

A need for Maritime Spatial Planning in the Arctic: A proposal for establishing a Marine Protected Area network

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Abstract

“Regardless of where we live, all of us depend upon healthy ocean ecosystems: either as a source of food or revenue, or as a key shaper and regulator of climate and weather. This dependency and the need to embrace sustainable development led nations of the world to agree to a series of high-level political commitments for marine conservation and marine protected areas” (IUCN - World Commission on Protected Areas, 2008).

However, the increasing dependence on energy (oil and gas) and other resources by humans has led to an increase in marine activities, which if left unchecked or managed effectively may result in irreversible damage to our oceans, considering the vast amount of services and human well-being provided by the oceans.

This increased need for especially marine resources has led to the pressure to exploit the Arctic¹ for the alleged social and economic development of the Arctic Nations and its indigenous people and other countries and stakeholders with an interest in the area (see figure 1 below for Arctic region).

The aim of this paper will address the effects of climate change on the Arctic and its impact and then propose a detailed and justified Marine Spatial Plan (MSP) with specific reference to establishing a Marine Protected Area (MPA) network as a management tool for addressing the climate change impacts, and finally address the role, influence and responsibility of the shipping sector in the Arctic.

1. Introduction

The climate change has led to a diminishing of the ice in the arctic region, thus opening the way for exploitation of the region and increase the human activities such as commercial shipping, tourism, exploration of mineral, gas and oil, military operations and sovereignty claims comes with significant risk for the region’s ecosystem future and put the arctic species endanger, this in turn could open the field for the international cooperation, competition, or conflict in coming years (Moore, Heidar, & Nordquist, 2010).

¹ The region north of the Arctic Circle, or north of the latitude 66° 33' 44" north of the equator. (<http://www.arcticworld.net/>).

In the recent years the ice of the Arctic areas has been diminished yearly by around 8% of normal ocean ice or what is equal one million-square kilometre, this area considered bigger than Denmark, Norway and Sweden (or Texas and Arizona) consolidate, in the late summer the percentage of ice melting is much higher than the yearly normal whereas the ice declining reach to 15-20%. By 2100, it is expected that the ratio of ice melting will increase extra decays of 10–50% of yearly normal ocean ice and a complete vanishing of summer ocean ice during this period which is expected by a few models (West, 2009).

Therefore, implications and demanding from the regional and the international community to take serious steps in order to maintain stability between the region developing sustainability and protecting the marine ecosystem and to follow the fast and huge continuous changes in the arctic environment which occurring faster than the predicted models by computer and could have a negative consequences on the marine ecosystem (Calahan, 2009).

2. Definitions of the Arctic

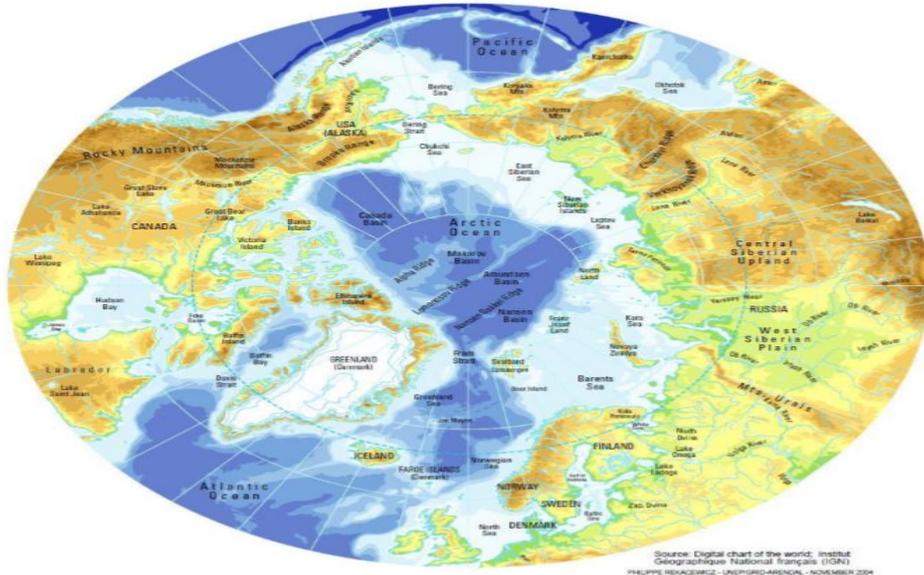
The definitions of the arctic are numerous every definition has the distinctive portrayal of the area and ocean region included in the definition rely upon the strategy exchange, however the Arctic Circle definition and resulting Arctic Countries is the most well-known and essential definition of the Arctic characterizes the district as the area and ocean territory north of the Arctic Circle which lay at latitude 66.30° as shown in figure 1 below, for the surface areas inside this zone as shown in figure 1 below, at the summer solstice there is a sunny day for 24 persistent hours at least once every year above the horizon and at the winter solstice at least once every year the sun should be below the horizon.

