2020 is the year when 40% of the 4,000-year-old Milne Ice Shelf, located on the north-western edge of Ellesmere Island, caved into the sea. 2020 is the year when the Greenland Ice Sheet has already passed the point of no return. 2020 is the year when human presence in the Arctic Ocean fell dramatically due to the COVID-19 outbreak. And at the same time, 2020 is another year when the dispute between the economic profit from mining in the Arctic and environmentally sustainable future was not resolved. Environmentalists are afraid that, as the sea ice melts, the Arctic Ocean will become more available and accessible for mining and navigation. Economists are afraid that mining activity in the Arctic Ocean will become less available as shrinking sea ice areas get international protection measures. Existing legal measures are not able to address the problem of melting in the Arctic adequately. The common problem of environmental protection measures and mining regulation measures is considering sea ice as "part of something." There are no ice protection regulations as a separate natural object, only as a Natural Park as in Canadian and the United States legislation, and there are no international protection measures that consider sea ice as "sui generis". Initiatives to invent glaciers protection legislation meet the strong opposition of mining supporters, as it was in Chile and Argentina. The main question of our research about potential sea ice protection legislation concerns the concept of "sui generis": is it possible to create legal measures based on the fact that sea ice areas are "one of a kind" that require their own, unique, protection? We will check existing legal protection systems and analyze current mining practices through the triple bottom line approach to answer this question.

Sea ice and the environment

Nowadays, Polar vortex-increased heat waves, and the unpredictability of weather caused by ice loss are already causing significant damage to crops on which global food systems depend (Hancock, 2020). Furthermore, but no less critical, the melting of the Arctic ice pack affects sea level in the Arctic Ocean, sea surface temperature, and wildlife populations, like beluga whales, narwhals, and bowheads. Moreover, these species would require additional protection measures and flexible measures adapting to the consequences of melting. In the first section of our research, we would like to pay attention to the significance of sea ice protection from the environmental perspective. Melting Arctic sea ice opens up this once frozen frontier to new interests, such as fishing, shipping, and resource development. Increased human presence in the Arctic Ocean could potentially affect many sea ice

patterns and local marine biodiversity. We will answer the following questions to understand how to make shrinking ice areas environmentally safe: Who has the rights to "sea ice"? Who has the rights to fish and tap the minerals that potentially may be found underneath of sea ice areas? And is it possible to protect flora and fauna?

Who has the rights to sea ice? Sea ice areas located within national jurisdiction are regulated by the legislation of the coastal state. Coastal states may adopt non-discriminative legal measures to protect these areas from pollution, according to Article 234 of the United Nations Convention on the Law of the Sea (UNCLOS) (United Nations, 1982). In the case of sea ice areas located beyond national jurisdiction, we need to define the legal concepts of res and terra, communis and nullius. The main feature of the nullius concept is that something belongs to nobody and can be taken by the first taker, and terra can be occupied in a real or effective way. The concept of communis means that something belongs to everybody and cannot be occupied by somebody. In the case of sea ice, we question whether it is possible to effectively or really occupy and establish sovereignty over sea ice. The most common opinion is that it cannot: sovereignty can be established over the territory possible to transform for further effective use. So, those Arctic sea ice areas, located beyond national jurisdiction, may be considered as res communis: territories belonging to everybody and exploitable by those who wish to and are capable of doing so. However, fish located underneath sea ice is res nullius and appropriated by taker in the amount of completed catch.

The situation with mineral resources that potentially may be discovered underneath is different. Extraction of minerals explored underneath the sea ice areas, potentially on the seabed and ocean floor, is regulated by Part IX, Section 2 of UNCLOS, since the seabed and ocean floor located beyond national jurisdiction falls under the definition of "Area" provided in Article 1 section 1 of UNCLOS and in Agreement relates to the implementation of Part XI of the United Nations Convention on the Law of the Sea of 10 December 1982. Article 136 of UNCLOS and annex to Agreement reaffirm that all mineral extraction on the seabed and ocean floor is implemented under the principle of the common heritage of mankind (Agreement, 1982). Following legal regulations mentioned above, we can conclude that the most applicable legal concept for minerals underneath is res communis. Notwithstanding, we need to pay attention to the fact that the United States (US) is not a member-state of UNCLOS and Agreement, so the linkage of mineral extraction with the concept of the

common heritage of mankind would be ineffective from the US's perspective.

