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The Effects of Territorial Usage on Polar Regıons and Polar Policies of Türkiye

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Abstract

Rising temperatures in the Arctic and Antarctic, driven by climate change, have opened new land and sea routes, posing significant threats to the biodiversity and fragile ecosystems in these regions. This article examines the impacts of climate change in the polar regions, emphasizing the importance of protecting aquatic ecosystems and addressing inter-country ownership and utilization policies. The study highlights that, beyond safeguarding economic and political rights, the demarcation of property boundaries, marine cadastre, and other utilization strategies are essential to ensuring the sustainability of aquatic ecosystems. By analyzing the Turkish Cadastre System alongside those of countries near Antarctica and prominent nations recognized for their advanced cadastral systems worldwide, 13 countries were identified for detailed examination. The findings underscore the potential benefits of establishing marine protected areas and adopting ecosystem-oriented management approaches within the framework of international arrangements, such as the Arctic Council and the Antarctic Treaty System (ATS). Furthermore, the article stresses the importance of enhancing Türkiye's scientific research and policy efforts in the polar regions, ensuring that activities are conducted in alignment with environmental responsibility. The text emphasizes the necessity for human activities in polar regions to prioritize both ecosystem sustainability and international collaboration.

Introduction

Some unchanging facts in the world are constantly renewed and developed. The desire to own something comes first among these facts. The right to own something, to use it as you wish, to benefit from it, to take responsibility for it, or to sell it whenever you wish has always attracted people. Property is the relationship that occurs when a person establishes dominance over things. The property right, which is as old as human history, is the most fundamental legal right that has come down from the past to the present. Cadastre can be defined as the determination of the location and position of all kinds of land in a country on the world, their surface area, their values, their rights and obligations, and their registration on the map by the state (Karagoz & Ozgumus, 2021). It keeps the ownership, use, and value information of the immovable under legal guarantee (Cete, 2008). Therefore, the cadastre is one of the most essential services for land, which has a significant role in the formation and organization of the country's social order, economic situation, and political profile because the cadastre is one of the ways of determining the ownership right of immovable property (Cete, 2008).

The concept of cadastre, which traditionally focuses on terrestrial properties, has been extended to the maritime domain to address the unique challenges

posed by marine environments. Marine Cadastre is a system developed for the physical determination, recording, and spatial management of maritime rights and the boundaries of maritime investments (Robertson et al., 1999). Unlike the classical cadastre, this system encompasses not only land but also seas and oceans, incorporating the mapping and management of the continental shelf, exclusive economic zones (EEZ), fishing zones, and areas rich in natural resources (Balık, 2018). Marine cadastre, which is also a critical tool for the sustainable management of maritime resources, is essential for the protection of aquatic ecosystems, the regulation of maritime activities such as fishing, and the designation of maritime protected areas. The need for collaboration and alignment on maritime issues underscores the challenges of creating a comprehensive and universally accepted framework. Parts that require agreement between countries, such as determining national and international sea boundaries, determining marine protected areas and hunting zones, and determining the boundaries of oil and mineral exploration rights, make marine cadastre a critical issue.

In the Antarctic and Arctic Regions, considered one of the most valuable regions in the world, both as sea and land, no clarity has been reached regarding ownership. Although some areas may be controversial due to geographical landforms, rights claims, economic interests, and dominance over transportation routes, some areas also have clearly defined borders. It is understood from the geopolitical assessments made on the polar regions that cadastral discussions will continue depending on the interests of the countries (Caymaz, 2021). Climate change, which affects every part of the world, has made the Arctic and Antarctic Regions more attractive. When the increasing high-speed temperature caused the emergence of frozen land masses and the melting and disappearance of existing glaciers; it has provided the emergence of new energy sources and, new transportation routes, and new commercial pathways. These newly accessible resources and routes have driven countries to focus on these regions both economically and politically. However, there are systems in which the two polar regions balance their regional usage policies.

The Arctic region has garnered increasing attention from the international community due to its critical role in maritime trade and the escalating demand for access to its abundant natural resources. In light of shifting climatic conditions and the region's strategic geopolitical significance, the 1982 United Nations Convention on the Law of the Sea (UNCLOS) provides a fundamental legal framework (United Nations, 1982). This framework addresses issues related to natural resources, agriculture, fisheries, transportation, and shipping by delineating sovereign boundaries, continental shelves, exclusive economic zones (EEZs), and regulations governing the navigation of vessels in these areas. Although no single state holds sovereign ownership of the Arctic, its use is regulated within the scope of international agreements. In this context, the Arctic Council serves as a high-level forum that influences decision-making processes. However, it does not possess the authority to make binding decisions (Limon, 2021).

In the Antarctic and surrounding ocean regions, melting glaciers attributed to global climate change have opened up economic opportunities and positioned the continent attractively on the worldwide stage. This rising interest has amplified the necessity for sustainable management and regulatory measures to avert environmental degradation. The ATS, which came into effect in 1961 and is currently endorsed by 54 countries, has grown in influence and has acquired significant enforcement power (Baslar, 2003). For the Antarctic Region, within the scope of the ATS, as a continent dedicated to peace and science, the use of the region cannot go beyond establishing a research base and conducting scientific research. However, the utilization of the region has significantly increased in recent years due to the rise in research activities, scientific studies, and tourism (Akpinar Mulun, 2020).

With the increase in the effect of climate change, melting glaciers are creating new trade routes in the northern polar regions, while in the southern polar region, land masses are emerging due to the thawing of glaciers. These changes are compelling regional governments to update legal frameworks and create new policies. The impacts of climate change in the polar regions are not limited to economic and political opportunities; they also result in irreversible alterations to the sensitive aquatic ecosystems. Rapid warming in the Arctic poses severe threats to local ecosystems, leading to glacier melt and changes in water chemistry. The melting of ice sheets and sea ice areas is contributing to rising sea levels and increasing sea temperatures, directly affecting the biodiversity and food webs of polar ecosystems and threatening the habitats of numerous marine species (AMAP, 2017). In this context, marine cadastral practices are critical not only for defining political and economic boundaries but also for the conservation and sustainable management of aquatic ecosystems in polar regions. The rising temperatures and anthropogenic activities underscore the need for ecosystem-based conservation and management strategies, such as marine protected areas and sustainable fisheries. Ensuring the sustainability of ecosystems by protecting aquatic life in both the Arctic and Antarctic should be integrated into legal and environmental policies to safeguard these regions for future generations. Therefore, this study, which provides a perspective on aquatic ecosystems, emphasizes that human activities in these regions must be guided not only by economic considerations but also by environmental responsibilities.

A literature review examines the political and legal perspectives of countries on cadastre, marine cadastre, and polar regions, and summarizes the studies carried out by Türkiye in the polar regions. Based on this review,

recommendations have been developed for Türkiye's policies in the polar regions. This article aims to discuss the effects of climate change in the polar regions, the importance of protecting aquatic ecosystems, the future policies of Türkiye towards the polar regions, and the concept of property.

