød & Aslaksen, 2006)

3.4.1.3 Environment.

The Arctic marine is a host to a large array of animals, not only species that live in the water itself depend on the northern seas, but also unique land mammals such as the polar bear and shore bird species such as the goose. (CAFF International Secretariat, 2010)

The unique environment of the arctic is also unfortunately one that is particularly sensitive to changes and pollution. For a long time nature conservation was not seen as an important issue in these regions and nature was only regarded as something that could be exploited. Because of its remote location and sparse inhabitance the coastal seas were often regarded as a cheap disposal option. In the north of Russia this was in particular prevalent and industrial and nuclear wastes were dumped too often in the northern shelf seas. (Holland, 2002)

In the last decades however, concern about environmental consequences started to grow and natural reserves and nature protection schemes grew along. Especially in the last decade nature conservation in the Arctic grew enormously. Although marine protection hasn't got the same attention and fewer nature conservation areas, nature protection also grew offshore.

Presently much of the arctic is still seems to be in its natural state and until now impacts of human activity remain relatively minor. However, even after the value of nature conservation has been acknowledged the ecosystem still faces a multitude of challenges and the long-term effect of many human impacts are not known yet. The most important impacts to the arctic environment in the future are most likely to be related to climate change. In 2010 the CAFF (Conservation of Arctic Flora and Fauna) published a report on the trends in biodiversity ion the arctic region. (CAFF International Secretariat, 2010) the most relevant key findings of this report are

- The majority of the species are currently stable or increasing, however, some species of importance to arctic people or species with global significance are declining.

- Beside climate change, other stress factors for the biodiversity are contaminants, habitat fragmentation, industrial development, and unsustainable harvest levels. Interactions between these factors potentially magnify the impact on biodiversity.
- Since 1991, the extent of protected areas in the arctic has increased, although marine areas remain poorly represented.
- Changes in arctic biodiversity have global consequences.

These findings once again stress that the fragile environment of the arctic should be conserved and protected against harmful impacts.

3.4.1.4 Sea Ice.

Sea ice is formed by the freezing of seawater, besides influencing the possible uses in the arctic it is also an important element in the global climate system. Sea ice influences the climate system in three ways; loss of ice increases the albedo feedback mechanism, it modifies the exchange of heat between the ocean and the atmosphere, and finally it redistributes the freshwater in the polar area (IPCC, 2007). Because of these mechanisms, sea ice losses can trigger an increased warming rate, not only in the study area but also in the rest of the world. For our study area this means that functions, such as transit shipping, that were previously not possible in this area now have new opportunities opening up in the Russian arctic. However, the sensitive environment will also be heavily influenced by these changes. This section will cover how the sea ice in the study area is influenced by the recent climate changes.

Climate change is one of the most important processes that are influencing the Arctic currently. Extensive researches have been done by many scientists but there is still no widespread consensus about the magnitude and consequences of climate change and how this might influence sea ice. The Arctic in particular is an area that is discussed frequently. The sparse information about the current climate and even less historical measurements mean a lack of data to analyze and cause uncertainty in climate models. However, there are indicators that climate change in the high north is more pronounced and progresses quicker than average. In a climate as harsh as in the Russian Arctic a softening of the

climate and a melting of the sea ice could create large possibilities for development.

Changes in sea ice occur in two ways; a change of the sea ice extend and a of the sea ice thickness.

3.4.1.4.1 Sea ice area.

The remoteness and the harsh climate in the arctic caused data on the sea ice extend irregular and sparse. Trustworthy data has only been gathered since the late 70's when the first data collections via satellite remote sensing started. It is estimated that between 1980 and 2005 the sea ice extend in the northern hemisphere has decreased by 2,7 - 0,6 % per decade. (IPPC, 2007) In 2005 the record minimum ice extend in the arctic was measured and in 2006 even the whole of the northern sea route was reported to be ice free. (Richter-Menge et al, 2006) This trend however, is not as straightforward as expected; a strong seasonal variability can be found in the magnitude of change.

The trend shows that the changes in summer ice extend are larger than in winter when only relatively small changes occur. Further a large variation can be found between different regions and even regions exist where sea ice is more common than 30 years ago. (IPPC, 2007) A closer look toward trends occurring in the study area is needed before conclusions concerning the melting of the ice can be drawn.

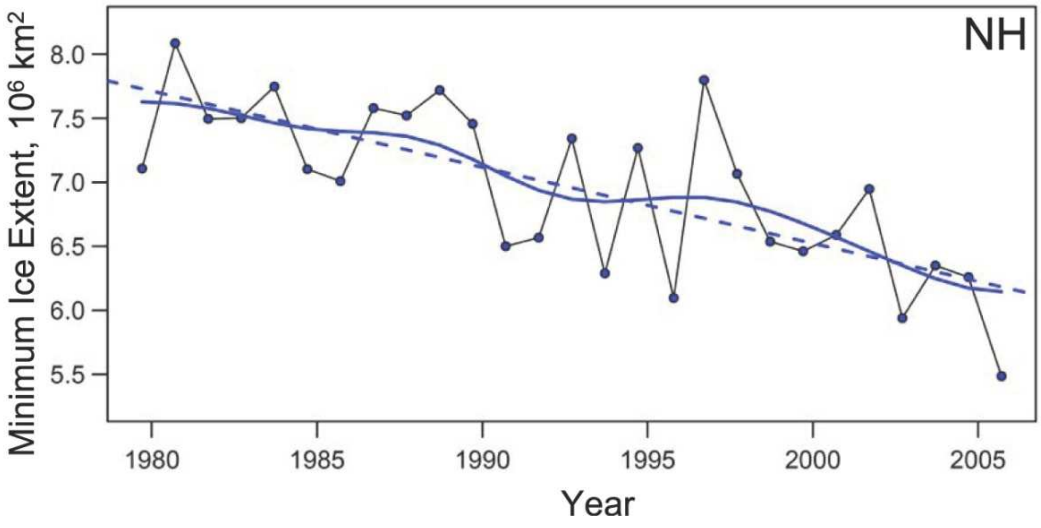


Figure 4. Minimum ice extend in the Northern hemisphere 1980-2005 (IPPC, 2007)

In the beginning of millennium Russia has published data of ice extend and thickness going back as far as the beginning of the 21st century, concerning almost a large part of our study area, the Kara Sea, the Laptev Sea, the East Siberian Sea, and the Chukchi Sea. (figure 5) A striking trend can be found back in this dataset, beside the fact that the recent decline in ice is stronger in some region than in others, a period with a small amount of ice can also be found in the 40's and 50's. Closer examination of the ice extend trend in these four seas show that these are small and generally not statistically significant, meaning that a long term trend have not been proven yet in this area. (Polyakov et al, 2003).

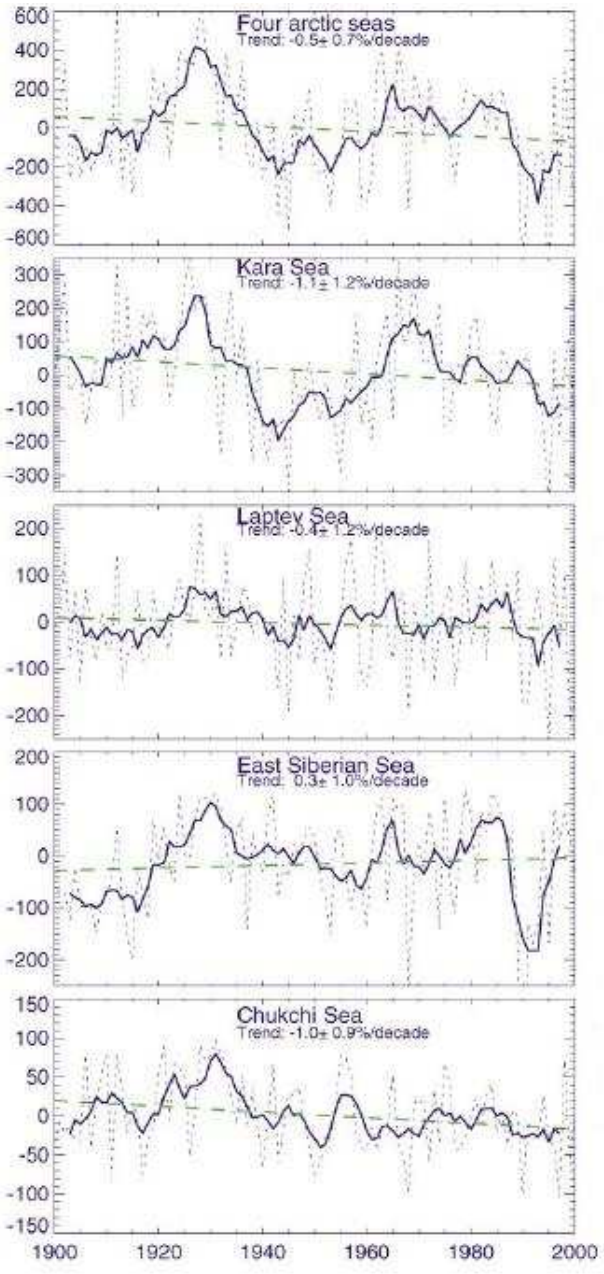


Figure 5. Time series of the august ice-extend anomalies (x1000 km^2) in four arctic seas (Polyakov et al, 2003)

Although a long-term decline in sea ice extend has not been undisputedly proven, many scientist do believe that the decline in recent decades will prevail and will lead to a smaller extend of ice, particularly in summertime. For this study we will assume that the ice extend in winter will not be significantly influenced and that the summer ice-extend will not decrease dramatically within the scenarios 20 year time period, but will only decrease with a slow rate.