Access to fish and mineral resources may be limited, but limitations should be justified by reasonable ground. Today, the most reasonable ground for imposing limitations on access to natural resources is global warming and sea ice melting. Consequences of melting, which is especially fast-paced, will lead to Arctic marine ecosystem changes. These issues need to be addressed. Protection measures from human activities would apply to sea ice areas with an average thickness less than 1.5 meters or ice temperature from -20 to -10℃, since human activities can accelerate shrinking (see for example: polarportal.dk/en/sea-ice-and-icebergs/sea-ice-thickness-and-volume/). As an example of existing biodiversity protection measures of areas where sea ice will probably melt and increase accessibility and availability, we would like to point out the Agreement to Prevent Unregulated High Seas Fisheries in the Central Arctic Ocean. Thinking of fishing as two types – for commercial and exploratory purposes – would protect those affected by sea ice melt and changed ecosystem species and allow commercial fishing to be beneficial at the same time. How will it work in case of fragile aquatic ecosystems? It is possible to declare exploratory fishing, which according to Article 1 section e), means fishing to assess the sustainability and feasibility of future commercial fishing, only applicable for threatened species (Agreement, 2019), the list of which would be possible to put into the annex. Commercial fishing would apply only to species who may have an advantage from global warmings, like Polar (Arctic) cod, and krill. At the same time, we would like to point out that the mentioned international fishing regulation will apply only to high sea areas without sea ice. Currently, massive commercial fishing is not taking place on the Central Arctic Ocean sea ice, plus, sea ice-associated species have no substantial commercial value nowadays. Nonetheless, sea ice-associated species are the most vulnerable to ice melt and their extinction can affect the food web, for example, ice algae that form the base of the food web (Barry, 2011). Some algae stay attached to the bottom of the ice, some fall into the water column, and some fall to the bottom of the sea to provide food for species that feed at different depths (Barry, 2011). Protists (single-celled organisms) and zooplankton eat the algae which are then eaten by, for instance, Arctic cod and sea birds, which in turn act as the primary link to other fish and birds, seals, and whales (Barry, 2011). So, the extinction of sea ice-associated species will make "commercial" species vulnerable. Yet commercial fishing would increase the vulnerability of such commercial species.

To limit human interference into fragile ecosystems around sea ice areas, we need to pay attention to the Marine Protected Areas approach. Example of provisions regulating the issues of Protected Areas can be found in the Antarctic Treaty System. Antarctic Treaty System is effectively recruiting human activity limitations in the most fragile areas. Annex V to the Protocol on Environmental Protection to the Antarctic Treaty regulates the establishment of specially protected and specially managed areas in the most fragile environments. Such regulations make it possible to limit human presence in such areas (Annex, 1991). In addition to the tool mentioned above, article 9 section 2 of the Convention for the Conservation of Antarctic Marine Living Resources (CCAMLR) provide an opportunity to designate the quantity of any species harvested, regions, and sub-regions based on the distribution of populations of Antarctic marine living resources, opening and closing of areas, regions or sub-regions for purposes of scientific study or conservation, including special areas for protection and scientific study (Convention, 1980). Moreover, the article of CCAMLR makes it possible to regulate harvesting methods, including fishing gear, with a view, inter alia, to avoid undue concentration of harvesting in any region or sub-region (Convention, 1980). To use the analogy of the above-mentioned legal instruments, the Arctic Ocean's sea ice areas may be defined as areas kept inviolate from human interference so that future comparisons may be possible with other localities affected by human activities, such as representative examples of major marine ecosystems, or potentially, areas of particular interest to planned scientific research (Annex, 1991). However, as the Arctic does not have its hard-law treaty system, it would be almost impossible to analogize this situation to the Antarctic Treaty System. In the Arctic, the Marine Protected Areas establishment is in International Maritime Organization and Regional Fisheries Organizations' competence. In our opinion, the best way to define the type of protection regime for the sea areas with accelerated ice melt is to use the International Union for Conservation of Nature (IUCN) Protected Area Categories System. According to their guidelines for applying protected area management categories, there are seven categories of the Protected Areas, and we would like to pay attention to the most suitable regimes for vulnerable ecosystem after sea ice melt. By implementation of the Category IA: Strict Nature Reserve, protection areas may achieve preservation of ecosystems, species, and biodiversity features in a state that is as undisturbed by recent human activity as possible, while still procuring examples of the natural environment for scientific studies, environmental monitoring and education, including baseline areas from which all avoidable access is excluded, and minimizing disturbance through careful

