Research article
UDC 34:004:341.4:004.8
EDN: https://elibrary.ru/gcvuaw
DOI: https://doi.org/10.21202/jdtl.2025.15

International Fundamentals of Legal Regulation of the Data Center Industry in the Arctic States and the Antarctic

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Keywords

data processing centers,
digital technologies,
environmental law,
environmental security,
indigenous peoples,
international law,
law of indigenous peoples,
law,
the Antarctic,
the Arctic

Abstract

Objective: to critically assess the effectiveness of existing international legal norms under the new challenges of technological progress, related to the development of the data center industry in the Arctic states and the Antarctic.

Methods: the methodological basis of the research is a set of special and general methods of scientific cognition, including methods of comparative law, content analysis, deduction, induction, formal logical method and document analysis. The author turns to interdisciplinary approaches in order to objectively assess the environmental, social and legal risks arising from the data center industry growth in regions with increased climatic and social vulnerability.

Results: the article analyzed international legal acts regulating the functioning of data centers in polar regions. It identified the key risks and divided them into environmental (instability of local ecosystems, lack of adaptability to rapid changes, risk of losing biological diversity, and greenhouse gas emissions) and social (marginalization and violation of the rights of indigenous peoples, loss of traditional cultures and lifestyles, increased social tension). The author points out that new conflicts and challenges will inevitably emerge due to the insufficient effectiveness of national and international regulatory mechanisms. The states the need to create specialized international legal instruments taking into account the specifics of the environmental safety of the polar territories.

Scientific novelty: for the first time, the article provides a comprehensive analysis of the integral risks and drawbacks of the current international legislation on data center industry in the Arctic states and the Antarctic. The author provides a comparative analysis of the normative framework and shows the inconsistency between the "soft law" principles application on the polar regions and the fourth technological revolution. The author substantiates the requirement to create new certification and reporting procedures throughout the lifecycle of data centers, taking into account the legal and cultural context.

Practical significance: the results are focused on improving international and national policies in the sphere of regulating the data center industry and on developing certification and reporting standards that could be effective in the climatic, social and economic conditions of the Arctic states and the Antarctic. The research is aimed at minimizing the negative impact of anthropogenic factors and ensuring a balance between industrial development and the preservation of unique natural and cultural landscapes.

For citation

Shumakova, N. I. (2025). International Fundamentals of Legal Regulation of the Data Center Industry in the Arctic States and the Antarctic. *Journal of Digital Technologies and Law, 3*(3), 369–396. https://doi.org/10.21202/jdtl.2025.15

Contents

Introduction
1. The Arctic and Antarctic as special risk zones subject to international regulation
   1.1. General international legal framework for ensuring environmental safety and respect for the rights of indigenous peoples
   1.2. Special international legal framework for ensuring the safety and rights of indigenous peoples in the Arctic and Antarctic
2. The role of the Arctic and Antarctic in ensuring the data centers development and operation
3. Risks associated with the growth of the data center industry and attempts to mitigate them
Conclusions
References

Introduction

The rapid pace of the ongoing fourth technological revolution is accompanied by the growth of new industries, one of which is the construction of data processing centers (further referred to as DPCs). Energy-intensive data centers that require maintaining a certain temperature are located up to the extreme points of the globe – the Arctic and the Antarctic. The Arctic states are attractive for locating data centers due to the relatively

low cost of electricity and to the climatic conditions that help reduce cooling costs. In Antarctica, the anthropogenic activity grows because we need to research its regions and popularize polar tourism. This also requires the creation of new data centers and the laying of deep-sea cables for operational communication and timely data transmission.

The vulnerability of the Arctic and Antarctic regions to anthropogenic emissions is a well-known fact, and an array of international legal acts are devoted to protecting their environment. Nevertheless, there is reason to believe that in the 21st century, not all states that have acceded to its conventions and declarations are sufficiently complying with their obligations. In particular, this is related to the implementation of the objectives of the EU Law on Critical Raw Materials, such as the independence of its member states from third countries in the provision of extractable resources[1]. There is an additional factor indicating a decrease in the effectiveness of international law on land use change in the Arctic countries: it is the violation of the rights of the indigenous peoples under the auspice of the critical need for mining required for the developing digital technologies and the transition to green energy. The vague formulations and criteria of current legal regulations make it possible to implement political decisions that go against the will of the indigenous peoples, even in those countries where they enjoy relative autonomy guaranteed at the constitutional level (Živojinović et al., 2024).

The above defines the article objective – to provide a critical assessment of the effectiveness of existing international legal norms under the new challenges of technological progress. This objective is achieved by identifying risk groups specific to the Arctic states and the Antarctic; analyzing general and special international legal acts; determining the role of these territories in ensuring the data centers development and operation; and identifying risks directly related to the growth of the data center industry in their regions. The main purpose of the study is to call for the development of special international measures that can offset the negative impact of new types of anthropogenic activity in the territories on which the climatic well-being of all humankind depends. The article calls for the development of uniform certification and reporting requirements for the entire lifespan of a data center, including accompanying industries. The author also calls for establishing liability violations, given the specifics of the environmental safety, cultural and social features of these territories.

1. The Arctic and Antarctic as special risk zones subject to international regulation

Under the global climatic changes, The Arctic and Antarctic are the zones of specific economic risks. Temperature rise results in rapid warming of the polar regions, provoking ice thinning, sea ice and eternal frost melting and causing negative consequences far

[1] Regulation (EU) 2024/1252 of the European Parliament and of the Council of 11 April 2024. https://clck.ru/3NNWKX

beyond their boundaries (Raimondi et al., 2024). The consequences include disturbance of climatic and geochemical cycles leading to not only the loss of biological diversity and animals' habitat, but also social-economic degradation of the arctic regions' population. Moreover, today the point of no return may have been reached, which means the humankind may face "a cascade of unfavorable consequences" for the whole planet[2]. According to the research under Horizon 2020 project held by University of Bergen, the Arctic is most acutely influenced by the global warming caused by human activity. In the Arctic Ocean, acidification due to greenhouse emissions is progressing 10 times, and warming – two times faster than anywhere in the world. This testifies to passing the point of no return as an actual fact[3]. For example, together with the increased carbon dioxide (CO_2) content in the atmosphere and temperature growth, seasonal fluctuations of partial carbon dioxide (pCO_2) grow, as well as the changes in water hydrogen index (pH). This increases the summer acidification of the ocean, which may reduce the endemic sea organisms' resistance to higher summer temperatures (flying snails, copepods, polar cod, etc.). These organisms are the key link between zooplankton and sea mammals, sea birds and other fishes (Orr et al., 2022). Increased CO_2 emissions is the primary cause of the water surface absorbing the anthropogenic carbon (C_{ant}), which, in turn, is the main factor of the open ocean acidification (Terhaar et al., 2020). At the same time, the share of oxygen (O_2) determines the safety of sea ecosystems, sensitive to the interconnected processes of warming, acidification, deoxygenation[4] (reduced oxygen level), decreased nutrients and primary production[5]. Scientists also point to the so called polar amplification – the proved fact that the Arctic warms faster than the rest of the globe. Recent research demonstrate that from 1979 to 2021 this process was almost four times faster than anywhere else. This indicates that earlier forecasts of the global warming speed (two times faster than in other regions) were not accurate, insufficiently evaluating the situation on the recent 43 years. Since the start of satellite observations, certain regions in the Eurasian sector of the Arctic Ocean warmed up to seven times faster than the globe, while the overall temperature growth in the Arctic was almost four times faster than in other territories during the same period (Rantanen et al., 2022). The factors of climate change in the Arctic are also globalization and digitalization. The territory contains deposits of mineral resources, which are necessary for the "green shift" – the transition to renewable energy sources. As the European Union strives for zero emissions of carbon dioxide by 2050, their excavation

