ZBIGNIEW CZACHÓR[1]
Adam Mickiewicz University, Poznań
ORCID: 0000-0001-9397-6261
ARKADIUSZ JAN SÓJKA
ORCID: 0000-0003-2224-2716

DOI : 10.14746/rie.2023.17.19

European Space Programme for the Arctic

Introduction

Environmental policy has begun to play a fundamental role in the European Union's foreign policy, shaping its position in international relations. The processes of internationalization, globalization and Europeanization have created new opportunities for interaction, including in the environmental field. The response to rapid climate change has become the driving force here, making the EU more aware of its domestic and international interests in the Arctic. The EU has begun to develop an Arctic policy, putting environmental protection at its core.

The process was initiated by Denmark and Greenland, later joined by Finland and Sweden (after their accession to the EU in 1995). The enlargement of the EU to include the Nordic countries has given a new impetus to address the problems of the North. During the Finnish presidency of the EU Council in 1999, the 'Arctic window' of the EU's Common Foreign and Security Policy began to take shape (Sójka, 2021, pp. 165–166).

The history of the European Union's institutional interest in the Arctic began with the June 1999 resolution of the European Parliament on a new strategy for agriculture in the Arctic, which led to the adoption of the Arctic Policy of the European Union (Sójka, 2021).

In 2014, the European Parliament clearly emphasized that the EU has interests (political and economic) in the Arctic, which result from the rights and obligations imposed on the EU by international law. These interests also result from EU involvement in environmental, climate and other policies, as well as from funding and research activities in the Arctic (Sójka, 2021, p. 174).

Research aim, structure and methods

The aim of the article is to show the evolution of environmental policy in the Arctic from the perspective of scientific research. The fundamental research question posed is as follows: do the institutions, and the technical capacities and tools they use, allow the EU to effectively attain the objectives of its environmental policy in the Arctic? In

order to answer this question, an institutional-legal research method is applied, using research tools such as comparative content analysis of documents, as well as critical content analysis of academic literature that directly or indirectly addresses the issue of EU policy towards the Arctic, including environmental policy.

The paper is divided into the following sections: the first section deals with scientific research as an important element of EU involvement in the Arctic. Policy-making aimed to protect the environment and combat climate change in the Arctic should rely on science. This is why the EU is making a significant contribution to Arctic research. In recent decades, activities in this area have involved Arctic observation and monitoring as well as numerous research projects. Polish scientific achievements in Arctic research are also briefly outlined.

The second section discusses the relationship between the space and environmental policies of the European Union. Environmental policy, combined with the European Union’s space policy towards the Arctic, is gradually becoming one of the important elements of the European Union’s external soft power policy system. It goes beyond the powers assigned to the EU’s Common Foreign and Security Policy, and space activity contributes to improving the protection of the Arctic environment.

The third and fourth sections deal with the observation and monitoring of the Arctic, including the European observation system. Earth observation is about collecting information about the physical, chemical and biological systems of the Earth using remote sensing technology, while geographic information comprises data and information generated at specific locations on Earth. The issue of observing the Arctic from space assumed a strategic character in the EU Council document *Space as an enabler*, adopted on 28 May, 2019. It emphasises the importance of space infrastructure, data and services for the Arctic region, particularly with regard to climate change monitoring and economic activity.

One of the basic concepts employed in this analysis is remote sensing. This term defines methods of obtaining data about objects, phenomena and processes on the Earth’s surface through devices that are not in direct (physical) contact with the object under study (Ciołkosz, 2023). Remote sensing is also a type of geospatial technology applied in the Arctic, where samples from terrestrial, atmospheric and aquatic ecosystems (in this case in the Arctic) emit and reflect electromagnetic radiation, whereby the physical features of an area can be detected and monitored without physical contact. This method of data collection usually involves sensor technologies, mainly satellite-based ones. The most common source of radiation that is measured by passive remote sensing is reflected sunlight (*Definicja...*, 2022).

The EarthObservation (EO) system is the outcome of the European Union’s remarkable activity with respect to space policy. Data obtained through satellite observation of the Earth provide unique opportunities for Arctic research. Never before have so many satellites orbiting around the North Pole been in operation, providing EO data for Arctic monitoring.