3.4.1.4.2 Sea ice thickness.

Besides sea ice extend an important second factor is sea ice thickness. The thickness can be a parameter of the amount of ice even if the extend remains unchanged, and a decreasing thickness can be a sign that the ice extend in the future might decrease faster. Besides being a parameter for changes in the climate the thickness can also influence the functions possible in the region. Whereas thin ice can be broken with little effort and pose only small risks to shipping, thick ice limits the industrial functions significantly and heavy ice-breaker will be needed to break the ice. a number of difficulties exist for find significant changes in sea ice thickness. First, ice thickness is one of the most difficult geophysical parameters to measure and only limited amounts of data exist. And secondly, large scale variability makes analysis even more complicated. (IPPC, 2007)

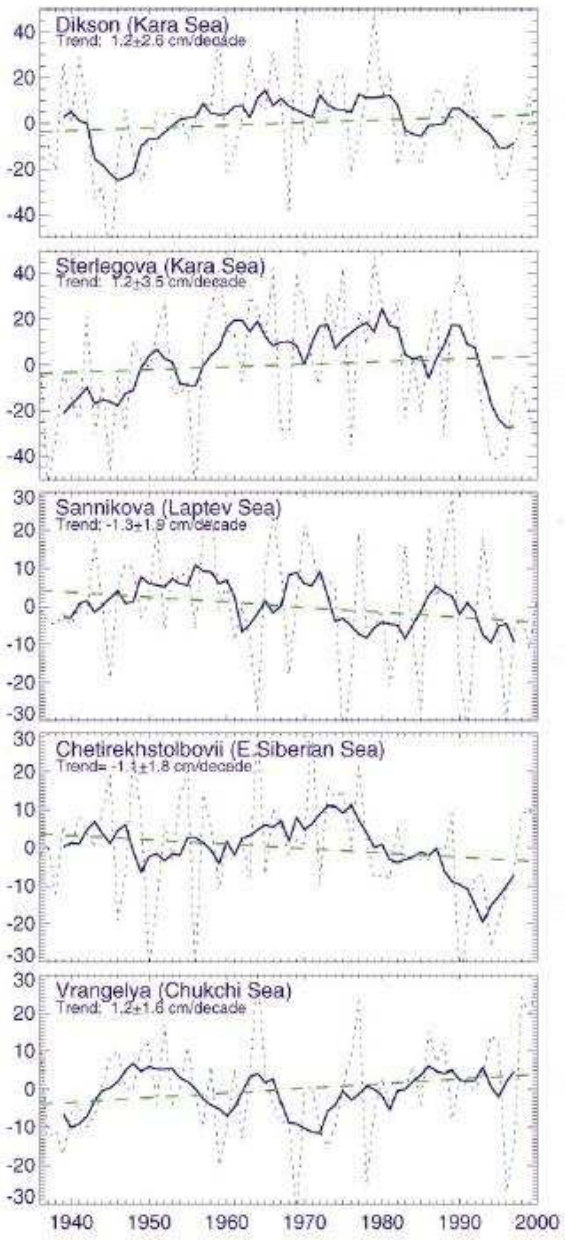


Figure 6. Time series of May fast ice thickness anomalies (cm) at 5 locations (Polyakov et al, 2003)

According to the IPPC report (2007) it is very likely that the average thickness decreased up to 1 m. since the 1980 in the central arctic. However, the recent decrease occurs within the lines of long-term decadal variability. This long-term variability is the same that can be found back in the ice-extend records. It is thought that these changes occur due to circulation changes in the atmosphere.

Zooming in on our study area, measurements over a longer period of time have been performed in several locations in the Russian Arctic. (Figure 6) Here we can find that the trends in land-fast sea ice thickness between 1940 and 2000 are relatively small and not statistically significant, and even signs of an increasing ice thickness in can be found in a number of locations. (Polyakov et al, 2003)
While there is no clear evidence of a thinning of the sea ice in our project area the assumption will be that the thickness in sea ice will remain stable in the next 20 years.

3.4.2 Functions.

In this part six functions in the Russian Arctic will be analyzed; shipping, nature conservation, oil and gas exploitation, fishing, strategic, and waste disposal. Besides providing information about the current status of the activity a small prediction will also be made of how each function is likely to develop in the next 20 years.

3.3.2.1 Shipping.

For centuries shipping companies have been looking for a short cut between Asia and Europe, unfortunately the mythical North East passage as well as the North West passage are almost completely bound in ice for most of the year proving navigation for ships almost impossible.
The Northern Sea Route (NSR) is a shipping lane between the Atlantic Ocean and the Pacific Ocean along the Russian coast. The route cuts right through the study area and crosses the Barents Sea, the Kara Sea, the Laptev Sea, The East Siberian Sea, and the Chukchi Sea. While The NSR is not a single route but more a multitude of different routes in passing through these seas there is no single length of the route, instead it ranges between 2100 – 2900 nautical miles. The route that will be chosen by a ship will mainly be depended on the characteristics of the ship and the ice conditions. (Liu & Kronbak, 2010) It has been estimated that the route between Hamburg in Germany and Shanghai in China can cut the distance up to 40%, instead of travelling 10.200 nautical miles via Suez, a shipping company can minimize this to 7.700 nautical miles when the NSR is

being used (Verny & Grigentin, 2009) Note that a shorter route does not automatically mean that it is cheaper, additional costs such as fees for navigational services and ice-breakers, and higher risk of damage should also be taken into account.

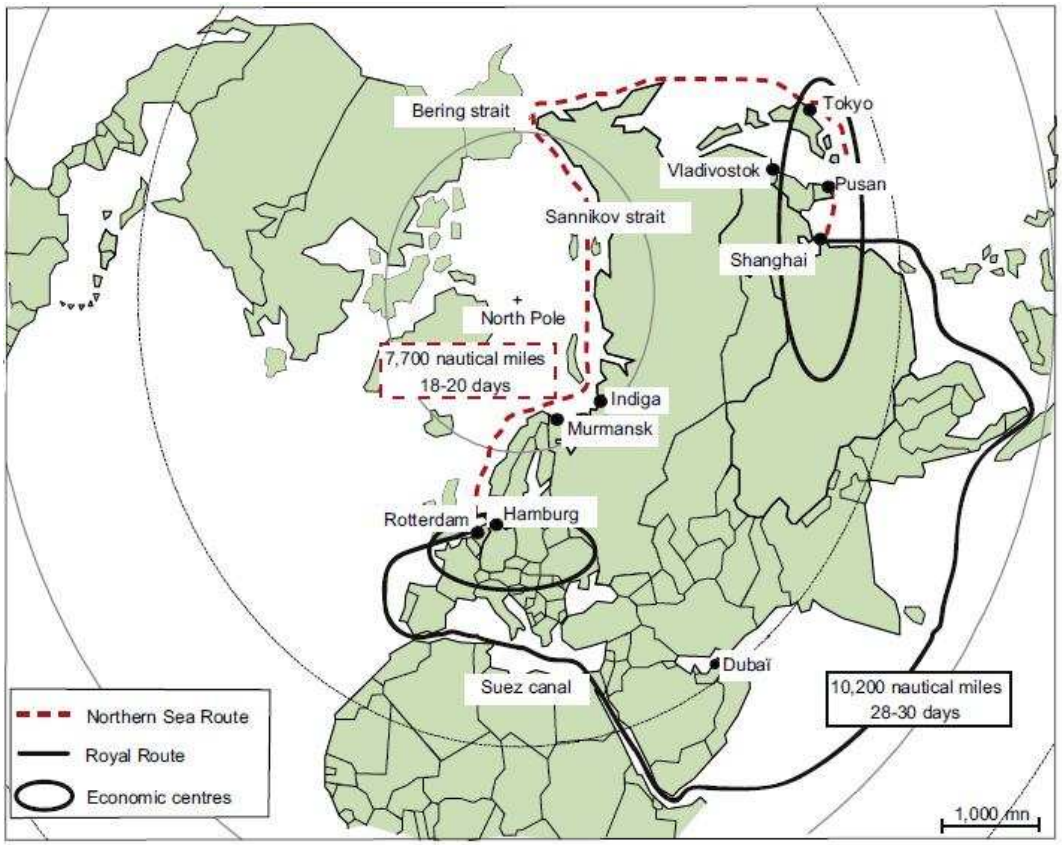


Figure 7, Northern Sea Route and the Royal Route (Verny & Grigentin, 2009)

In the cold war period the route was further developed as national shipping route that was mostly used in summer periods, foreign ships were banded from the region and it was viewed as a strategic military area. With the help of, among others, nuclear icebreakers the Northern Sea Route (NSR) reached a highpoint in 1987 when 6.6 million tons were transported through the seaway. (Ho, 2010) In that same year, after Russia's perestroika and which was the herald of the end of the cold war Gorbachev held a speech declaring the NSR open for international traffic. In 1991 the Regulations for Navigation on the Seaways of the Northern Sea Route were accepted which contained shipping regulations in the NSR without discriminating between nations regarding commercial shipping. (Liu &

Kronbak, 2010) Unfortunately the expected growing significance of the seaway has not occurred and in 2007 only 2.13 million tons were transported within the NSR, less than one third of the amount that was transported in 1987. (Ho, 2010) there are a number of reasons why the NSR has not lived up to its expectations. The first one is that the region lacks major commercial centers which attract shipping. (Liu & Kronbak, 2010) The second reason however is seen as the main cause for a small use of the seaway; the route is almost never ice-free, not even in the summer months. (Ho, 2010) Can global warming change this and make the NSR a flourishing sea route?

Although the Russian Arctic is rich with natural resources economic activities, including shipping are influenced by a large number of factors such as; governance, state cooperation, oil prices, changes in global trade, new resource discoveries, climate change, marine insurances, and finally arctic marine technologies. In 2009 the Arctic Marine Council created the Arctic Marine Shipping Assessment (AMSA) which focuses on the current and future marine activities in the whole of the arctic region, including the NSR. This report assessed among others the possibilities for shipping in the arctic. They came to the conclusion that in the next 10 year, the shipping activities in the NSR will remain mainly declinational and that trans-arctic voyages by commercial ships will remain an exception. It is likely that the western part of the NSR will be used more frequently in the future for gas and oil transportation and the amount of tonnages transported here might even rise to 40 million tons per year. On the other hand it is expected that the eastern part of the NSR will remain sparsely used. (Arctic Council, 2009)

The estimates and assessment by the Arctic Council run over a period of 10 years up to 2020, while the scenario that will be designed in this thesis runs until 2030 there is a significant chance that the shipping activities in the arctic will grow further compared to 2020. The Arctic Marine Shipping Assessment (Arctic Council, 2009) researched the bottlenecks and attention points for in case arctic shipping will develop further in the future, they came to a number of recommendations. Below the ones that relate to marine spatial planning are listed;

- Protect arctic people and the environment
    - Engagement with arctic communities. Assessments of marine use by indigenous are needed to fill in gaps of knowledge about their current habits. After this is done better assessments of the impact of arctic shipping on these activities can be made.
    - Designate areas of heightened ecological and cultural significance. This should be done in with climate change and increasing multiple marine use in mind. When appropriate implementations of measures should be encouraged to protect these areas from the impact of shipping. These areas should be designated in coordination with all stakeholders and should be consistent with the international law.
    - Specially designated arctic marine areas. Taking into account the special characteristics of the Arctic marine environment the need should be explored for internationally designated areas that will be under environmental protection. This could be done with the aforementioned tools such as Special Areas or Particularly Sensitive Sea Areas (PSSA) that are created by the IMO.
- Building the arctic marine infrastructure.
    - Addressing the infrastructure deficit. To enhance safety in shipping and to promote environmental protection the Arctic marine infrastructure needs to be improved. Examples of critical infrastructure that needs improvement are; communication systems, port services, ice centers, places of refuge, and icebreaker support.

The NSP will have a chance to become a major navigational route in the future and in 2009 two German commercial vessels were the first ever to pass through the NSR. (Ho, 2010) However, it is also clear that a lot of improvements have to be made before the NSP can become a prosperous navigational route. Not only are the climatic conditions now, and in the next decade to harsh for regular commercial navigation, the lack of marine infrastructure and large social and environmental impacts should be addressed before the NSP will be used

regularly. In the next 20 years it is likely that the NSR will play a larger role in the Russian Arctic but it is not likely that this route will be used extensively before 2020. However, the first steps can already be made to protect the environment and improve the infrastructure for the future.

