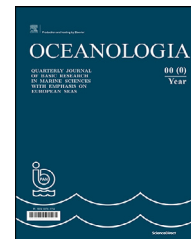




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ORIGINAL RESEARCH ARTICLE

Political dimension of Arctic research

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Summary The article contributes to a better understanding of the role of research in the policies of the states that are scientifically engaged in the High North. The research covers 17 European states: six are Arctic and 11 non-Arctic, which were selected according to the following (at least one) formulated criteria: having an established tradition of carrying out scientific research in the Arctic region; having issued Arctic policy documents and/or Arctic research strategies; participation in the activities of the Arctic Council; and having gained membership of the International Arctic Science Committee (IASC). In the analysis we have applied a mixed research method, since it incorporates elements of both qualitative and quantitative approaches and offers a more comprehensive review of the scrutinised texts. The qualitative analysis relies on a discourse analysis (predicate analysis). The quantitative part of the analysis utilizes the instruments of a software research tool – The AntConc. In the end, the outcomes of both methods are merged and compared. The study reveals that conducting scientific research is not a top priority for all Arctic states. However, it has the highest similarity in terms of applied approaches among Arctic states as compared to other fields (e.g. the economy, security or pollution). At the same time, the environment and climate change are perceived to be the most important drivers behind Arctic research as defined in the Arctic states' strategies. Moreover, there are major differences among both Arctic and non-Arctic states in terms of the level of accuracy in the presentation of their research activities, particularly with regard to the implementation of scientific programmes and research aims. Finally, the research indicates that all states highlight that international scientific cooperation stimulates cooperation also in

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other areas and that research provides information that supports decision making and policy creation.

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1. Introduction

The importance of arctic scientific research to the political domain – both nationally and internationally – is a complex and multi-dimensional issue pervaded by divergent and contradictory views. An example of this is the nature of the relations between science and politics. These worlds are considered separate spheres that are in opposition to each other in terms of the logic of their functioning and their operative axiological values (Copeland, 2016). In science, a primary position is reserved for knowledge that is based on ethically obtained objective evidence (evidence-based knowledge), while science itself is perceived as completely free of the influence of politics and ideology. In accordance with this perspective, science would constitute humanity's universal language, and the scholars' sole aim is the understanding of the nature of things. On the contrary, the political sphere characterises itself by the clashing of various influences and interests, where causes and principles are relativized, are unstable and prone to change. Politics is both dialogue and conflict, and diplomacy may only be regarded as the brighter side of politics.

However, another approach that is completely opposite to the former, emphasizes the proximity of the scientific and political domains and their complementariness for the sake of the development of humanity. In this view, the cooperation between scientists and political decision-makers makes politics more effective and responsible and at the same time enables steering the development of science in such a way that it will contribute to the solution of the most vital and urgent challenges to individual states and the international community. What is more, as science is frequently financed by nation-states, it is strictly connected to their needs and interests (Wagner, 2002). Since these views are very much contradictory, one may argue that the real character and scope of the relations between science and politics lies somewhere between these two just indicated positions.

Another dimension relevant to the relationship between science and politics, particularly on the international level, involves their operational forms: international scientific cooperation and so-called science diplomacy (Copeland, 2016; Flink and Schreiterer, 2010). While science diplomacy typically constitutes an element of a state's foreign policy and serves its interests, international scientific cooperation focuses on scientific progress and is animated and conducted by individuals or groups of individuals (Turekian et al., 2015). As indicated by Turekian et al. (2015) since the end of the Cold War, in the period of globalization, one can observe that science and foreign policy have become more aligned, which resulted in the advent of science diplomacy. Subsequently, they argue that science diplomacy is “the process by which states represent themselves and their interests in the international arena when it comes to areas of knowledge – their acquisition, utilization and communication – ac-

quired by the scientific method” (Turekian et al., 2015). For the participants in the workshops organized by the American National Research Council in 2011, science diplomacy is both a way to pursue a national agenda as a component of “soft power” as well as a way of addressing common problems and fostering personal relationships (National Research Council, 2012). Taking a historical perspective, it can be argued that international scientific cooperation tended to be a response to undertakings of a strictly scientific nature, while science diplomacy is frequently presented as an outcome of increased threats to states' existence and development, threats of a trans-border nature, etc. which due to their global scale have forced various states (and other agents) to engage in political cooperation.

While the relationship between science and politics is prone to change depending on the historical era at hand: at times these two worlds function independently while in other periods their trajectories lie close to each other. The same can be said in a geographical context: in some parts of the world scientific research and politics are quite separate, while in others they are very much intertwined.

In the last two decades we have been witnessing the increasing number and growing complexity of international problems that became objects of international politics and diplomatic processes. Moreover, finding their solution often lies within the realm of scientific knowledge. One example of such a state of affairs is the Arctic region, which has gained international significance and became an object of global interest due to multifarious consequences of climate change and processes of globalization.

Arctic research is specific in several environmental and social aspects and hardly comparable to any other region. As such, the nature of science diplomacy in this particular case is hardly comparable to its nature in other areas. Unlike in other regions, climate change effects are most visible in the Arctic. While both the Arctic and Antarctic are the most inhospitable places on the planet, these are concomitantly the two most vulnerable regions on Earth when it comes to the consequences of climate change. However, unlike in the Arctic, there is no permanent human habitation in the South Pole. There are only scientists working on research stations and tourists. Also, there are no commercial industries. The scientific outcomes of polar research aim at providing solutions for ongoing scientific challenges. Yet, it is even more problematic and demanding in the Arctic, since scientific outcomes directly influence Indigenous peoples and local communities residing there. Giving the above-mentioned factors, we assume that the research interests of Arctic states differ from states that have no inhabited territory in the Arctic.

The Arctic region has aroused the curiosity of Europeans for centuries, who explored the stern, wintry and dangerous lands and seas of the High North in a relatively slow manner. The acquisition of knowledge about the Arctic

by the Europeans occurred initially alongside explorations carried out with the purpose of colonization in mind (e.g. the Viking settlement in Iceland and Greenland in the 9th and 10th centuries, respectively), or even fishing and whaling expeditions (e.g. the discovery of Novaya Zemlya in the 11th century or the unconfirmed discovery of Spitsbergen by the Pomors in the 14th or 15th century). Arctic exploration assumed a more systemic form in the modern era when some Western European states were forced by the European geopolitical situation (in terms of Spain's and Portugal's naval dominance) to search for a north sea-passage to Asia while the rulers of Russia initiated an intense conquest of Siberia. It will be no exaggeration to claim that the erstwhile discoverers of the Arctic often played the roles of both explorers and representatives of current European rulers, and they were sometimes entrusted with official or secret instructions from their principals (McCannon, 2012).