planning and implementation of research and other approved activities (IUCN Ia, 2018). The Category IV: Habitat/Species Management Area usually helps to protect or restore: 1) flora species of international, national or local importance; 2) fauna species of international, national, or local importance including resident or migratory fauna; and/or 3) habitats (IUCN IV, 2018). The size of the area varies but can often be relatively small. Category IV will be the best protection regime if locations around the shrinking sea ice area have threatened species. Nevertheless, IUCN has no power to establish protected areas and can only provide recommendations and assessments to existing protected areas. Nowadays, the most powerful categorization of the marine protected areas is the Marine Environment Protection Committee's (MEPC) of the International Maritime Organization (IMO) division of protected areas on particularly sensitive sea areas, special areas, emission control area designation, areas to be avoided, and no anchoring areas. The most suitable protection regime, according to MEPC categorization, is a particularly sensitive sea area. IMO's Resolution A.982(24) Revised Guidelines for the identification and designation of particularly sensitive sea areas regulate the criteria of adopting such a regime, including the one mentioned in section 4.4.1-4.4.11 ecological criteria (Resolution, 2005). Adoption of a particularly sensitive sea area regime will oblige parties to adopt ships' routing and reporting systems near or in the area, according to the International Convention for the Safety of Life at Sea (SOLAS) and following the General Provisions on Ships' Routing and the Guidelines and Criteria for Ship Reporting Systems, and to limit navigation through such areas that should protect the environment from navigational harm (Resolution, 2005). However, we think that procedurally it is hard to demand the adoption of such a regime. It is difficult to prove scientifically that some Central Arctic Ocean area meets ecological criteria for adopting particularly sensitive sea area regimes. Besides, in the case of IMO, the navigational issue will always prevail over the ecological one, but it is definitely a subject of disputes. The question remains, who will be responsible for the control and assessment of environmental protection, prevention, and response in connection with navigational and industrial issues? The most likely organization for such responsibility is IMO, since it is the specialized agency of the United Nations (UN) and is responsible for the safety and security of shipping and the prevention of marine and atmospheric pollution by ships, the main reason why the imposition of strict environmental protection measures may become necessary in the future. Such control and assessment of IMO can cooperate with the Protection of the Artic Marine Environment (PAME), a working group of the Arctic Council, the main interest of which is mentioned in this section on environmental protection.

In conclusion to this section, we would like to draw attention to Category VI: Protected area with sustainable use of natural resources: the primary objective of this protection regime is to protect natural ecosystems and use natural resources sustainably when conservation and sustainable use can be mutually beneficial (IUCN VI, 2018). To understand if conservation and sustainable use of natural resources can be mutually beneficial, we need to answer the question: would it be possible to promote sustainable use of natural resources, considering ecological, economic, and social dimensions (IUCN VI, 2018)? The answer to this question is the subject of the next section of our research. We summarize that sea ice areas located within national jurisdiction are protected following domestic legislation rules from the environmental perspective. Regarding sea ice located beyond national jurisdiction, we would like to assume these ice areas res communis. However, resources located inside this territory, except resources that can be extracted only from seabed and subsoil, are res nullius. Resources that can be extracted only from seabed and subsoil, due to UCLOS's existing regulations, are res communis, thus extending to them the principle of the common heritage of mankind. Nonetheless, due to existing legal practices and regulations, especially on the international level, we can conclude that through increased adoption of the protection areas regimes, it seems possible to protect sea ice from increased human activities. The question remains, how will these protection measures affect the economic consequences of melting? And how will they affect navigational? It's worth mentioning that the consequences of sea ice melt may be seen from the indigenous perspective also. As the brightest example, we would like to point out the Canadian and Greenlandic Inuits located around Pikialasorsuaq, where the North water plynya connects the Canadian and Greenlandic settlements of Inuits. The accelerated melt of local sea ice makes communication difficult and creates risks that could cause dog sledding to become extremely dangerous. That may lead to crucial changes in Inuit's lifestyle.