3.4.2.2 Nature conservation

In the Russian high north a number of nature preserves are established to protect the sensitive arctic environment. The so called Zapovedniks are protected scientific nature reserves that are meant to stay forever wild, they belong to IUCN category I meaning that they belong to the highest category of conservation. Currently there are around 101 Zapovedniks in Russia of which 8 are located within the arctic. While not all of these conservation areas include marine ecosystems not all of these 8 are relevant. The most important protected areas for an MSP are; (Center for Russian Nature Conservation, 2010)

- Great Arctic State Nature Preserve. This nature preserve is the largest of Russia and Europe and the third largest preserve in the world. The preserve spans an area of in total 41.682 km^2 of which 981 km^2 is marine area. it is build up from 7 different clusters which are located in (Great Arctic Nature Reserve, 2001)
- Lena Delta Zapovednik (Ust-lensky). This reserve has an area of in total 59.320 km^2 however this is not all protected with the same intensity. The nucleus exists out of 14.330 km^2 of delta ground and a 10.500 km^2 buffer area surrounds the nucleus. Later on a former raw material reserve was added to the Lena Delta buffer area. The reserve now spans half the area of the entire delta. The area also covers a parts of the Laptev sea and the New Siberian Islands (National Heritage Protection Fund, 2009) (Centre for Russian Nature Conservation, 2010)
- Wrangel Island Zapovednik. This reserve consists out of two islands, Wrangel Island and Herald Island which are both located in the Chukchi Sea. Although the reserve itself mainly covers land area, a large buffer zone around the islands can affect an MSP significantly. The buffer zone is with

14.300 km^2 almost twice the size of the islands themselves. (Centre for Russian Nature Conservation, 2010)

- Nenetsky Zapovednik. In the Pechora Bay where the river Pechora reaches the Barents Sea the Nenetski reserve was established. This reserve contains a large marine zone that is home to numerous marine mammals and spans 1.819 km^2. (Russian Nature, 2010) The reserve consists out of two areas which together add up to 3.134 km^2 which is further protected by a 2.692 km^2 large buffer zone. (Centre for Russian Nature Conservation, 2010)
- Kandalakshsky Zapovednik. Established in 1932 the Kandalakshsky preserve is situated in Kandalakshsky bay in the White Sea. Although it is one of the smaller nature preserves, it still covers over 350 islands and 70% of the 705 km^2 that the Zapovednik spans consist out of marine habitats. (Centre for Russian Nature Conservation, 2010)
- Gydansky Zapovednik. This Zapovednik covers an area of 8.782 km^2 of which 718 km^2 is water. A large part of the conservation area consists out of peninsulas and islands in the Kara Sea. (Russian Nature, 2010)

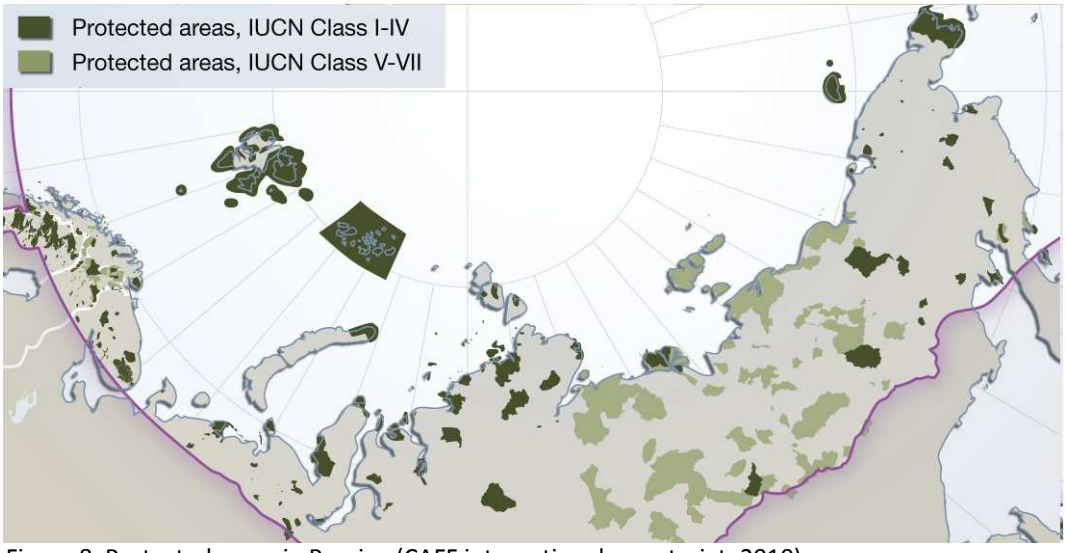


Figure 8, Protected areas in Russia. (CAFF international secretariat, 2010)

Beside these important Zapovedniks, where the highest rate of protection is implemented, numerous other protection areas exist, all with a different kind of

intensity of protection. In the map above the different protected areas are depicted as well as the wilderness areas that are not.

For an MSP the protected areas that are most important are the ones on the shore of the mainland, located on island, or also cover a marine area. Equally important is the current state of the environment in non-protected zones. With the help of this knowledge, decisions can be made in which area nature protection can be increased or where this is not necessary. Figure 9 below, shows beside protected areas also where wilderness areas are located. These wilderness regions are a priority for conservation. Note that this map is created a number of years before figure 8, and several nature preserves are not depicted. In the protected wilderness areas and adjacent buffer zones all other uses should be minimized and specifically conflicting uses should be banned.

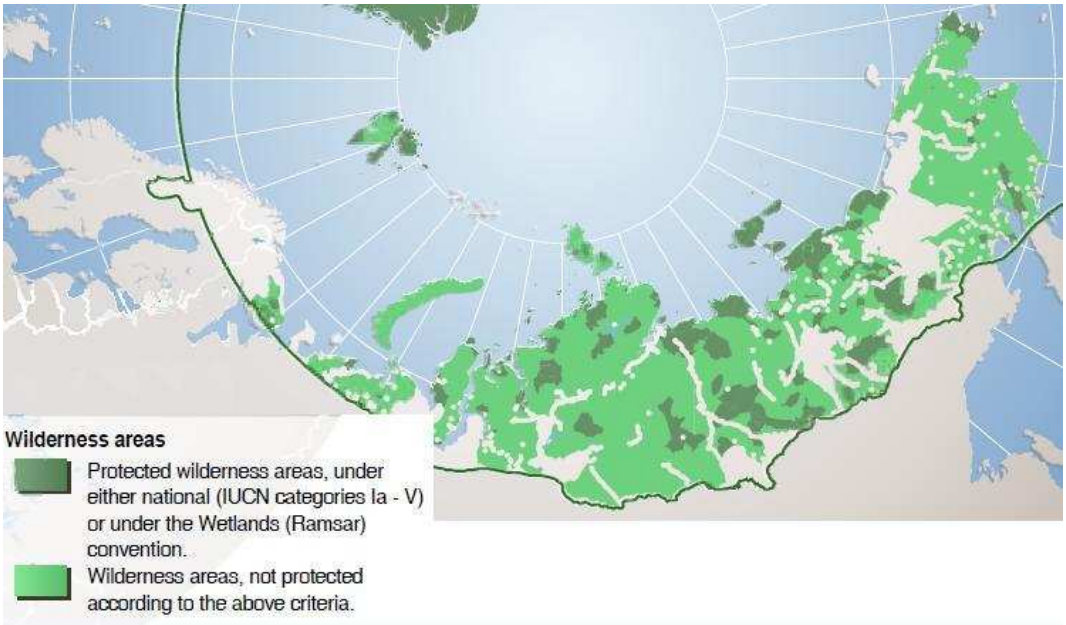


Figure 9, Protected areas and wilderness in Russia (UNEP/GRID-Arendal, 2007)

3.4.2.3 Oil and gas

Russia's economy made a remarkable comeback compared to 1998 when the country was on the verge of bankruptcy. For a large part this economic recovery has been owned to high oil and gas prices. Currently, Oil and gas is produced in an overwhelming extent, especially in the high north. Expected is that this

industry is likely to grow even further in the next decades, not only onshore but also offshore. (Moe & Wilson Rowe, 2008)

Currently, most offshore oil and gas extraction take place in the Barents Sea, Kara Sea, and the Pechora Sea (shelf sea located south-east of the Barents sea). These areas are rich in natural resources and in contrast with the eastern part of the Russian arctic waters it is close to pipelines, gas-processing plants, oil refineries, and chemical production centers. (OAO Gazprom, 2009b) Dominant in the offshore industries is until now gas extraction. In 2009 5.091,3 billion cubic meter natural gas, 65,5 million tons of gas condensate, and 47,4 million tons of oil was extracted from the northern Russian shelf seas (OAO Gazprom, 2009a) the exact locations of the current gas and oil extraction in the Arctic waters or near the coast are shown below in figure 10.

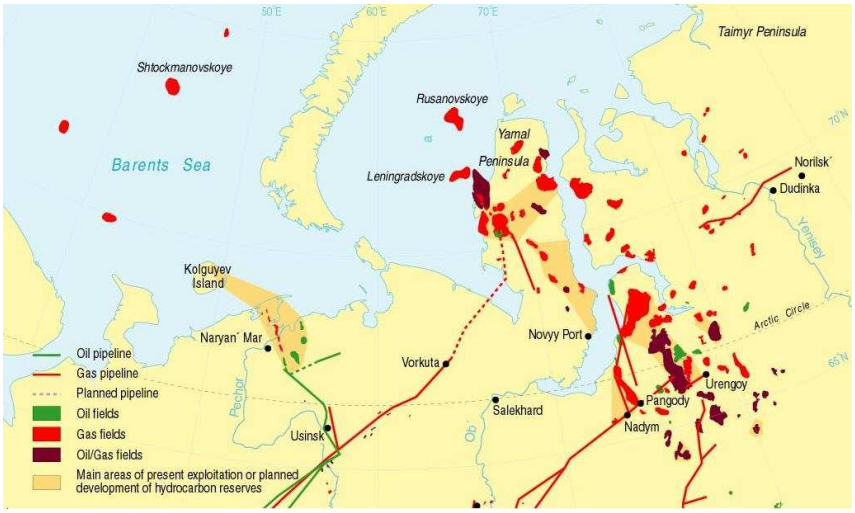


Figure 10. Major oil and gas development and potential development areas in arctic Russia and the Barents Sea region. (Arctic Monitoring and Assessment Programme, 1998a)

Beside the current locations of resource extraction it is also important how it will develop in the future. Will development be concentrated on offshore or onshore extraction? Will the industry be limited to the western part of the arctic waters or will the eastern shelf seas be developed as well?

Most of the Arctic Circle is essentially unexplored for petroleum. In total the arctic spans over 7 million km^2 of continental shelves, these are marine areas where the water depth is under less than 500 m of water. The arctic continental shelves may constitute the geographically largest unexplored prospective area for petroleum on earth, of which a large part belongs to Russia. (Bird et al, 2008)

The USGS did a study after the probability of the existence of undiscovered gas and oil field in the Arctic. The map below gives a summary of the findings.

