

Arctic and North. 2022. No. 46. Pp. 105–127.

Original article

UDC 339.97(98)(045)

doi: 10.37482/issn2221-2698.2022.46.127

## Features of the Arctic Policy of the United States and Canada and the Contribution of Their Northern Universities in Its Implementation \*

**Konstantin S. Zaikov**<sup>1</sup>, Dr. Sci. (Hist.), Professor

**Nikolay A. Kondratov**<sup>2✉</sup>, Cand. Sci. (Geo.), Associate Professor

<sup>1,2</sup> Northern (Arctic) Federal University named after M.V. Lomonosov, Nab. Severnoy Dviny, 17, Arkhangel'sk, 163002, Russia

<sup>1</sup> k.zaikov@narfu.ru, ORCID: <https://orcid.org/0000-0001-6479-416X>

<sup>2</sup> n.kondratov@narfu.ru, ORCID: <https://orcid.org/0000-0002-7763-1797>

**Abstract.** The United States and Canada, along with Russia, Denmark, Iceland, Norway, Finland and Sweden, are the so-called "official" Arctic countries. In the 21st century, The United States and Canada have begun to implement national Arctic strategies and updated them. The accepted documents have both similarities and differences. The United States and Canada are active members of the Arctic Council and view it as a platform for negotiations on a wide range of issues related to the development of the Arctic. The United States has come a long way in the Arctic, including in terms of regulation. Unlike other Arctic countries, the United States has a minimal area of access to the Arctic Ocean, their strategy as a whole is turned "outward". The first Canadian strategy for the development of the Northern Territories (2013) is addressed directly to the development of the northern periphery of the country, formulates tasks for its sustainable socio-economic development, the development of indigenous peoples, and the support of sovereignty. In 2019, the updated strategy presented already combined national and international goals for the development of the Arctic and the North. To advance national interests in the Arctic, the US and Canada have developed and funded a geographically, infrastructure, stakeholder, and thematically differentiated Arctic research policy in which higher education institutions play an important role and are used to reinforce their geopolitical aspirations. The purpose of the article is to characterize the features of the Arctic strategies of the USA and Canada, as well as to analyze the contribution of universities and colleges in Alaska (USA) and the northern territories and provinces of Canada to the implementation of research policy in the Far North and the Arctic. The practical significance of the paper is in the possibility of its use in the educational process, as well as for the analysis and updating of international aspects of research activities by universities in the Arctic zone of Russia.

**Keywords:** Arctic, development strategy, research policy, university

### Introduction

In the 21st century, leading foreign countries have shown an increasing interest in the Arctic region by formulating strategies and programs for the development of national areas of the High North and Arctic zones. Each country independently determines the boundaries of the Far North (Arctic zones) and the concept of the Arctic. Such "free" approaches make it difficult to develop a coherent policy for managing the vast and unconventional Arctic region in the interests of balanced environmental management and comprehensive human security.

---

\* © Zaikov K.S., Kondratov N.A., 2022

For citation: Zaikov K.S., Kondratov N.A. Features of the Arctic Policy of the United States and Canada and the Contribution of Their Northern Universities in Its Implementation. *Arktika i Sever* [Arctic and North], 2022, no. 46, pp. 105–127. DOI: 10.37482/issn2221-2698.2022.46.127

There are many similarities in the adopted in 2010–2014 strategies for the development of the territories of the Arctic (USA)<sup>1</sup> and the Far North (Canada)<sup>2</sup> [1]. In the context of this article, it should be noted that both countries, when implementing policy documents, recognize the need to develop science and education in the Far North and the Arctic, extend expeditionary activities, and fill the Arctic information and statistical center ([arcticstat.org](http://arcticstat.org)) with relevant content. In order to implement the provisions of the Arctic strategies, the meteorological services of the United States and Canada operate national Arctic Regional Climate Centers, where information (temperature, precipitation, sea ice condition) is updated 2–3 times a year and then provided to users (governments, shipping, cruise, fishing companies, scientific organizations)<sup>3</sup>.

Despite similar historical and socio-economic development, the educational systems in the northern regions of the US and Canada are different. The North American model is characterized by minimal interference of state authorities in the development of higher education, a high share of responsibility of provinces and regions, and a diversity of funding sources for research and educational activities of universities. It should be noted that in Russia, including the subjects of the Arctic zone, the modernization of higher education is based on the principles of a unified educational space, which implies a significant role of federal authorities in determining the quality standards of personnel training, the desire to link them with professional industry standards.