Ice Melt and the Resulting Industrial Opportunities

Promoting comprehensive legal protection regimes for non-jurisdictional Arctic sea ice and the Central Arctic Ocean will naturally face opposition due to the potential industrial economic value of the region. The Triple Bottom Line (TBL) sustainability approach demands that when implementing strategies or sustainability practices, three prongs be analyzed and balanced: 1) people, 2) profit, and 3) planet. As discussed above, there are numerous factors and considerations present to support that a protection regime for Arctic

sea ice is beneficial from an environmental lens. However, a proper TBL analysis will also require an in-depth inquiry of the benefit that the utilization of resources in the Arctic can bring to the pillars of profit and people.

The melting of Arctic sea ice and the opening of access to greater portions of the Arctic have important economic consequences for a number of industries. There is a wealth of highly valuable resources that are being made accessible due to Arctic sea ice melt. Untapped within the Arctic, there is an estimated 1,670 trillion cubic feet of natural gas (30% of the planet's untapped gas), 44 billion barrels of liquid natural gas, 90 billion barrels of oil (13% of the world's undiscovered oil reserve), and reserves of gold, zinc, nickel and iron (Bryce, 2019). The opportunity to exploit these new resources is of great interest not only to Arctic states, but to other world powers as well, and has led to a greater politicization of the Arctic in recent years (Rosenthal, 2012). As more ice melts, more of these resources will be available for extraction and nations will be vying for increased access. For non-jurisdictional Arctic areas, which are open to all for exploration, the opportunity for access to these resources is not only of interest to the surrounding Arctic states, but of global interest as well. A concern here from an environmental perspective, is that the economic incentive of exploiting these resources, particularly for Arctic nations with sovereignty over them, may weaken resolve to mitigate Arctic sea ice loss.

Oil & Natural Gas

As more sea ice melts, it is anticipated that vast reserves of oil and natural gas, which have remained mostly undiscovered, will become accessible. As of 2015, the United States Geological Survey (USGS) had predicted that there could be approximately 90 billion barrels of available oil in the area above the Arctic Circle, which equates to 13% of the world's undiscovered and accessible oil (US Energy Information Administration, 2012). As for natural gas, it is estimated by the USGS that 1,670 trillion cubic feet of natural gas and 44 billion barrels of recoverable natural gas liquids are stored in the area beneath Arctic sea ice (US Energy Information Administration, 2012). This is equivalent to 30% of the world's undiscovered natural gas reserves. The economic potential of these resources is vast and, as a result, the world is enticed by the opportunities that melting sea ice presents. These resources only become available when, in the eyes of some environmentalists, there has been failure to adequately protect and prevent the melt of Arctic sea ice. As sea ice melts, the potential to capitalize on the wealth of resources below increases and countries are

poised for when that happens.

Oil and natural gas companies have already begun to develop agreements with Arctic countries for access to their reserves. Russia in particular has taken initial steps to advance their exploration and extraction efforts. However, other states have certainly shown interest in capitalizing on these opportunities.

Navigation and Shipping in the Arctic

One of the significant impacts from Arctic sea ice melt that will lead to global economic implications and power struggles is the opening of shipping lanes across the Arctic. These passages were previously inaccessible but, because of sea ice melt, there is potential for mass-scale commercial shipping through shipping lanes made accessible with additional sea ice melt. The first new sea route is the Northwest Passage, which connects the Atlantic and Pacific Oceans through the Canadian Arctic Archipelago (Sharma, 2019). Since the turn of the twenty-first century, that passage has experienced relatively ice-free conditions multiple times, though it's not yet a dependable pathway for commercial ships (Struzik, 2019). The other path, the Northern Sea Route, is along the coast of Siberia and has begun experiencing summertime sea ice declines that may transform it into a reliable shipping route (Sharma, 2019). The Northern Sea Route runs from the Barents Sea to the Bering Strait between Siberia and Alaska and would dramatically reduce the transit time for ships traveling from East Asia to Western Europe (Sharma, 2019). In fact, it is estimated that it would reduce transit time by 10-15 days and that, as a result, a huge portion of Chinese trade would be conducted through this route if it became available (Sharma, 2019).