Property and Turkish Cadastre

Property is the right to own, use, and be responsible for something. Property is an absolute and real right that provides the owner with the broadest, most comprehensive, and absolute authority over property. The property right is defined in Article 17 of the "Universal Declaration of Human Rights", which was declared by the United Nations General Assembly to ensure that it can be carried out without restricting the fundamental rights and freedoms of human beings in the world; "everyone has the right, either alone or in community with others, to own property and possessions, and no one shall be arbitrarily deprived of his property" (United Nations, 1948).

In Türkiye, property rights are protected by legal regulations such as the Constitution and the Civil Code, and Article 35 of the Constitution of the Republic of Türkiye No. 2709 states: "Everyone has the right to property and inheritance. These rights can only be restricted by law for the public interest. The exercise of the property right cannot be contrary to the public interest." (Republic of Turkey, 1982). Article 683 of the Turkish Civil Code No. 4721 reads as follows: "The person who owns something has the authority to use, benefit and dispose of that thing as he wishes within the limits of the legal order." (Republic of Turkey, 2001). These provisions indicate the broad powers granted to the owner of the right of property. Property is to establish sovereignty over immovable property to the extent permitted by law. Although property rights have changed, developed, and even transformed throughout human history, today it is recognized as a fundamental human right in legal systems. This right is an essential factor regulating the economic and social lives of individuals and societies. It should be protected by considering justice, public interest, and social balance.

Human beings possess innate, unchangeable, and inalienable rights, which have been subject to limitation or expansion over time based on societal needs and purposes of use. Property, as a fundamental element of the right to life—one of the most essential human needs—has remained a priority throughout history and has been consistently safeguarded by law. In this context, the cadastre plays a critical role by securing the ownership of immovable properties, identifying associated rights and obligations, and recording them in the land registry. Beyond protecting individual property rights, the cadastral system serves as a vital mechanism for maintaining social order and ensuring the equitable management of resources (Cete, 2008).

The Importance of Country Cadastre and Its Regional Use in the Poles

In cadastral applications in the world, a single method is not applied, and systems with different characteristics vary from country to country. For example, while it varies according to whether the map components are parcel-based or not, the cadastral systems of countries vary depending on whether the borders are determined generally or strictly. In another respect, countries have developed systems according to their policies according to their organization or financial structure.

Considering both the Turkish Cadastre System and the cadastre systems of the countries close to Antarctica, as well as the countries that lead the cadastre systems in the world, 13 countries were determined, and the cadastral systems of these countries were examined. These countries are Germany, Argentina, Australia, Switzerland, New Zealand, Norway, the United Kingdom, the United States of America (USA), Canada, Russia, China, France, and Chile. Cadastral practices in countries initially emerged primarily for taxation. However, over time, evolving needs and changing perspectives have led to modifications in the content and use of cadastral systems. Considering the multipurpose applications of cadastral data, countries have progressively adapted their cadastral policies to align more effectively with broader national objectives, ensuring greater efficiency and comprehensiveness. A summary of the cadastral systems of the countries examined reveals that the main purpose of the German cadastre is taxation. There is a single land registry system and a single type of cadastre system. The data recorded under a legal order has been digitized. If we talk about the Argentine cadastre system, it has been prepared as legal (land transfer, land market), financial (land valuation, land tax), and multi-purpose role (planning, local government). The country does not have a general cadastre law, but each province applies its own laws. Australian cadastre systems are primarily designed for the definition, delimitation, measurement, and mapping of legal land ownership and legal parcel boundaries. Information on land records is defined as the verbal component, and cadastral maps are defined as the locational component. The Swiss cadastre, on the other hand, was established to secure land ownership rights and to be able to conduct land transactions. New Zealand does not have a formal written constitution, but legislation, legal provisions, and constitutional agreements constitute the main elements of a constitution. The primary purpose of the cadastral system is to regulate land registration. The first known property registry in Norway was created to collect taxes for the king and to prepare men for military service. The Norwegian Cadastre system has a multi-purpose role. It is preferred for many purposes by government agencies/public sector and private companies. There is no traditional cadastre in the United

Kingdom, but there is a compulsory land registration system. No system accurately records the geometric descriptions of the areas under ownership or control of land. In the United States, the cadastre is a surveying system known as the Rectangular Survey System, developed and used for the planning, valuation, settlement, and sale of a piece of land. In the United States, title insurance is required as title is not guaranteed by the state. In Canada, the main purpose of the cadastre system is for all Indigenous people to own and claim property with real boundaries. While the federal lands have a separate and distinct digital cadastre and registration system, each province and territory has its own digital cadastral map and registration system maintained by its government. The purpose of the Russian cadastre system was initially to identify and value natural resources, but it emerged for tax purposes. China has adopted the modern cadastre for taxes and property. In most cities, land is owned by the state. There is a general cadastral law. In France, the cadastre emerged to create and collect land taxes. The Chilean registration system, unlike other legal frameworks that derive from Spanish norms, was developed two centuries ago as a hybrid between French tradition, especially the Civil Code, and German law. In Chile, land registration is optional, and the parcel is a unique identifier (Cadastral Template Project, n.d.).

According to the cadastral systems of the selected countries, there are similarities and differences between the Turkish cadastral system and other countries. These findings suggest that cadastral systems are shaped by the specific legal, administrative, and historical contexts of each country. While some countries do not have a legal cadastral system, some have established cadastral systems even in their smallest units. It has been observed that the emergence of the cadastre was for taxation purposes in most countries, and parcel-based systems were more commonly applied. Countries have shaped their cadastral systems based on factors such as population, density, land area, governance style, economic conditions, and political perspectives. In other words, when examining the selected countries, each has organized its system according to its priorities and interests. Furthermore, countries have either already transitioned to or are in the process of transitioning to digital systems, which have become a necessity in the modern era.

Property in the Polar Regions

The concept of ownership in the polar regions has been examined separately in the Arctic and Antarctic Regions. First of all, the Arctic Region includes a very large area of approximately 21 million square kilometers with the northernmost parts of the continents of North America, Europe, and Asia, the Arctic Ocean, and some parts of the Atlantic and Pacific oceans. Russia, the USA, Canada, Norway, and Denmark are called the Arctic Five and have coasts on the Arctic Ocean. Iceland, Sweden, and Finland are among the countries that want to have a say in the region despite not having direct borders with the Arctic Ocean. Activities in the region are provided by a series of bilateral agreements, the national legislation of the Arctic countries, and international agreements that do not affect the legal status of the region. The most basic international agreement that determines the actual legal status of the region can be stated as the UNCLOS, dated 1982. Coastal countries Norway, Russia, Canada, and Denmark signed the convention in 1996, 1997, 2003, and 2004 respectively, while the USA signed the convention but did not ratify it (Karasoy, 2017). According to this agreement, the sovereignty borders of states, continental shelves, exclusive economic zones, and the rules that ships navigating in the region must comply with are specified (Karasoy, 2017). With this agreement, while Arctic states have the right to extract mineral and energy resources in their own exclusive economic zones and continental shelves where they have sovereign authority, the sea areas outside these areas are considered open seas, and no state's claim is accepted. In terms of international law, all states have the right to freely navigate, engage in fishing, and conduct scientific research, along with the deep sea bed that forms the bottom of the open sea (Anlar Günes, 2007).