The northernmost third or so of Alaska and the Chukchi Sea, which separates that part of Alaska from Russia is incorporated in the Arctic Circle definition plus the territory of the United States of America (US) and Exclusive Economic Zone (EEZ) waters north of Alaska, but the other two third of Alaska or the Bering Sea, which separates Russia from that lower part of the state which is not included, there is eight countries are sharing the north of the Arctic Circle, which make up the members of the Arctic council² (Moore, Heidar & Nordquist, 2010).

² usually referred to those countries as Arctic countries as set up in 1996 an intergovernmental forum: Canada, US (Alaska), Norway, Russia, Denmark in by virtue of Greenland, Finland, but only 5 states are sharing the Arctic Ocean coast : Denmark, Canada, Russia, Norway and US (Moore, Heider & Nordquist, 210)

Figure1: Arctic seas and coastal areas

Source: Arctic Ocean Review PHASE II 2011-2013



3. Key findings on the impact of climate change in the Arctic: natural systems and socio-economic

Without elaborating on any of the key findings, the following in table 1 below represent what is reported as most noticeable:

Table 1: Key findings of climate change impacts

(Source: (Arctic Climate Impact Assessment (ACIA), 2004))

Arctic warming and its consequences have worldwide implications
Arctic climate is now warming rapidly and much larger changes are projected.
Arctic vegetation zones are very likely to shift, causing wide-ranging impacts.
Animal species' diversity, ranges, and distribution will change.
Many coastal communities and facilities face increasing exposure to storms
Reduced sea ice is very likely to increase marine transport and access to resources.
Thawing ground will disrupt transportation, buildings, and other infrastructure.
Indigenous communities are facing major economic and cultural impacts.
Elevated ultraviolet radiation levels will affect people, plants, and animals.
Multiple influences interact to cause impacts to people and ecosystems.

As a result of the pressure to exploit the Arctic marine resources, the Arctic Council's³ 2009 AMSA (Arctic Marine Shipping Assessment) report prioritized the identification of areas of heightened ecological and cultural significance and in light of climate change together with an increase in multiple marine use as shown in figure 1 below, encouraged the implementation of measures to protect these areas from the impacts of arctic shipping. Even the President of the USA had an official visit to Alaska on 1 September 2015 to express his concerns about global warming and its effects on both Alaska and the globe as a whole and acknowledged the necessity to embrace the responsibility to use all tools available to manage the effects of human activity on the world's oceans (PAME, 2015).

Figure 2: Arctic Region
Source: (Athropolis.com)



4. Marine Spatial Planning (MSP) for the arctic Oceans

One of the available tools In order to achieve maximum protection for the marine ecosystem is the Marine Spatial Planning which is a useful approach to make and set up a more reasonable association of the utilization of the marine space and the connections between its uses, to adjust requests for advancement with the need to secure marine biological systems, and to accomplish social and financial goals in a transparent way (Ehler & Douvère, 2009).

³ Canada, Denmark (including Greenland and the Faroe Islands), Finland, Iceland, Norway, Russia, Sweden and the United States and six international organisations representing Arctic Indigenous Peoples with permanent participant status constitute the Arctic Council (<http://www.arctic-council.org/index.php/en/about-us/member-states>)

The benefits of using MSP are various such as ecological/environmental, economic and social benefits. MSP is a complex procedure combining politics, management and science, with different approaches steps such as UNESCO 10 steps as illustrated in table 2 below which applied to this research in order to build an MSP on the Arctic Ocean as follows:

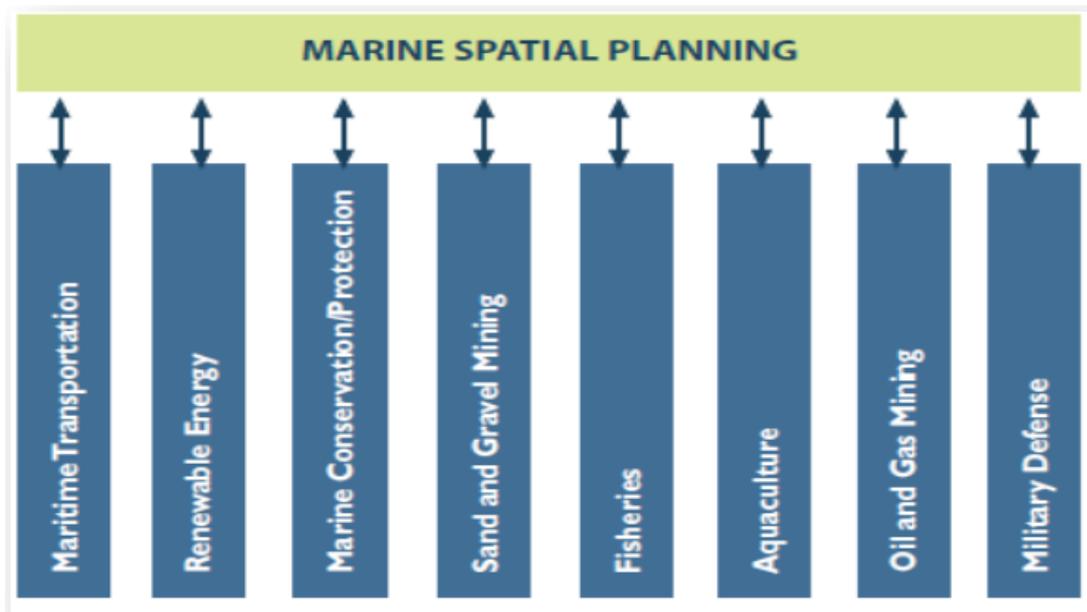
Table 2: MSP 10 step process
(Ehler & Douvère, 2009)