2 EU. Understanding impacts of climate change on Earth's vulnerable polar regions. https://clck.ru/3NNWzc

3 EU. (2020). Our common future ocean in the Earth system. https://clck.ru/3NNX3x

4 FAQ: Ocean Deoxygenation. Scripps Institution of Oceanography. https://clck.ru/3NNX5m

5 Ibid.

(for production of solar panels, wind turbines, automobile accumulators, etc.) continues to grow. This entails irreversible impacts on the environment and landscape and causes alarm (and sometimes social tension) among the local population (Živojinović et al., 2024). Positive aspects of the industrial development of these territories include infrastructure development, new jobs, increased income of the local population and higher tax revenues. However, there are also risks of disappearance of traditional industries and other elements of national cultures, which leads to the loss of cultural identity (Živojinović et al., 2024). Indeed, the development of new types of land use, including excavation of raw materials for the "green shift" and other purposes, electric energy production, construction of roads and other infrastructure are the drivers of negative changes in traditional deer breeding in Fennoscandia (according to 60 % of respondents in a poll held within an Artic Hub project) (Turunen et al., 2024). Given the current geopolitical situation, mining causes more and more disputes – on the one hand, the EU strives for self-provision with all necessary mineral resources. On the other hand, fundamental rights of the residents, as well as the research ethics, may be violated. This indicates further exacerbation of the "war for resources" not only among countries but also between states and population of the Arctic. The latter is more and more unsatisfied by turning their lands into "Eldorado for large companies" and by perceived lack of state defense of their legal rights and interests (Suopajärvi et al., 2024). It should be understood that the mentioned phenomena are not a problem of the future generations. In particular, meteorological observations in the Icelandic Westfjords show that the climate started to change quicker in the few recent years. Before the end of the century, this arctic state will face the corresponding changes of the physical and anthropogenic environment, and the speed of these changes depend on reduction of anthropogenic emissions (Bannan et al., 2022). Scientists more and more often mark the correlation between the Arctic temperature rise and increased appeals for psychological help among the local population. The latter develop "ecological anxiety", exacerbation of solastalgia and psychological states such as "climatic and environmental grief". These are reactions to the global negative changes in the environment, including those associated with changes in land use (construction of mines, railroads, wind power stations, etc.), and the lack of power in making ecological decisions when their rights are restricted by policies (Markkula et al., 2024). This is also about safety – the eternal frost is a reservoir of biological, chemical and radioactive materials; hence, the ongoing melting leads to wakening of the ancient, often unknown primitive organisms. This increases the risk of biological danger, including beyond the Arctic (Ali et al., 2024). Besides, the melting of the eternal frost, including the underwater one in the sea, may

cause emissions of another greenhouse gas – methane (CH4), contained in the natural sources of the region (wetlands, fresh water systems, gas hydrates, etc.) and produced as the soil humidity rises (Parmentier et al., 2024). Together with the increased frequency of extreme weather phenomena, these negative factors have already led to mass loss of flora and fauna, caused changes in migration of birds and fishes, led to disturbance of coastal social-economic systems and reduction (and sometimes complete elimination) of fish and other sea resources (Pecuchet et al., 2025). In the context of health of the Arctic population and wild nature, it is necessary to mention the ongoing pollution of the region with mercury (Hg)[6].

The term "the point of no return" started being used in relation to the Antarctic too. This is the ice shield of the planet, containing over 60 % of the world stock of fresh water. Climate changes lead to ice melting, ice shelf disintegration and, as a consequence, to increased ocean level[7]. Splitting of ice masses leads to water mixing and redistribution of warmth in the ocean, disturbing delivery of nutrients into the euphotic zone. This violates the stability of the ocean's upper layer, hence, the availability of light necessary for plankton, influencing the CO2 absorption (Meredith et al., 2022). Experiments show that with the temperature growth, the speed of ice melting increases, which will lead to the fast desalination of the continental shelf (Mathiot & Jourdain, 2023). In Antarctic, these phenomena are not due to greenhouse gases emissions on its territory, but are the result of global changes in the atmosphere and ocean. They go with the same speed as, for example, in Greenland, where such connection is established. This does not make the climatic forecast more optimistic, however. Modeling demonstrates that, with the current policy preserved, the sea level will rise not less than by 42 cm (Edwards et al., 2021). The negative influence on the continent's climate is produced also by extreme temperature phenomena (heat waves and sea heat waves), which may provoke a cascade of extreme events, such as a record temperature rise in the East Antarctic caused by an atmospheric river or a complete disintegration of a shelf Conger Glacier in 2022 (Siegert et al., 2023). The Antarctic lack local population, but its territories are influenced by anthropogenic activity related to science and tourism (appearance of non-local flora and fauna, mobilization of pollutants from waste deposits due to ice melting, etc.) (Hughes et al., 2021). Researchers call for paying attention to the lack of the necessary norms and criteria to assess pollution caused by increased human activity (Bargagli & Rota, 2024).

6 Why is mercury a concern in the arctic? AMAP. https://clck.ru/3NNXMK

7 EU. (2020). Identifying ice loss 'tipping points' in Antarctica. https://clck.ru/3NNXP2

1.1. General international legal framework for ensuring environmental safety and respect for the rights of indigenous peoples

The United Nations (further referred to as the UN) 2030 Agenda for Sustainable Development A/RES/70/1, within the list of Sustainable Development Goals (further referred to as the SDGs), highlights the need to take urgent measures to combat climate change and its consequences. This cannot be achieved without fulfilling the commitments made by developed countries – parties to the UN Framework Convention on Climate Change (further referred to as the UNFCCC), to accomplish joint mobilization (Goal #13)[8], which underlies all environmental standards. These include: reporting on anthropogenic emissions; development of climatic change mitigation programs; promotion and cooperation in the field of technologies for minimizing anthropogenic emissions; cooperation in taking preparatory measures to adapt to the climatic change; taking into account the considerations related to climatic change in the implementation of the relevant social, economic and environmental policies and measures; promotion and cooperation in the comprehensive, open and prompt exchange of scientific, technological, technical, socio-economic and legal information related to the climatic system and climatic change; implementation of national policies and appropriate measures by developed countries to mitigate the effects of climatic change by limiting their anthropogenic greenhouse gas emissions and protecting and improving the quality of their sinks and reservoirs of greenhouse gases; provision of new and additional financial resources to cover all agreed costs caused by the Convention fulfillment by developing countries and other obligations provided for in Art. 4[9]. A number of agreements have also been signed within the UNFCCC framework, including:

1. The Kyoto Protocol (1998). Its key provisions are commitments to reduce greenhouse gas emissions into the atmosphere, including CH4 and CO2, to establish transparency in the field of anthropogenic emissions and responsibility, given the features of the parties' economic development[10].