Section five briefly outlines the scope of activities of the European Environment Agency and the European Union Agency for the Space Programme (EUSPA). An important step which was taken by the European Union to intensify studies into the Arctic ecosystem using space research involves the EU Parliament and Council Regulation

2021/696 of 28 April 2021, establishing the EU Space Programme and the European Union Space Programme Agency.

The final, sixth section identifies the results of the EU space program for Arctic security and environmental protection.

In the conclusion, the research question posed is answered in the affirmative. EU activities towards the Arctic and the use of the space program contribute to the improvement (increase) of the environmental protection of the Arctic, and are therefore significant for the global and European system for environmental and climate protection.

Scientific research in the Arctic

It is crucial for the scale and pace of climate change in the Arctic region, as well as its impact on the rest of the world, to be scientifically examined. Therefore, the EU’s objectives involve the following:

– acquiring knowledge/information about what is happening in this region;
– deeper understanding of the Arctic through investment in scientific research;
– development in monitoring the Arctic from space;
– fostering networks for sharing information and observations, while building know-how and technical expertise;
– collaboration with other entities to combat climate change, protect the natural environment in the Arctic, and expand scientific knowledge to help address the challenges mentioned above (*Kształtowanie...*, 2012).

As part of the *Innovation Union* flagship initiative envisioned in the *Europe 2020* strategy and the *Horizon 2020* programme for investment in research and innovation for 2014–2020, the European Commission has aligned EU research and innovation policy with a focus on Arctic challenges. For this reason, steps have been taken to (*Europa 2020*, 2010):

– strengthen partner cooperation in the Arctic region regarding the development of research infrastructure;
– launch extensive cooperation with countries actively conducting multidisciplinary research on the Arctic region and establish the research infrastructure there.

As part of the 7th Framework Programme, and then *Horizon 2020*, a number of research projects involving the observation of the Arctic natural environment from space have been funded in the period up to 2020. The *INTAROS* (Integrated Arctic Observation System) project is among the most important of them. The project aims to increase the spatial-temporal coverage of observations in the Arctic, in order to improve the forecasting capacity for planetary changes and, in particular, within the Arctic, and to support efforts to standardise, calibrate, and validate observational data and improve their interoperability, strengthen the integration of satellite and ground-based observations in the processes of modelling and forecasting systems, and long-term strengthening of Arctic observation systems. In addition, *Horizon 2020* funded a project to provide scientists with access to a network of research and observation stations throughout the Arctic (*INTERACT*) (Immler, 2014).

Polish scientific research is also inextricably linked to the Arctic region. This is due to the unique combination of Polish history and scientific achievements. Poles have been exploring the Arctic since the first half of the 19th century. Poland was a signatory to the Spitsbergen Treaty signed in Paris on February 9, 1920. Polish scientific expeditions have been operating in the Arctic since 1932 on Bear Island, Greenland and Spitsbergen. Since 1957, the Stanislaw Siedlecki Polish Polar Station Hornsund has been operating in White Bear Bay on the island of Spitsbergen, which is part of the Svalbard archipelago. Every year, scientific projects are carried out in the Arctic, in which Polish scientists are accompanied by researchers from other countries. The Ministry of Science and Higher Education plays a special role in Arctic research. The Ministry adopted the Polar Research Strategy 2017–2027. Selected scientific research institutions, including the Institute of Oceanology, the Institute of Geophysics and the Institute of Biochemistry and Biophysics of the Polish Academy of Sciences, also play an important role. In addition, major Polish universities conduct teaching and research activities related to polar issues.

The organizational (functional) manifestation of this activity is Poland’s observer status in the Arctic Council. Together with the Netherlands, Germany and the United Kingdom, Poland is one of the first four countries to be granted permanent observer status in the Arctic Council.

An important role is played by the Committee on Polar Research of the Polish Academy of Sciences, established in 1977. It brings together a panel of scholars, experienced researchers and young scientists conducting research on the polar regions. Committee members represent a wide range of scientific disciplines (science, natural sciences, social sciences and humanities) and represent more than twenty scientific institutions in Poland. The Committee is managed by its Presidium, and the scientific endeavors are carried out by six teams.