1. Identifying need and establishing authority.
2. Obtaining financial support.
3. Organizing the process through pre-planning.
4. Organizing stakeholder participation.
5. Defining and analyzing existing future conditions.
6. Defining and analyzing future conditions.
7. Preparing and improving the spatial management plan.
8. Implementing and enforcing the spatial management plan.
9. Monitoring and evaluating performance.
10. Adapting and marine spatial management process.

In order for the MSP to be comprehensive it must be construed as an integrated framework as illustrated in figure 2 below, which provides a guide for ecosystem-based management for governmental sector planning, but does not replace single sector planning (Ehler & Douvère, 2009). In fact, for an effective country MSP, all essential governmental sectors must work in collaboration in order to make the plan sustainable and accepted, as illustrated by figure 3 below.

Figure 3: MSP and governmental sector interaction

(Source: (Ehler & Douvere, 2009))



4.1 Identifying needs, establishing authority and obtaining

The Arctic Ocean is extremely rich in critical constituents of worldwide biodiversity. Arctic marine biological systems are natural surroundings to an inconceivable exhibit of more than 5,000 creature species and more than 2,000 types of green growth and a huge number of organisms as illustrated by Josefson & Mokievsky, Daniels and Lovejoy. The marine Arctic additionally gives a suitable environment for a large populace of marine mammals and birds as outlined by Reid, Ganter and Gaston some of which form huge gatherings that are among the largest seabird gatherings in the world (Conservation of Arctic Flora and Fauna, 2013).

Arctic marine ecosystems are considered a unique contributor to the marine ecosystem diversity. For example, Arctic Ocean ice biological systems bolster the biological diversity⁴ at different scales going from one of kind microbial groups to summit predator species, for example, the polar bear *Ursus maritimus* and walrus *Odobenus rosmarus* whose biology is firmly associated with the Arctic ice environment (Conservation of Arctic Flora and Fauna, 2013).

In a roundabout way, the Arctic Ocean assumes a key part in forming the worldwide biodiversity of marine and physical environments as it assumes a key part in the Earth

⁴ As defined by the convention on biological diversity "Biological diversity" means the variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems

atmosphere framework. The Arctic Sea additionally impacts marine environments of the Atlantic Ocean, specifically, as waters and ocean ice, leaving the Arctic Ocean influence the physical, synthetic and natural qualities of the North Atlantic. Then again, the Cold Sea gets waters from the Pacific and Atlantic Oceans, and in this manner Ice marine biological systems are impacted by worldwide changes that impact biodiversity in these Oceans connected with the Arctic Ocean environment (Conservation of Arctic Flora and Fauna, 2013).

On the other hand the development in technology and science parallel with the global warming effects caused in an increasing of Arctic marine operations, which has been expanding as characteristic asset advancement and financial ties between the Arctic and the worldwide economy grow, there are two expected trends to be continued in the future with the diminishing of the Arctic sea ice, more noteworthy marine get to and navigate with more operations are expected to get longer season (Arctic council, 2013).

The characteristics of the evolving maritime arctic is an offshore hydrocarbon exploration and developing the resources; marine tourism expanding; trans-Arctic cargo movement which still modest but growing; summer marine transportation courses that backing hard minerals and mining operations; voyages with scientific purpose also is expected to increase, especially in the central area of the Arctic Ocean; possibility of increasing fishing in coastal waters such as the area around Baffin Island⁵ and Davis Strait⁶; wide-ranging from ship's size and other correlated developing (Arctic council, 2013).

In order to start the MSP the authorities which will plan and implement need to be identify by using a separate authority to start plan and this could be achieved by the Arctic Council member states (The United Nations Convention on the Law of the Sea (UNCLOS) Article 234, offers an important framework for the governance of Arctic marine navigation and permits coastal states the privilege to embrace and implement non-discriminatory laws and regulations for the counteractive action, decline and control of marine pollution from vessels in ice-secured regions inside of the breaking points of the EEZ) which consists of eight members state as referred in the paragraph 3 whereas the Arctic Council has been involved in many projects, cooperation's and collaborations between the stakeholders of the Arctic region for the purpose of marine ecosystem such as LME, which has been adopted by

⁵ Located between Canadian main land and Greenland and it is considered as one of the most unspoiled places on earth, world's fifth largest island and the largest in Canada. <http://global.britannica.com/place/Baffin-Island>.