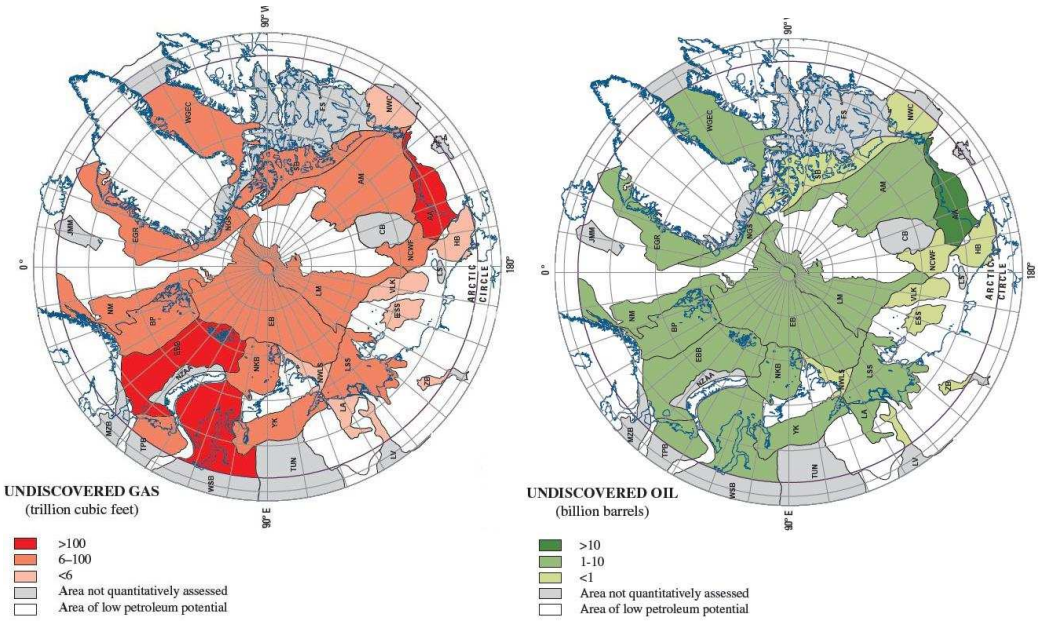


Figure 11, Provinces in the Circum-Arctic Resource Appraisal (CARA) colour-coded for mean estimated undiscovered natural resources. left map depicts undiscovered gas and right map depicts undiscovered oil. (Bird et al, 2008)

As can be seen in figure 11, most undiscovered gas is likely to exist in the Barents Sea and the Kara Sea that are currently already heavily used for gas extraction. In the Laptev Sea, the East Siberian Sea, and the Chukchi Sea less undiscovered gas is expected, the gas industry is until now also not present in these regions. For oil the expectations are slightly different, as in the case with gas, undiscovered oil fields are to be expected in the Barents Sea and the Kara Sea, but also in the Laptev Sea. The East Siberian Sea and the Chukchi Sea show again a smaller potential for undiscovered oil fields.

Besides the natural factor that prescribes where oil and gas can be exploited there is also a human factor that influences where exactly drilling will occur. In the case of Russia's arctic waters this will be decided mainly by the Ministry of Energy of Russia and the country's leading gas and oil producer, Gazprom. Russia's energy strategy up to 2020 (Ministry of Energy of the Russian Federation, 2003) states that in the next decade the Russian shelf seas are one of the regions where oil and gas drilling will be developed further and investments will be made into the further research for offshore drilling techniques. Although

this does hint that in the future offshore gas and oil drilling will exist in the future and most probably will also grow further, the strategy of Russia's Ministry of Energy does not prescribe areas where this is allowed. A better insight can be provided by Gazprom, listed in an overview with promising fields for in the future solely fields are named that are located within the Barents Sea, the Pechora Sea and the Yamal peninsula in the Kara Sea or within non-relevant areas to an MSP. The listed promising fields are commissioned to open between the present and 2018 meaning that it is not likely that fields in the Laptev Sea, the East Siberian Sea, and the Chukchi Sea will be opened in this decade. (Ministry of Energy of the Russian Federation, 2003)

Another factor that will influence the location of offshore oil and gas drillings is the present infrastructure, while in pipelines and plants already exist near the Barents Sea, the Pechora Sea, and the Kara Sea it is likely that the natural resources in this area will be exploited first. The lack of infrastructure in the eastern arctic, the high costs of constructing these, and fact that natural resources in the eastern arctic are less abundant will probably lead to less resource extraction in the eastern shelf seas meaning that oil and gas extraction is likely to stay limited to the Barents Sea, the Pechora Sea, and the Kara Sea.

3.4.2.4 Fishing

The seas that make up the study area are concerning fishing part of the so called Northern fishery basin. This basin covers all the shelf seas from the Barents Sea in the west unto the Chukchi Sea in the East. This region is the second most important fishing region of the six that are distinguished within the Russian territory. Catches here have a share of 22% of the total amount of fish that is caught in Russia. The most important species that make up the catch are cod, haddock, herring, redfish, salmon, capelin, blue whiting, arctic cod, flatfish, and mackerel. A quarter of these fish are harvested in the Barents Sea, this sea also has a year-round ice-free harbour to its disposal in contrast to the other shelf seas in the Arctic. (Eurofish, 2005) Beside the advantages of an ice-free harbour and a smaller ice-extend in general, the Barents Sea has a number of other benefits in comparison to the other seas. First and foremost it is home to a larger

fish stock then the seas further to the east, (Arctic Portal, 2010) figure 12 shows the level of the fish stock per sea.

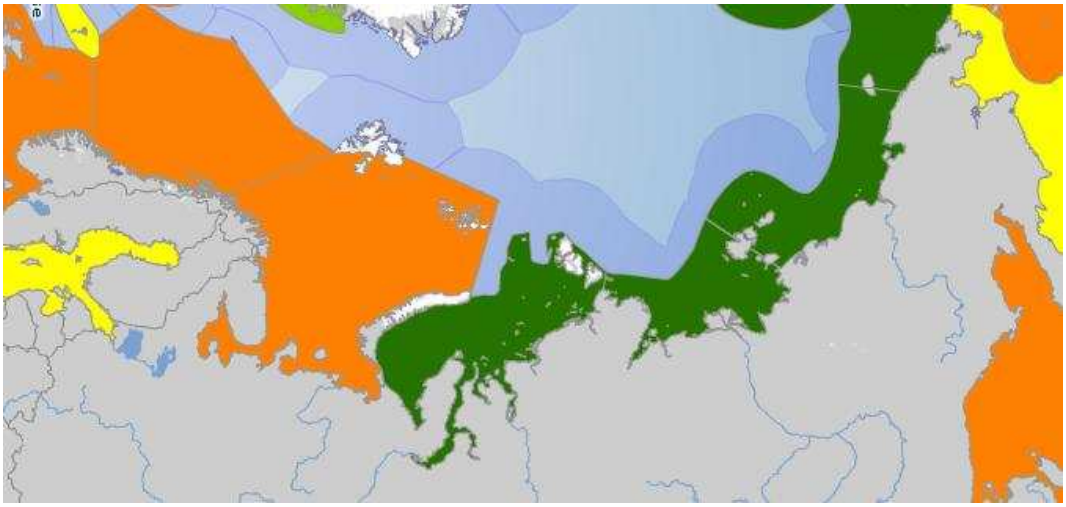


Figure 12, Fisheries catch abundance in arctic shelf seas. Orange = high, yellow = medium, green = low, dark green = very low. (Arctic portal, 2010)

In addition the Barents Sea not only has the largest fish stock, there is also a small rising trend in biomass. On the other hand, in the Kara Sea, the Laptev Sea, the East Siberian Sea, and the Chukchi Sea a small decreasing trend in biomass can be found in addition to the already very low fish stock present in these seas. (Arctic portal, 2010)

The final advantage that the Barents Sea fishing industry has over the fishing industries in other arctic seas is the proximity to the fish processing infrastructure and consumption centers. The Barents Sea disposes over three large fishing harbours, Archangelsk, Belomorsk, and the ice-free Murmansk. The seas further to the east lack fishing harbours and thereby the necessary processing industry. The main consumption markets for Russian fish are located within the larger city centers in Russia; St. Petersburg and Moscow. Additional important markets can be found in the biggest fishing cities such as Murmansk. (Food and Agricultural Organization of the United Nations, 2007)

In November 2004 the Law on Fishery and Conservation of Aquatic Biological Resources was adopted, this law constitutes a complete new legal framework for fishing and introduces a new long term quota allocation system. (Eurofish, 2005)

This law has been the last in a long row of reorganizations in the Russian system of fishery management since the early 1990's. The large number of changes has led to coordination problems, confusion, and a reduced effectiveness of the regulations and institutions. Unfortunately the result is that Russia focus was upon short-term profit instead of long-term viability of the fish stock for a large number of years. The primary goal of Russia's fish management is the exploitation of fish stocks for economic benefit instead of protection of the fish stocks. (Hønneland, 2005)

Besides the commercial fishing discussed above a number of other fishing activities also take place in Russia, one of these is artisanal or subsistence fishing. Artisanal or subsistence fishing means that traditional gear is used and the catch is mainly meant for subsidence. The villages along the White Sea the Pomor population still practice the traditional fishing and life is governed by the annual cycle of fishing. For Indigenous people and Russian settlers in the north of Siberia fishing used to play the same important role in the communities as is the case with the Pomor people along the White Sea. However, the traditional lifestyle was disrupted in the 1960's when the administration forced the inhabitants to abandon the coastal villages and to resettle in bigger settlements. The slow process of the revival of cultural traditions and identity requires also the revival of subsistence fishing. Although legally these fish are not allowed to be sold by the native inhabitants, in praxis this does happen on a relatively small scale. (Food and Agricultural Organization of the United Nations, 2007)

For the MSP it seems that fishing is especially large in the Barents Sea and the adjacent White Sea. In these regions it will be important that fish stocks living in or near conservation areas will be protected against large commercial fishing. In the Kara Sea, the Laptev Sea, the East Siberian Sea, and the Chukchi Sea fishing only plays a marginal role and fish stocks are naturally low. Artisan or subsistence fishing should be allowed on a small scale for indigenous people, when done on a sustainable level this can even be possible within nature conserves with a lower level of protection.

3.4.2.5 Strategic.

The Russian Arctic has played a significant role in Russia's military strategy. Since revolution in 1917 the Russian North has been a restricted area for foreign vessels for a long time. The Russian waterways along the shelf seas did not only serve a commercial purpose by opening up the east for resource extraction, but in addition it also played a significant military role. The Northern Sea route was regarded as a passage way for the Northern and Pacific naval fleet to bind these two fleets together when necessary. Even when Russia was not in a war situation the arctic waters maintained their status as an important strategic military region. The Russian part of the arctic maintained to be closed for foreign vessels throughout the cold war. In 1991, a few months before the Soviet Union dissolved, the NSR was opened to the public for the first time since 1917. (Ragner, 2008)

Even in the present day the arctic waters still play a strategic role for Russia. In the Maritime Doctrine of the Russian Federation 2020 (The Russian Federation, 2001) the goals that the government created for its marine areas are described. In case of the Arctic a number of strategic goals can be found besides economic and scientific objectives. Among the strategic goals stated by the Russian Federations are; (The Russian federation, 2001)

- Protecting the interests of the Russian Federation in the Arctic.
- Creation of conditions for ensuring the protection of sovereignty, sovereign and international rights of the Russian Federation in the Arctic regional direction.
- Restriction of foreign naval activities in the agreed areas and zones on the basis of bilateral and multilateral agreements with the leading maritime power.