One of the reasons underlying the ongoing geopolitical competition between states in the Arctic is the struggle to access energy resources, while the other is the activation of maritime routes connecting Europe and Asia due to the melting of glaciers due to global warming. The first competitive issue is access to hydrocarbon resources (oil and natural gas); the region has one-fourth of the natural gas reserves and 13% of the oil reserves in the world, and 84% of these reserves are located in the ocean bed, making the borders of the continental shelf attractive for countries (Hansler, 2019). Moving on to the second competitive issue; with the melting of glaciers, the possibility of discovering new sea routes in addition to the Northern Sea Route in the region by 2040 increases (Sahin & Ozel Ozcan, 2024). Considering the commercial advantages that new routes will provide to countries, it can be seen as normal for many countries to want to dominate the region.

The Ottawa Declaration, as a convention defining the Arctic Region and granting rights to certain countries here, regulates the legal status of the region. The most important international organization established in 1996 with the Ottawa Declaration for the Arctic Region is the Arctic Council (Arctic Council, 1996). It aims to ensure cooperation and coordination on sustainable development and environmental protection issues in the region with the Arctic States and their indigenous peoples and other Arctic residents. The members of the Council are divided into two permanent participants and observers. The permanent participants are the Arctic States and indigenous peoples' organizations and are closed to the participation of other countries or

international organizations. Observer membership in the Council is open to all international organizations and other countries of the world. The members of the Arctic Council are Canada, the Kingdom of Denmark, Finland, Iceland, the Kingdom of Norway, Russia, the United States of America, and the Kingdom of Sweden. The Arctic Council has contributed to the preservation of a safe environment in the region and has played an important role in solving emerging problems with the policies it has developed and awareness-raising activities it has created since 1996 (Genc, 2020).

The climate changes that have occurred all over the world have negatively affected the situation much more than expected. In particular, the countries bordering the Arctic Ocean have started to make plans on many different issues. While these plans include issues such as new defense strategies, plans have been made to obtain valuable energy resources that will come out of the sea. Even countries that do not have a coast in the region, such as China, have become involved in regional politics for economic interests. With the changing conditions, the idea of having a say in new trade routes and benefiting from the economic resources of the region has also been added to the agenda of the states.

The melting glaciers and new sea routes have increased interest in the Svalbard Archipelago, located between Norway and the North Pole in the Arctic Ocean (Yalcinkaya et al., 2022). The Svalbard Treaty, signed in Paris, France, dated 09.02.1920, regulates the international status of the Svalbard Archipelago affiliated with Norway. It defined Norway's sovereignty while granting all countries party to the agreement equal economic rights in Svalbard (Yalcinkaya et al., 2022). These rights include conducting scientific research, which provides a significant opportunity to address the challenges of climate change affecting the Arctic Region and the entire world (Cetin & Büyüksagnak, 2021). Türkiye's accession to the treaty, formalized by the "Law on the Approval of Our Participation in the Treaty Signed in Paris on 09.02.1920 Regarding Spitsbergen," published in the Official Gazette dated 09.10.2023, would grant it extensive rights (Republic of Turkey, 2023). These include access to the Svalbard Archipelago, territorial waters, ports, and residency; the right to fish, hunt, and conduct maritime, industrial, mining, and commercial activities; and the right to acquire and use property (Cetin & Büyüksagnak, 2021). The region's proximity to the North Pole further enhances its strategic importance, particularly as global warming has made Arctic sea routes increasingly significant. Additionally, global warming's broader impacts on polar regions reshape international scientific and geopolitical priorities. In Antarctica and the Southern Ocean, for instance, changes in sea ice coverage and marine ecosystems underline the need for enhanced international cooperation and research, which could serve as a model for the Arctic (Madani & Shibata, 2023). By joining the Svalbard Treaty, Türkiye can actively participate in Arctic scientific research and environmental governance. Such engagement not only aligns with its strategic interests in the Arctic but also enhances its role in tackling global climate challenges, promoting a collaborative framework similar to the one between the ATS and the United Nations Framework Convention on Climate Change (UNFCCC) (Madani & Shibata, 2023). Becoming a party to the Svalbard Treaty not only provides Türkiye with economic and strategic advantages but also positions it to contribute to the international discourse on climate change, underlining its commitment to science, sustainability, and global cooperation.

Antarctica is the world's most intriguing ice-covered continent and an essential component of the global climate system. Changing climate conditions are causing glaciers to retreat and sea levels to rise due to ice melting on land. For many years after its discovery, no sovereignty claims were made over Antarctica because its climate was considered unlivable. Antarctica, which has a very cold climate, has the lowest temperature in the world, and its temperature is 40 degrees lower than the Arctic (Ferguson, 1956).

The Antarctic Treaty was signed in Washington on 01.12.1959, by twelve countries (Australia, Argentina, Belgium, Chile, France, Japan, New Zealand, Norway, South Africa, Russia, the United Kingdom, and the USA that play an active role in and around Antarctica during the International Geophysical Year (1957-58) (Akpinar Mulun, 2020). The treaty entered into force in 1961, and as of 2019, the number of countries that have signed the treaty has reached 54 in total (Akpinar Mulun, 2020). Article 1 of the treaty stipulates that the continent shall be used exclusively for peaceful purposes, effectively prohibiting military activity and promoting disarmament in the region. Article 2 ensures the continuation of freedom of scientific research, emphasizing international cooperation in research endeavors. Furthermore, Article 3 contains provisions mandating that scientific observations and findings related to Antarctica are to be shared openly and made accessible to all, fostering transparency and collaboration among nations. Collectively, these articles reflect the treaty's commitment to preserving Antarctica as a zone dedicated to peace and science, free from geopolitical conflict (Antarctic Treaty Secretariat, 1959).

The coordination of scientific activities is directed by the Scientific Committee on Antarctic Research (SCAR), which is affiliated with the International Science Council. SCAR aims to create a broad perception of the current nature of Antarctica, the role of Antarctica in the Earth System, and the effects of global weather changes on Antarctica through scientific research and international cooperation (Scientific Committee on Antarctic Research, 2019).

Antarctica, 97% of which is covered by ice, hosts a diverse array of marine plant and animal species, particularly when considered in conjunction with the surrounding Southern Ocean. These species not only

sustain the continent's unique ecosystem but also play a vital role in maintaining the global ecological balance. This ecological significance is one of the main reasons Antarctica attracts substantial scientific interest, with its exceptional marine biodiversity being a focal point of research. The Madrid Protocol, signed in 1991 as a supplement to the Antarctic Treaty, has further facilitated Antarctica's development as a global research hub, enabling studies in fields such as climatology, geology, glaciology, and marine and terrestrial biology. In its 2001 report, the Intergovernmental Panel on Climate Change (IPCC) highlighted that warming in the Antarctic Peninsula had reached alarming levels. The report underscored the potential consequences of this warming, including sea level rise caused by glacial melt, disruptions to the thermohaline circulation in the oceans, and significant alterations to marine ecosystems (IPCC, 2001). Rapid warming in Antarctica is also expected to cause sea acidification and changing precipitation patterns (Chaturvedi, 2012). These changes in precipitation are expected to bring about problems such as drought, water shortages and food security (Australian Government Department of Defence, 2016). This situation has critical implications when considering water and food security issues worldwide.