Geographical discoveries in the High North together with the evolution of theoretical knowledge and successive improvements in the techniques of observation and experimentation in extreme polar conditions have stimulated the development of Arctic scientific research in many areas of science since approximately the second half of the 17th century. Even though the majority of expeditions into the Arctic circle were typically organized by and were meant to serve the interests of individual European states, in the second half of the 19th century the concept of international cooperation evolved as a *sine qua non* condition to further effective development of knowledge about numerous phenomena and processes related to the Arctic, especially in regard to meteorology. This had a key practical significance for the development of navigation and for the understanding of climatic phenomena in the northern hemisphere. An example of this tendency was Weyprecht's initiative to organize coordinated national expeditions to the Arctic instead of 'a race to the North Pole' (Barr, 2008). A wide international research program was then proposed to be realized as part of the International Polar Year by the national expedition and research units of 12 states in 1882/83. It is worth emphasizing that the initiative had its subsequent editions in 1932/33, 1957/58 and 2007/8 (Łuszczuk et al., 2015).

Another factor supporting the development of observation and research in the European Arctic was the Svalbard Treaty, indirectly making it possible for researchers from various states to work in the archipelago. There are many arguments that support the view that scientific cooperation in the Arctic is one of the oldest and most important areas of international cooperation in this part of the world, including many initiatives of a strictly exploratory or competitive nature (the race to the North Pole). Interestingly, even though the significance of research (especially meteorological research) in the Arctic increased during World War II (Selinger and Glen, 1983), the conflict initiated a weakening of international scientific cooperation that lasted throughout the Cold War due to the widening of political and ideological barriers. Clearly, this change was strictly connected with the development of national research projects realized in the Arctic and geared towards the military security of individual states or alliances. With the end of the Cold War, the usefulness of science for state interests somewhat decreased, while at the same time the thematic scope of research was significantly widened (Doel et al., 2014).

Due to its inherent international nature and the fact that a lot of observation and research conducted in the Arctic centres on the specificity of the natural environment and the changes that have taken place therein, arctic scientific research constitutes a starting point for extra-scientific initiatives of regional cooperation. The most important example of this was the so-called Rovaniemi process that is the implementation of the Arctic Environmental Protection Strategy (AEPS) adopted in 1991 (Tennberg, 2000). After a few years this cooperation was transformed into the activity of the Arctic Council.

For a quarter of a century, the International Arctic Science Committee (IASC), established in 1991, has been a basic platform for international scientific cooperation in the Arctic. It is a non-governmental organization whose mission is supporting and facilitating research cooperation between all the states that are involved in gaining knowledge about the Arctic regions. IASC promotes and supports interdisciplinary research aimed at gaining deeper knowledge and understanding of the Arctic region and its role in the Earth's system. IASC's major functions include: (a) providing unbiased, independent scientific counselling as regards the Arctic and providing the public with vital information; (b) undertaking actions to protect, exchange and provide access to scientific data concerning the Arctic; and (c) supporting easy access of scientists to all geographical areas and sharing knowledge as well as logistics and other resources (IASC, 2018).

Undoubtedly, scientific cooperation in the Arctic plays a crucial role in a period of intense climatic change, for it makes it possible not only to learn more about the processes and phenomena under way, but it also constitutes the basis for the preparation of strategies of adaptation to the new situation in the 21st century. At the same time, research in some areas may have a particular significance for the socio-economic, political or strategic interests of individual states of the region and beyond. This is the case, for example, with research into the structure of the Arctic Ocean's seabed and continental shelf, with the prognosis of extreme weather conditions, or with the development of state-of-the-art technologies of civilian or military use. On the one hand, these conditions contribute to an increase in the number of international research projects, while on the other hand they motivate states to move toward a more active deployment of research results in their Arctic policies.

So far, no detailed research has been carried out to establish the role of research into the policies of states that are scientifically engaged in the High North. This study aims to fill this gap by presenting the results of the quantitative and qualitative content analysis of the main policy documents and Arctic research strategies issued by the selected European Arctic states.

One of the key features of this selection is its dual composition – both Arctic and non-Arctic states were considered. It is worth emphasizing, however, that this distinction is not limited only to geographical location. It is assumed that being or not being an Arctic state implies different needs or motivations behind conducting Arctic research, and this results in different positions or roles of scientific research in the overall involvement of states in the Arctic region. Countries with Arctic territories generally have a longer, stronger and more comprehensive tradition

of undertaking Arctic research, while non-Arctic states due to their distance to the region have a different scientific perspective. The detailed characteristics of the examined group of states are provided in the following section.

2. Methodology and data examined in the analysis

The research covers a set of 17 European states, which includes both six Arctic states (Finland, Iceland, the Kingdom of Denmark, Norway, Russian Federation, Sweden) and 11 non-Arctic states (Austria, the Czech Republic, France, Germany, Italy, the Netherlands, Poland, Portugal, Spain, Switzerland, the United Kingdom). This selection was determined by the application of at least one of the following criteria: having an established tradition of carrying out scientific research in the Arctic region; issued Arctic policy documents and/or Arctic research strategies; participation in the works of the Arctic Council; and membership in the International Arctic Science Committee (IASC).

From this group of 17 analysed countries, there are six countries – Austria, Czech Republic, the Netherlands, Poland, Portugal, Switzerland – which have not issued any, publicly available in English and in full version, political documents relating to the Arctic region. However, all of these participate in the different working groups of IASC. In addition, some of these – Poland, Portugal and Switzerland – are engaged in the Arctic Council as Observers. Therefore, despite the lack of official documents, their involvement in and contribution to Arctic research is not negligible. These countries are certainly part of the developments in the region and therefore it is relevant to include these in this analysis. The lack of official positions could be explained by various factors, which would need additional research. However, this possibly leads to (1) a lack of political willingness or readiness to involve adequate resources in the formulation of Arctic policy documents or to (2) systemic barriers preventing the research communities to efficiently inform policy-makers about the political importance of the Arctic region. [Figure 1](#) presents a list of countries selected for the analysis, their participation in the Arctic Council and International Arctic Science Committee and their documents related to the Arctic and Arctic research.