Although there are no areas in the arctic waters that are currently restricted to foreign vessels (except naval vessels in certain areas) there are still strict rules for border areas in Russia, including coastal areas where foreigners could come on to shore. A number of these restricted areas are also located within the Arctic. (Visalink, 2010) This however does not have any spatial consequences for the maritime area. In contrast with the cold war era, when the strategic function of

the northern shelf seas would have a large spatial impact in the form of restricted areas, this has currently changed. For an MSP the strategic function of the arctic has on this date hardly any spatial consequences and other functions can coexist with the strategic function.

3.4.2.6 Waste disposal.

Waste disposal in seas and oceans is not a theme of which countries are proud and thus information is not readily available about if and where these activities take place. However this does not mean that dumping did not take place in the past or even still takes place currently. In 1992 news spread about radioactive wastes being dumped by Russia. Most of this dangerous material was dumped in shallow waters of the arctic shelf seas, in particular the Kara Sea. Worldwide large concerns were expressed and immediately after the IAEA (International Atom Energy Agency) started a research after the consequences caused by the dumping. The research concluded that; (International Atomic Energy Agency, 1997)

- Releases from identified dumped objects are small and localized to the immediate vicinity of the dumping sites.
- Projected future doses to members of the public in typical local population groups arising from radioactive wastes dumped in the Kara Sea are very small. This magnitude that was found is approximately the same as the natural background dose.
- Doses to marine fauna are insignificant, orders of magnitude below those at which detrimental effects on fauna populations might be expected to occur.
- The Controls on the occupation of beaches and the use of coastal marine resources and amenities in the fjords of Novaya Zemlya used as dump sites must be maintained.

The outcomes mean that although there is until now no large impact on the environment or humans, this can still happen in the future and activities should be limited in the area around the dumping site. Below, figure 13 shows where the dumping sites are located exactly. As can be seen most of the sites are

located near the Novaya Zemlya Island in the Kara Sea, but also near Kolguyev Island in the Barents Sea. These areas will be off limit for most other functions due to the danger that nuclear waste poses to human health and the environment.

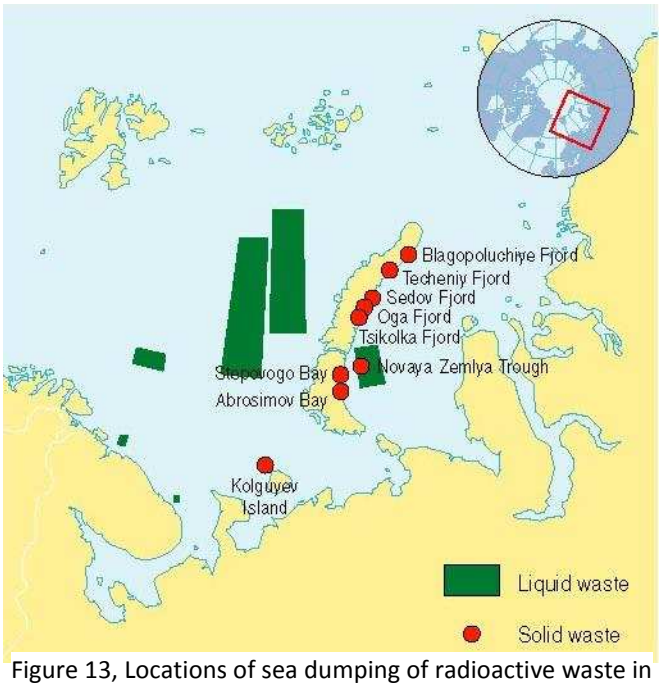


Figure 13, Locations of sea dumping of radioactive waste in the Russian Arctic. (Arctic Monitoring and Assessment Programme, 1998b)

It is more than likely that beside nuclear waste also other types of wastes have been dumped in the arctic waters, an activity that may be continue to this date. However, a lack of information and openness about this theme makes it difficult to find appropriate information about non-nuclear dumping sites. In this case the MSP will limit itself to old dumping sites from nuclear waste, especially solid waste,, not only because this is the only kind of dumping on which information is freely available, but also while this has the most spatial impacts on other functions.

3.5 Summary

Similar as in the previous chapter a short overview is provided. In the conclusion in chapter 5 the two overviews will be compared to see if and what the differences are between an MSP in the Russian Arctic compared to MSP's in other parts of the world. The same subject are discussed here as in the summary of chapter 2; Benefits of MSP, specific goal of the MSP, the legal framework, scale, boundaries, timeframe, process, and functions to be included.

Subject	
Benefits MSP	- Provide financial security for investment decisions - Provide tools for the management of increasing and often conflicting uses of the ocean. - Manage competition among various uses - Develop a stable regulatory environment that ensures better and simpler regulation toward the location of an economic activity - Ensure that individual decisions on activities, taken at a national or regional level, but affecting the same ecosystem or cross-border activities are dealt with in a coherent manner - Ensure that the future development of offshore activities is consistent with the need to evolve multilateral rules.
Specific goal MSP	The goal is centered around sustainability but does not take into account all its elements
Legal framework	Important conventions and laws; - UNCLOS - CBD - Agenda 21 - WSSD - National framework Although the national framework is a very important element in the legal framework this has not been researched because it's beyond the scope of this study and its complicated nature.
Scale	The study area encompasses the whole of the EEZ located on the north of Russia.
Boundaries	Although not optimal the boundaries are drawn at administrative boundaries. Landward boundaries are also drawn at the border between land and sea.
Timeframe	A timeframe of 20 years has been chosen and a 5 year review period is chosen.
Process	Process exist out of 8 steps - Determine goals and objectives - Identify issues and collect information - Analyze information and generate options - Evaluate options - Prepare spatial plan - Examination of plan - Adopt plan - Implement, monitor, and review Stakeholder engagement should be an iterative activity during the whole process.

	In this study only the first 3 steps are executed while the end-result exists out of scenarios instead of a legally binding MSP.
Functions to be included	Although in this chapter we have found out that these functions have not all spatial repercussions the most important functions are; - transport - strategic - minerals and energy - living resources - waste disposal - conservation

Table 2. Summary of chapter 3.

Chapter 4. Analysis and generation of scenarios.

In this chapter three scenarios will be created of how the marine space in the Russian Arctic may be organized in the future. Before the three scenarios can be created an overview must be created of the current situation in the area (Schultz-Zehden et al, 2008), this step is necessary while the method of exploratory forecasting scenarios that will be used in this chapter, are being build up from the current situation. Furthermore it is a good way to summarize all the information compiled in chapter 3.

The second step into the creation of the scenarios will be creating an overview of which functions are compatible with each other and which ones are conflicting. The reason for this second step is that in the scenarios conflicting uses should be separated while otherwise they can coexist next to each other. (Schultz-Zehden et al, 2008)

The end result of this chapter will be three separate scenarios for the Russia's Nordic seas. The first scenario will be how the study area might look like in 20 years if the current trends are to be maintained. Next a scenario will be created where natural conservation will be the main priority. Finally a scenario will be made where economic benefits are of great importance.

4.1 Analysis of current uses.

In order to create a clear overview of how the study area currently functions, a map of current uses can be compiled. For this all the aforementioned functions can be drawn together in one map, this way conflicting uses in the same area can be identified quickly. Beside the function strategic, the functions shipping and fishing are not drawn in. this is done while the function of fishing has no spatial delineation and takes place in the complete region, it is however mostly limited to the Barents Sea while fishing in this region is most profitable. The function shipping also does not have any set routes, and additionally shipping is only practiced sparsely.

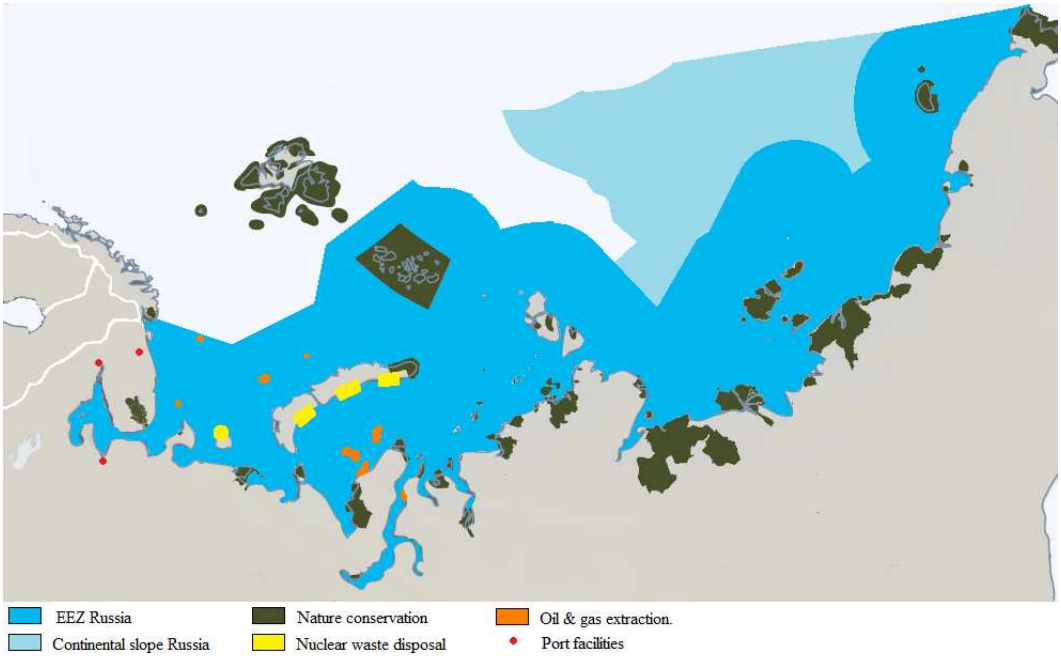


Figure 14, map of current uses.

4.2 Compatibility of functions.

For some functions such as nuclear waste disposal it is clear that it cannot coexist with most functions. For other functions such as shipping and fishing it gets more complicated. To get a clear overview a table can be constructed of compatibility of functions. (Schultz-Zehden et al, 2008) This table will be an important input for the scenarios. These will have to take this table into account and make sure that only compatible functions will take place within the same location. Any non-compatible uses that will be combined will cause either user-user conflicts or user-environment conflicts.

Below such a table is composed of what functions are compatible with each other for the case of the Russian arctic waters.

In table 3 the strategic function has been deliberately left out. The information about this function revealed that there are hardly any spatial consequences. Therefore the strategic function will not have to be taken into account in the Marine Spatial Plan.

	Shipping	Nature conservation	Oil and gas extraction	Fishing	Waste disposal
Shipping		-	+ except in safety zone	+	-
Nature conservation	-		-	Only subsidence fishing	-
Oil and gas extraction	+ except in safety zone	-		+ Except in safety zone	-
Fishing	+	Only subsidence fishing	+ except in safety zone		-
(nuclear) waste disposal	-	-	-	-	

Table 3. Compatibility of functions. - = non-compatible += compatible

For the combination oil and gas extraction-fishing and oil and gas extraction-shipping the rating '+ except for safety zone' has been given. This means that in theory these uses are compatible, but to prevent collisions or damages a safety zone should be planned around the gas and oil installations.