Global climate change, both legal and illegal fishing activities are increasing in the region. Industrial fishing, especially krill hunting, whaling, demands for increased fishing quotas, research on biological microorganisms for commercial use, and tourism pose ecological threats to Antarctica (Lavorel, 2021).

The Antarctic Treaty does not take direct measures regarding the environment, but aims to prevent nuclear explosions and radioactive waste on the continent, and also obliges signatory states to protect the flora and fauna on the continent. The Convention for the Protection of Antarctic Seals, signed in 1972, banned the hunting of seals (Antarctic Treaty Secretariat, 2024). The Convention for the Conservation of Marine Living Resources, signed in 1980, set fishing quotas in order to prevent overfishing and the extinction of the krill population, and created protected marine areas where human activities are limited (Antarctic Treaty Secretariat, 2024). The Madrid Protocol, signed in 1991, is one of the most important steps taken in the field of environmental protection and requires environmental impact studies to be conducted before any human activity (Antarctic Treaty Secretariat, 2024). The most important benefit of this protocol is that it bans mineral exploration, especially hydrocarbon exploration, on the continent (Coskun Altıner, 2018).

There are five basic situations in the management of Antarctica and the clarification of its legal status; these are the resolution of sovereignty claims, ensuring the security of the continent, keeping the continental area free of weapons and nuclear weapons, and continuing scientific cooperation (Baslar, 2003). Sovereignty claims emerged after the discovery of the continent, even after the desire to own land in the 1910s, and seven countries have claimed national sovereignty. While the United Kingdom claimed rights in 1908 and 1917, New Zealand and France in 1923 and 1924, respectively, and Australia in 1933 (Mancilla, 2018). These countries were followed by Norway in 1933, Chile in 1940, and Argentina in 1946 (Mancilla, 2018). Only 15% of the continent had no claims (Baslar, 2003). Although USA and Russia were the greatest powers of the Cold War, they did not claim any sovereign rights in Antarctica other than their scientific studies.

Although the ATS provides agreements and cooperation solidarity on many issues and helps the continent maintain its status as a continent of international cooperation and peace, it is becoming more and more attractive for countries such as China, India, Russia and Japan, which have an influence on the world economy and want to increase this influence. This attractive situation reveals the idea that Antarctica has significant economic potential in terms of marine, genetic and mineral resources. The increasing interest carries the risk of turning the management of the region into the center of a new geopolitical chaos.

Up until now, countries claiming sovereignty have been concerned with regional administration rather than the local legal and administrative controls that would be expected from national sovereignty through the ATS (Triggs, 2008). Australia claims 42% of Antarctica, while Chile demonstrates its claim to the continent by issuing an Antarctic passport (Triggs, 2006). The United Kingdom defines the area it claims in Antarctica as the "British Antarctic Territory" and exempts scientists conducting research on the continent from taxation. The area claimed by Argentina overlaps with the areas claimed by Chile and the United Kingdom. There are American bases on the continent, but the United States does not explicitly claim rights over the Antarctic continent and does not make any additional claims (Triggs, 2006).

The countries' claims on Antarctica are shown in Figure 1a. Despite their intensive activities in Antarctica, China and Russia have not claimed any rights on the continent to date. The continent also includes the unclaimed Marie Byrd Land Region, which is completely covered with glaciers and where even penguins rarely live (Cool Antarctica, 2001).

Figure 1b shows the distribution of stations established by countries in Antarctica. Argentina, Australia, New Zealand, and Chile, which are close to the Antarctic continent, have chosen their campsites and research stations to be close to their own countries. The remaining countries have chosen strategic locations on the continent and have chosen the parts where their research is concentrated. However, it is seen that countries that want to have a say in the region outside of scientific research have settled more widely.

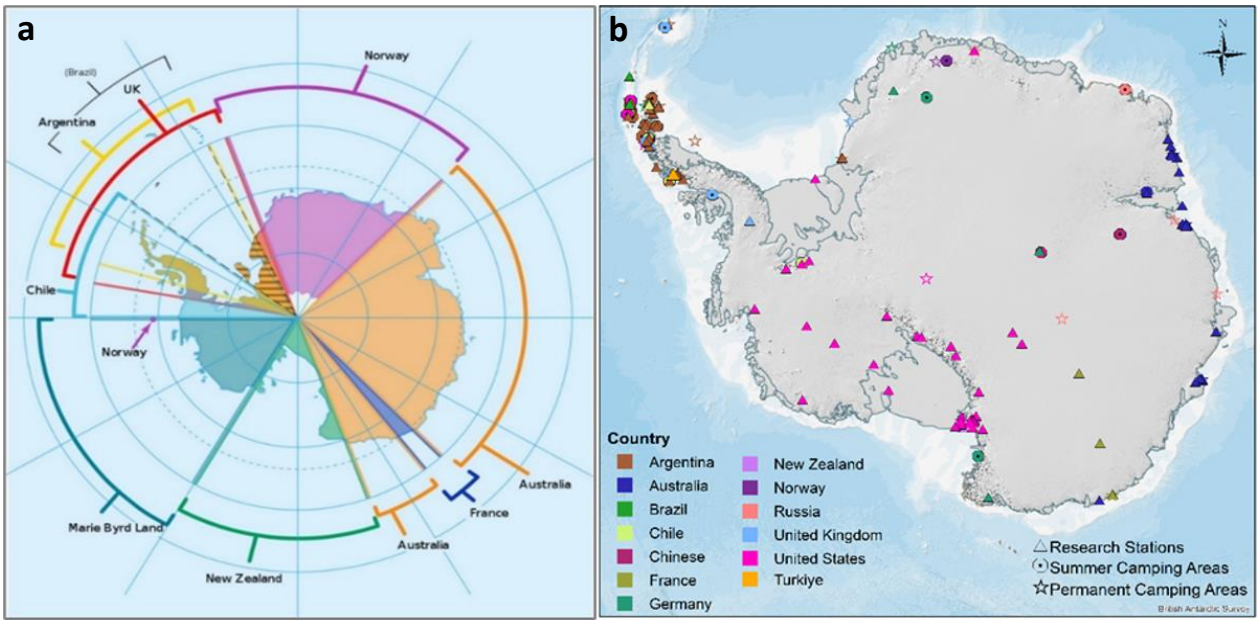

Figure 1. a) Claims in Antarctica (Cool Antarctica, 2001). and b) countries' campsites and research station locations on the continent.