The research design of this study is based on a mixed research method since it incorporates elements of both qualitative and quantitative research approaches for the broader purposes of breadth and depth of understanding ([Johnson et al., 2007](#)). The quantitative method relies on a software research tool – The AntConc ([Laurence, 2019](#)). The qualitative method includes the discourse analysis, or more specifically, the predicate analysis. Eventually, the outcomes of both methods are merged and compared by applying a comparative analysis.

As [Phillips and Hardy \(2002\)](#) explain: “social reality is produced and made real through discourses, and social interactions cannot be fully understood without reference to the discourses that give them meaning”. The method of discourse analysis pays particular attention to the language issues in the construction of social reality (see also: [Milliken, 1999](#)). Individual elements of discourse are the speech acts that fit into it. Such an act of speech is the Arctic policy

document, the creator of which is the selected state. Predicate analysis focuses on the language practices of predication – verbs, adverbs, adjectives and other nouns that are attached to reference nouns. The AntConc software, a tool used to analyse the corpus, is used to apply this method to the Arctic policy documents. This software allows users to create basic corpus analysis categories, e.g. a word list and a keyword list but also helps to find advanced categories like collocates, clusters and n-grams in the text. Collocates are all predicates close to the word with a short window span (around, from left to right of the word). Clusters are the predicates that are placed next to the reference word. Together with the reference word they form logical word clusters and they could be present in general written English. In other words, a cluster is a logical phrase.

The second method used in the research is a comparative analysis, which allows to determine convergences and contradictions in the parts of the documents regarding the scientific research. The comparative analysis is applied as a research method, especially with comparative explanation and the method of agreement in mind. The method of agreement is suitable for use when there is a difference in the structures of the compared agents while a similarity exists in their function ([Hopkin, 2018](#)).

The core of the analysis are the official documents (see: [Appendix 2](#)) – Arctic strategies of Arctic and non-Arctic states ([Denmark, 2011, Denmark, 2013; Finland, 2010, 2013; France, 2016; Germany, 2013, 2019; Iceland, 2006, 2007, 2009, 2011; Italy, 2016; The Netherlands, 2014; Norway, 2006, Norway, 2009, Norway, 2011, 2014, 2017; Poland, 2017; Russian Federation, 2001, 2008, 2013; Spain, 2017; Sweden, 2011, Sweden, 2016; Switzerland, 2015; UK, 2013, 2018](#)). In order to operationalise the corpus analysis, two groups of words were selected to be examined using the AntConc software ([Laurence, 2019](#)). These are ‘research’ and ‘science’ and their related forms or lemmas (researchers, researchers’, researcher; sciences, scientists, scientific, scientifically). In written English both groups often appear together. Both words form a phrase ‘scientific research’, the reference object of this study. A preliminary test revealed that research is the third most popular word in all documents (excluding commonly used grammatical elements in English such as ‘the’, ‘and’, etc.). The most popular words are Arctic; north; research; cooperation (see: [Appendix 1](#)). Based on this we can claim the prominence of research in Arctic policies. The use of the software consists of a quantitative dimension of the analysis. This software enables a broadening of the analysis because of the quantity of processed data where non-software investigation could not have provided such in-depth results.

During the research several barriers emerged, including limited accessibility of documents (some of which were not in an editable format) and in three cases there were no documents at all (Czech Republic, Austria, Portugal). Moreover, it appears that the software does not offer relevant statistics and result comparisons for different types of discourse analysis. This research tool is crucial in performing such analysis. This is highlighted by the obtained results that are presented below. Nonetheless, due to the characteristics of the software, it does not provide many opportunities to compare different types of documents with different lengths. It was particularly difficult to obtain a percentage

State	Arctic state (Arctic Council member)	Non-Arctic state (Arctic Council observer)	IASC member	Issued Arctic strategy/ policy	Arctic research strategy
Austria					
Czech Republic					
Finland					
France					
Germany					
Iceland					
Italy					
The Kingdom of Denmark					
The Netherlands					
Norway					
Poland					
Portugal					
Russian Federation					
Spain					
Sweden					
Switzerland					
United Kingdom					

Figure 1 List of countries selected for analysis, their participation in the Arctic Council and International Arctic Science Committee and their documents related to the Arctic and Arctic research. Grey cells show if and how states are engaged in the Arctic organisations and if/what documents they issue.

distribution for the phrases in the text. Therefore, these findings need to be interpreted with some measure of caution.

3. Presentation of results of the analysis

An application of the mixed research method used in this study allows for the integration of qualitative and quanti-

tative approaches which results in a better, more insightful understanding of the political dimension of the Arctic research. Although the main premise of this methodology is that such methodological integration allows for a more complete and synergistic utilization of data compared to separate quantitative and qualitative data collection and analysis, it is still conceivable to present the results of the qualitative and quantitative analysis separately and to explain all findings in the discussion and conclusion sections.

3.1. Qualitative analysis

In this section the outcomes of the qualitative analysis are presented. The qualitative approach allows us to investigate single cases in detail. The analysis is divided into two groups of states – Arctic and non-Arctic states – that illustrate comprehensive observations of the political dimension of Arctic research. As mentioned above, the choice behind categorizing the selected countries into two groups is driven by the assumption that each country follows its own research needs or interests that are determined by their territorial presence (or absence) in the Arctic. Hence, we assume that the research interests involved (supporting the countries' foreign policy goals) would be different for Arctic and non-Arctic states.

3.1.1. Single cases – Arctic states

The field of science is not a top priority for all Arctic states. However, it has the highest similarity among the Arctic states as compared to other fields (e.g. economy, security, pollution, etc.) (Padrtova, 2019). At the same time, the environment and climate change are seen as the most important drivers behind the Arctic research defined in the Arctic states' strategies. Indeed, all Arctic stakeholders are dependent on scientific research and international cooperation in science because of climate change (Heininen et al., 2019).