2. The Bali Action Plan (2007). It recognizes the fact of global warming to be proved and calls for the development and strengthening of measures to combat it, including technological, financial and political ones[11].

3. The Copenhagen Agreement (2009). It considers global critical climate change as one of the main problems of humanity, which has a scientific basis and requires urgent solutions. To this end, we must reduce anthropogenic emissions, intensify actions and

8 United Nations. (2015, October 21). Resolution adopted by the General Assembly on 25 September 2015. https://clck.ru/3NNZvD

9 UN Framework Convention on Climate Change. Adopted on May 9, 1992. https://clck.ru/3NNZxc

10 UNO. (1998). The Kyoto Protocol. https://clck.ru/3NNa4f

11 United Nations. (2007, December 14). FCCC/CP/2007/L.7/Rev.1. https://clck.ru/3NNa6R

international cooperation in reducing global and national greenhouse gas emissions, with more developed countries supporting less developed ones. It is also important to combat cutting and degradation of forests, in order to maintain greenhouse gas uptake, preserve biodiversity and living conditions of indigenous peoples[12].

4. The Cancun Agreements (2010). They are also aimed at increasing transparency in the area of annual greenhouse gas emissions, as well as reducing them depending on the economic development of a country[13].

5. The Durban Platform (2011). It provides for the continuation of the Kyoto Protocol and establishes the structure of the Green Climate Fund, whose task is to support adaptation to climatic change in less economically developed countries[14].

6. The Paris Agreement (2015). It once again raises issues of accountability and transparency, calling for real action to fulfill the commitments made by the UNFCCC member states, to take action under the Kyoto Protocol, to keep global average temperature rise well below 2 °C above pre–industrial level, and to strive to limit temperature rise up to 1.5 °C above pre-industrial level, recognizing the climatic change in order to reduce its risks and effects[15].

The general international framework for the protection of environmental safety and the rights of indigenous peoples in the polar regions also includes:

1. The Convention on the Continental Shelf (1958). It obliges coastal states to take safety measures to protect marine living resources from harmful effects[16].

2. The International Covenant on Economic, Social and Cultural Rights (1966). It prohibits the deprivation of peoples of their means of subsistence[17].

3. The Convention for the Prevention of Marine Pollution by Dumping of Wastes and Other Materials (1975). It is aimed at effective control of marine pollution and imposes obligations on member states to control dumping[18].

4. The Convention on Long-range Transboundary Air Pollution (1979). It is aimed at protecting humans and the environment from air pollution[19].

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12 United Nations. (2009, December 18). FCCC/CP/2009/L.7. https://clck.ru/3NNa8z

13 United Nations. (2011, March 15). FCCC/CP/2010/7/Add.1. https://clck.ru/3NNaGB

14 The UNO Durban Platform. (2013, July). https://clck.ru/3NNaHD

15 United Nations. (2015, December 12). FCCC/CP/2015/L.9/Rev.1. https://clck.ru/3NNaJE

16 The Convention on the Continental Shelf. (1958). https://clck.ru/3NNaL3

17 UNO. (1966, December 16). The International Covenant on Economic, Social and Cultural Rights. https://clck.ru/3NNaM5

18 UNO. (1975). The Convention for the Prevention of Marine Pollution by Dumping of Wastes and Other Materials. https://clck.ru/3NNaNq

19 UNO. (1979). The Convention on Long-range Transboundary Air Pollution. https://clck.ru/3NNaS5

5. The United Nations Convention on the Law of the Sea (1982). Among other things, it stipulates the right of coastal states to take legislative measures to preserve the environment and prevent its pollution[20].

6. The Vienna Convention for the Protection of the Ozone Layer (1985). Its main purpose is to protect human health and the environment from the effects of changes in the ozone layer caused by anthropogenic activity[21].

7. The Convention on Indigenous and Tribal Peoples in Independent Countries (1989). It obliges the participating countries to promote the full realization of the social, economic and cultural rights of indigenous peoples while respecting their social and cultural identity, and, if necessary, to take special measures to protect the peoples concerned, their institutions, labor, culture, and the environment[22].

8. The Convention on Environmental Impact Assessment in a Transboundary Context (1991). It requires parties to take all possible measures to prevent and control significant harmful transboundary impacts resulting from planned activities and control over them, such as environmental impact assessment[23].

9. The Convention on Biological Diversity (1992). It is aimed at countering the loss of the planet's biological diversity, recognizing the dependence of indigenous peoples on biological resources and the need to use them mutually on an equitable basis. It also obliges the participating countries to create specially protected areas, take measures for rehabilitation and restoration of endangered species and interact with indigenous peoples for these purposes, based on the principles of respect, preservation and support of their knowledge and traditions[24].

10. The United Nations Declaration on the Rights of Indigenous Peoples (2007). It prohibits any actions aimed at depriving indigenous peoples of their lands, territories and resources, including actions that may result in the destruction of culture and identity. At the same time, it gives indigenous peoples the right to participate in decision-making on issues that would affect their rights[25].

11. The Stockholm Convention on Persistent Organic Pollutants (2011). It recognizes the particular vulnerability of ecosystems and communities in the Arctic due to the bio-amplification of exposure to persistent organic pollutants and contamination

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20 UNO. (1994). The United Nations Convention on the Law of the Sea. https://clck.ru/3NNaVL

21 UNO. (1985). The Vienna Convention for the Protection of the Ozone Layer. https://clck.ru/3NNaa2

22 UNO. (1989). The Convention on Indigenous and Tribal Peoples in Independent Countries. https://clck.ru/3NNabb

23 UNO. (1991). The Convention on Environmental Impact Assessment in a Transboundary Context. https://clck.ru/3NNadD

24 UNO. (1992). The Convention on Biological Diversity. https://clck.ru/3NNmeG

25 UNO. (2008, March 17). The United Nations Declaration on the Rights of Indigenous Peoples. https://clck.ru/3NNccN

of traditional food products used by indigenous peoples. It also requires taking measures to reduce or eliminate emissions from anthropogenic activity[26].

12. The Minamata Convention on Mercury (2013). It aims to protect human health and the environment from anthropogenic emissions and releases of mercury and its compounds[27].

The list also includes international legal tools adopted by the International Maritime Organization (IMO), such as the International Convention for the Prevention of Pollution from Ships MARPOL 73/78 (aimed at combating ocean pollution), the International Safety Code for Ships Using Gases or Other Fuels with a Low Flash Point (MGT Code 2017), the International Convention on the Control and Management of Marine Ballast Water and Sediments (2004), etc. IMO is also developing medium-term measures to reduce greenhouse gas emissions from ships and the use of hydrogen and ammonia as marine fuels[28].