As shown in figure 1, the number of universities in the Arctic region (in the regions of the Far North) differs in each Arctic country. Their maximum number is in the countries of Northern Europe, as well as in the Far North of Russia, especially in the Murmansk Oblast. The least scientific and educational space is formed among foreign countries with Arctic areas — in Greenland and in the Far North of Canada, which can be explained by the historical features of the development of these territories. The peculiarity of the Canadian experience is the use of tools for interdisciplinary research cooperation at both national and international levels, including in the Arctic Council and using the thematic networks of the University of the Arctic<sup>4</sup>.

---

<sup>1</sup> National Strategy for the Arctic Region. May 2013. USA, Washington D.C. 13 p., United States Coast Guard. Arctic Strategy. May 2013. USA, Washington D.C. 48 p.

<sup>2</sup> Canada's Northern Strategy. Our North, Our Heritage, Our Future / Government of Canada, Ottawa, 2009, 48 p.; Canada's Arctic and Northern Policy Framework. URL: <https://www.rcaanc-cirnac.gc.ca/eng/1560523306861/1560523330587> (accessed 10 May 2021).

<sup>3</sup> Arctic Regional Climate Centre. URL: <https://arctic-rcc.org/> (accessed 10 November 2020).

<sup>4</sup> University of the Arctic. URL: <https://education.uarctic.org/universities/canada/> (accessed 19 April 2021).

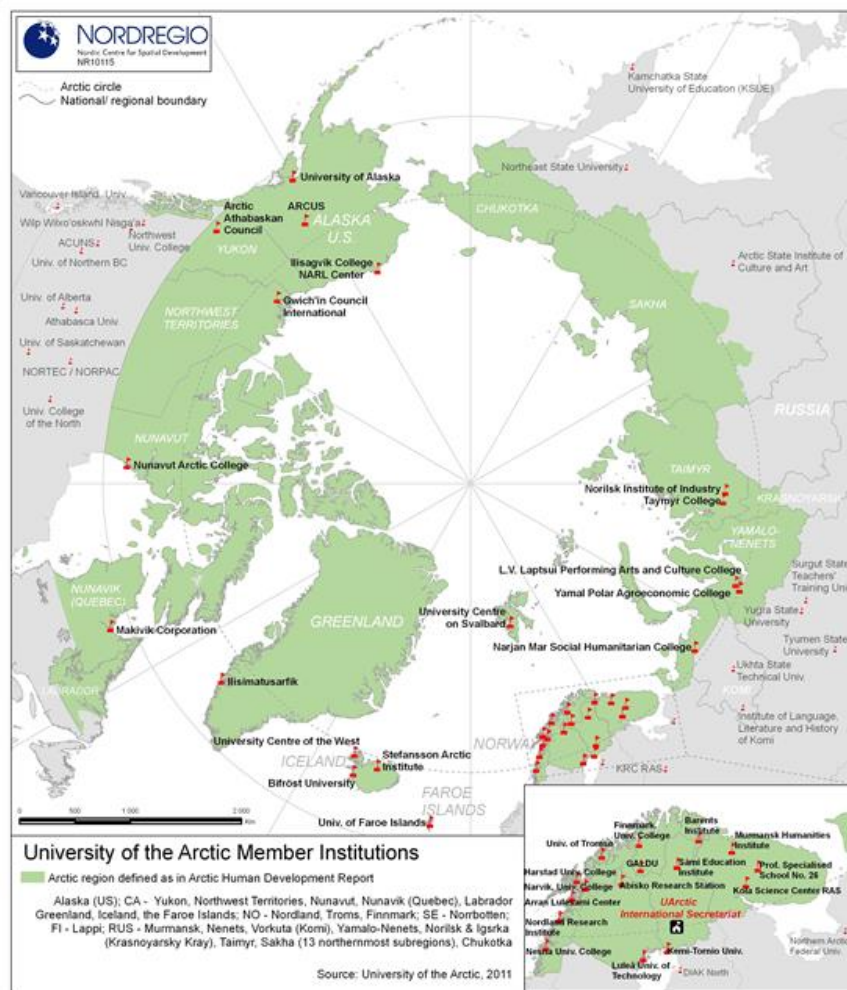


Fig. 1. Universities of the Arctic region, 2011<sup>5</sup>

The analysis of Russian-language literature revealed an information vacuum on the topic of the article. The Arctic Human Development Report 2014 of the Arctic Council hardly discusses the topic of research and education space and topics of research in the northern territories of Canada and Alaska.