In the case of Finland, the government emphasizes the importance of making scientific contributions. The two Finnish strategies also outline other purposes of the research that is undertaken, such as decision making, economic, and social purposes. In particular, the 2013 strategy states that “the new knowledge generated by research needs to be actively disseminated to support decision making, expand business opportunities and increase general awareness of the Arctic among the public at large” (Finland, 2013, 2010). Furthermore, the document explains that research can be used for gaining and maintaining geopolitical influence in the region because “Finland will be able to consolidate its position and increase its appeal as a leading world-class expert in the Arctic” (Finland, 2013).

For Iceland research is clearly a priority highlighted in their two documents that cover the Arctic policies (Iceland, 2009, 2011). The 2011 strategy document provides a long list of topics that research should cover including “climate change, glacier research, marine biology, international politics and law, security, oil and gas extraction, history and culture, economic and social development, gender equality, health care issues and Arctic shipping” (Iceland, 2011). Additionally, its 2009 strategy document suggests that research should help inform policy (Iceland, 2009). Furthermore, Iceland emphasizes a need “to promote the involvement of Icelandic scholars and institutions in international cooperation on Arctic science such as the International Arctic Science Committee, and work carried out by the Arctic Council working groups” (Iceland, 2011).

The perspective for the political dimension of Arctic research is also presented extensively in the policy documents of The Kingdom of Denmark, where research is among the

main priorities. The two Danish documents identify the different drivers for Arctic science development. The main driver in both documents appears to be climate change, followed by pollution (Denmark, 2011). Similar to Finland, Danish documents emphasize the multipurpose nature of Arctic research, which could aid the Kingdom in its decision making e.g. in regard to the management of living resources like fish (Denmark, 2011). In addition, research can also help inform climate agreements, as well as be of benefit to economic development. Importantly, both documents state that “research will help with the Kingdom's continental shelf claim” (Denmark, 2011).

In Norwegian Arctic policy documents research is of high importance, although not specifically listed among the state's priorities. Norway also emphasizes that the research can also be used for different purposes. For instance, both strategy documents (2014 and 2017) suggest that research and knowledge can help improve Norway's economy as well as inform its economic decisions, including on sustainable development (Norway, 2017, 2014). The 2017 strategy directly links climate and environmental research to business development. The document states that “more knowledge about interactions between oceans, ice, biodiversity, and ecosystems is necessary for overall management of the northern sea areas and business development and value creation” (Norway, 2017). For Norway, “it is [also] important to have a research-based approach when evaluating environmental consequences before making decisions about new activity” (Norway, 2014).

In its 2013 strategy, the Russian Federation identifies ‘the development of science and technology’ as one of the five main priorities of the state in the Arctic region. However, research is among the least discussed topics compared to other Arctic states. The 2013 strategy document identifies several drivers of science such as natural hazards, climate change, and the environment (Russian Federation, 2013). The document states that research can also be used for other purposes and contribute to a better understanding of social and economic conditions. The 2013 strategy document explains that other research areas include “history, culture and economy of the region, as well as the legal regulation of economic and other activities in the Arctic”. Indeed, research can help improve health and wellbeing, and contribute to greater international cooperation (Russian Federation, 2013). The 2008 strategy also recognizes the importance of research related to social and economic issues (Russian Federation, 2008).

Finally, for Sweden research plays a considerably important role, although it is not explicitly mentioned among the listed priorities (Sweden, 2011). The strategy recognizes the need for interdisciplinary research. Particularly, the document states that “Sweden will continue to be a leading nation as regards climate and environmental research, focusing also on the impact of climate change on humans” (Sweden, 2011). Climate change and the environment are the key drivers of science and research. Besides that, Arctic research serves other purposes as well. For instance, Sweden's long history of Arctic research can be used to ensure Sweden's place as an Arctic stakeholder (Sweden, 2011). Sweden also recognizes the importance of international research cooperation. Indeed, “cooperation across national

borders in the North helps to maintain good relations in the High North” (Sweden, 2011).

Summing up the observations relating to the Arctic states, it can be concluded that in most cases Arctic research has a very pragmatic meaning, very often it is associated with economic developments and social needs. Emphasis is also put on the aspect of international cooperation within the field of research. Surprisingly, it is not linked with the sustainable development of the region, which would have been expected. In general, the political dimension of Arctic research is not presented as a key political issue for Arctic countries.

3.1.2. Single cases – non-Arctic states

The following section provides a detailed content analysis of six non-Arctic states’ Arctic strategies – France, Germany, Italy, the Netherlands, Spain, and the United Kingdom. The remaining five non-Arctic states included in this research (Austria, the Czech Republic, Poland, Portugal, Switzerland) are excluded from this section since they do not have any official political Arctic documents to be analysed.

In the case of France, scientific research and cooperation is one of the seven priorities of its ‘National Roadmap for the Arctic’ (France, 2016). There is a long-standing polar exploration and research tradition in France as “France was the first country to set up, in 1963, a scientific research base in (...) Svalbard, where it shares a permanent base with Germany” (France, 2016). The document also states that “in historical terms, the polar regions have had a special place in international scientific cooperation” (France, 2016). Moreover, “France’s scientific activities relating to the Arctic strengthen its legitimacy in dealing with Arctic affairs” (France, 2016). Although the French document is very clear about the political importance of Arctic research for the state, it still seems to be quite vague in this respect.

In German strategy there are no explicitly stated priorities. Nevertheless, the document lists 11 issues which are of high interest to the Federal Government – research being one of these. Although, the research drivers tend to be related to the environment and climate change (Germany, 2013), there are also other purposes that underpin the research. Economic reasons for instance. That is why the Federal Government “is convinced that, as a partner with vast expert knowledge in the areas of research, technology and environmental standards, Germany can contribute to sustainable economic development in this region” (Germany, 2013). Arctic research can also be used as an instrument to create policy and inform decision making. Therefore, the Federal Government “is working to guarantee the freedom of Arctic research, based on the conviction that scientific findings are of fundamental importance for Arctic policy” (Germany, 2013).