An overview of the Arctic and Antarctic Regions shows that they are two strategically and geographically significantly different regions. The Arctic is a landlocked, mostly shallow and relatively lightly ice-covered ocean that extends along the Arctic Circle. Much of the Arctic is formed by exclusive economic zones or seabed formations that extend directly from the territories of the states themselves. Antarctica, on the other hand, consists of land area and is almost entirely covered by a thick layer of ice, with only a few small, scattered islands surrounded by deeper seas. In the Arctic Region, countries' claims are kept in balance by a series of bilateral agreements that regulate their disputes. Antarctica, on the other hand, is a natural reserve dedicated solely to science, where all claims have been halted. However, changing climatic conditions have increased the interest of countries in both regions, attracting even landlocked countries. Melting glaciers with rising temperatures have brought new transportation routes and economic activity plans that will likely emerge in the Arctic back to the agenda. The same situation is foreseen for the South Pole in the coming years. In addition, the environmental impact of rising tourism in the region and the increasing commercial exploration of mineral resources raise concerns.

Global Polar Policies and Climate Change

The polar regions, particularly Antarctica and the Arctic, are among the most vulnerable to climate change, with its effects being felt more rapidly and intensely. Such changes have significant environmental, geopolitical, economic, and governance implications. In this context, global polar policies provide a comprehensive framework that addresses environmental protection, scientific research, resource management, and international cooperation. Both regional dynamics and broader international strategies shape Türkiye's approach to these policies.

Antarctica is governed by the ATS, and all activities in the region are aimed at scientific research and environmental protection. The ATS provides a framework ensuring that regional activities remain peaceful and environmentally friendly. Economic activities, particularly the extraction of natural resources, are prohibited in Antarctica, and the region is reserved solely for scientific purposes (Madani & Shibata, 2023). The Arctic, on the other hand, is governed by the countries of Canada, Denmark, Finland, Iceland, Norway, Russia, Sweden, and the United States, each claiming various territorial sovereignty. These countries pursue strategic interests in the region, including shipping routes, energy resources, and minerals (Hossain & Roncero, 2023). This change has opened up new shipping routes in the Arctic, altering global trade routes. Additionally, the discovery of rich hydrocarbon and mineral reserves has intensified geopolitical competition and created disputes among countries regarding border demarcations (Hossain & Roncero, 2023). In this context, the UNCLOS, the UNFCCC, and the Agreement on the Conservation and Sustainable Use of Marine Biological Diversity of Areas Beyond National Jurisdiction (BBNJ) provide a global framework for maritime boundaries, underwater resources, environmental management, and the protection of marine biodiversity (Hossain & Roncero, 2023).

The UNFCCC is an international agreement signed at the United Nations Conference on Environment and Development in 1992. This framework agreement was signed to develop a global response to combat climate change and to create a coordinated action plan. The primary purpose of the agreement is to minimize the

effects of climate change by limiting greenhouse gas emissions and to protect the world's climate system. It is supported by two important agreements. These are the Kyoto Protocol (1997) and the Paris Agreement (2015). Although the aim of both agreements is to reduce greenhouse gases, the countries they cover are: The Kyoto Protocol covers only developed countries, while the Paris Agreement provides a broad framework covering all countries. With the Paris Agreement, countries commit to continuously increase their contribution to combating climate change by submitting their emission reduction targets, called Nationally Determined Contributions (NDCs), updated every five years (UNFCCC, 2015) (Bodansky et al., 2017).

The Agreement under the United Nations Convention on the Law of the Sea on the Conservation and Sustainable Use of Marine Biological Diversity of Areas Beyond National Jurisdiction (BBNJ), adopted in 2023, is the first comprehensive ocean treaty of its kind. It is an international agreement designed to ensure the conservation and sustainable use of marine biodiversity, particularly in areas beyond national jurisdiction. The BBNJ seeks to provide a comprehensive framework for protecting marine life and emphasizes the necessity of sustainably managing natural resources in these regions. To achieve this, the agreement envisions mechanisms to enhance cooperation and information sharing for the effective governance of marine areas (United Nations, 2023).

A core element of the BBNJ is the identification and implementation of measures necessary for the protection of marine biodiversity. These include the establishment of marine protected areas, the development of ecosystem-based management strategies, and the implementation of effective monitoring systems. Furthermore, the agreement aims to enhance the resilience of marine ecosystems to global threats such as climate change. These measures are designed not only to protect marine life but also to promote the economic and social well-being of both local and international communities (United Nations, 2023).

The BBNJ also serves as a significant platform for fostering international cooperation and partnerships. Coordinating efforts among nations to protect marine biodiversity while ensuring the involvement of local communities is critical to the success of the agreement. In this context, supporting scientific research and data sharing is essential for the development of sustainable management policies. The implementation of the BBNJ represents a global response to the conservation of marine ecosystems, ensuring the sustainable use of natural resources in these areas. In summary, the BBNJ Agreement reflects an ambitious effort to address critical global challenges such as climate change, biodiversity loss, and pollution while promoting international collaboration and adopting science-based approaches to ocean governance (United Nations, 2023).

Climate change is becoming increasingly evident in the polar regions. In Antarctica, glaciers are melting rapidly, and sea levels are rising, and this poses significant threats to coastal regions while also threatening marine biodiversity (Madani & Shibata, 2023). In the Arctic, the melting sea ice is opening up new shipping routes, but this also leads to the degradation of local ecosystems (Hossain & Roncero, 2023). These ecosystem changes are particularly affecting the habitats of marine animals and disrupting regional and global food chains. The environmental changes in both Antarctica and the Arctic have impacted not only regionally but also globally. Melting sea ice can increase atmospheric carbon dioxide levels, alter ocean currents, and lead to broader changes in the global climate system (Madani & Shibata, 2023). For these reasons, managing changes in the polar regions is not only crucial for life in these regions but also has profound implications for the entire global climate.

Türkiye contributes to global polar policies primarily through its scientific research in Antarctica and diplomatic activities in polar regions. Türkiye actively participates in scientific research in Antarctica and engages in international cooperation for environmental protection in the region. As a non-signatory to the Antarctic Treaty, Türkiye's efforts to play an independent role in this area are significant, contributing to global environmental policies in the region. In 2016, Türkiye announced plans to establish a Scientific Research Station in Antarctica, increasing its involvement in scientific activities in the region (Ak, 2019). Türkiye's international collaborations in this context aim to align with global polar policies and contribute to the development of regional environmental strategies. Additionally, Türkiye's active role in global climate change negotiations strengthens its contribution to international agreements aimed at the protection of polar regions. In the Arctic, Türkiye's interests lie in participation in international cooperation and maritime cadastral matters. Strategically positioned in Arctic energy and shipping, Türkiye advocates for environmental protection and the sustainable use of natural resources in line with global polar policies (Hossain & Roncero, 2023). Strengthening its cooperation with other countries in this region will not only protect the environment but also enhance Türkiye's role in the global arena.

To sum up, global polar policies represent a complex structure where environmental, economic, and geopolitical dynamics converge. Türkiye's approach to these policies seeks to balance environmental sustainability with national interests. Türkiye's scientific activities and diplomatic initiatives in the polar regions hold a significant place within the framework of global environmental governance. By considering the impacts of climate change on the polar regions, Türkiye adopts an approach that strengthens global cooperation and responsibilities. Its active role in this process establishes

a strong connection between national interests and global environmental policies.