⁶ Lying between south-eastern of Baffin Island (Canada) and south-western Greenland. The strait separates the depths of Baffin and connecting the Atlantic and Pacific oceans. <http://global.britannica.com/search?query=Davis+Strait>.

the council at 2006 on the other hand the implementations role can be played only if the member states adopt a new legislations or at least modifications for the present legislations to be enforcement by using the existing management authority for each country and this cannot be achieved without collaboration of the all member states (Ehler & Douvere, 2009).

4.2 Identifying financial support

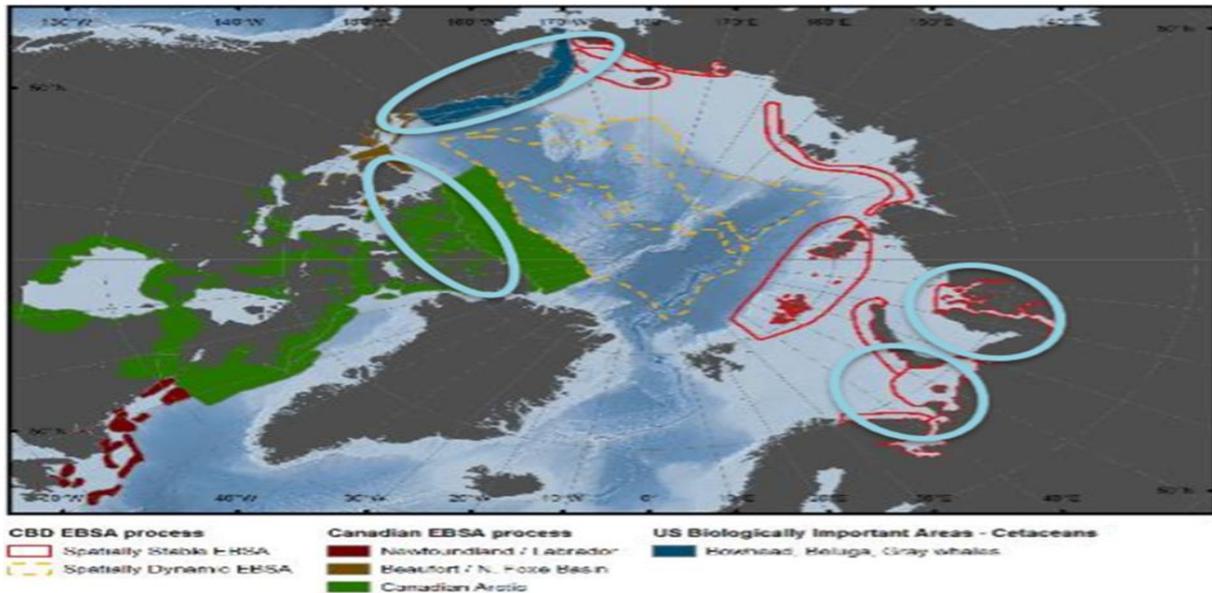
The Arctic member states governments ought to find a mechanism to provide adequate finance support to establish the MSP trough the general tax revenues or alternative ways such as grants and donations, tourism, energy, fishing, marine transportation, or mining revenues (Ehler & Douvere, 2009).

4.3 Organizing the process throughout pre-planning

One of the most important factors to establish MSP throughout the process of pre-planning is the choosing of the multi skilled team such as ecologists, biologists, geographers, planners, and economists. In this stage a time frame should be identified with work plan description, the coast, the principles, risks, contingency plans and finally the goals and objectives which is to manage the conflict between the rich marine ecosystem and growing mankind's activities in the Arctic region, marine ecosystem need to be protected for achieving the long-term conservation of nature with associated ecosystem services and Cultural values is by specifying a particular Marine Protected Areas (MPAs) (Ehler & Douvere, 2009).

MPAs can protect the natural ecological values as shown in figure 3 below, Associating and ensuring spatially isolate territories fundamental to the life cycles of trans-limit marine species, for example, encouraging, reproducing, and nursery grounds and relocation passageways for marine well evolved mammals, fish and seabirds, different types of important habitat features can be protected by providing refuge for marine species, providing biodiversity reservoirs that can help species repopulate after great occasions and territories that are shielded from different stresses that exhaust strength by protecting and uniting components and living spaces that backing the capacity of species to be versatile too, or adjust to, environmental change, Supporting or restoring marine group structure, efficiency, and nourishment web multifaceted nature and Protecting natural bio-physical values (PAME, 2015).