The Italian Arctic Strategy refers to the “Scientific dimension” which is one of the key areas to focus on in the Arctic. Research is thus clearly a priority. The expeditions to the North Pole are noted as “the first Italian scientific missions in the Arctic region”. The document highlights that “a major role is to be played by scientific and technological research, in which Italy excels”. The strategy also informs and addresses how “the Italian scientific community, supported by the national research agencies ... [is about] to reinforce Italian presence in the Arctic”. Finally, the

strategy provides a specific example of implementing the interplay between science, politics and business, the recently reactivated Tavolo Artico (Arctic Table), as “an informal, open-ended consultation group on the Arctic, [including] members from academic, scientific and business communities”.

The Dutch strategy outlines clear Arctic priorities in its Strategy Plan. The document provides guidelines for future polar research as “the Netherlands continues to play a role in international (polar) issues” (The Netherlands, 2014). The Netherlands in its research “combines ‘space for science’ and ‘space for policy’” (The Netherlands, 2014). Within this context, there are four key drivers behind the scientific agenda that addresses both science and policy i) “ice, climate and rising sea levels”, ii) “polar ecosystems”, iii) “sustainable exploitation”, iv) “social, legal and economic landscape” (The Netherlands, 2014). In addition to creating knowledge, as one of the main functions of the research, there are four other purposes of the research. One of these is to support policy as “the results of Dutch research into the polar climate system are increasingly finding an audience with (inter) national policymakers” (The Netherlands, 2014).

In the case of Spain there is a substantial focus on scientific research. Polar research, which includes education, is defined as a “strategic priority for the Spanish scientific system”. In addition, “scientific cooperation is one of the most effective forms of international cooperation, as it can be transformed into essential political capital enabling effective action [and] defend both its own interests and global interests”. The Spanish strategy considers “polar research to be a strategic priority for the Spanish scientific system, both due to its scientific importance and to its high internationalization and repercussions in areas of interest to Spain, both strategically and socio-economically”. The document also calls for the establishment of its own Spanish scientific infrastructure in the region.

The United Kingdom is portrayed as “a world leader in Polar affairs where British views have long held sway in the fields of polar science, exploration, diplomacy, business and environmental protection”. Moreover, “the UK research community has a strong record of collaborating internationally and delivering high impact Arctic research ... [and] high-level agreements with Arctic states ... [and] provides strong frameworks for collaborative research” (UK, 2018). As the policy outlines “highly regarded UK science is present in most areas of Arctic research and also helps to underpin good policy, stable governance and responsible commerce” (UK, 2013). Indeed, “by its nature, science contributes directly to diplomacy, policy and our understanding of the Arctic” (UK, 2013), therefore the UK “will encourage the timely feedback of robust evidence into decision making mechanisms” (UK, 2013).

All of the six non-Arctic states pay attention to the importance of their involvement in polar research. Specifically, their presence in the Arctic through scientific activities could strengthen their legitimacy in dealing with Arctic affairs. At the same time, the research could help inform decision making, support policy and contribute to stable governance of the region. Non-Arctic states also put emphasis on the contribution of research to the sustainable development of the Arctic.

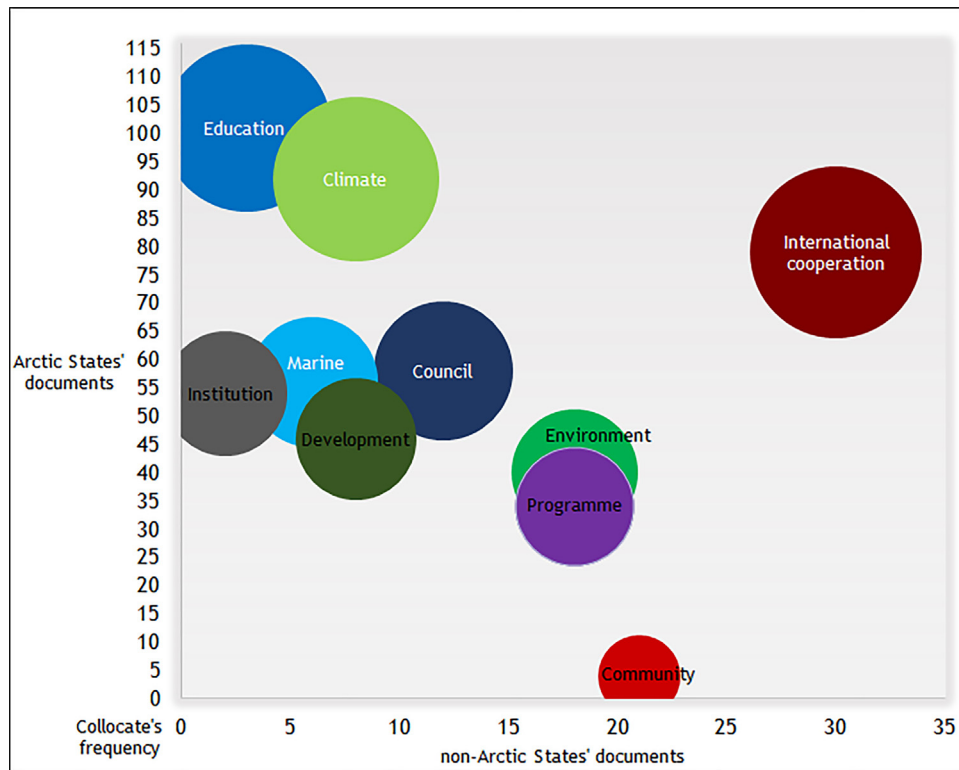


Figure 2 Frequency of the collocates with 'research' between the Arctic states and non-Arctic states. The size of the circle in the figure shows the aggregated frequency of the collocate. The position of the circle indicates stronger correlation with particular states. For better visibility, the scales of the axes differ.

3.2. Quantitative analysis

Further examination reveals the context in which the reference words of research and science occur. Studying collocates is the essence of predicate analysis. Collocates of reference words indicate different contexts. The most frequent predicates obtained from this analysis are: education, climate, international cooperation, marine, environment, institution, development, community and economy. Research tends to be a strong catalyst for international cooperation in the Arctic. Despite its international dimension, it is crucially important on a local level in the Arctic states. The context of scientific research also includes the education system and issues regarding Indigenous peoples. However, most of the research stems from science in which environmental issues and climate change are hot topics. Moreover, in the Arctic policy documents 'research' and 'science' collocates frequently with economic matters; broadening the sphere of human activity in the Arctic.