There are, however, still barriers to using these routes: the ice conditions are unpredictable and there is a lack of rescue teams and support infrastructure (Murphy, 2018). Therefore, it may be several years, if we continue on our current path, before these routes become available for large-scale commercial shipping. However, Arctic states are beginning to address these issues in anticipation of these new shipping routes. For example, in Russia there are plans to construct new ports and roads, and to improve roads between Arctic states for movement of goods (Murphy, 2018). Therefore, some countries may be more prepared for this transition than we think. This new reality will have impacts not only on the environment, but also on the world economy and national security, as nations compete to gain rights to shipping lanes and newly accessible resources in the Arctic.

The "New Cold War"

These resources have sparked a battle over the Arctic, coined "the New Cold War." Climate change is drastically changing the Arctic, and Arctic states are all staking claims over regions of the Arctic seabed, and the valuable resources within them. Under the United Nations Convention on the Law of the Sea, coastal states have sovereign rights over their continental shelf for the purpose of exploration and exploitation of its natural resources (United Nations, 1982). The continental shelf typically extends 200 nautical miles (nm) from the baselines of the coastal states (United Nations, 1982). However, under some circumstances, such as when there are unique geological geographical features, states can extend their continental shelf beyond the 200 nm, but not greater than 350 nm from the baseline (United Nations, 1982). The desire to control more of the continental shelf in order to exploit those valuable resources has led to extended claims and significant debate over who has sovereignty over Arctic waters and the continental shelf. For example, in 2001, Russia was the first to claim an extended continental shelf. Denmark followed suit in 2014 (Barents Observer, 2019). More recently, in May 2019, Canada submitted its claim for an extended continental shelf, including 1.2 million square kilometers of seabed and subsoil, with the UN Commission on the Limits of the Continental Shelf, who holds the decision-making power over these claims (Barents Observer, 2019).

The Arctic Council was established by the states with territorial claims in the Arctic in part to help manage the competing interests that arise concerning the Arctic and promote cooperation among different countries and indigenous communities in the region, as well as help manage and discuss plans for sustainable development and environmental protection in the Arctic (Exner-Pirot, 2019). There is both opportunity and hope that the engagement of the Arctic Council can help facilitate any action taken to establish protection regimes among the Arctic states and help balance these competing interests.

The Triple Bottom Line Analysis

The potential for legal protection of these non-jurisdictional Arctic sea ice can be analyzed using the Triple Bottom Line (TBL) approach. The TBL approach is a sustainability framework that attempts to balance the interests of "people, planet, and profit" when dealing with a particular issue or activity. This tool balances the competing interests of an activity and can be used to develop a stable and just regulatory framework. Arctic oil and gas exploration is a perfect example of both the advantages and challenges of using the

TBL. On the one hand, it helps all relevant aspects be considered when constructing a new thinking framework for Arctic mining, given there is currently no hard-law regulatory scheme. There is little value in only considering the environmental effects or economic of an activity, as these complex issues cannot be addressed in a silo. On the other hand, balancing the many different interests involved in Arctic oil and gas extraction is a difficult task. The exploitation of resource-based industries in the Arctic is a key economic driver of the region, which makes it complicated to implement strict legal policies that affect not only all eight Arctic states, but impede the global interests of untapped and unexploited potential resources in the Arctic.

Of course, a key factor in this analysis is the profit potential of extracting these resources from the Arctic. The economic value to Arctic countries who have offshore resources within their jurisdictional continental shelf, and then the economic value of resources outside of Arctic state jurisdiction are not to be underestimated. There is global interest in investing in exploration and extraction. In particular, China is looking to expand efforts to the Arctic. They are not only interested in the oil and gas opportunities in the Arctic, but the opening of shipping lanes. China ships vast amounts of goods and the opening of new routes, such as the Northwest Passage and the Northern Sea Route, could substantially reduce their transit times. In fact, in early 2018, China published a white paper dictating the nation's first Arctic policy and unveiling their vision for a "Polar Silk Road" across the Arctic (Nakano, 2018). This vision included plans to build infrastructure and conduct trial voyages along those new shipping routes (Nakano, 2018). It will be interesting to see how China's involvement shifts the distribution of power among the other Arctic nations. Offshore extraction in the Arctic could also affect the global market and price point for these resources (Krupnick, 2011).