Türkiye's Initiatives in the Arctic and Antarctic Regions

Numerous international agreements govern Antarctica, a continent designated for peaceful purposes and scientific research. Along with the Antarctic Treaty, 3 additional agreements regarding Antarctica constitute the Antarctic Treaty System (AAS). These are the "Convention for the Conservation of Antarctic Seals" (CCAS) dated 1972, the "Convention for the Conservation of Marine Living Resources" (CCAMLR) dated 1980 and the "Antarctic Treaty Environmental Protection Protocol (Madrid Protocol)" dated 1991. Our country is a party to only the Antarctic Treaty and the Madrid Protocol among the agreements in the Antarctic Treaty System. Türkiye became a party to the Antarctic Treaty, which entered into force in 1961, in 1996, and to the Madrid Protocol, which entered into force in 1998, in 2017 (Republic of Turkey Ministry of Foreign Affairs. (2024). Although Türkiye is a party to the Antarctic Treaty, it has not yet gained the right to be a consultative member country. Consultative member countries have the right to vote in the decisions taken. In order to be a consultative member country in the ATS and have a say in the management and future of the continent and to be able to vote, a scientific base must be established, continuous and many scientific studies must be conducted, and these studies must be shared with the scientific world (Republic of Turkey Ministry of Foreign Affairs. (2024).

As a result of the efforts of Burcu Ozsoy, a Turkish academic actively involved in scientific research on Antarctica and its surrounding regions, the Polar Research Center (PolRec) at Istanbul Technical University, where she is employed, was established through a regulation published in the Official Gazette dated 17.01.2015 (Republic of Turkey, 2015). This development was Türkiye's first institutional initiative on the poles. With the support of The Scientific and Technological Research Council of Türkiye (TUBITAK) and Istanbul Technical University (ITU) PolRec, Türkiye was accepted as a member of SCAR in 2016 (Ak, 2019).

Türkiye's first Turkish Arctic Scientific Expedition was carried out in 2019 by the ITU Polar Research Application-Research Center (ITU PolReC). The 2nd Arctic Scientific Research Expedition was completed in July 2022 in the Greenland Sea and the Arctic Ocean around the Spitzbergen/Svalbard Archipelago under the auspices of the Presidency, the auspices of the Ministry of Industry and Technology, and the coordination of the TUBITAK Marmara Research Center (MAM) Polar Research Institute (TÜBİTAK MAM, 2023). The 3rd National Arctic Scientific Research Expedition returned in July 2023, having taken samples and measurements at 28 points and completed scientific research for 14 different projects in the Barents Sea (TÜBİTAK MAM, 2023). The 4th National Arctic Scientific Research Expedition was completed in July 2024, with a team of 11 members conducting scientific sampling and studies at 24 different locations across the Arctic Ocean for 16 projects (TÜBİTAK, 2024).

The first National Antarctic Scientific Expedition was carried out in 2017 (Ministry of Foreign Affairs, 2019). The expeditions, which were under the auspices of the Presidency in 2017, continued in December 2019 under the coordination of the Ministry of Science, Industry and Technology and ITU PolRec (Istanbul Technical University, (2019). In 2018, the first camp area was established in the Second National Antarctic Scientific Expedition (TAE-II), and during their stay in Antarctica, our scientists conducted continuous scientific research and studies on where the research base should be established. The Third National Antarctic Scientific Expedition (TAE-III) was carried out in 2019 (Istanbul Technical University, (2019). The first Turkish Scientific Research Camp was held on Horseshoe Island, where the base was planned to be established between 2019-2022 (Figure 2) (TÜBİTAK MAM, 2020). In December 2019, the Polar Research Institute (KARE) was established within the TUBITAK Marmara Research Center (MAM) to ensure the coordination and logistics of future studies. The Fourth National Antarctic

Figure 2. Horseshoe Island Turkish Research Station (TÜBİTAK MAM, 2020).

Scientific Expedition (TAE-IV) was completed in 2020, and three fixed global satellite system stations were established outside the borders of Türkiye (Yirmibeşoğlu, Oktar, & Özsoy, 2020). The establishment of the stations will enable observation of climate change parameters, sea level, crustal movements, and changes resulting from glacial melting (Yirmibeşoğlu, Oktar, & Özsoy, 2020). Our Fifth National Antarctic Scientific Expedition (TAE-V) was carried out in 2021 with a limited number of teams under the impact of the Covid-19 pandemic to ensure the repair and maintenance of monitoring stations and infrastructure for the sustainability of national polar research (Caymaz & Özsoy, 2022). The Sixth National Antarctic Scientific Expedition (TAE-VI) continued in 2022 on Horseshoe Island (Anadolu Agency, 2022). The seventh expedition was conducted in 2023, with the main research topics determined as "climate change and differences created by human impact on the polar regions," and research was conducted on these topics (TÜBİTAK Polar Research Institute, 2023). Our 8th Antarctic Scientific Expedition was completed in 2024 with studies carried out in different areas, from glacier melting on Horseshoe Island in our temporary settlement in Antarctica to tidal events in the sea, from changes in atmospheric conditions to microplastic measurements and observation of geological structures (TÜBİTAK Polar Research Institute, 2024).

In order to ensure that scientific research to be conducted in Antarctica and the Arctic Regions is in line with national interest and sustainable, the establishment of the National Polar Science Program (NPSP) (2018-2022) has been deemed appropriate (Ministry of Science, Industry, and Technology (MoSIT), 2018). Prepared by the Ministry of Science, Industry, and Technology, NPSP was published and entered into force on 29.12. 2017 (MoSIT, 2018). The main objective of NPSP is to evaluate Türkiye's scientific studies and activities in the polar field as a whole within a regular system. In addition; it aims to organize regular national expeditions to the continent, coordinate with the bases of other countries by establishing bilateral relations to have a say in the future and protection of the poles, and to be among the leading states while supporting the establishment of a Turkish scientific base in Antarctica. Although the expression of creating a roadmap for participation in the Arctic Council was included in the NPSP, priority was given to Antarctica in the polar field studies. Within the scope of the program, national polar science workshops have been made traditional in order for scientists conducting scientific research in the poles to evaluate the results of scientific expeditions to the region and to determine their priority areas (MoSIT, 2018). Studies have been initiated to renew the NPSP, and as a result, the 2023–2035 National Polar Science Strategy (NPSS) has been prepared by the Republic of Türkiye Ministry of Industry and Technology (MoIT, 2023).

While Türkiye's first official plan, the National Polar Science Program, was planned to cover the studies to be carried out between 2018-2022, today's National Polar Science Strategy 2023-2035 has been organized to show how the roadmap should be for Türkiye to continue by building on the paths achieved in the previous plan. The 2023-2035 NPSS is a roadmap prepared for the continuation of the sustainability of national polar science studies and to improve the current situation. The mission has been determined; "To develop scientific research and science diplomacy activities steadily with a governance-based approach in order to strengthen a sustainable world, which is the common vision of humanity, with polar research." 3 important strategic goals have been determined until 2035: First; to achieve scientific excellence - to strengthen Türkiye's position in the international arena, second; to increase interaction - to increase awareness and knowledge on polar regions and global climate change, and third; to ensure sustainability continuity of research (MoSIT, 2018) (MoIT, 2023).