Figure 2 depicts a graphical presentation of the frequency of collocates with the word 'research'. The ten most popular collocates are placed between two coordinate axes. The axes refer to the frequency of the selected collocates where a distinction is made between the documents of Arctic states' and non-Arctic states. Hence, it suggests that the environment is a focal point when conducting research in the Arctic. Nevertheless, non-Arctic states pay slightly more attention to international science cooperation and Arctic science is recognized as being embedded in a community of

researchers. Correspondingly, many research institutions in the Arctic states are involved in Arctic science. It influences both domestic education and directions of economic development. Figure 2 illustrates the frequency of the collocates with 'research' as distinguished between Arctic states and non-Arctic states.

Another type of research technique used in text analysis is cluster analysis. Further analysis of clusters in the text highlights the collocates examined below. It reveals the most popular clusters in the corpus; e.g. international research, research cooperation, research and education, climate research, research and innovation and research and development. Moreover, this branch of analysis underlines the prominence of the research itself. In the analysed texts, states relatively often mention the collocates research centre; research programmes; research institutes and research stations in the context of scientific research.

Generally, hits of reference words are conspicuously dispersed in all documents. In the majority of cases the Arctic states' documents are longer than those of non-Arctic states. Interestingly, there is no evident correlation between being an Arctic state or not and the number of hits. Scientific research is a focal point in the discussion of the Arctic, and this is an important topic also for non-Arctic states. Moreover, there is an explicit tendency in non-Arctic states' documents to have a higher 'hits to all-text characters ratio' than in the documents of Arctic states. It is a positive and directly proportional correlation. In other words, scientific research occurs relatively more often in the documents of non-Arctic states. It suggests that

scientific research is often the only on-site activity that non-Arctic states could provide in the region, because of the obvious reason of the sovereignty of Arctic states. In closing, it needs to be mentioned that every state has a similar section on research in its documents. There is no significant difference in this area between Arctic and non-Arctic states.

An in-depth analysis of the image of scientific research can be illustrated by recognizing its five underlying pillars. This is the result of categorising all relevant quotes into subjects in the analysed documents. The name of the particular pillar describes the nature of the main category of quotes. The following five pillars are listed in order of the highest frequency of occurrence in the processed data:

- own achievements and prominence;
- aims and challenges of the research;
- international cooperation;
- describing the region through science;
- connections with the economy.

A more comprehensive description of these pillars is presented below. In the first two pillars, the states pay attention to their own achievements and aims to stand out from others. The next two pillars are specifically about the international dimension of the research and how it influences the understanding of the region itself. The latter pillar applies to the science-based economy, which is especially important in the Arctic. An amplification of these reflections with citations of the selected phrases from the documents can be found below. The quotes were selected from each category to describe the pillar in the context of a specific example.

3.2.1. Own achievements and prominence

Firstly, the states are trying to present their own close connections with Arctic research and the region itself. For example, The Kingdom of Denmark “will maintain its leading position internationally in a number of research fields concerning the Arctic and will promote national and international Arctic research” (Denmark, 2011). Sweden’s strategy states that “Swedish ice-breakers are uniquely qualified to support Arctic research and monitor the vulnerable marine environment” (Sweden, 2011). In a similar way, Finland perceives itself as “an Arctic expert. The Arctic region is undergoing a major transition. Finland possesses the top-level expertise and the know-how it takes to understand, adapt to- and even make use of this transition” (Finland, 2013). Indeed, non-Arctic states take a similar approach, for example “Germany is internationally recognised for- and very active in a wide range of Arctic research activities” (Germany, 2013). Furthermore, “Italian research agencies (CNR, ENEA, INGV, OGS) already take an active part in international Arctic initiatives”. Similarly, “excellence of France’s polar scientific research and its integration with international research constitute a major asset of French foreign policy in the Arctic and underpin its legitimacy” (France, 2016).

Both the Arctic states and non-Arctic states present their scientific activities as closest to the core of Arctic research. It is a matter of prestige and is substantially important to diplomacy. Analysis of own achievements and prominence revealed that there are no significant differences between the states, however in the case of Arctic states it is naturally tied to its internal dimension.

3.2.2. Aims and challenges of research

Similar to the above, states present aims and challenges for their scientific research. For example, Denmark’s strategy indicates that “cooperation between research institutions must constantly be consolidated and developed and researchers have to be familiar with the available options for the funding of Arctic research. Continuity and stability in the research environment must be assured, for example, by the recruitment of young researchers” (Denmark, 2011). Other Arctic states formulate these challenges similarly. Sweden highlights that “stronger forms of cooperation and better research infrastructure are needed to create opportunities for interaction between research, higher education, politics and society” of Sweden and other actors engaged in Arctic issues (Sweden, 2011). In Finland’s case, “knowledge of the Arctic nature and the special features of the geophysical environment require long-term basic research and field work” (Finland, 2013).

Some broader comments on this topic can be found in the documents of non-Arctic states. Above all, “continuously amassing knowledge about the polar regions and the changes occurring there is necessary in order to deal properly with the changing conditions” (The Netherlands, 2014). On the other hand, Italy’s efforts “will contribute to the geographical expansion of our research activities and to the promotion of the Italian research system in Europe”. In general, climate change and its effects pose the greatest challenges in the region. However, the states are willing to connect the research with the other forms of human activity.

3.2.3. International cooperation

Turning to international cooperation, scientific research in the Arctic could be both the subject of cooperation but also an independent catalyst for the broadening of cooperation. The states mention both scientific and non-scientific institutions that stimulate international research cooperation. For example, the Kingdom of Denmark “will work to strengthen international cooperation on scientifically based management of shared fish stocks and fisheries in international waters with a view to promoting consensus” (Denmark, 2011). Particularly, the most important institution is the Arctic Council which “has compiled research and environmental monitoring data on specific Arctic climate processes” (Sweden, 2011). At the same time, Germany “does its part to support international cooperation in all areas of Arctic research through the International Arctic Science Committee (IASC), which is based in Potsdam” (Germany, 2013). Similarly, the Government of Norway “will give priority to Norwegian participation in international research cooperation, for example under the Arctic Council and EU research programmes” (Norway, 2017).