The EU’s space and environmental policies

The goals of the EU’s space policy address today’s challenges, such as combating climate change, fostering technological innovation and providing socio-economic benefits to people. Space-related technologies, data and services have become indispensable to the Arctic. Satellites (satellite technologies) provide direct information for Arctic agriculture and fisheries. They enable better mapping of farmland for irrigation, and yield forecasts and facilitate fisheries control. They help Arctic regions access knowledge and information. They support communications where the capacity of ground-based solutions is limited. They also provide improved emergency response: satellite services help reduce emergency response times. They contribute to protecting the environment and combating climate change. They improve security in terms of satellite positioning, satellite communications and precise observation of Arctic changes (*Arktyczna...*, 2022).

The external environmental policy of the European Union, combined with its space policy, is a product of specific forms of politicisation and institutionalisation that have formed formalised ties within an expanding community of Arctic entities. Without institutionalisation and without the EU’s collective, expanded political and regulatory

system, it would not be possible to achieve the environmental and space goals enshrined in the treaties and formal and informal acts of the European Union (Nowlan, 2001, pp. 2–15).

The institutional dimension of environmental policy on Arctic observation from space is based on understanding politics and institutions not only in terms of their operations, but also from a normative and regulatory perspective. In this case, a policy institution is (1) a repetitive and established pattern of behaviour and values; (2) a structure of institutional interactions or a set of rules (norms) that creates the rights and obligations to observe the Arctic by entities seeking to pursue their interests/rational preferences; (3) formal and informal rules of the game in which Arctic entities participate; (4) an environmental culture shared by the participants in integration; and (5) a formula for environmental behaviour on an international scale (Stephen, Knecht, Bartsch, 2018, pp. 103 ff.).

The analysis of the research problem posed by observation of the Arctic from space should also refer to the institutionalised process of political change. As early as in 2017, the EU Council discussed the future of EU space programmes and adopted conclusions on the Copernicus programme. Ministers acknowledged then that the flagship Galileo and Copernicus programmes were contributing to advantageous changes in the Arctic. Two years later, the same Council adopted conclusions on the role of space services in ensuring the sustainability of the Arctic region. EU ministers encouraged the European Commission and the Global Navigation Satellite System (GNSS) Agency to actively cooperate with the European Space Agency (ESA) and the European Organisation for the Exploitation of Meteorological Satellites (EUMETSAT) on the issue (*Przebieg...*, 2022).

European system for Arctic observation

Space observation clearly demonstrates that changes in the Arctic environment translate into extensive and profound changes in the cryosphere, hydrology, natural habitats, and biodiversity, and have both favourable and unfavourable influences on traditional and modern ways of life in the region. These processes have a direct and indirect impact on all entities operating in the Arctic (Kaluga, 2020).

As for direct observation of the Arctic from space, the EU has designed and implemented its own space initiatives and programmes, such as the European Geostationary Navigation Overlay Service (EGNOS), followed by Galileo and Copernicus, which take into account the needs of the EU’s external environmental policy, among other things.

The Joint Research Centre (JRC) of the Commission has been actively involved since the start of the Global Monitoring for Environmental and Security (GMES) initiative and has supported developments for Galileo and the SWE sub-component. Under Regulation (EU) No 377/2014, the JRC manages the Copernicus emergency management service and the global component of the Copernicus land monitoring service, it contributes to the review of the quality and fitness for purpose of data and information, and to its future evolution (Rozporządzenie..., 2021, pp. 9 ff.).

The development of the Arctic cannot be seriously considered without a global and European space programme.

Firstly, the free, precise and replicated images obtained from the European space observation system for the Arctic are transforming the EU’s forecasting activity, as they combine all the features needed to create useful commercial space services for all (*A brief...*, 2023).

Secondly, satellite images of the Arctic are particularly interesting when combined with other data from this area. For example, extremely sensitive instruments on the satellites can detect tiny variations in altitude on very large structures, such as pipelines, dikes or viaducts (*A brief...*, 2023).

Thirdly, the EU also seeks to develop its own observation infrastructure. To this end, Europe must maintain a competitive space sector capable of making new discoveries and ensuring access to strategic data and new services, including in the Arctic.