For the combination of uses fishing-nature conservation the rating 'only subsidence fishing' has been given. This means that commercial fishing should be banned but local indigenous peoples of the North should be allowed to practice artisanal subsidence fishing to support their traditional lifestyle.

4.3 Scenarios.

For the development of the scenarios three visions will be created first, with the help of these the scenarios will be created. These scenarios are co called explorative foresting scenarios; their goal is to make visible what may happen in the future if certain policies and priorities are changed. These scenarios will create ideas towards what directions are possible and not necessarily how ideas of how the future should look like.

While the three visions should vary sufficiently to create different outcomes 3 extremes are chosen for the scenarios. In reality the future is more likely to be a combination of these different visions than one specific scenario.

The first scenario will be a prolongation of the current trends and policies. Further two scenarios will be created that deviate from the current trends. One will portrait how the future might look like if priority will be put upon nature conservation. The third will show how the area might evolve if priority is given to economic benefits.

The visions created here are;

- Business as usual. (current trends)
- Wild Arctic. (priority nature conservation)
- Resource Rich Arctic. (priority economic benefit)

4.3.1 Business as usual.

In "business as usual" the current trends will be used to forecast how the area may be organized in 20 years. The current trends of planning seem to lack coordination and planning often seems haphazardly. In this scenario the natural conservation will only be sparse and will follow the trend of only assigning small and isolated areas to nature conservation.

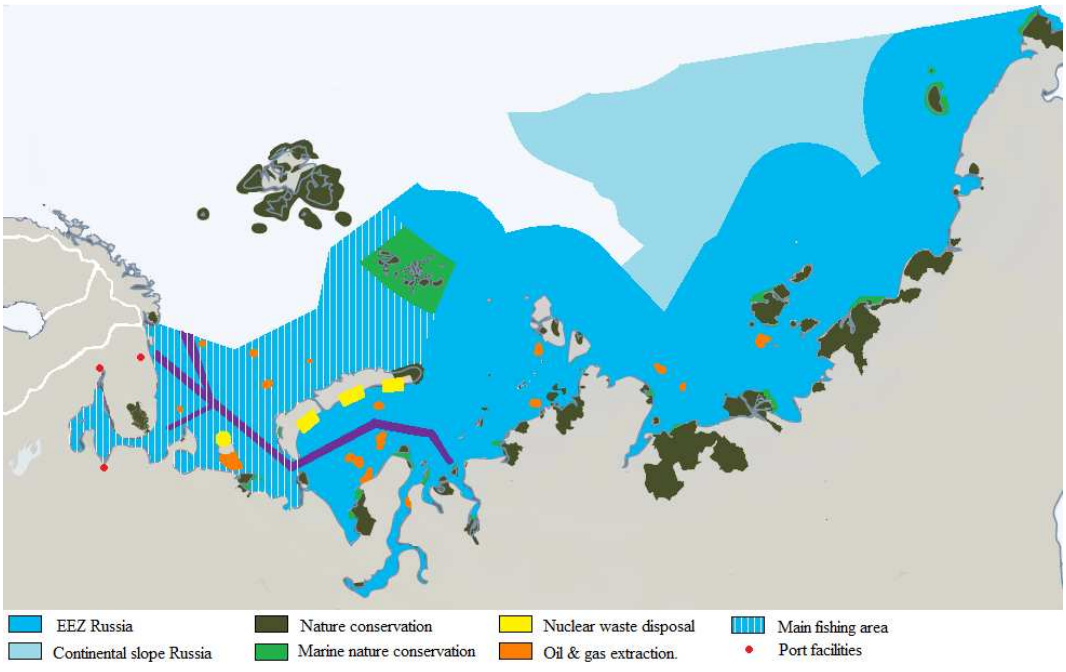


Figure 15, scenario business as usual

Shipping will not grow much further, and will be limited unto the western part of the study area. The extraction of natural resources will grow significantly but will probably not be limited to the more resource rich western part.

- In the marine nature reserves, all other functions, except artisanal fishing are prohibited. In this scenario nature conservation is limited to small and isolated patches of water that are usually adjacent to onshore protected areas. This falls in line with the current tradition of creating only a sparse number of small marine reserves.
- In the nuclear waste disposal zone, no other function is allowed due to danger to the human health. However, new dumping of nuclear waste is prohibited.
- Oil and gas extraction sites are accessible for the functions shipping and fishing, as long as a safety distance is kept to any offshore structures. Oil and gas extraction outside these locations is not allowed. In this scenario the number of oil and gas location has grown significantly. The growth has not been limited to the Kara Sea and the Barents Sea but has also spread out to the Laptev Sea that was formerly not exploitated.
- If not conflicting with other functions, fishing is allowed throughout the whole of the study area. (Not in nature reserves, waste disposal sites, and safe distance kept to oil and gas infrastructure) the so called main fishing area is only created to make visible where the main fishing activity is likely to take place. The Barents Sea is designed to be the main focus for fishing while the largest fishing stock lives in this area and all the port facilities with fishing harbour are located in the Barents Sea and the White Sea. Fishing in the other, more eastern seas will most probably remain relatively small.
- Shipping is, like fishing, allowed in the whole of the area if compatible with other functions. (Not in nature reserves, waste disposal sites, and safe distance is to be kept to oil and gas infrastructures) However, it is likely that shipping will remain small and it will mostly be limited to the

western part of the study area, between the ports on the Barents Sea and the White Sea up to the port of Dudinka on the Kara Sea.

4.3.2 Wild Arctic.

This scenario will focus mainly on nature conservation, the current industries in the area will remain and will only grow slightly, however this will mostly take place in areas where these industries already exist. The eastern part of the Russian north that is currently mostly wilderness will be protected. While an MSP only focuses on marine areas, only marine protected areas will be planned. The outcome of this scenario can be found below in figure 16.

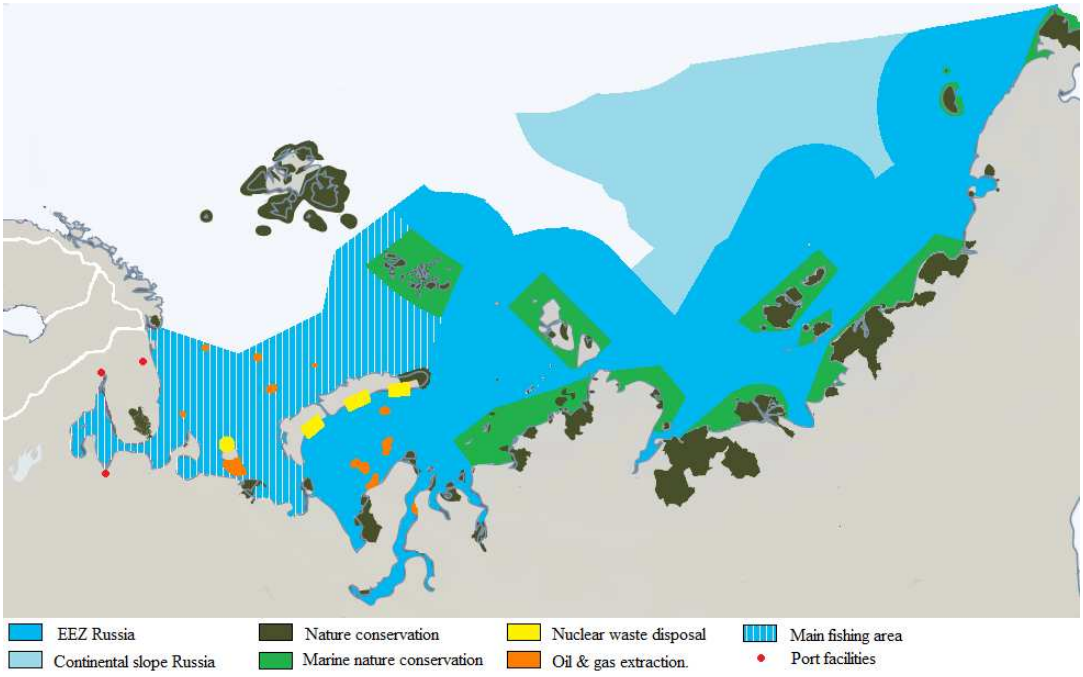


Figure 16, Scenario Wild Arctic.

While not every zone prohibits other uses or makes uses limited to the specific zone, clarification is necessary.

- In the marine nature reserves, all other functions, except artisanal fishing are prohibited. These conservation areas are all located next to areas that are still part of the so called wilderness areas. These marine areas are most likely to still be in a pristine or near pristine state. The adjacent wilderness zones onshore are also most likely to become involved in

conservation schemes, thereby are they likely to create a large joint protection zone on and offshore.

- In the nuclear waste disposal zone, no other function is allowed due to danger to the human health. However, new dumping of nuclear waste is prohibited.
- Oil and gas extraction sites are accessible for the functions shipping and fishing, as long as a safety distance is kept to any offshore structures. Oil and gas extraction outside these locations is not allowed. In this scenario the number of oil and gas location has grown slightly. Although this scenario is build upon the vision of nature protection and only a small growth in industrialization, it is not realistic to expect no increase in offshore oil and gas exploitations. Therefore a small number of additional exploitation locations are drawn in, this however remains in the Kara Sea and the Barents Sea where currently drilling activities already take place.
- As is the case in the "Business as usual" scenario Fishing is allowed everywhere except in areas that are assigned to conflicting uses, but will probably be most intense in the Barents Sea. Fishing in the other, more eastern seas will remain sparse.
- Shipping has not been drawn into the map because it is most likely to stay small in this vision, the nature reserves are shaped in such a way that (future) shipping routes will not be hindered. Even though commercial shipping is thought not to be profitable in this area until 2030 and will remain only relatively small, in the further future this function may become more important. This way the plan is designed to be more future-proof then just until 2030.

4.3.3 Resource rich Arctic.

In this scenario the economic activities in the region will be encouraged, while the oil and gas, the fishes and the most important port facilities are all located in the western part of the arctic and in particular the Barents Sea, most industries will developed here. In the summer months shipping is expected to take place in

the whole of the arctic, a large part will of the shipping activities will be trans-arctic.