In the Arctic Council, member countries have been encouraged to enhance scientific studies by participating in observer status with non-governmental and international organizations. With Türkiye's formal accession to the Svalbard Treaty in 2022, there is now the potential to establish a Turkish Science Station within the region. This development has enabled researchers to conduct their studies in this unique environment while also providing Turkish students with the opportunity to pursue their education at Svalbard University.

On the other hand, Türkiye, which has the 18th largest economy in the world and is surrounded by seas on three sides, has a wide potential with its dynamic human power working in various institutions in the maritime sector and thanks to this great potential, it can transform maritime issues into a state policy. Considering the economic opportunities that have emerged for the world maritime sector, creating new opportunities for the Turkish maritime sector with sufficient infrastructure is possible thanks to scientific and diplomatic studies and awareness to be created in our society.

As a result, it will make a significant contribution to Türkiye's visibility and ensure that it takes a more prominent place in the relative power distribution among states. Thus, Türkiye, which effectively uses the soft power elements referred to as science diplomacy in foreign policy, will also achieve its goal of increasing its momentum. The international examination of the successes in all scientific activities organized for the polar regions, their general framework, and the international follow-up of trend analyses will contribute to the process of determining priority research areas and topics, as well as guide scientists.

Discussion

Melting glaciers have created the possibility of damaging settlements at low altitudes due to rising water levels. These changes will also cause the geography in the Arctic Region to change and change the balance of power. Melting glaciers have also caused an increase in visits to the region. For example, according to the 2023-2024 tourism reports received from Norway, 140,000 people visited the Svalbard Archipelago annually (Visit Svalbard, 2024). This situation has prepared the ground for damage to natural life, ecosystem destruction, increased carbon emissions and garbage. At the same time, it is estimated that approximately 30% of the undiscovered natural gas and 13% of the oil in the world are found in this region in the Arctic Region, which shows the potential for massive oil and natural gas extraction operations. (Dolata, 2015). However, the extraction of these resources can cause irreversible damage to the Arctic's delicate ecosystem. The extraction of energy resources from the Arctic can cause the region's glaciers to melt faster through operations such as drilling and excavation, triggering global warming. In this process, the risk of extinction of sensitive species such as polar bears and walruses increases, while the ecosystem balance can also be disrupted. In addition, oil and heavy metal leaks that may be caused by such industrial activities can harm the underwater life of the Arctic, disrupt the ecological balance, and negatively affect the food chain (Visit Svalbard, 2024).

With climate change, the melting rate of glaciers in Antarctica is slower than in the Arctic Region. For every 360 gigatons of land ice lost, the ocean rises 1 millimeter. According to data published on NASA's website, sea level rose 63 millimeters between 2002 and 2024 (NASA, 2024). The deterioration of natural life in Antarctica due to the effects of global warming poses a major threat to the biodiversity and functionality of polar ecosystems. New resources emerging with the melting of glaciers will revive claims on the continent dedicated to peace and science. In addition, the emergence of the region will facilitate accessibility and will also re-establish economic and power-hungry policies such as tourism, mineral exploration, and access to energy resources.

According to Article 76 of the UNCLOS, one of the agreements affecting the areas of use in the polar regions, each state may have a continental shelf up to a distance of at least 200 nautical miles. If the continental shelf exceeds 200 miles, the coastal state may extend the continental shelf to the point where this shelf ends due to natural extension (Anlar Gunes, 2007). Denmark, the USA, Canada, and Russia are countries trying to expand their continental shelves. The areas claimed by these states are the sea areas of the Lomonosov and Mendeleyev mountain ranges, where rich oil and natural gas deposits are located. In addition, Russia's income from resources extracted from the region constitutes 30% of the country's gross domestic product (Babahanoglu, 2024).

The Marine Cadastre, UNCLOS, UNFCCC, and the BBNJ Agreement together provide a vital framework for managing marine and coastal ecosystems, especially in the rapidly changing polar regions. While each has distinct roles, they complement each other in addressing climate change, biodiversity conservation, and fair resource management. The Marine Cadastre defines maritime zones, which is crucial in polar areas where melting glaciers open up new opportunities for energy exploration and shipping. UNCLOS governs the sovereign rights of coastal states, resource exploitation, and environmental protection, particularly in the Arctic, where countries are expanding claims over resource-rich continental shelves. The UNFCCC addresses climate change by reducing emissions and mitigating sea-level rise, ocean acidification, and coastal erosion, which threaten polar ecosystems and species like polar bears. The BBNJ Agreement fosters international cooperation to protect marine biodiversity in areas beyond national jurisdiction, promoting marine protected areas and ecosystem-based management, particularly in polar regions. Together, these frameworks support sustainable ocean governance, balancing economic interests with environmental protection, especially in the Arctic and Antarctic (Hossain & Roncero, 2023).

For Türkiye to have a say in the poles, it needs to develop its polar policies both scientifically and diplomatically. Polar policies have been making progress in our country with increasing activities since 2017. However, being able to move forward in a planned and rapid manner will be more beneficial for our country since it is more organized when it is done with certain strategies and definite goals. If we talk about some infrastructure works that can be done; scientific studies need to be spread throughout the country. Postgraduate education should be encouraged especially in the polar regions, and special topics should be determined for researchers working on this subject. The basis of polar studies should be given in high school, polar competitions should be organized and young people's attention should be drawn to these competitions. Scientific funds should be increased for studies that will conduct research abroad, and the length the duration of the projects should be carefully determined according to the scope of the project to be done. All educational curricula should be customized according to their fields, taking into account scientific and technological developments. Importance should be given to scientific collaborations in the polar regions and more partner studies should be conducted. The budget for the poles should be increased. A separate unit should be established for the poles in the Ministry of Foreign Affairs, and special training should be given to those who will work in this field by experts in their fields. Diplomatic relations should be strengthened along with scientific relations. A polar data center should be established. British Antarctic Specialized websites such

as the Survey should be created under the title of Türkiye Polar Studies, and country visibility and scientific file sharing should be increased. Within the scope of this study, all the meetings held under the name of the ATS are examined and the changes in the reports published since 2016, when Türkiye started to take an active role, are shown below (Figure 3a and Figure 3b) (Antarctic Treaty System, 2024).

Looking at the number of reports published between 2016 and 2024, it is seen that countries that want to have a say are focusing on scientific studies. Türkiye has also increased the number of reports over the years and continued to publish regular scientific research and reports to show its interest in the poles.