Fourthly, space observation must serve civilian purposes, and a European space strategy could become another element of European soft power expertise and be implemented, alongside other elements, as an effective policy tool. Space exploration could draw on dynamic European integration and expand the development potential of the Arctic (Hoerber, 2009).

Observation and monitoring of the Arctic – data set processing

The Joint Research Centre of the European Commission has analysed the EU’s space-based observation capabilities for the Arctic in the context of navigation, communications and monitoring. The final report presented the possible needs of Arctic users in four main areas, including the maritime sector, disaster risk management, monitoring of relevant climate variables, as well as search and rescue services, communications and disruption of satellite services. These potential users include scientific and operational entities on the one hand, and users from indigenous and local communities on the other.

The European system for observing the Arctic from space is crucial for monitoring and assessing the outcomes of climate change, adaptation needs in the region and, to a greater extent, the global effects of the overwhelming changes in the Arctic. Satellite data are used with a multitude of advanced models to monitor sea ice cover, glacier runoff, snow cover, snow melt, iceberg drift, and river and lake ice.

The European system for observing the Arctic is also used for the purposes of environmental protection to help monitor compliance with global regulations on CO_2 emissions (e.g., the Paris Agreement – United Nations Framework Convention on Climate Change[2]), fisheries, biodiversity, natural resource extraction, air pollution and trace gases. Arctic winter temperatures are already 2.5°C higher than temperatures in the pre-industrial era, leading to widespread shrinkage of cryosphere and significant reductions in snow cover and the extent and thickness of Arctic sea ice (cf. Boniface et al., 2021, pp. 23–56).

[2] It was signed on 22 April 2016 and ratified by the European Union on 5 October 2016.

European Environment Agency and the European Union Agency for the Space Programme (EUSPA)

The EEA is also helping to refocus technology, particularly the Internet, taking into account its interaction with the environment. Two new initiatives in which the EEA is playing a leading role are at the heart of this new campaign, namely the GMES and the European Shared Environmental Information System (SEIS) initiatives that will continue to be developed. For the purpose of environmental monitoring, GMES uses satellites and measurement sensors located on land, floating on water or in the air. Information obtained through the GMES initiative helps to better understand how the Arctic is changing, why it is changing, and how it may affect our daily lives. SEIS is an initiative of cooperation between the European Commission, EU member states and the EEA. By linking the various systems and creating a European network that the public can use via the Internet, the initiative will help organise the rich data collected at local and national levels.

> “The European Space Agency has also signed a contract with OHB Sweden to build a prototype satellite as part of the Arctic Weather Satellite mission. It will provide more frequent data on weather over the Arctic, allowing scientists to better understand and forecast circumpolar weather. The prototype is a forerunner to a planned constellation of satellites providing a virtually continuous stream of data on temperature and humidity from anywhere on Earth – including the Arctic.
> Today, satellites provide rich data sets that meteorologists routinely use to forecast the weather. However, monitoring of the Arctic is still inadequate. Current geostationary satellites, located 36,000 kilometres above the equator, are not visible at higher latitudes and, therefore, cannot be used to study Arctic weather. In contrast, MetOp satellites, which provide data collected over the poles when orbiting from one pole to another, take up to 24 hours to collect data from around the globe” (Kawalec, 2021).

EU space programme and the environmental security and protection of the Arctic

Digital platforms are another important element facilitating the development of the space sector. They provide access to data and products, as well as to toolkits, and storage and computing facilities. To accomplish this goal, thereby bringing freedom of operation, independence and security, it was important for the European Union to have autonomous access to space and to be able to use it in a secure manner. The autonomous, reliable and cost-effective access to critical infrastructure and technology provided by member states and the European Space Agency made this possible (Rozporządzenie..., 2021).

In the course of the EU’s strategic planning process, research and innovation activities have also been identified for the Arctic to take advantage of EU-owned infrastructure, mainly in the observation subsystems of Copernicus, Galileo and EGNOS.

Today, research infrastructures, particularly on-site observation networks, are essential components of the observation infrastructure enabling such services.