1.2. Special international legal framework for ensuring the safety and rights of indigenous peoples in the Arctic and Antarctic

Given the strategic, social, economic and climatic features of the polar regions, an extensive multi-level international legal framework has been formed to ensure security on their territory. Besides general international legal framework for ensuring environmental safety and protecting the rights and legitimate interests of indigenous peoples, a whole range of international acts has been developed. They are aimed at modifying national legislation, developing comprehensive international cooperation, and increasing transparency in the field of anthropogenic emissions in the Arctic and Antarctic. For this study, the main special international legal acts that ensure security in these regions are:

1. The Antarctic Treaty (1959). It prohibits nuclear explosions in Antarctica and the disposal of radioactive materials in this area, establishes the principles of transparency of work and scientific research, establishes control over expeditions and stations, and calls for cooperation in the development of measures for the protection and conservation of living resources in Antarctica[29].

2. The Protocol on Environmental Protection to the Antarctic Treaty (1991). Its parties assume responsibility for the "comprehensive protection of the Antarctic environment and its dependent and associated ecosystems"[30]. In this connection, it is recognized necessary to limit the negative impacts on the Antarctic environment and its dependent

26 The Stockholm Convention on Persistent Organic Pollutants. (2001). https://clck.ru/3NNcdR

27 UNO. (2013). The Minamata Convention on Mercury. https://clck.ru/3NNchn

28 International Maritime Organization. Official Internet resource of the Ministry of Transportation of the Russian Federation. https://clck.ru/3NNcjJ

29 The Antarctic Treaty. (1959). https://clck.ru/3NNck5

30 The Protocol on Environmental Protection to the Antarctic Treaty (1991). https://clck.ru/3QHnur

and associated ecosystems (negative effects on climate, weather, water and air quality, ice and marine environments, flora and fauna)[31].

3. The Declaration of the Protection of the Arctic Environment (1991). It is aimed at preserving the environment and natural resources, monitoring its condition and reducing pollution, as well as harmonizing environmental principles with the needs of the indigenous population[32].

4. The Agreement on Consent and Cooperation between the Russian Federation and Canada (1992). It emphasizes the role of the participating countries in environmental conservation and aims, among other things, at strengthening their cooperation in the Arctic, which is considered as a priority area of Russian-Canadian relations. The Agreement also provides for constant interaction with the indigenous peoples of the northern regions[33].

5. The Russian-Swedish Declaration (1993). It establishes international cooperation between the Russian Federation and Sweden, implying "socially and environmentally oriented policies, economic liberalization, freedom of trade and entrepreneurship within the framework of a civilized attitude to the environment and the rational use of natural resources"[34].

6. The First Kirkenes Declaration (1993). It set the basic principles of cooperation in the Barents/Euro-Arctic region and established the Council of Barents/Euro-Arctic region. The declaration emphasized the importance of scientific and technological cooperation in the region, of the development of cultural relations and support for indigenous peoples (Nenets and Sami). To this end, it was proposed to create a special working group[35].

7. The Declaration on the Foundations of Relations between the Russian Federation and the Kingdom of Norway (1996). It was aimed at fruitful cooperation in the Barents/Euro-Arctic region, strengthening respect for human rights and fundamental freedoms, including the rights of national minorities. It also proposed intensifying work on global environmental issues and addressing issues related to the internal relationship between energy, environmental protection, and economic development[36].

8. The Iqaluit Declaration (1998). The participating countries committed themselves to improving the well-being of Arctic residents, as well as taking measures to protect and improve the environment, economy, culture and health of indigenous peoples and other peoples living in the region[37].

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31 The Protocol on Environmental Protection. (1991). https://clck.ru/3NNcm2

32 The Declaration of the Protection of the Arctic Environment. https://clck.ru/3NNcpo

33 The Agreement on Consent and Cooperation between the Russian Federation and Canada. (1993). https://clck.ru/3NNcs3

34 The Russian-Swedish Declaration. (1993). https://clck.ru/3NNct2

35 Declaration Cooperation in the Barents Euro-Arctic Region. (1993, January 11). https://clck.ru/3NNcut

36 Declaration on the Foundations of Relations between the Russian Federation and the Kingdom of Norway. (1996). https://clck.ru/3NNcwu

37 The Iqaluit Declaration. (1998). https://clck.ru/3NNcyX

9. The Inuvik Declaration on Arctic Climate Change and Global Action (2005). It called for uniting the humanity in order to drastically reduce anthropogenic emissions to prevent further critical climate change, where the Arctic is one of the key components of the planet's climate well-being. The Declaration also recognizes that current climate change poses an existential threat to the safety of Arctic natives[38].

10. The Ilulissat Declaration (2008). It confirmed the unique status of Denmark, Canada, Russia, the USA, Norway and Canada as states capable of finding a solution to the climate crisis in the Arctic. This task does not require a special legal regime for the Arctic Ocean – the existing norms of international law and national regulations of the participating countries are sufficient, but only with their continued comprehensive cooperation[39].

11. The Declaration of the Circumpolar Inuits on Sovereignty in the Arctic (2009). On behalf of the Inuit living in Greenland, Canada, the USA and Russia, it reminded states that "in pursuit of economic opportunities in the Arctic, which continues to warm up", it is necessary, among other things, to strive for environmental sustainability, to prevent the harmful exploitation of resources and the marginalization of the indigenous population[40].

12. The Nuuk Declaration on Environment and Development in the Arctic (2010). It recalled that the Inuit are a single people living in four different countries, but united by a respectful attitude towards the shared culture, resources and "life itself" with other peoples. It recognized the fact that the rights of indigenous peoples, including Inuit, along with fundamental human rights, have not yet been fully implemented. The document indicated fragility of the Arctic environment under the increasing land and water resources development. It called for the exchange of knowledge with the indigenous population and their more active participation in the protection of the territories where they live[41].

13. The Declaration following the meeting of the Heads of Government of the BEAC member countries (2013). It confirmed the commitment of the participating countries to the principles of the First Kirkenes Declaration and focused on environmental protection and the protection of the rights of the indigenous population. The latter include the right to participate in decision-making on issues affecting their rights, as well as the rights of indigenous peoples to preserve the traditional way of life, including hunting, fishing and reindeer husbandry[42].

14. The International Code for Ships Operating in Polar Waters (Polar Code 2014). It was adopted in order to improve the safety of ship operation and limit its impact on

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38 The Inuvik Declaration. (2008, December 5). https://clck.ru/3NNd5z

39 The Ilulissat Declaration. (2008, May 27–29). https://goo.su/vuqV

40 A Circumpolar Inuit Declaration on Sovereignty in the Arctic. (2009). https://clck.ru/3NNdEn

41 Nuuk Declaration. (2010). https://clck.ru/3NNdFu

42 The Declaration following the meeting of the Heads of Government of the BEAC member countries. (2013). https://clck.ru/3NNdGr

humans and the environment. In its Preamble, it recognizes that "communities of Arctic coastal peoples may be, and polar ecosystems are vulnerable to human activities such as shipping", and in Part II-A, it establishes pollution prevention measures (operational and structural requirements)[43].

15. The Reykjavik Declaration (2021). It recognizes the inextricable link between human, animal and environmental health and calls for further development of cooperation in the field of safety and health of Arctic communities and the social well-being of Arctic residents. It also calls for continued research on new, emerging and regulated pollutants and for strengthening measures to implement commitments, related to mercury (Hg) and carbon trioxide (CO3) pollution[44].

16. The Ilulissat Declaration (2022). It confirmed the status and goals of the Inuit Circumpolar Council, recognizing the entry of the Inuit and the rest of humanity into an era of environmental and global insecurity and condemning threats to food security, changes in wildlife, as well as environmental and industrial impacts on the territories of Inuit communities[45].