Figure 4: Ecologically or Biologically important areas
 Source: Arctic sea Biodiversity project



IN addition, Socio-economic and cultural benefits such as the economic values as instant employment and commercial benefits, heritage values, societal and existence value, landscape / seascape value, educational value, scientific and research value, management values (PAME, 2015).

4.4 Organizing the stakeholders

The stakeholders in the Arctic region are individuals, gatherings, or associations that are (or will be) influenced, included or intrigued (decidedly or contrarily) by MSP measures or activities in different ways (Ehler & Douvère, 2009).

Based on analysing the mankind activities in the Arctic Ocean found that the stakeholders are the Indigenous marine use, Arctic Council, gas and oil companies, factories around the coast, fishing boats, aquaculture farms, marine ports, renewable energy companies and tourism companies

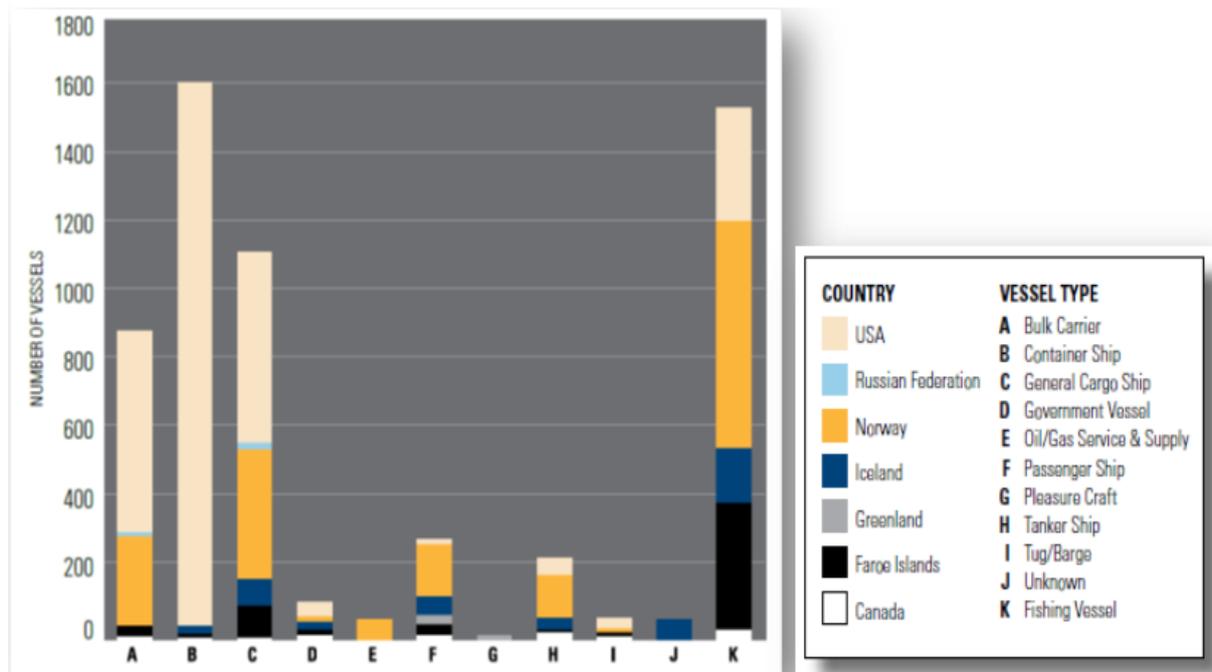
4.5 Defining and analysing, exiting condition

The marine transport have a long history in the Arctic Ocean, whereas the number of ships are using the arctic region, making multiple voyages during the same year of the AMSA survey were reached to 6000 ships as illustrated below in figure 2, whereas the half of these ships have been passed the North Pacific that crosses the Aleutian Islands while sailing by using the great circle, almost 1600 was fishing ships and many of cruise ships where there is a significant increase of cruise vessels in the Arctic region and most of them

are built not for a purpose of sailing in the Arctic Ocean specially in the late summer around Greenland which conflict with the marine environment protection (PAME, 2015).

Figure 5: Total number of vessels by type and country

(Source: (PAME / Arctic Council, 2009))