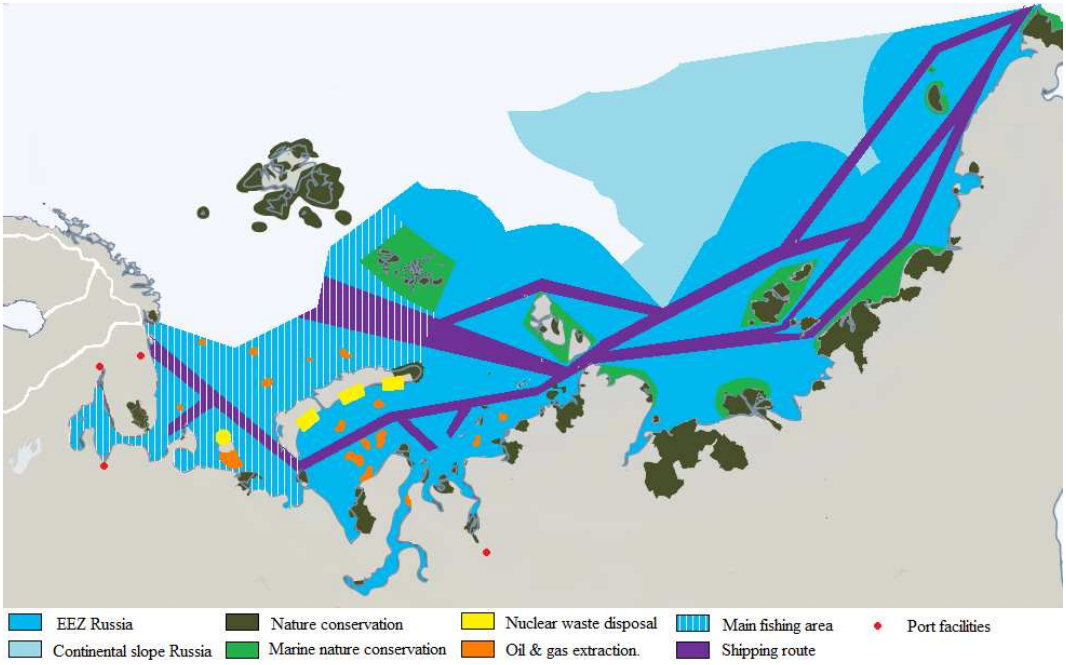


Figure 17, Scenario resource rich scenario.

There are several changes in this scenario compared to the Wild Arctic version and the Business as usual scenario.

- Natural marine reserves are in this version are considerably less and smaller compared to the Wild Arctic but still larger than is the case in the business as usual scenario. They are mostly located near already existing natural onshore reserves or in areas where there are no developments in the vicinity and wilderness reigns. The conservation areas are even more shaped in such a way that they provide minimum of hindrance to other functions.
- In the nuclear waste disposal zone is similar to the wild arctic scenario, no other function is allowed due to danger to the human health. New dumping of nuclear waste is prohibited.
- Oil and gas extraction has grown significantly. While the most (undiscovered) gas and oil fields are located in the Kara Sea and the Barents Sea the offshore drilling remains limited to these seas. One of the natural reserves in the scenario Wild Arctic disappeared and made room

to new industrial developments. Further, the extra developments in the Kara Sea makes it possible for the small port of Dudinka to become significantly larger and new port facilities are likely to be developed here.

- Fishing is regulated in this scenario in the same way as in “Wild Arctic” and “Business as usual”, fishing is allowed almost everywhere but is likely to maintain most intense in the Barents Sea. Although the developments in the port of Dudinka might open up new possibilities in the Kara Sea, the fish stock is only small in this region and thus the fishing industry is likely to remain small.
- Shipping is much larger in this scenario. A number of probably most used routes are depicted in the map. There is a multitude of possible routes in order to provide ships choices so the route can be adjusted to ice-conditions and the characteristics of the ships. It should be noted that in a number of sea-ways between islands and the shore, depth is limited. Larger ships are therefore forced to sail north of the island groups. Russia is allowed to lay down these routes legally. Domestic as well as foreign ships are then obeyed to follow these routes. This however, can only be done within the EEZ, not above the continental shelf.

Although all three scenarios have separate visions and aims, there are certain important aspects that appear to be similar. The most obvious is that most of the industrial activities will likely to develop in the Barents Sea and to a lesser degree also in the Kara Sea. This is largely due to a lack of population, infrastructure and industries on the shore of the eastern arctic, a low fish stock, and a lower gas and oil potential. On the other hand, for these reasons combined with the high amount of wilderness area, the eastern arctic proves to be more suitable for nature protection.

Chapter 5. Conclusions.

In this chapter we will accumulate the knowledge gained in the previous chapter to answer the research questions that where asked in chapter 1.
First the focus will be upon the eight sub questions and these will be answered to gain an extra overview of what was found in chapter 2 and 3.
Further, the 2 main questions will be answered with the help of the answers on the sub questions, the summary tables from chapter 2 and 3, and the findings from chapter 4.

Sub questions about marine spatial planning;

- *What is the purpose of a marine spatial planning?*

  A creation of a marine spatial plan can have a number of advantages for the area (Commission of the European communities, 2006);

  - Provide financial security for investment decisions
  - Provide tools for the management of increasing and often conflicting uses of the ocean.
  - Manage competition among various uses
  - Develop a stable regulatory environment that ensures better and simpler regulation toward the location of an economic activity
  - Ensure that individual decisions on activities, taken at a national or regional level, but affecting the same ecosystem or cross-border activities are dealt with in a coherent manner
  - Ensure consistency between land and marine systems
  - Ensure that the future development of offshore activities is consistent with the need to evolve multilateral rules.
  - Coordinate the spatial implementation of off-shore renewable energy with other activities.

- *What scope and scale should be used?*

  The timeline being used is usually between 10 and 25 years, (Douvere & Ehler, 2009, Gilliland & Laffoley, 2008) and a timeline of 20 years is recommended with a review period of 5 years. (MSSP consortium, 2006) The scale being used varies between whole EEZ that are being planned to local plans. (Gilliland & Laffoley, 2008)

- *What steps should be taken?*

  The planning process of an MSP usually consists out of 8 steps (MSSP consortium, 2006);

  - Determine goals and objectives
  - issues and collect information
  - Analyze information and generate options
  - Evaluate options
  - Prepare spatial plan
  - Examination of plan
  - Adopt plan
  - Implement, monitor, and review

  Stakeholder engagement should be an iterative activity during the whole process.

- *What should be the end-result?*

  The end result should be a marine spatial plan; this is a strategic policy document that should be easy to work with. (Schultz-Zehden et al, 2008) This plan is build up out of a number of documents (MSSP consortium, 2006)

  - A statement of objectives
  - An explanation of the spatial framework and policies
  - A zoning map containing information where the general policies apply
  - A more detailed zoning map where specific policies apply
  - However, in some areas no spatial planning might be more suitable than an MSP, this will avoid unnecessary regulations and the current policies can be maintained. (Gilliland & Laffoley, 2008)

Sub questions about the region;

- *Is an MSP useful for the study area?*

  To see whether an MSP is beneficial for the study area the possible benefits of MSP's have been analyzed, it turns out that not all the benefits can be reached for the Russian Arctic. The goals that can be reached are;

  - Provide financial security for investment decisions
  - Provide tools for the management of increasing and often conflicting uses of the ocean.
  - Manage competition among various uses
  - Develop a stable regulatory environment that ensures better and simpler regulation toward the location of an economic activity
  - Ensure that individual decisions on activities, taken at a national or regional level, but affecting the same ecosystem or cross-border activities are dealt with in a coherent manner.

  The benefits that will probably not be reached are;

  - Ensure consistency between land and marine systems. This is likely not to be reached while the boundaries are likely to be put at the border between land and see, thereby making consistency between land and sea will be difficult.
  - Coordinate the spatial implementation of off-shore renewable energy with other activities. Due to the harsh climate conditions and the remoteness of the study area, development of renewable energies is not likely in the near future.

- *What are the area characteristics?*

  The study area consists out of a number of shelf seas and a part of the Arctic Ocean. This area has a remarkable large continental shelf, shallow seas, and large number of islands. The region is difficult to navigate because of the shallow straits between the island groups and extensive ice area and thickness, and a lack of charting. (Arctic Council, 2009)

The study area has a unique environment that is host to a large array of animals. (CAFF International Secretariat, 2010) unfortunately this environment is particular sensitive to changes and pollution. Although the north of Russia has been regarded as a cheap disposal option in the past, due to the vastness of the region the human impact is until now relatively minor (Holland, 2002, CAFF International Secretariat, 2010) the most important impacts in the future is likely to be global warming. (CAFF International Secretariat, 2010)

The Arctic coast is sparsely populated and since the disintegration of the Soviet Union, population numbers decreased even further. The GPD in the region is higher than the Russian average; this fact is mostly caused by the large number of extraction from natural resources of which energy resources is the main source of income. (Gløsmrod & Aslaksen, 2006)

Sea ice area and sea ice extend seem to be shrink with a large speed in the last decades, meaning that an ice-free summer in the arctic could be possible in the foreseeable future. However closer examination shows that a statistical long-term change can't be found yet (IPPC, 2007, Polyakov et al, 2003)

- *What are the current uses in the area?*

The most important marine functions in this area are;

- transport
- strategic
- minerals and energy
- living resources
- waste disposal
- conservation

It should be noted that not all these functions have a large spatial impact.

Why these functions are important and other ones are excluded will be analyzed in more detail later.

This information together with the spatial consequences of these functions provided the input for the "map of current uses" in chapter 4.

- *How are the current uses likely to change in the future?*
    - *Transport:* The function transport will largely be depended on both global warming and the melting of the ice, and the infrastructure that will make shipping in the Arctic better possible. How this function may develop in the future is highly uncertain, but it is not very likely that this will develop itself into an important shipping route in the next 20 years
    - *Strategic:* This function is likely to maintain its current status. However, while this function does not really have important spatial consequences, this is not of a large significance.
    - *Minerals and Energy:* the large reserves of natural resources combined with the softening of the climate and the government strategy to encourage offshore industry, cause that it is very likely that this industry will grow significantly in the next two decades.
    - *Living Resources:* While the areas that are mostly unexploited currently are also low in fish stock, combined with the location of the fishing harbours, the main fishing area is likely to stay in the Barents Sea.
    - *Waste disposal:* The nuclear wastes that we're dumped still pose a threat to human health; these locations will be closed to other functions for the next 20 years. No new dumping grounds will be appointed.
    - *Conservation:* there is a slight increase in marine conservation areas, it can be expected that in the next two decades the area devoted to conservation will be extended, but will mostly be small-scaled preserves.

This information was largely the input for the creation of the 3 scenarios in chapter 4.

After the sub questions have been answered, we can now take a closer look to the main questions.

- How would an MSP for the Russian Arctic look like and how might the process differ from MSP elsewhere.
- How could the end-result of the planning process look like for the study area?

The conclusions that can be drawn on the hand of the first question are related to the process of the MSP. After researching why and how an MSP in general should be conducted in chapter 2, and consequently how an MSP can be designed for the case of the Russian Arctic in chapter 3. The differences between general theory and the case study can be discovered, these differences and similarities will be discussed in detail below.

Secondly, conclusions can be found on the hand of the second question concern the outcome of the study and findings from the scenarios about the Russian arctic. These conclusions can be found with the help of chapter 4.

Findings about the process can easily be found by comparing the summary tables of chapter 2 and 3. Below the two tables are combined. They findings will be discussed in further detail under the table.

General MSP	MSP Russian arctic
Benefits of MSP	
- Provide financial security for investment decisions - Provide tools for the management of increasing and often conflicting uses of the ocean. - Manage competition among various uses - Develop a stable regulatory environment that ensures better and simpler regulation toward the location of an economic activity - Ensure that individual decisions on activities, taken at a national or regional level, but affecting the same ecosystem or cross-border activities are dealt with in a coherent manner - Ensure consistency between land and marine systems - Ensure that the future development of offshore activities is consistent with the need to evolve multilateral rules. - Coordinate the spatial implementation of off-shore renewable energy with other activities.	- Provide financial security for investment decisions - Provide tools for the management of increasing and often conflicting uses of the ocean. - Manage competition among various uses - Develop a stable regulatory environment that ensures better and simpler regulation toward the location of an economic activity - Ensure that individual decisions on activities, taken at a national or regional level, but affecting the same ecosystem or cross-border activities are dealt with in a coherent manner - Ensure that the future development of offshore activities is consistent with the need to evolve multilateral rules.