17.The Helsinki Declaration on Climate Change in Antarctica (2023). It recognized that if CO_2 emissions remain at current levels, the atmosphere and oceans will continue to heat up and the oceans – to acidify. The Declaration once again confirmed that mining for any purpose other than scientific research is prohibited on the continent, and stated the need to jointly study the impact of global climate change on Antarctica, as well as the role of Antarctica and the Southern Ocean in regulating the global climate and future rise of sea level[46].

The central organization for cooperation in the Arctic is the Arctic Council (further referred to as the AC), established in 1996 by the Arctic states (Russia, Denmark, Norway, Sweden, Finland and Canada). Its goals are environmental protection and sustainable development of the region[47]. The AC, as an intergovernmental forum, includes six permanent participants representing the interests of the indigenous peoples of the Arctic: the Aleutian International Association, the Athabaskan Arctic Council, the International Gwich'in Council, the Inuit Circumpolar Council, the Sami Union, and the Russian Association of Indigenous Peoples of the North. The AC also has special working groups, such as the AMAR International Charitable Foundation, which assesses the state of the Arctic environment, and PAME, conducting policy research and developing measures to protect the marine environment[48]. In addition to the AC, the operating organizations

43 The International Code for Ships Operating in Polar Waters (Polar Code). (2014). https://clck.ru/3NNdQw

44 The Reykjavik Declaration. (2021). https://clck.ru/3NNdST

45 Inuit Circumpolar Council. The Ilulissat Declaration of 2022. (2022). https://clck.ru/3NNdV3

46 The Helsinki Declaration on Climate Change in Antarctica. (2023). https://clck.ru/3NNdXN

47 Arctic Council. https://clck.ru/3NNdZC

48 Arctic Fund. AMAP, AEPS, CAFF, PAME International programs. https://clck.ru/3NNdaX

are: 1) The International Barents Secretariat, established under the Agreement between the governments of Finland, Norway, the Russian Federation and Sweden to develop cooperation in the Barents/Euro-Arctic region[49]; 2) Barents/Euro-Arctic Region Council (BEAC), established in 1998 to maintain cooperation in the field of environmental protection and improve the situation of the indigenous population of the North[50]; 3) the Barents Regional Council (BRC), which is an independent multilateral cooperation body of 13 administrative-territorial entities of the Barents region, comprising their leaders and representatives of indigenous peoples (Sami, Veps and Nenets) [51]; 4) an independent Working group on indigenous peoples with the status of a permanent advisory body to the BEAC and the BRC[52]. To date, the Russian Federation has denounced the Agreements between the governments of Finland, Norway, the Russian Federation and Sweden on the establishment of the International Barents Secretariat for the Development of Cooperation in the Barents/Euro-Arctic region (Decree of the Russian Government No. 921-p dated 04/16/2025[53]) and was excluded from the BEAC, which Finland also left[54].

In Antarctica, the role of a special international body is performed by the Antarctic Treaty Secretariat, which has established an Environmental Protection Committee. The functions of the latter are to present considerations and formulate recommendations to the parties in connection with the implementation of the Protocol on Environmental Protection, including the operation of its Annexes, for consideration at Antarctic Treaty Consultative Meetings (Article 11 of the Protocol on Environmental Protection)[55].

2. The role of the Arctic and Antarctic in ensuring the data centers development and operation

Over the past few years, a number of successful projects have been implemented in the Arctic to locate data processing centers (further referred to as DPCs). The latter appear to be a new type of critical infrastructure. The main reason for their location was the abundant reserves of electricity, including green one, and its low price, coupled with a cold climate,

49 Agreement between the governments of Finland, Norway, the Russian Federation and Sweden. (2007). https://clck.ru/3NNdhK

50 Barents/Euro-Arctic Region Council (BEAC). (2021, July 1). https://clck.ru/3NNdic

51 Barents Regional Council. (2021, July 2). https://clck.ru/3NNdjX

52 Barents/Euro-Arctic Region Council (BEAC). (2021, July 1). https://clck.ru/3NNdmL

53 Decree of the Russian Government No. 921-r of 16.04.2025. (2025). https://clck.ru/3NNdnn

54 Cabinet of Ministers denounced the agreement on cooperation in Barents region. (2025, April 18). TASS. https://clck.ru/3NNdob

55 Protocol on Environmental Protection to the Antarctic Treaty of October 4, 1991. (1998). https://clck.ru/3NNdpS

fiber-optic connectivity, and reasonable land prices (Saunavaara & Laine, 2021). For example, Iceland is positioning itself as an ideal location for DPC construction due to its cheap green energy and strives to become the largest data center operator in the Nordic countries[56]. Indeed, assessing its prospects for the DPC industry development, the KPMG international audit and consulting corporation highlighted such advantages as the possibility of using natural cooling (ventilation systems without additional coolers) and fairly low electricity prices (while energy consumption in Iceland increased by 75 % on average over a five-year period in 2018)[57]. The growth of requests for the construction and expansion of existing DPCs continues along with an increase in projects using AI technologies and the amount of data that needs to be processed. In particular, Verne in Iceland owns a DPC using hydro and geothermal energy. According to the company, it "does not cause any damage to the planet", but uses liquid cooling technologies[58]. It is noteworthy that Verne does not specify on its official page which type of liquid cooling is used – indirect water, immersion using a special mineral oil or some other technology. The Kolos data center, which was supposed to be located in the Arctic, in Norwegian Ballangen, also deserves attention. It was planned but never built due to changes in Norwegian legislation regarding miners. Claimed to be the largest in the world, it would be located on 600,000 square meters and use climate cooling, operating on hydroenergy[59]. In an effort to promote transparency and increase trust, the Norwegian Association of the Data Center Industry (Norsk Datasenterindustri) presented a report on DPCs for 2023–2024. It once again emphasized that the growth of this industry is due to digitalization and the widespread introduction of artificial intelligence, which causes additional CO2 emissions (in 2024, these emissions were 12 times higher in the UK and Germany than in Norway). The report confirmed the importance of data centers for the country's economy and recalled that this industry was brought under control through amendments to the Law "On Electronic Communications"[60]. Finland, which hosted the Meta[61] data center, is not far behind. In particular, one of their data centers, which processes huge amounts of data, is located in Lulea, Lapland. According to the company, the goal of zero CO_2 emissions was achieved there by using "clean and renewable energy" and a strategy of adding renewable energy sources to the local

56 Moss, S. (2024, 26 March). Iceland's AI moment. https://clck.ru/3NNeJD

57 The Icelandic Data Center Industry. (2018, March). https://clck.ru/3NNeLi

58 High-performance computing in Iceland. Verne. https://clck.ru/3NNeNQ

59 Kolos Data Center. https://clck.ru/3NNoHk

60 The Data Center Industry in Norway 2023–2024. (2024). Norwegian Data Center Industry. https://clck.ru/3NNeX4

61 The organization is recognized as extremist, its functioning is prohibited in the territory of the Russian Federation.

network. Moreover, the company claimed that it would "restore more water than consume" by 2030[62].