4.6 Defining and analysing future condition

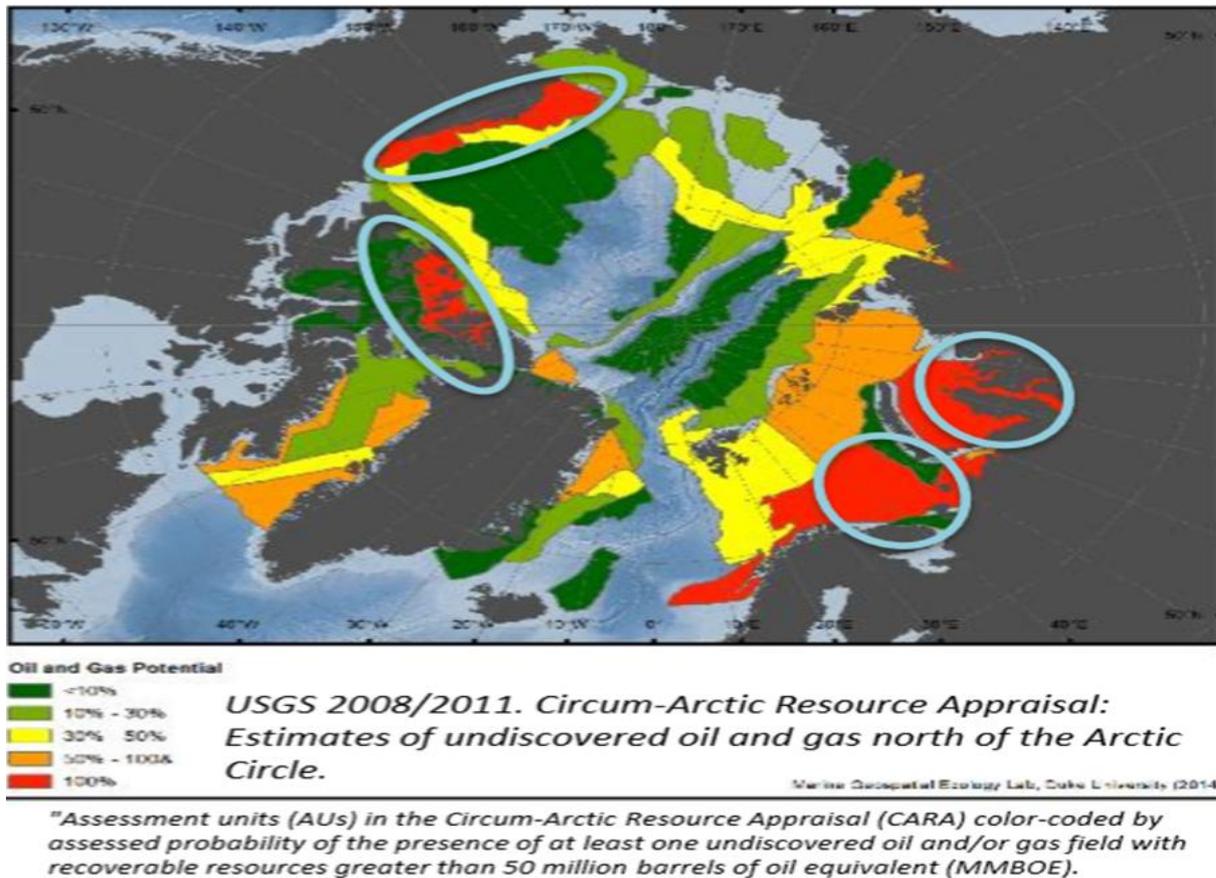
It is likely that the marine transport will continue to flourish with the continuation of the global warming which will result in increasing emissions containing black carbon from the vessels sailing in the Arctic region such as SO_x and NO_x specially if there are ships accidents resulted in oil leak oil or oil discharge. Extra potential impacts of Arctic vessels include the vessel strikes on marine mammals, the presence of alien species, and disturbance of migrant patterns of marine mammals. There is a general absence of marine infrastructure in the arctic, aside from territories along the Norwegian coast and northwest Russia, contrasted and other marine districts of the world with high convergences of vessel activity. Crevices in hydrographic information exist for huge parts of essential delivery courses imperative to assist safe navigation (PAME, 2009).

What's more, for safe operations in the Ice there is a weakness for the same suite of meteorological and oceanography information, items and administrations as in different seas, in addition to complete data on ocean ice and ice shelves plus there is a lack of satellite communications availability which entails weakness of emergency response for saving lives and marine pollution. There a significant increase of cruise vessels in the Arctic

region and most of them are built not for a purpose of sailing in the Arctic Ocean especially in the late summer around Greenland (PAME, 2009).

Figure 5: Oil & Gas potential

Source: Arctic sea Biodiversity project



The predicted scenarios for arctic region 2020: the regional trade and development of the natural resource such as hydrocarbons, hard fisheries and hard mineral are the most important factors to determine the future of the marine activities with other less important factors such as the oil price, governance, regional cooperation in the arctic region, the trend of the global trade, the acceleration of the climate change, the role of the new technology, discovers of the new resources. There are indigenous communities are ringed the Bering Strait region⁷ and a very beneficial ecosystem with numerous types of marine mammals, seabirds and fish, may oblige formally settled vessel steering measures. Seaward hydrocarbon advancements may prompt expanded marine movement in the Bering Strait area (PAME, 2009).

⁷ It is a strait connecting between the Pacific Ocean and Arctic Ocean between Russia and the United States of America. State of Alaska by 58 nm <http://www.worldatlas.com/aatlas/infopage/bering.htm>.