The operational goal of Copernicus is to provide an autonomous and civil user-oriented Earth observation system (including the Arctic) that is based on existing national and European capabilities, and offers geo-information data and services, including satellites, ground-based infrastructure, data and information processing facilities and distribution infrastructure, based on a policy of free, full and open access to data, and taking into account security needs and requirements where appropriate. Copernicus should provide autonomous access to environmental information and to key technologies for Earth/Arctic observation and geo-information services, thereby supporting the EU in independent decision-making and action in the fields of environment, climate change, seas, maritime affairs, agriculture and rural development, cultural heritage protection, civil protection, land and infrastructure monitoring, security, and the digital economy, among others.

Thanks to the constellation of Earth observation Sentinel satellites and other missions, such as the European Space Agency’s under-ice CryoSat system, the European Copernicus Earth observation programme provides a comprehensive catalogue of data about our planet and its very important Arctic region. This includes one of the most sensitive indicators of climate change, namely the extent and thickness of Arctic sea ice (*Grupa polarna...*, 2022).

The satellites operating under the Copernicus programme provide large amounts of useful data collected over the Arctic, an area preferred over others on Earth because most of the orbits of the satellites in the EO observation system converge on the poles, expanding spatial viewing coverage there. Copernicus services transform satellite data into products, such as maps of vegetation, sea ice, air quality, ship presence, and disaster risks and impacts (Boniface et al., 2021, pp. 2–8).

Conclusion

The Arctic is no longer a peripheral region with a space agenda that is solely focused on environmental and sustainability issues. For this reason, the observation of the Arctic has become a global problem that can be solved in a systemic way rather than in piecemeal or sectoral terms.

Earth observation from space, satellite navigation, satellite communications and weather observations covering the Arctic effectively help to address challenges and threats in the region as well as globally. Given the limited terrestrial infrastructure in the Arctic, satellite-based services improve connectivity and, importantly, do so while not harming the environment (Pozdnakova, 2022).

Copernicus provides a working, reliable, stable and continuous system for monitoring key variables, including Arctic seawater temperature and salinity, precipitation, changes in freshwater and the area covered by sea ice, and levels of greenhouse gases such as CO_2 and methane (*Projekt konkluzji...*, 2019).

By monitoring the Arctic marine environment, Copernicus provides information on the *blue* (physics), *green* (biogeochemistry) and *white* (sea ice cover) marine en-

vironments. In the case of the Arctic Ocean, the observation services and products usually come along with a large set of ice-related indicators, such as the extent of the sea ice cover, its borderline, charts, thickness and drift, as well as the concentration of icebergs. The impact of large wildfires is also observed (*Informacje w ramach...*, 2022).

The overarching environmental goal of the European Union is to ensure development of the Arctic whereby the condition of its environment does not deteriorate and EU standards of environmental protection are increasingly applied. In this regard, the EU (its institutions and member states, as well as transnational entities) has pledged to reduce greenhouse gas emissions by 40 percent by 2030 and by 80 percent by 2050 (compared to 1990 levels). European climate law enshrines a mandatory EU climate target to reduce EU emissions by at least 55 percent by 2030. EU countries are working on new legislation to achieve this goal and make the EU climate neutral by 2050.

Another initiative being implemented is the *EU-PolarNet*, involving leading European scientific institutions that study the Arctic. They are the ones that developed the joint European Polar Research Programme. The European Union is also developing international access to Arctic research infrastructure (research stations, scientific vessels, satellite observations) and open access to data. On this account, the EU *Copernicus* space programme supports international research on climate change in the region. The provisions of international environmental agreements (e.g., the UN Convention on Biological Diversity) continue to be implemented (Doel, Wråkberg, Zeller, 2014, pp. 2–15).