Moreover, the non-Arctic states pay attention also to unit-level research. For example, Spain facilitates “Spanish researchers’ access to land-based installations through the agreements necessary for exchanging scientific capabilities with other countries or institutions” (Spain, 2017). Likewise, the United Kingdom is keen “to undertake high quality research in partnership with the best Canadian researchers across a wide range of marine terrestrial and other fields” (UK, 2018).

3.2.4. Describing the region through science

Another way of presenting the scientific research in the Arctic policy documents is by using it to describe the region. The Arctic is a unique region where research results are crucial in defining its borders and explaining the main processes that are taking place there. As the Polish document states “Polar regions (...) are both the fastest changing and the most important areas on Earth for understanding global changes” (Poland, 2017). Russia’s strategy further explains that the region can be characterised by “extreme climatic conditions, including low temperatures, strong winds and the presence of ice in the waters of the Arctic seas” (Russian Federation, 2013). Indeed, “recent scientific studies conclude that warming in the Arctic since 1980 has been twice as much as the rest of the globe” (Denmark, 2011).

The document analysis also shows a number of statements that link the policy of a particular state with science. France’s strategy argues that “the Arctic is a zone of global scientific interest” (France, 2016). In addition, “the Arctic region extends both to the North Pole area proper and the part of the North Atlantic Ocean which is closely connected to it” (Iceland, 2011). Correspondingly, Switzerland’s strategy reveals that “special interest that Swiss researchers have in the Arctic and Antarctic can also be explained by the close relationship between polar and high altitude research” (Switzerland, 2015).

3.2.5. Connections with the economy

The fifth biggest pillar of the research image is about connections between science and the economy. There is a tendency to present research as an inevitable component of the many forms of human activity. On the one hand, it has been suggested that “research and education are closely connected – and must be tightly linked with economic and industrial development” (Denmark, 2011). On the other hand, “research plays a key role in the area of planning, licensing procedures and evaluation of risks and threats in connection with the various activities (Finland, 2013).

States especially stress their role in economic activities. For example, “Italy has a long tradition in the research and development of offshore hydrocarbons”. In the same way, “France will do everything that it can, here in the Far North of the planet, to take action, mobilise its researchers and its businesses, to enable us to preserve this part of the world” (France, 2016). It should also be noted that in terms of connections with the economy, the states affirm the need to facilitate “research and development into innovative technical solutions, which have the views and needs of the indigenous people and those in remote communities at their heart will bridge this gap” (UK, 2018).

These are the elements of the scientific research image that occur in all studied Arctic policy documents. Further analysis shows that there are a further three topics that are present in a few of the analysed documents: the European Union (EU) involvement in research, freedom of conducting scientific research and the connection between research and indigenous peoples issues. There is no difference in the documents of Arctic and non-Arctic states concerning the involvement of the EU. Eight of the nine selected states are EU Member states. Furthermore, the rule of freedom of scientific research is presented in the non-Arctic states’ documents. As explained above, scientific research is often

the only one form of activity of non-Arctic states in the region. It should be noted that indigenous people issues are common to Arctic states and for obvious reasons are of less importance to other states.

To summarise this part of the study, using software in our analysis has enabled us to process a vast amount of data. In this case, the quantitative analysis facilitated the categorisation of the content of Arctic policy documents. Together with the qualitative analysis, it is an attempt at the comprehensive evaluation of the role of research in Arctic policies.

4. Discussion

Despite the fact that obvious differences exist between Arctic and non-Arctic states in terms of the manners of engagement in the Arctic region, several intriguing findings are discussed in this section. Firstly, it is interesting to observe that through the years and editions of the Arctic documents, the research is presented increasingly in connection with other fields of human activity (e.g. business, education, healthcare). In the case of the Arctic states’ documents, relations of research with other fields are more comprehensive (e.g. development, innovation, social, infrastructure). For non-Arctic states, the main political dimension of their strategies ties their research activities to the European Union and highlights the role of the Arctic Council Observers. In the research strategies, three non-Arctic states (the Netherlands, Poland, Switzerland) paid the most attention to international cooperation and knowledge-based activities. There is a tendency to underline the usefulness of studies undertaken by non-Arctic states’ researchers.

Secondly, this analysis reveals that common research influences common policy goals. International scientific cooperation stimulates cooperation in other areas, which is a matter of great importance, especially in the Arctic; an environmentally vulnerable region. “Research also is important in providing information in support of decision making and the Arctic policy” (Finland, 2013). Norway’s Arctic strategy underlines “research-based value creation” (Norway, 2017). Moreover, “in diplomatic terms, global scientific interest in the Arctic helps to preserve a common interest dimension” (France, 2016). Finally, the Arctic policy document has the explicit purpose – “to supplement the resulting analysis, [with] a policy report [that] was developed to facilitate dialogue between scientists and decision-makers” (UK, 2018).

Thirdly, it is clear that the political dimension of Arctic research is differently perceived and approached in these two categories of states. While the Arctic states hold respectful legitimate positions in Arctic international cooperation, they do not treat the research as any kind of foreign policy activity, even when they engage in more or less broad international scientific cooperation. Moreover, their scientific focus is more driven by regional or even local needs than by more general or global concerns. In their Arctic strategies these states are much more eager to refer to climate change as a factor shaping socio-economic developments than to deal with it as an exclusive subject of scientific research. They do not ignore the value of scientific knowledge in this respect, however, in general they are less likely to highlight political aspects. In the case of

non-Arctic states, scientific activities are much more accentuated and prioritised, what in the context of the political character of the studied documents can also be understood as the politicisation of their Arctic research. In some cases, the research is more or less consciously treated as political arguments or resources. The scope of our study does not allow for commentary on domestic contexts and the determinants and consequences of such situations (e.g. if non-Arctic states are paying more attention and better support Arctic research institutions to strengthen their activities in the Arctic today as compared to some decades ago).

Finally, as the analysis illustrates there are also major differences among Arctic and non-Arctic states in the level of accuracy in the presentation of their research activities in the Arctic; particularly in regard to the implementation of the declared scientific programmes and aims. To some extent, due to the strategic nature of the studied political documents, this may be understandable. However, it should also be considered as an important element determining the consistency and impact of the presented arguments.