Important to note are the incredibly significant investment and operational costs. There are hefty financial and logistical challenges associated with offshore exploration, which could slow efforts to commercially and substantially capitalize on these resources (Bergo, 2014). Serious Arctic exploration is predicted to be years, if not decades, in the future, predicated on the further melting of sea ice and the development of adequate infrastructure. The infrastructure dilemma in the Arctic is significant. The harsh environment of the Arctic makes it slower and more difficult to establish the needed infrastructure to make the Arctic an industrial hub of resource exploration and extraction (Bergo, 2014). Naturally, many nations would likely hope to see the Arctic develop into that image. However, as more Arctic

states work to capitalize on their resources found within their jurisdictional waters and the continental shelf, coastal infrastructure will be built that will facilitate and expedite exploration into non-claimed regions of the Arctic open to all for extraction (Sherwin, 2019). Therefore, while the upfront time and cost associated with Arctic exploration is great, the barriers to resource extraction will likely diminish exponentially as more infrastructure and newer methods are developed.

However, we also must consider that there is a significant economic benefit from the existing ecosystems, wildlife, and natural resources in the Arctic, even without the exploitation of mineral and oil resources. “Local communities benefit from access to subsistence goods, such as fish, birds and marine mammals, and obtain significant cultural benefits from collectively engaging in subsistence hunting and interacting with their landscapes.” If Arctic exploration and resource extraction is allowed or encouraged to a great extent, coastal Arctic communities may have reduced access to ecosystem services and natural resources that help sustain livelihoods of Arctic peoples merely due to the feedback loops and ripple effects stemming from the exploitation of Arctic resources. As costly as resource extraction may be in the Arctic, future efforts to invest in exploration and develop the necessary infrastructure should be anticipated in the coming years. Therefore, the time is ripe to discuss how these economic benefits can be objectively balanced with the resulting environmental harm.

Finally, we must consider how mining affects the people of the region. Resource extraction in the Arctic has the potential to bring significant sums of money to Arctic states. With the opening of shipping lanes and the potential for the industrialization of the Arctic Ocean, the push to develop infrastructure in coastal Arctic towns may yield entire new industries, create jobs, bring in revenue, and generate tourism for Arctic states and communities. The infrastructure may very well benefit the people by bringing significant economic benefit to the region. However, extraction activities can also run contrary to the culture and heritage of Arctic communities and may bring industry in an undesirable direction. Furthermore, as mentioned above, the degradation of the Arctic environment due to glacial melt and mining may disrupt their way of life and cultural practices.

Given the many factors influenced by mining in glacier areas, it is clear how the balancing of these interests would pose challenges and create great opposition to region-wide

protection regimes for sea ice in the Arctic.

Conclusion

From the environmental perspective, sea ice areas should be considered sui generis and require special protection measures. These protection measures should define the status of such areas and resources within and under areas, regulate biodiversity protection, and declare limitations of human activities in the most fragile areas. The most applicable concepts defining the status of sea ice areas and resources are res communis and res nullius. As biodiversity protection measures for sea areas that will lose ice cover, we would like to recommend the separation of fishing activities based on the list of threatened species, as well as the implementation of the Marine Protected Areas approach following IUCN or IMO categorization, which would be a useful tool in limiting human presence in the fragile glacial areas.

There is no doubt that the Arctic still suffers the severe consequences of climate change and the conservation of the Arctic ecosystem is a huge incentive to reduce greenhouse gas emissions and promote sustainable societies. However, the battle over the Arctic will continue as its resources become more accessible. For the sake of the environment and conservation, the hope remains that climate change mitigation practices will reduce the amount of Arctic sea ice loss and therefore the amount of space and resources over which disputes can arise. Organizations like the Arctic Council provide confidence that the efforts to protect the Arctic and promote sustainable management are very much still alive.

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