The above analysis leads to the following final conclusions:

1. Systemic changes in the Arctic are a problem shared by the entire global population. Since observation activities through remote sensing make it possible to monitor changes in the Arctic, mainly as regards changes to the environment, in a way that is not possible with other techniques, their important role in combating crises and in supporting sustainable development has been widely recognised in EU operational instruments.
2. The EarthObservation (EO) system in the European Union has become an essential tool fostering decision-making to better manage water resources, natural disasters and environmental and climate monitoring.
3. Climate change poses an immense threat to the Arctic, a threat the EU is facing today and will have to face in the future. Therefore, space technology needs to be further developed as it plays an increasingly important role in supporting the monitoring of rapid environmental change and the identification of associated risks.
4. Maintaining the same measurement methodology over decades is fundamental for monitoring the Earth’s changing environment. Therefore, satellite observations must be regularly adjusted and revised, taking into account a specific set of variables. The European Space Agency and NASA are already collaborating to calibrate their satellite readings through inspections on-site, by aircraft and by ground-based teams. This includes the collection of huge and diverse data sets on snow and ice, which are obtained by a range of instruments, both airborne and ground-based. These are then compared with data obtained from space (*Ile będzie nas...*, 2019).

Bibliography

A brief history of Earth Observation (2023), https://atos.net/en/blog/a-brief-history-of-earth-observation, 20.01.2023.

Arktyczna obserwacja z kosmosu (2022), https://ec.europa.eu/info/funding-tenders/find-funding/eu-funding-programmes/european-space-programme_pl, 8.08.2022.

Boniface K., Gioia C., Pozzoli L., Diehl T., Dobricic S., Fortuny Guasch J., Greidanus H., Kliment T., Kucera J., Janssens-Maenhout G., Soille P., Strobl P., Wilson J. (2021), *Europe's Earth Observation, Satellite Navigation and Communications Missions and Services for the benefit of the Arctic. Inventory of current and future capabilities, their synergies and societal benefits*, Publications Office of the European Union, Luxembourg.

Ciołkosz A. (2023), *Wstęp do teledetekcji*, https://geoforum.pl/teledetekcja/teledetekcja, 23.01.2023.

Definicja teledetekcji, (8 lipca 2022), https://montblanczone.com/pl/teledetekcja/. 1.01.2023.

Doel R. E., Wråkberg U., Zeller S. (2014), *Science, environment, and the New Arctic*, "Journal of Historical Geography", no. 122.

Europa 2020, *Strategia na rzecz inteligentnego i zrównoważonego rozwoju sprzyjającego włączeniu społecznemu*, Komunikat Komisji, COM(2010) 2020 wersja ostateczna, Bruksela 3.03.2010.

Grupa polarna udoskonala wizję arktycznych misji lodowych (2022), https://marine.copernicus.eu/news/polar-group-refines-vision-arctic-ice-missions, 2.05.2022.

Hoerber T. C. (2009), *The European Space Agency and the European Union: The Next Step on the Road to the Stars*, "Journal of Contemporary European Research", vol. 5, issue 3, Autumn.

Ile będzie nas kosztowało topienie lodów Arktyki? Odpowiedź jest w kosmosie, 4 czerwca 2019, „The European Data Journalism Network", https://voxeurop.eu/pl/ile-bedzie-nas-kosztowalo-topienie-lodow-arktyki-odpowiedz-jest-w-kosmosie/, 20.01.2023.

Immler F. (2014), *Arctic research funded by the European Union*, Luxembourg, https://op.europa.eu/en/publication-detail/-/publication/f6475f02-ceb7-4629-b95a-2ceb7cd43c9c, 26.09.2020.

Informacje w ramach usług systemu Copernicus i produkty Sentinel dla regionu arktycznego (2022), https://www.copernicus.eu/pl/informacje-w-ramach-uslug-systemu-copernicus-i-produkty-sentinel-dla-regionu-arktycznego, 1.11.2022.

Kaluga B. (2020), *Arktyka w polityce zagranicznej Federacji Rosyjskiej*, http://www.psz.pl/117-polityka/bartosz-kaluga-arktyka-w-polityce-zagranicznej-federacji-rosyjskiej, 1.07.2020.

Kawalec Z., *Powstanie satelita monitorujący pogodę nad Arktyką – kontrakt podpisany*, https://astronet.pl/loty-kosmiczne/powstanie-satelita-monitorujacy-pogode-nad-arktyka-kontrakt-podpisany/, 5.08.2021.