In Russia, both non-profit and commercial data centers also continue to grow. Technological modules with a total capacity of 4,000 devices with a capacity of 16 MWatt will soon be placed directly above the Arctic Circle on a land plot of 15,000 square meters. These are part of a data center owned by Intelion Sever, a resident of the Russian Arctic zone[63]. To avoid the impact of sanctions, the state-owned Rosatom Corporation is also planning to launch a data center in the Murmansk oblast. It will be based on the Kola Nuclear Power Plant, where about 20–25 % of electricity remains unclaimed, while the cold climate makes it possible not to install cooling systems, also reducing electricity consumption[64]. A Russian hosting provider RUVDS went even further and in 2024 launched a modular data center on a drifting ice floe, directly next to the North Pole. It was powered by diesel generators, as part of an experiment that was completed within a month due to the appearance of a crack on the ice floe[65]. RUVDS has planned a similar project for 2025, but this time the data center will be located at the South Pole[66].

Chile, which is also striving to become a country that attracts data center operators, plans to extend underwater cables to the last of the continents deprived of them, to the Antarctic. The Antarctic SMART Cable, with almost unlimited bandwidth, is to connect Antarctica's largest research center to either the American McMurdo Station, or New Zealand's Invercargill, or Australia's Sydney. This would improve current and future Antarctic research and create the opportunity for stable interaction for scientists and staff[67].

3. Risks associated with the growth of the data center industry and attempts to mitigate them

The first group of risks associated with the construction of data centers in the Arctic states and the Antarctic certainly comprises the risks of their negative impact on the environment. The Norwegian research center SINTEF Energi AS draws attention to the fact that when electric power is used to cool the data center (air cooling of data processors), an excessive amount of heat is generated at a temperature of 40–50 °C. This temperature

62 Meta's* Luleå Data Centre. https://clck.ru/3NNedg (* The organization is recognized as extremist, its functioning is prohibited in the territory of the Russian Federation)

63 First commercial DPC in Murmanskoblast to be launched by a Russian Arctic zone resident with state support. (2023, July 13). Corporation for the Far East and Arctic development. https://clck.ru/3NNeje

64 "Arktika" DPC at Kola nuclear power station will be built solely with Russian equipment. (2022, July 18). TASS. https://clck.ru/3NNeoC

65 First DPC in the Arctic! RuVDS. https://clck.ru/3NNepL

66 RUVDS will test server equipment in the Antarctic. (2024, October 16). RuVDS. https://clck.ru/3NNeqT

67 Winston Qiu. (2024, December 14). US NSF Requests for Information on Antarctic SMART Cable. Submarine cable networks. https://clck.ru/3NNevG

increases up to 60-80 °C if more efficient cooling systems are used (liquid or two-phase, in which the liquid refrigerant evaporates in a cold plate heat exchanger). In both cases, this excess heat is usually not used in any way; moreover, CO2 emissions from data centers already account for at least 2 % of the global total, which is equivalent to damage from the aviation industry[68]. Excess heat, if it has a sufficiently high temperature, can be used to heat buildings and for other industrial and household purposes, as is done, for example, in Sweden (Yuan et al., 2023). However, today excess heat is most often released into the atmosphere, which, for example, is noticed by PivIT Global specialists (a data center maintenance and repair company). They remind that excess heat cannot be used to heat houses and buildings if the data center is located in a remote and/or sparsely populated region. Moreover, such disposal requires the creation of an expensive infrastructure[69]. In addition to excess heat, greenhouse gases such as CO_2, CH_4 and N_2O (nitrous oxide) are released into the atmosphere. This is directly related to the operation and construction of data centers, where leaks of refrigerants used in cooling systems pose a particular threat to the environment. One must not forget about the use of diesel generators running if the main electricity is disconnected or during equipment testing, which occurs on a regular basis. There is also enormous consumption of water, given that most operating data centers use evaporative cooling, which releases heat into the environment (Thangam et al., 2024). For example, according to official data provided in a Google report, the total amount of greenhouse emissions associated with their activities increased by 48% in 2023 alone compared to 2019[70]. Independent investigations results look even less optimistic. The British Guardian presents its own analysis, according to which emissions from data centers owned by such technology giants as Google, Microsoft, Meta[71] and Apple from 2020 to 2022 could be 662% higher than officially registered ones; the underestimation is the result of imperfect accounting and certification systems[72].

The situation is aggravated by the fact that technologies are developing faster than their legal regulation, for example, in Norway[73]. In an attempt to bring the data centers under control, the Norwegian legislator supplemented Articles 3–7 of the Law “On Electronic Communications”. Now they stipulate mandatory registration of data center operators and a recommendation to use “the best available technical solutions, recognized standards,

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68 Foslie, S. St. & Moen, O. M. (2021, March 16). This is how we reduce data centres carbon footprint. SINTEF. https://clck.ru/3NNkPD

69 4 Ways Data Center Heat Can Be Reused. (2024, March 26). Pivit Global. https://clck.ru/3NNkN7

70 Google Environmental Report 2024. https://clck.ru/3NNkM4

71 The organization is recognized as extremist, its functioning is prohibited in the territory of the Russian Federation.

72 Data center emissions probably 662 % higher than big tech claims. Can it keep up the ruse? (2024, September 15). https://clck.ru/3NNkL8

73 Andreassen, B. L. (2023, April 28). Scandinavian data centres: fewer jobs and less profit than forecast. Nordic Labour Journal. https://clck.ru/3NNkKJ

cost and usefulness of the measures applied"[74]. Assumingly, the following generally recognized standards and certificates applicable to DPCs are meant:

1. ISO 14001 is an internationally recognized standard for environmental management systems that contributes to the achievement of the UN SDGs on climate protection, responsible consumption and production, affordable and clean energy, etc.[75]. This international standard defines the requirements for an environmental management system that an organization can use to improve its environmental performance, namely, the organization's environmental policy development, environmental impact assessment, pollution control, potential risk assessment, and striving for continuous improvement of environmental performance[76].

2. ISO 50001 is an internationally recognized standard that implies the integration of energy management into the overall efforts of a certified company to improve environmental management[77].

3. LEED is an internationally recognized system for assessing the environmental friendliness of all types of buildings, which is based on solving the problem of climate change (protecting and restoring water resources, protecting biodiversity, reducing negative impacts on the planet's climate, etc.) and achieving the UN SDGs[78].

4. EU DC CoC is a European Data Centers Code of Conduct, which is a voluntary initiative, developed by the Joint Research Center and guiding data center owners and operators "in cost-effective reduction of energy consumption without compromising the critical function of their facilities"[79].

5. BREEAM is an internationally recognized certificate for assessing the environmental sustainability of buildings, where the ultimate goal is zero CO2 emissions by 2050[80].

6. Nordic Swan Ecolabel is an internationally recognized certificate based on the assessment of a product's full life cycle. Its purpose is to reduce the environmental impact during the production and consumption of goods[81]. Data centers do not belong to any of the Nordic Swan Ecolabel certified groups; however, the latter include materials used in construction and maintenance, as well as offices located on a data center territory[82].