Specific goal MSP	
Before MSP is started the goal what the MSP is supposed reach should be stated. This goal should contain elements of sustainability.	The goal is centered around sustainability but does not take into account all its elements
Legal framework	
Important conventions and laws; - UNCLOS - CBD - Agenda 21 - WSSD - National framework	Important conventions and laws; - UNCLOS - CBD - Agenda 21 - WSSD - National framework
Scale	
Ranges from whole EEZ to a more local scale, depended on circumstances such as the number of functions located in the region	The study area encompasses the whole of the EEZ located on the north of Russia.
Boundaries	
Optimally located on the borders of ecosystems and taking the land inward from the coast also into account. However, in praxis administrative boundaries and the coast are used.	Although not optimal the boundaries are drawn at administrative boundaries. Landward boundaries are also drawn at the border between land and sea.
Timeframe	
Between 10-25 years, review periods of 5 years are recommended	A timeframe of 20 years has been chosen and a 5 year review period is chosen.
Process	
Process exist out of 8 steps - Determine goals and objectives - Identify issues and collect information - Analyze information and generate options - Evaluate options - Prepare spatial plan - Examination of plan - Adopt plan - Implement, monitor, and review Stakeholder engagement should be an iterative activity during the whole process.	Process exist out of 8 steps - Determine goals and objectives - Identify issues and collect information - Analyze information and generate options - Evaluate options - Prepare spatial plan - Examination of plan - Adopt plan - Implement, monitor, and review Stakeholder engagement should be an iterative activity during the whole process. In this study only the first 3 steps are executed while the end-result exists out of scenarios instead of a legally binding MSP.
Functions to be included	
Most important functions in the oceans; - transport - strategic - minerals and energy - living resources - waste disposal - leisure and recreation - education and research	Although in this chapter we have found out that these functions have not all spatial repercussions the most important functions are; - transport - strategic - minerals and energy - living resources

- conservation - coastal engineering	- waste disposal - conservation

Table 4, summary chapter 2 and 3

Although a number of small differences came into existence while the MSP in this study only encompasses the first 3 steps of the process, from the table above it becomes clear that a large number of aspects of the process are similar. But there are some notable differences, these will be discussed below.

First, not mentioned in the table above but still of great importance is the reason for starting the MSP process. In most cases a marine spatial plan is developed to create solutions for spatial problems in heavily used seas. In these areas several non-compatible functions exist in the same room and are a cause of conflict. In the case of the Russian arctic the situation is slightly different. In this region the space is not heavily used but is likely to develop quickly in the future due to new technologies, high demand for products and resources, and climate change. This means that instead of planning current uses this MSP should be oriented more towards planning possible future functions.

The next difference can be found regards the benefits that can arise from the creation of an MSP. Although the Commission of the European communities (2008) finds 9 different benefits that can arise from an MSP, an MSP in the Russian Arctic only seems to be able to reach 7 of them. These 7 can be found back in table 4 and how these benefits can be reached is explained in further detail in chapter 3.

The 2 benefits that are likely not to be reached are; ensure consistency between land and marine systems, and.

A better consistency between land and marine systems would largely be gained if an MSP would not only take the marine area into account but also a stretch of land. This aspect of an MSP should ideally always be implemented and thereby this benefit should also be gained. Praxis however, shows that it is more practical to use the border between land and sea for the boundary of an MSP. This is also the case in the Russian Arctic. While an MSP is usually limited to only marine

areas not just in this case, it is probable that this benefit will also not be reached for a large number of other projects.
The benefit of coordination of the spatial implementation of off-shore renewable energy with other activities is also not reached in this case. The simple fact that it is not likely that off-shore renewable energy will be profitable in the next 20 years due to harsh conditions in this region makes this impossible. This benefit is likely not to arise also in other areas that face similar problems with off-shore renewable energy.

Before the actual process of the MSP is started a third difference between general theory and the case study can be found. Although Gilliland & Laffoley (2008) advice to use the principles of sustainability for the general goal of an MSP, the case of the Russian Arctic shows that not all principles can be taken into account. Often it is extremely difficult if not impossible to make use of the precautionary principle, the preventive principle, and the polluter-pays principle in a spatial plan. It seems that it is likely that the case of the Russian arctic is not an exception and MSP in other regions may not incorporate this sustainability principle either.

The legal framework that should be studied does not only create rules and regulations to which a marine spatial plan should comply, it also provides a legal justification for the creation of an MSP. It is found that in this case the same legal conventions and laws are needed as was found in the general theory. What this framework entails will differ in each case, the rules that should be followed and the justification for an MSP depends on the national legal framework that varies from country to country and on the international conventions that the country may or may not have joined. This entails that the actual framework will vary from country to country.

In the first chapter the complete waters of the Russian Arctic were chosen as study area. This area has been chosen while the seas in this area are strongly correlated with each other, if shipping will grow in one of the seas in the middle

of the region this will have repercussions for the whole of the arctic. A strong correlation can be found too for oil and has industries, development will first take place in the regions where profitability is the largest, making other seas less preferred and exploitation will be less attractive in those regions, at the same time transportation to and from this area will expand. The strong correlation between the seas make it necessary plans in this region should coordinate with each other.

While the size of a study area varies between complete EEZ to local plans, this can be an appropriate size. Unfortunately in chapter 4 a large difference between the seas was found making it difficult to make an overall MSP. It can be concluded that the area might best be divided into smaller areas. To maintain an overall coordination it is advisable to make a non-detailed strategic plan for the complete region, the smaller MSPs should comply to this strategic plan, thereby ensuring coordination.

Lateral boundaries of an MSP that correspond with meaningful ecosystem boundaries are seen as an ideal. (Gilliland & Laffoley, 2008) Using this method assures that the whole of the reviewed area possesses similar characteristics, in practice these boundaries are only taken as a starting point. Administrative boundaries are often more practical. By drawing in a limited number of governments, bureaucracy can be limited and the creation and implementation of an MSP will go by faster. In the case of the Russian Arctic the boundaries that are chosen also make use of administrative boundaries. Another deviation from the ideal boundary of an MSP can be found in the landward boundary. In order to reach the optimal amount of benefits from an MSP an inland stretch of the shore should be incorporated into the MSP as well. This however can create jurisdictional problems, in case of an existing spatial land planning this area two plans would exist that might conflict with each other. Another disadvantage would be the excessive time and effort needed to make these plans connect with each other perfectly. Therefore the landward boundary for the study area will be located on the border of land and sea.

Concerning the timeframe, the MSP for the Russian Arctic can follow the recommended timeframe of 20 years. (MSSP consortium, 2006) a small difference can be found in the importance of the review periods. Although the case study follows the recommended timeframe of 5 years between review periods, these reviews might play a more important role than in other MSPs. This is while the study area is subject to fast and large changes, this causes that the need for review is more urgent than in areas that are subject to a smaller amount of changes.

The process that results into an MSP is a general process that can be implemented for every MSP. In this thesis the first three steps have been performed for the Russian Arctic. In the third step of the process, the information is analyzed and options are generated. The end-products of this step are a map of current uses (Schultz-Zehden et al, 2008) and options for the spatial plan. (Gilliland & Laffoley, 2008) However, before the options can be generated an additional input is needed, besides a map of current uses which provides a base for planning of new activities, a clear overview should also be created about the which functions are compatible with each other. Such an overview can take shape in the form of a table and should avoid that non-compatible uses are planned within the same location. (Schultz-Zehden et al, 2008) after clarity has been reached about the current situation as well as the compatibility options for the future can be generated. This can be done in a multitude of ways, such as consultation, consensus building, and scenario building. Because a lack of time and resources, in this case scenario building is chosen as the most appropriate form of option generation. Scenario building has the advantage of showing clearly how policy decisions might influence the area in the future, and visualizing the effects makes it easier to judge which options are desirable. Before the scenarios were created the additional steps recommended by Schultz-Zehden et al (2008), the map of current uses and the compatibility overview, were also created.

The final difference between the general planning theory and Russian arctic can be found in the functions that have to be taken into account. While not all seas support the same marine functions not all functions have to be taken into account in every MSP. In chapter 2 the most important industries in the ocean are listed, according to Smith (2000) they are; transport, strategic, minerals and energy, living resources, waste disposal, leisure and recreation, education and research, conservation, and coastal engineering.

Three functions where excluded before the actual information gathering started;

- Leisure and recreation, this function is excluded while the Russian Arctic has a very limited amount of tourism that takes place in this area. the harsh environment scares of most tourists and only a small amount of specialized cruises visit the area. While this function is very limited and is likely to have virtually no spatial repercussions, this function has been excluded.
- Education and research. Although the area of a great scientific meaning and research is conducted in the area this function is also excluded from the study. The fact that this use is relatively small compared to other activities and it causes little spatial consequences make it redundant to research this function extensively.
- Coastal engineering. The reason why this function is excluded is similar to the function of education and research. Although this function takes place in the study area, it effects only a minute amount of marine area.

It is not only sensible for the case of the Russian arctic to take only the functions into account that are important in the area and might have spatial consequences, but this topic relates to all MSP's. It is sensible to take a critical look at the possible functions that can occur in the area, before researching them extensively.

After the gathering of information about the functions, one of them was not drawn into the scenarios. The function "strategic" turned out not to have much spatial repercussions. The function was indeed present in the area but was not limited to a specific location and did not conflict with any of the other uses.

Therefore it turned out to not to be necessary to take this function further into account in the planning process.

Concerning the second main question of this thesis; how could the end-result of the planning process look like for the study area? There are two important findings about the outcome.

First, although some countries plan their complete EEZ in one MSP, the size of the Russia's territory makes this impossible. Although the study does only take a part of Russia's EEZ into account, the study area of the Russian arctic is still considerably larger than what is useful for planning it is recommendable to divide the area into several planning areas. This way the large differences between the western seas and the eastern seas can be taken into account more properly. Using this approach the areas that are expected to be heavily developed in the future can be planned in more detail. On the other hand, the regions that are expected to maintain mostly undeveloped can remain unplanned and no redundant plans will be developed. However it can be practical to create a general strategic vision for the complete study area, this way the consistency between the different plans is guaranteed.

Further, while the analysis of data showed that most industrialization is likely to take place in the Barents Sea and to a lesser extend also in the Kara Sea, these seas are most suitable for the development of an MSP. While the Laptev Sea, The East-Siberian Sea, and the Chukchi Sea are more likely to stay largely undeveloped in the next decades. In these seas creating an MSP will probably remain unnecessary up to 2030.

In this thesis a very unique area was studied in order to find out how an MSP process might look like in such an exceptional region and how the outcomes might look like. Findings show that with small adaptations, an MSP can be a very useful instrument to prevent problems that might occur in the future.

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