5. Conclusions

In this article we have explored the societal relevance of science through an analysis of the interplay between science and politics. The research findings of this article contribute to a better understanding of the role of research in the policies of 17 European states (6 Arctic and 11 non-Arctic) that are scientifically engaged in the High North. The core of the research focuses on the qualitative and quantitative analysis of national policy documents and Arctic research strategies issued by the selected states. The qualitative analysis relies on the discourse analysis (predicate analysis). The quantitative part of the analysis exploits the instruments of a software research tool – The AntConc. In the end, the outcomes of both methods have been merged and compared.

Based on the research findings, we argue that there is a clear difference of perception of the political dimension of Arctic research in two categories of states – Arctic states and non-Arctic states. Interestingly, although scientific research is among the countries' priorities in the Arctic, it occurs slightly more frequently in the documents of non-Arctic states. Indeed, scientific research is often the only on-site activity that non-Arctic states could provide in the region. Furthermore, this article illustrates that the research is often presented in Arctic documents together with other fields of human activity (e.g. business, education, health-care). In addition, in the case of the Arctic states' documents, the connection of Arctic research with other fields is more comprehensive and includes i.e. development, innovation, and infrastructure. For non-Arctic states, the main political dimension of their strategies is often presented in relation to the European Union.

Importantly, this article has revealed that research and science could be one of the drivers for states to get engaged in political cooperation. The states realize that the increasing threats are often of a trans-border character and could threaten their existence. Therefore engaging in international cooperation is crucial to their survival. Apart from this, both categories of analysed states highlight that inter-

national scientific cooperation stimulates cooperation also in other areas and that research provides information which supports decision making and the creation of policies. Science diplomacy then is among the core elements of what constitutes the state's foreign policy.

Last but not least, this article also contributes to a better understanding of international initiatives concerning scientific cooperation in the Arctic, like the implementation of the "Agreement on Enhancing International Arctic Scientific Cooperation", signed in May 2017 and the organisation of the Arctic Science Ministerials in 2016 (in Washington, D.C., USA) and in 2018 (in Berlin, Germany). In both cases the interplay between Arctic and non-Arctic states' understanding of the political dimension of Arctic research is a significant concern, but it also helps to understand what the potential is of the further development of their cooperation. From this perspective the upcoming 3rd Arctic Science Ministerial in 2020 (in Tokyo, Japan) can contribute to a more developed and better constructed cooperation offering common ground for not only presenting the political value of Arctic research, but also in the creation of a joint perspective.

Appendix 1. Lists of the most frequent words in all documents of the Arctic States and non-Arctic States (excluding common words used in English, i.e. 'the', 'and', 'is', etc.)

Arctic States' documents		
	Word	Frequency
1	arctic	3834
2	north	1593
3	cooperation	1464
4	sea	1137
5	development	1097
6	area	1063
7	region	1038
8	research	1007
9	norway	982
10	government	868
11	international	866
12	ship	860
13	activity	714
14	ice	701
15	council	695
16	resource	692
17	northern	664
18	climate	651
19	environment	588
20	russian	587
21	route	586
22	change	585
23	state	585
24	develop	576

(continued on next page)

25	finland	575	11	scientific	269
26	environmental	565	12	state	269
27	policy	559	13	ocean	260
28	russia	541	14	area	253
29	barents	537	15	council	227
30	country	532	16	policy	218
			17	work	199
			18	environment	192
			19	science	188
			20	global	187
			21	development	185
			22	environmental	184
			23	government	183
			24	antarctic	182
			25	marine	177
			26	support	166
			27	ship	165
			28	interest	161
			29	activity	158
			30	economic	155
Non-Arctic States' documents					
	Word	Frequency			
1	arctic	1773			
2	research	658			
3	polar	570			
4	international	389			
5	uk	384			
6	region	378			
7	ice	333			
8	change	316			
9	climate	292			
10	sea	287			

Appendix 2. Lists of the analysed documents

		Title	Type of the document	Year of publication	Number of pages
Arctic States	The Kingdom of Denmark	Strategy for the Arctic 2011–2020	strategy/policy	2011	58
		The Faroes Islands – a nation in the Arctic	strategy/policy	2013	43
	Finland	Finland's strategy for the Arctic region	strategy/policy	2010	98
	Iceland	Strategy for the Arctic Region	strategy/policy	2013	70
		North meets North. Navigation and the Future of the Arctic	government report	2006	38
		Breaking the ice	conference paper	2007	64
	Norway	A parliamentary resolution on Iceland's Arctic policy	parliamentary resolution	2011	11
		The Norwegian government's High North strategy	strategy/policy	2006	76
		New building blocks in the North. The next step in the government's High North strategy	strategy/policy	2009	94
		The High North. Visions and strategies	strategy/policy	2011	23
		Norway's Arctic policy	strategy/policy	2014	44
	Russian Federation	Norway's Arctic strategy	strategy/policy	2017	40
		Basics of the state policy of the Russian Federation in the Arctic	strategy/policy	2001	9
		Basics of the state policy of the Russian Federation in the Arctic for the period till 2020 and for a further perspective	strategy/policy	2008	10
		Russian strategy of the development of the Arctic zone and the provision of national security until 2020	strategy/policy	2013	21

(continued on next page)

	Sweden	Sweden's strategy for the Arctic region	strategy/policy	2011	52
		New Swedish environmental policy for the Arctic	strategy/policy	2016	5
Non-Arctic States	France	The great challenge of the Arctic. National roadmap for the Arctic	strategy/policy	2016	62
	Germany	Germany's Arctic policy guidelines. Assume responsibility, seize opportunities	strategy/policy	2013	22
		Germany's Arctic Policy Guidelines. Assuming responsibility, creating trust, shaping the future	strategy/policy	2019	25
	Italy	Towards an Italian strategy for the Arctic	strategy/policy	2015	21
	The Netherlands	Pole Position – NL 2.0. Strategy for the Netherlands Polar Programme 2016–2020	research strategy	2014	36
	Poland	Strategy of Polish polar research - concept for 2017–2027	research strategy	2017	44
	Spain	Guidelines for a Spanish polar strategy	strategy/policy	2017	36
	Switzerland	Swiss polar research. Pioneering spirit, passion and excellence	research strategy	2015	36
	United Kingdom	Adapting to change. UK policy towards the Arctic	strategy/policy	2013	40
		Beyond the ice. UK policy towards the Arctic	strategy/policy	2018	21

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