7. EKOenergy label is an internationally recognized certificate of renewable electricity, heat, gas and cooling. It implies annual audit of the compliance of sold or used labeled

74 Ekomloven. (2024). Lovdata. https://clck.ru/3NNk43

75 ISO 14001:2015. https://clck.ru/3NNk5U

76 Environmental management systems – Requirements with guidance for use. https://clck.ru/3NNk6e

77 ISO 50001. https://clck.ru/3NNk7h

78 LEED rating system. https://clck.ru/3NNkB7

79 EU. European Code of Conduct for Energy Efficiency in Data Centres. https://clck.ru/3NNkDm

80 Achieve your net zero goals with BREEAM certification. https://clck.ru/3NNkEs

81 Why choose ecolabelling? Nordic Swan Ecolabel. https://clck.ru/3NNkGq

82 Criteria. Nordic Swan Ecolabel. https://clck.ru/3NNjgb

electricity with the EKOenergy criteria (location of solar panels and wind turbines; geothermal and offshore installations outside protected natural areas; production of hydroelectric power with the account the fish migration and the preservation of aquatic species' habitats, etc.) [83].

8. ASHRAE are international recommendations on heating, cooling and air conditioning[84].

9. Carbon Trust is an internationally recognized certificate aimed at reducing operational emissions and greenhouse gases. It requires companies to continuously finance relevant changes and disclose information about their implementation[85].

10. Provisions of European Union regulations, such as Commission Regulation 2019/424 of March 15, 2019, establish requirements for the environmental design of servers and data storage devices in accordance with Directive 2009/125/EC of the European Parliament and the EU Council[86].

At the same time, there is a trend in national legislations to mitigate the requirements. For example, the US plans to ease environmental restrictions for data centers in certain federal areas, where special power plants working on natural gas will be built. The latter will service massive data centers that consume at least 1 GW of electricity (the amount of energy consumed by a city with a population of 10,000,000 people) [87]. The corresponding order was signed by President Joe Biden in January 2025[88]. Russia is in the legal vanguard in this field. The Code of Rules 541.1325800.2024 "Buildings and structures of data processing centers. Design Rules" was adopted by the Russian Ministry of Construction to ensure compliance with the Federal Law No. 384-FZ dated December 30, 2009 "Technical Regulations on the Safety of Buildings and Structures". It complies with the requirements of Federal Laws No. 123-FZ dated July 22, 2008 "Technical Regulations on Fire Safety Requirements" and No. 261-FZ dated November 23, 2009 "On Energy Conservation and Energy Efficiency Improvement and on Amendments to Certain Legislative Acts of the Russian Federation". It also established mandatory general requirements for compliance with sanitary, epidemiological and environmental norms for the protection of human health, environment and adjacent buildings, energy saving and safety, and to basic engineering and technical systems of electrical and cold supply[89].

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83 The EKOenergy ecolabel. EKOenergy. https://goo.su/GWlE2

84 Updated and Improved Standards Review Database. ASHRAE. https://clck.ru/3NNjkf

85 Net Zero transition planning and delivery. Carbon Trust. https://clck.ru/3NNjno

86 EU. (2019). Document 32019R0424. https://clck.ru/3NNjrF

87 Biden plan would encourage AI data centers on federal lands. (2024, December 19). The Washington Post. https://clck.ru/3NNjsv

88 Biden Wants Data Centers, Clean Energy on Federal Land by 2027. https://clck.ru/3NNjuN

89 Order of the Russian Ministry of Construction. Code of Rules 541.1325800.2024 of 23.12.2024. (2024). https://clck.ru/3NNje3

Environmental risks include land-use changes related to the construction, operation and provision of data centers with electricity. The construction of a data center and related infrastructure involves deforestation of large areas, as well as intake of water, often drinking water, which can lead to irreversible environmental consequences (Thangam et al., 2024). Green energy also involves active intervention in the natural landscape, from installing wind turbines and solar panels to drilling deep wells. This is done in Iceland, for example, where demand for electricity is higher than it can offer. The country developed the Icelandic Deep Drilling Project (IDDP), which implies increasing the number of deep wells in order to increase geothermal energy production[90].

Finally, projects for the construction of deep-sea marine cables also involve environmental risks. The entire life cycle of such a cable, including installation, maintenance and decommissioning, is associated with environmental impacts. These include: disturbance of the species' habitat, chemical and noise pollution, changes in electromagnetic fields, heat generation and other types of environmental damage (Taormina et al., 2018). It would be unfair to say that the laying and operation of deep-sea cables are not regulated in any way; nevertheless, both national and international laws pay much more attention to the cables protection than to environmental protection in the areas where they are laid. For example, Article 79 of the United Nations Convention in the Law of the Sea (1982) gives all countries the right to lay underwater cables and pipelines on the continental shelf, provided that "reasonable measures are taken to explore the continental shelf, exploit its natural resources, and prevent, reduce, and control pollution". It also obliges them to take into account previously laid cables and pipelines so as not to impair capabilities for their repair and maintenance[91]. The provisions of this Article serve as the basis of, for example, the internal US regulation. It this country, the National Association for Safety at Sea is responsible for issuing permits for laying underwater cables, including permits for placing underwater cables on the territories of national marine reserves[92].

The second group of risks associated with the growth of the data center industry in the Arctic states are social risks. Extraction of metals and minerals necessary for the data center operation, direct development and associated logging, construction of roads on pastures and lands of cultural value to the indigenous peoples living there, construction of hydro and other power plants – all this is a continuation of operational practices, including in relation to the Sami living in the Arctic regions. The legal protection of their pastures, as well as the realization of their rights as an indigenous people, is often only nominal and is reduced to zero with the growing demand for green electricity and the construction of data centers. At the same time, the Sami once again experience such

90 Moss, S. (2024, March 26). Iceland's AI moment. DCD. https://clck.ru/3NNjbz

91 United Nations Convention in the Law of the Sea. (1982). https://clck.ru/3NNjaX

92 Submarine Cables – Domestic Regulation. NOAA. https://clck.ru/3NNjXA

legacy of the past as land seizures and even forced resettlement. A bright example is the previously mentioned data center in Lulea, located on the pasture of Sami reindeer herders. Its construction was not even discussed with them[93]. The United Nations has already drawn attention to this problem, calling for the rights of indigenous peoples to be taken into account when developing deposits of "critically important minerals" associated with deforestation, water and soil pollution, loss of biodiversity and forced relocation of the indigenous population[94]. Promises to create a large number of jobs in places where indigenous peoples live and in remote areas of DPCs location are also not always true – instead of 30,000 jobs in Lulea, only 56 were created[95]. Other local residents also face deteriorating living conditions. Among the reasons are rising prices – for example, in Norway, which is attractive for its cheap and excess electricity, greenhouses in a number of regions were to be closed due to rising electricity prices[96]. All this leads to a rise of protests against the data centers construction around the world and, of course, in Northern Europe as their concentration point. Citizens believe that their rights and legitimate interests are violated, the quality of life is decreasing, and land is given to foreign technology companies as a priority[97].