Robards M.D., Huntigton H.P. and others view knowledge from a philosophical perspective, characterizing patterns of “co-production of knowledge” in indigenous communities as a response to global climate change, which entails changes in communications and trade. “Attention to local needs, perspectives and cultures is seen as essential to promote effective adaptation planning, or, more broadly, sustainability of indigenous peoples...”. “The field of the ‘science-policy interface’ goes beyond observing or evaluating changes at different scales and perspectives, and identifying conditions conducive to the co-production of practical knowledge. This approach requires the development of response tools that can take into account the dynamic relationships between people, wildlife, and habitats that span across cultures, timeframes, and sometimes national borders” [2, p. 205].

<sup>5</sup> Nordregio. Maps. Research. URL: <https://archive.nordregio.se/en/Nordregio-Research/index.html> (accessed 19 April 2021).

We have found that rural and remote communities within the circumpolar world face the challenge of providing any kind of education, from secondary to post-higher, at the student's location due to geographical barriers and a lack of available resources. Significant experience has been accumulated around the world to overcome such isolation. For example, Butler L., Bullin C. et al., using the nursing education program as an example, show that education in the Canadian North can go beyond traditional teaching methods and include a student-centered approach based on distance learning. "Distributed learning not only mitigates geographical and resource challenges but, most importantly, it provides learning experiences that are context relevant". This "novel educational approach supports the educator to be in two places at one time in a synchronous, face-to-face delivery in which students are taught from a distance rather than having to relocate. The authors advise that there is no normative preference for a particular type of technology". [3, p. 42].

Petrov A.N. examines the socio-economic development and resettlement of the Inuvialuit (no more than 5000 people) in the North-West of Canada (the region of their residence was established by the government in 1984 on an area of more than 900 thousand km<sup>2</sup>) from the perspective of the spread of education in their environment, as well as such "Arctic social indicators under the Arctic Council as health and population, material well-being, cultural vitality, closeness to nature, fate management... The analysis revealed considerable internal differences within the Inuvialuit settlement region, especially between the Inuviks and other communities in the Northwest Territories (except for the capital city of Yellowknife)... Residents still face significant social problems and are forced to deal with inter-regional inequalities..." [4, p. 171].

Zashikhina I. and Postnikova M. consider "...the social implications that determine the use of media in contemporary education. Features of a new post-industrial society advance the necessity to redefine professional competences, taught within all kinds of curricula. Students receive the opportunity to enjoy a rich assortment of media, which is profoundly used as a learning source by most teachers today. The authors point to a dependency of modern education participants on their understanding of the mechanism and impact of media..." [5, p. 612].

Anderson K.L., Kaden U. and others state: Alaska faces challenges in the fields of science, technology, engineering and mathematics, including limited availability of resources and learning opportunities, as well as a lack of teachers and local educational resources. Museum education programs, traditionally focused on public outreach through docent-led tours, are playing an increasingly important role in both formal and informal aspects of STEM education. The authors focused on the possibilities of using museum practices in the scientific and educational process in the Arctic region on the example of the Museum of the University of Alaska and its collections of natural history [6, p. 641].

Lipatov V.A. considers the specifics of organizing distance education of students with disabilities. Many North American universities, in particular, Alaska (USA) have experience of such activities. The author notes that Arctic International University uses information and communication technologies and open educational resources (for example, Black-board). In 2008, the University

of the Arctic launched a thematic network on distance education and e-learning. This article attempts to find an answer to the question: does distance education in Alaska, as well as, by analogy, in the northern and Siberian regions of the Russian Federation, contribute to solving educational problems of people with disabilities? The basis of the study was research work on distance learning for people with disabilities in the Arctic, legal acts created by international organizations, American and Russian agencies, Internet resources of information and communication network on educational policy issues [7].

### ***Features of research policy in the Arctic with the participation of foreign states***

The development of education and research in the Arctic is regularly discussed at meetings of the ministers of education and science of the Arctic countries. According to the statement from the Tokyo Summit on May 9, 2021 (the first one was held in Washington in 2016), “science-based policy measures are becoming increasingly relevant in the Arctic due to the current pace of climate change, and they are relevant for all Arctic residents, including indigenous peoples, and for the global community”<sup>6</sup>. **Knowledge for a sustainable Arctic** is the main theme of the Arctic Science Forum. Four sub-themes that can be adopted in the framework of international cooperation were formulated there:

- *Observing*: establishing observation platforms and networks, sharing data through the Sustainable Arctic Observing Networks (SAON) initiative, the International Arctic Science Committee, Arctic Council working groups, developing mapping and remote sensing techniques for studying the Arctic;
- *Understanding*: increasing the ability to understand and predict changes in the climatic, ecological and social systems of the Arctic in relation to the global impacts of these changes;
- *Responding*: operational sustainability, assessment of vulnerability, resilience and application of knowledge;
- *Strengthening*: training the next generation of researchers and educators through training, networking within existing Arctic education frameworks such as Associated Polar Early Career Scientists (APECS), Polar Educators International (PEI), University of the Arctic (UArctic). Support for multinational participation in research at field stations and on ships through the Forum of Arctic Research Operators (FARO), the Pacific Arctic Group (PAG), the Svalbard Integrated Arctic Earth Observing System (SIOS), the International Network for Terrestrial Research and Monitoring in the Arctic (INTERACT), Arctic Research Icebreaker Consortium (ARICE).

In order to implement these measures, it is proposed to:

- strengthen the involvement of indigenous communities to use their traditional knowledge and co-produce new knowledge through research programs and projects.

---

<sup>6</sup> Joint Statement of Ministers on the occasion of the Third Arctic Science Ministerial, 9 May 2021, Tokyo, Japan, 11 p.



Such cooperation is essential to improve the effectiveness and usefulness of research for Arctic indigenous peoples, governments and other stakeholders;

- intensify the collection, analysis and modelling of meteorological data to enable timely responses to climate change.

The Arctic countries, within the framework of the international research community, are participating in the preparation of the IPCC Special Report on the Ocean and Cryosphere in a Changing Climate (SROCC), the IPBES Global Assessment Report on Biodiversity and Ecosystem Services. Arctic states take part in the Decade of Ocean Science for Sustainable Development (2021–2030), the Seabed 2030 global initiative, support the 2030 Agenda for Sustainable Development, the 2015 Paris Agreement (under the UN Framework Convention on Climate Change), the Global Biodiversity Framework and the Arctic Council Agreement to Strengthen Scientific Cooperation in the Arctic. During the Second Arctic Science Ministerial on March 30, 2020, the Forum of Arctic Science Funding Organizations was established<sup>7</sup>.

The purpose of this article is to describe the features of the Arctic strategies of the USA and Canada, as well as to examine the contribution of universities and colleges in Alaska (USA) and the northern territories and provinces of Canada to the implementation of research policy in the Far North and the Arctic. At the same time, the analysis of the US Arctic strategy and the development strategy of the northern territories of Canada is not a goal in itself for the authors. We have used our review of published policy documents to outline the role of education and research in their implementation. In particular, for this purpose, the article considers the main scientific programs and institutions that form the research and educational space of the American North.

### ***US Arctic strategy and approaches to its implementation in the research sphere***

The reason to consider the USA as an Arctic state is the state of Alaska. The +10°C isotherm of July, which is recognized by the USA (and the Arctic Council) as the southern boundary of the Arctic, runs through its territory. It is the northernmost, largest and most sparsely populated US state. The area of the state is 1.7 million km<sup>2</sup>, the population is 740 thousand people. In 1867, after signing the treaty, Alaska was sold (at a price of about \$7 million, about \$4 per km<sup>2</sup>, which is about two times less than, for example, the price of acquiring Louisiana from France) by the Russian Empire to the North American United States. Alaska for a long time was called “okrug”, “territory”; only in 1959 it received the status of state<sup>8</sup>.

Alaska generates 0.27% of the country’s GDP, but is characterized by high per capita income — over \$70.000 per capita (the national average in 2019 is \$55.000)<sup>9</sup>. Alaska’s economy has historically been based on the extraction of raw materials and fuel. The largest field is located on the North Slope of Alaska (Pradhoe Bay), and it has already production peak. Therefore, the rele-

<sup>7</sup> Joint Statement of Ministers on the occasion of the Third Arctic Science Ministerial, 9 May 2021, Tokyo, Japan, 11 p.

<sup>8</sup> Information about the USA and Alaska. URL: <http://infoamerica.ru> (accessed 10 April 2021).

<sup>9</sup> Statistical data about Alaska. URL: <https://arcticstat.org/research> (accessed 10 March 2021).

vance for the government is to find new development paths that do not involve the extraction of natural resources.

The interdepartmental body is responsible for the development of the Arctic policy in the United States, assuming the interests of state agencies responsible for various areas of US policy in the Arctic and the federal government [8]. The first version of the US Arctic strategy was drafted in 1971 in Memorandum 144 submitted by President R. Nixon. This document identified three priorities: reducing environmental risks, developing international cooperation and ensuring the region's security. In 1984, the US Congress passed the "Arctic and Policy Act", which added to the list of priorities the provision of national defense, fisheries development, environmental and climate research.