The Northwest Section of the Canadian Arctic is not anticipated that would turn into a reasonable trans-Arctic passage through 2020, but it is expected to grow as a destination for shipping lines. The oil marine transportation from Pechora Sea⁸ to Europe is expected to be feasible technically and economically; on the western Northern Sea Route as shown in figure 5 above 40 million tons of oil and gas is estimated production per year by 2020 therefore; The positive economic sides in the arctic region is expected to increase the marine transportation which increase the concerns for the social, cultural and environmental consequences by increasing the possibilities of the oil spills and hunters to disturb the marine species of their chasing practices (PAME, 2009).

5. MSP projects

There are many proposed projects for establishing MSP around the world such as the proposal for a directive of the European parliament and of the council establishing a framework for maritime spatial planning and integrated coastal management at 2013 in order to achieve sustainable economic development and protect the marine ecosystem in the European coastal areas (European commission, 2013). But the United Kingdom (UK) MSP project proposal was leader and has been offered at early beginning at 2002 and at present the UK authorities has taken a serious steps to implement it, the plan took five years to incorporate into the national legislation (UNESCO, 2014).

6. The influence and responsibilities of the shipping sector, by establishing MSP

After establishing MSP in the Arctic Ocean the ships navigating in the vicinity may have environment and commercial impact due to rerouting the shorter navigation route to be longer which will increase the operational coast and thus cause an increase the in trade cost also the logistics supply chain companies is depending on JIT good delivery, therefore the intermodal links using these routes may have a negative impact, and the possibility of change port competitions map due to rerouting is so high in addition increasing the sailing distance mean more fuel consumption which mean more emissions of SO_x and NO_x therefore the related environment will negatively impacted (The Nautical Institute, 2013).

On the other hand, the shipping sector should be involved otherwise there will be a substantial risk that MSP won't be incorporate full thought on the existing and possible

⁸ Located in the northwest of Russia, the western border of the sea is off Kolguyev Island, The south eastern part of the Barents Sea, while the eastern border is the western coasts of Vaygach Island and the Yugorsky Peninsula, and the northern border the southern end of Novaya Zemlya
<http://global.britannica.com/place/Pechora-Sea>.

economic exercises in the zone under thought, in addition the available scientific information and data resources and biological procedures that may not generally be accessible to planners, productive shipping industry should maintain continuous effort in order to build contacts and collaboration with the stakeholders involved (The Nautical Institute, 2013).

7. **The importance, of establishing an MPA network system**

It is highly recommended to establish an MPA network system which is characterized as a gathering of individual MPAs or stores working helpfully and synergistically, at different spatial scales, and with a scope of security levels that are intended to meet targets that a solitary MPA can't accomplish collected. MPAs network can provide significant protection different species which have different habitats at different stages of the species life; the cultural heritage resources underwater could be safer and protected. Whereas 80% of MPAs around the world, there is at least one of these MPAs is connected to another one (Center, Between, National Oceanic and Atmospheric Administration and, & Interior, 2015).

The ability to establish a regional coordinated network of MPA's in the Arctic as shown in the graph 6 below would from the onset depend on the level of coordination, regional integrated set of objectives between and among the Arctic States. An Arctic international *MPA network*⁹ has not been established yet but should be part of a broader conservation planning process in line with the AMSP objectives (UNEP-WCMC, 2008).

As a point of departure for establishing an Arctic MPA network, the following criteria have to be fulfilled by all Arctic States:

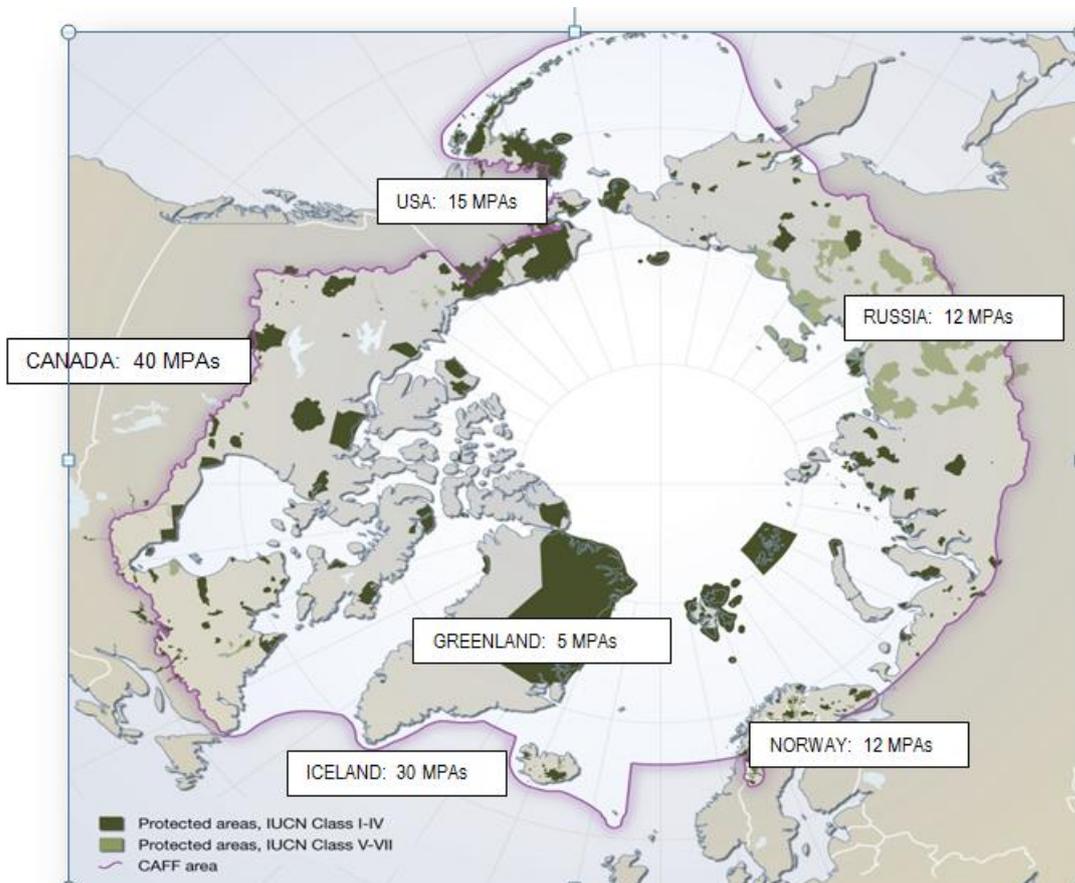
- The MPA obeys the IUCN meaning of a MPA¹⁰, including each of the key terms as depicted by the IUCN.
- The MPA adds to accomplishing no less than one of the pan-Arctic MPA network goals and one or a greater amount of the objectives.
- There is a relating administration arrangement, or protection administration unequivocally determined in supporting enactment or regulation, and the arrangement is being executed (PAME, 2015).

⁹ Collection of individual MPAs or reserves operating cooperatively and synergistically, at various spatial scales, and with a range of protection levels that are designed to meet objectives that a single reserve cannot achieve (IUCN - World Commission on Protected Areas, 2008).

¹⁰ Any area of intertidal or subtidal terrain, together with its overlying water and associated flora, fauna, historical and cultural features, which has been reserved by law or other effective means to protect part or all of the enclosed environment (AMAP/CAFF/SDWG, 2013)

Figure 6: Arctic MPA's

(Source: (Conservation of Arctic Flora and Fauna (CAFF), 2013))



Notwithstanding any of the above criteria mentioned, this author holds that the development of establishing an integrated network should be based on the following common principles:

- Rational or methodical approach based on ecosystem based management.
- Respect legal government authorities, agreements and legally licensed activities.
- Ensure public and participatory processes based on consultation and information exchange.
- Use an all-encompassing body of available knowledge, inclusive of scientific, indigenous and industry.
- Focus the design of the MPA network on ecological conservation and biodiversity protection in the context of actual projected changes in climate conditions.
- Focus on cultural and socio-economic needs and benefits that can be provided by the MPA's when designing cost-effective networks.
- Ensure suitable protection measures that can contribute to establishing the goals of the MPA network.

- Engage and appraise best management practices on a continuous basis to ensure adaptability.
- Incorporate efforts across organizations on all levels, i.e. intergovernmental, intra-governmental and commercial (PAME, 2015).

The criteria and principles mentioned above all seem reasonable and achievable, but this author is of the opinion that in reality the establishment of an integrated Arctic MPA network will be a complex, time consuming and challenging endeavor at the least, considering that all the Arctic states either already have established national MPA's and are still identifying more areas to protect. Below is an illustration of the Arctic MPA's in accordance with the IUCN:

8. Conclusion

The changing in the Arctic region's environment due to the global warming which result in decreasing in the Arctic ice amount, the changing is so fast and that is happening in parallel with the human activities such as shipping, tourism, oil and gas, mining which makes the marine biodiversity endanger therefore it is essential for the region states and the stakeholders to cooperate in order to protect the rich marine ecosystem in the Arctic Ocean and this can be achieved through using one of the most vital and efficient tools such as MSP which can resolve the maritime spatial uses problem and the conflict between the economic growth, social benefits and environmental protection.

Involving in MSP by the stakeholder's especially the shipping sector is very important due to the experience and the scientific information which is owned by the sector and to reduce any negative influences could impact the sector.

Connecting the Arctic Ocean MPAs together is essential for increasing the protection performance and may well help to protect the underwater cultural heritage

Part of the MSP is the MPAs which adds tremendous benefits for the marine ecosystem to maintain the productivity of the ocean and avoiding productivity decline.

9. Recommendations

Due to the importance of MSP, the Authority which, delegated by the arctic council should prepare and approve the spatial management plan, monitor and evaluating the performance and after completion of the monitoring and evaluating the spatial management plan should be adopted and continue updated periodically (Ehler, 2009).

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