Conclusions

The research results demonstrate that the construction of data centers and the development of the industry accompanying their operation and maintenance in the Arctic and Antarctic are associated with specific risks. The latter are determined by their geographical location, vulnerability of biological diversity and the ethnic composition of the population. These risks are divided into two main groups: environmental and social. Environmental risks are associated with the fact that the pace and scale of the occurring changes do not allow local ecological systems to adapt in a timely manner, and future changes cannot be adequately quantified (Robinson, 2022). At the same time, the slightest temperature fluctuations in their regions, as well as an increase in anthropogenic activity, can cause a chain reaction of irreversible climatic, sociological and economic changes throughout the planet[98]. Thus, the biological, food and physical

93 Sargysan, S. "Data Centers and Indigenous Sovereignty". https://clck.ru/3NNj6F

94 The UN urges to take into account the rights of indigenous peoples when developing deposits of "critically important minerals". (2025, April 23). UNO News. https://clck.ru/3NNj9a

95 Scandinavian data centres: fewer jobs and less profit than forecast. (2023, April 28). Nordic Labour Journal. https://clck.ru/3NNjBU

96 Andreassen, B. L. (2023, May 30). "Saving the environment" with liquid-cooled data centres. Nordic Labour Journal. https://clck.ru/3NNjEy

97 Tozzi, Ch. (2024, June 13). Why Communities Are Protesting Data Centers. Data Center Knowledge. https://clck.ru/3NNjLR

98 FAQ: Climate change in the Polar regions. SCRIPPS. https://clck.ru/3NNj2m

security of humanity is at risk. Social risks are associated with industrial development and land-use changes in the Arctic countries, namely with the ineffective implementation of the indigenous peoples' rights (the right to land, the right to health and a safe environment, the right to a decent life, the right to preserve and develop their own culture, etc.)[99]. In the scientific literature, this approach has already been called "green imperialism", i.e. the development of climate strategies in the interests of global elites with further marginalization of vulnerable communities. This implies the aggravation of centuries-old inequality and historical injustice. A striking example is the extraction of rare earth minerals and metals for the "green shift", disproportionately affecting the territories inhabited by indigenous peoples (Boretti, 2025). In the future, it may lead to new local and international conflicts. Today, we are already witnessing the territorial ambitions of the United States towards Greenland – a self-governing autonomy within the Danish Kingdom, the main population of which is Inuit.

The analysis of the international legal framework has revealed that, despite a large amount of declarations, conventions and agreements, it lacks specific acts to meet the current challenges of the new technological revolution. The latter requires increased mining, construction of modular and massive data centers, and laying of deep-sea cables. The Arctic territories are becoming increasingly attractive for that, while the Antarctic is turning into a center of scientific research on climate change. This, paradoxically, is associated with the growing harmful anthropogenic impact on the continent regions. Further industrial and anthropogenic development of the territories of the Arctic states and Antarctica will have global environmental and social consequences. At the same time, the national legislation shows low effectiveness in leveling the risks identified in this article. We can conclude that there is an urgent need to establish international regulation of the development of the data center industry in the Arctic and Antarctic. This system of regulation must include uniform requirements for certification and reporting, as well as responsibility for violations, taking into account the specifics of the environmental safety of these territories, their cultural and social characteristics.

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WoS Researcher ID: https://www.webofscience.com/wos/author/record/MTE-8168-2025
РИНЦ Author ID: https://www.elibrary.ru/author_items.asp?authorid=1211522

Conflict of interest

The author declares no conflict of interests.

Financial disclosure

The research had no sponsorship.

Thematic rubrics

OECD: 5.05 / Law
PASJC: 3308 / Law
WoS: OM / Law

Article history

Date of receipt – May 1, 2025
Date of approval – May 20, 2025
Date of acceptance – September 25, 2025
Date of online placement – September 30, 2025

Научная статья
УДК 34:004:341.4:004.8
EDN: https://elibrary.ru/gcvuaw
DOI: https://doi.org/10.21202/jdtl.2025.15

Международные основы правового регулирования индустрии центров обработки данных в арктических государствах и Антарктике

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Ключевые слова

Антарктика,
Арктика,
коренные народы,
международное право,
право коренных народов,
право,
центры обработки данных,
цифровые технологии,
экологическая безопасность,
экологическое право

Аннотация

Цель: критически оценить эффективность существующих международных правовых норм в условиях новых вызовов технологического прогресса, связанных с развитием индустрии центров обработки данных в арктических государствах и Антарктике.

Методы: методологическую основу исследования составляет комплекс специальных и общих методов научного познания, включая юридическую компаративистику, контент-анализ, дедукцию, индукцию, формально-логический метод и анализ документов. Автор уделяет внимание междисциплинарным подходам для объективной оценки экологических, социальных и правовых рисков, возникающих вследствие роста индустрии центров обработки данных в регионах с повышенной климатической и социальной уязвимостью.

Результаты: проведен анализ международных правовых актов, регулирующих деятельность центров обработки данных в полярных регионах. Выявлены ключевые риски, делящиеся на экологические (нестабильность локальных экосистем, неадаптивность к быстрым изменениям, риск потери биологического разнообразия и выбросы парниковых газов) и социальные (маргинализация и нарушение прав коренных народов, утрата традиционных культур и образа жизни, рост социальной напряженности). Указана неизбежность появления новых конфликтов и вызовов вследствие недостаточной эффективности национальных и международных механизмов регулирования. Констатирована необходимость создания специализированных международных правовых инструментов, учитывающих специфику экологической безопасности полярных территорий.

Научная новизна: статья впервые дает комплексную картину совокупных рисков и недостатков действующего международного регулирования индустрии центров обработки данных в арктических государствах и Антарктике. Проведен детальный сравнительный анализ нормативной базы, показана несоответственность применения принципов «мягкого права» в полярных регионах в эпоху четвертой технологической революции. Обосновано требование о создании новых сертификационных и отчетных процедур на всем жизненном цикле центров обработки данных с учетом правового и культурного контекста.

Практическая значимость: результаты работы ориентированы на совершенствование международной и национальной политики в сфере регулирования индустрии центров обработки данных, разработку стандартов сертификации и отчетности, эффективных в условиях климатических, социальных и экономических особенностей арктических стран и Антарктики. Направлены на минимизацию негативного влияния антропогенных факторов и обеспечение баланса между индустриальным развитием и сохранением уникальных природных и культурных ландшафтов.

Для цитирования

Шумакова, Н. И. (2025). Международные основы правового регулирования индустрии центров обработки данных в арктических государствах и Антарктике. *Journal of Digital Technologies and Law*, *3*(3), 369–396. https://doi.org/10.21202/jdtl.2025.15

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WoS Researcher ID: https://www.webofscience.com/wos/author/record/MTE-8168-2025
РИНЦ Author ID: https://www.elibrary.ru/author_items.asp?authorid=1211522

Конфликт интересов

Автор сообщает об отсутствии конфликта интересов.

Финансирование

Исследование не имело спонсорской поддержки.

Тематические рубрики

Рубрика OECD: 5.05 / Law
Рубрика ASJC: 3308 / Law
Рубрика WoS: OM / Law
Рубрика ГРНТИ: 10.87 / Международное право
Специальность ВАК: 5.1.5 / Международно-правовые науки

История статьи

Дата поступления – 1 мая 2025 г.
Дата одобрения после рецензирования – 20 мая 2025 г.
Дата принятия к опубликованию – 25 сентября 2025 г.
Дата онлайн-размещения – 30 сентября 2025 г.