Kształtowanie polityki realizowanej przez Unię Europejską w regionie Arktyki: postępy poczynione od 2008 r. i dalsze działania (2012), Wspólny Komunikat Komisji i Wysokiego Przedstawiciela Unii do Spraw Zagranicznych i Polityki Bezpieczeństwa, Bruksela 26 czerwca 2012 r. JOIN(2012) 19.

Nowlan L. (2001), *Arctic Legal Regime for Environmental Protection*, "Environmental Policy and Law Paper", no. 44.

Pozdnakova A. (2022), *Space Infrastructure for a Sustainable Arctic: Opportunities and Challenges of Spaceport Development in the High North*, https://www.thearcticinstitute.org/space-infrastructure-sustainable-arctic-opportunities-and-challenges-spaceport-development-high-north/, 20.01.2022.

Projekt konkluzji Rady w sprawie rozwiązań kosmicznych na rzecz zrównoważonej Arktyki (2019), CSDP/PSDC 523 CFSP/PESC 858, Bruksela 21 listopada 2019.

Przebieg chronologiczny. Arktyka w kosmosie (2022), https://www.consilium.europa.eu/pl/policies/eu-space-programme/timeline/, 8.08.2022.

Rozporządzenie Parlamentu Europejskiego i Rady UE 2021/696 z dnia 28 kwietnia 2021 r. *ustanawiające Unijny program kosmiczny i Agencję Unii Europejskiej ds. Programu Kosmicznego oraz uchylające rozporządzenia (UE) nr 912/2010 (UE) nr 1285/2013 i (UE) nr 377/2014 oraz decyzję nr 541/2014/UE*, Dziennik Urzędowy Unii Europejskiej, L 170/69, 12.5.2021.

Sójka J. A. (2021), *Arktyka w polityce ekologicznej Unii Europejskiej 1996–2018*, doctoral dissertation – WNPiD UAM, Poznań.

Stephen K., Knecht S., Bartsch G. M. (2018), *Internationale Politik und Governance in der Arktis: Eine Einführung*, Springer Spektrum Berlin–Heidelberg, Berlin.

Summary

Space technology is among the most rapidly developing sectors. It is also significant for the Arctic. Space technology requires international cooperation, and the effectiveness of European space policy depends on the commitment of its member states.

The Arctic and space exploration are essential topics in EU policies, given the recently defined strategies and programmes such as the European Green Deal, where the protection of the Arctic and its many ecosystems is emphasised. They have become an important element of the European space programme. Copernicus Sentinel satellites are already playing a significant role in the Arctic.

This activity resulted in the EU Council adopting the conclusions on “Space solutions for a sustainable Arctic” in 2019. Space instruments are fundamental to the implementation of the priorities of the European Union’s integrated Arctic policy on climate change mitigation, climate change adaptation measures and the protection of the Arctic ecosystem.

Key words: European space programme

Europejski program kosmiczny dla Arktyki

Streszczenie

Technologia kosmiczna jest jednym z najszybciej rozwijających się sektorów. Jest ona również istotna dla Arktyki. Technologia kosmiczna wymaga współpracy międzynarodowej, a skuteczność europejskiej polityki kosmicznej zależy od zaangażowania państw członkowskich.

Arktyka i eksploracja kosmosu są istotnymi tematami w polityce UE, biorąc pod uwagę niedawno zdefiniowane strategie i programy, takie jak Europejski Zielony Ład, w których podkreśla się ochronę Arktyki i jej wielu ekosystemów. Stały się one ważnym elementem europejskiego programu kosmicznego. Satelity Sentinel programu Copernicus już teraz odgrywają znaczącą rolę w Arktyce.

Działania te zaowocowały przyjęciem przez Radę UE w 2019 r. konkluzji w sprawie „Rozwiązań kosmicznych na rzecz zrównoważonej Arktyki”. Instrumenty kosmiczne mają fundamentalne znaczenie dla realizacji priorytetów zintegrowanej polityki Unii Europejskiej wobec Arktyki w zakresie łagodzenia zmiany klimatu, środków adaptacyjnych do zmiany klimatu i ochrony ekosystemu Arktyki.

Słowa kluczowe: Europejski program kosmiczny

Article submitted: 20.08.2023, accepted: 02.10.2023.