Conclusion

Climate change in the polar regions is profoundly transforming these fragile environments, presenting both substantial economic opportunities and significant challenges to the sustainability of aquatic ecosystems. Rapid ecological changes—such as glacier melting, rising sea levels, and increasing seawater temperatures—are disrupting biodiversity and destabilizing the intricate food chains that sustain life in these regions. Addressing these issues requires urgent action, particularly in redefining boundary determination strategies like marine cadastre. Traditionally focused on safeguarding economic and political rights, marine cadastre systems

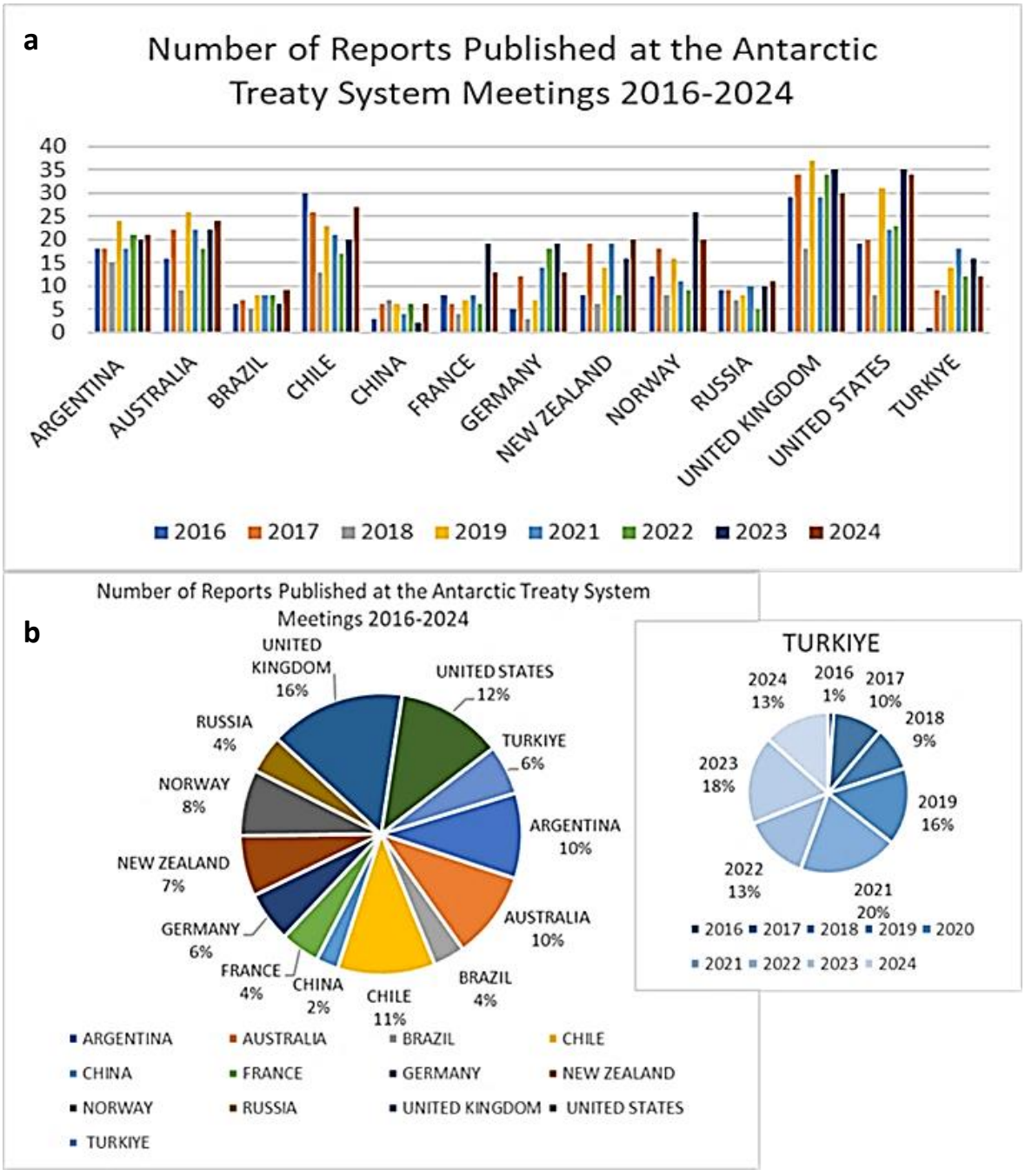

Figure 3. a) The rate of the number of reports of the countries elected in the Antarctic treaty system meetings over the years and b) The number of reports of the countries elected in the ATS meetings and Türkiye over the years (ATS, 2024).

must now evolve to prioritize the conservation of aquatic ecosystems. The establishment of marine protected areas (MPAs) and the adoption of ecosystem-based management strategies are essential to mitigate human impacts and ensure the resilience of polar ecosystems.

In regions as geopolitically and ecologically sensitive as the Arctic and Antarctic, marine cadastre and legal delineations play a crucial role beyond preventing state disputes. These tools are instrumental for fostering strategic conservation efforts, promoting international collaboration, and aligning with global efforts to protect marine biodiversity. For Türkiye, advancing scientific research and policy-making in polar regions is pivotal in enhancing its international presence. However, such advancements must be supported by compliance with international environmental norms and legal frameworks. Integrating marine cadastre strategies with global standards would enable Türkiye to contribute effectively to the sustainable governance of polar ecosystems, strengthening both its environmental and geopolitical standing.

The complex interplay of geopolitical and environmental factors in the Arctic and Antarctic highlights the need to reexamine existing governance structures. The Arctic's legal framework, characterized by overlapping national jurisdictions and diverse international agreements, contrasts with the ATS, which operates under a consensus-driven model focused on peace, scientific collaboration, and environmental protection. However, both systems face significant pressures from climate change and resource competition. Developing cohesive mechanisms that integrate regional governance frameworks with global initiatives, such as the UNFCCC, is vital to fostering sustainable and cooperative management of these regions.

Türkiye's growing engagement in polar regions is further supported by its commitment to science diplomacy, which merges scientific advancement with diplomatic efforts to address shared global challenges. Antarctica, as one of the regions most vulnerable to climate change, underscores the role of science diplomacy in promoting international collaboration. Multinational research projects and reports grounded in scientific principles provide Türkiye with an opportunity to increase its influence and visibility in polar governance. By actively contributing to discussions on property rights, environmental protections, and resource management, Türkiye can establish itself as a key stakeholder in the sustainable development of polar regions.

In conclusion, tackling the shared challenges of polar governance requires a balanced approach: reinforcing existing legal frameworks while embracing innovative, interdisciplinary, and inclusive strategies for environmental management. Türkiye's commitment to developing environmentally sustainable policies and implementing effective marine cadastre practices underscores its potential to become a significant actor in Arctic and Antarctic governance. By aligning its policies with international standards, adopting ecosystem-based approaches, and prioritizing global cooperation, Türkiye can not only contribute to the protection of fragile polar ecosystems but also play a leading role in shaping the future of polar governance.

Ethical Statement

Ethics approval and consent to participate not applicable for this study.

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Author Contribution

First author: Supervision, Conceptualization, Methodology, Investigation, Data curation, Visualization, Writing–original draft, Writing–review & editing; Second author: Methodology, Investigation, Formal analysis, Data curation, Visualization, Writing–original draft, Writing–review & editing.

Conflict of Interest

The authors declare that they have no known competing financial or non-financial, professional, or personal conflicts that could have appeared to influence the work reported in this paper.

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