The US National Arctic Strategy (2013) assumes that the US has fundamental interests in the Arctic and is "ready to act independently or in alliance with other states to protect these interests"<sup>10</sup>. The list of US strategic interests, drawn up with consideration the interests of other Arctic countries, includes ensuring national and security, environmental protection, climate change study, responsible environmental management, consideration of indigenous interests, scientific research and international cooperation<sup>11</sup>. In 2015, President B. Obama created the Arctic Executive Steering Committee (AESC), responsible for facilitating communication, emergence and interaction between federal departments, agencies and offices in charge of activities in the Arctic region. The 2016 State Department Arctic Policy Report outlined the need to maintain the dominant role of the US in addressing Arctic issues, taking into account Russia's growing policy in the region. The authors also draw the attention of the US government to the development of Chinese interests in the Arctic, especially in Iceland and Greenland<sup>12</sup>. In 2020, President D. Trump signed the Memorandum on Safeguarding U.S. National Interests in the Arctic and Antarctic Regions. It outlines the need for an icebreaker fleet (at least three ships) to work in polar waters<sup>13</sup>. However, experts believe that the real terms of implementation may be significantly delayed (2035–2040 instead of 2024) due to the lack of experience in building heavy icebreakers and irregular funding<sup>14</sup>.

A significant place in the US Arctic policy is occupied by military issues. It can be noted that in a non-strategic respect, the Arctic has long been a peripheral area of military activity, and the lack of military risks in the region is recognized at the state level. However, in 2014, U.S. Navy Arc-

<sup>10</sup> US Arctic Strategy. URL: [https://russiancouncil.ru/analytics-and-comments/analytics/arkticheskaya-strategiya-ssha/?sphrase\\_id=57176163](https://russiancouncil.ru/analytics-and-comments/analytics/arkticheskaya-strategiya-ssha/?sphrase_id=57176163) (accessed 10 February 2018).

<sup>11</sup> US: National Strategy for the Arctic region (May 2013). <https://polarconnection.org/us-national-strategy-arctic-region-may-2013/> (accessed 10 April 2021).

<sup>12</sup> New US Arctic Policy. URL: <https://icds.ee/ru/novaja-arkticheskaja-politika-ssha/> (accessed 10 May 2021).

<sup>13</sup> Tramp rasporyadilsya militarizirovat' prisutstvie SShA v Arktike i Antarktike [Trump ordered to militarize the US presence in the Arctic and Antarctic]. URL: <https://rg.ru/2020/06/10/tramp-rasporiadilsia-militarizirovat-prisutstvie-ssha-v-arktike-i-antarktike.html> (accessed 10 May 2021).

<sup>14</sup> Polyarnyy dedlayn: udastsya li SShA sozdat' ledokol'nyy flot k 2029 g. dlya postoyannogo prisutstviya v Arktike? [Polar Deadline: Will the US manage to create an icebreaking fleet by 2029 for a permanent presence in the Arctic?]. URL: <https://russian.rt.com/world/article/754138-ledokol-ssha-tramp-arktika> (accessed 10 September 2020).

tic Roadmap 2014–2030 was developed<sup>15</sup>. Its development involved assessing the Navy's capabilities that may be needed in the Arctic against the backdrop of increased shipping activity (such studies were initiated in 2009). In 2019, for the first time since 2013, an updated strategy for the US Coast Guard in the Arctic was presented. It focuses on the changes taking place in the Arctic: from the environment and geopolitics to socio-economic development and shipping<sup>16</sup>. In 2020, the United States published a new Arctic strategy, for the air forces<sup>17</sup>. In March 2021, the first Arctic strategy for the land forces was published, in which Russia and China were named the main competitors of the United States in the Arctic region<sup>18</sup>. The main goal of the strategy, according to the US Armed Forces, is that the military service can “quickly create and project its forces around the world, including with the help of soldier, specially trained and equipped to work in extremely cold weather conditions for a long time”<sup>19</sup>. The document declares three key goals that the country's Armed Forces plan to solve in the Arctic: protecting national interests and US territory, defending allied territory, and projecting power on a global scale. The USA pays great attention to the development of anti-missile, anti-aircraft and anti-submarine defense. There is a joint North American Aerospace Defense Command (NORAD) with Canada. Greenland (Tula) hosts the American military's missile warning infrastructure. American military personnel (as well as Canadian, Norwegian, Danish) participate in NATO tactical exercises, often at a considerable distance from the US Arctic zone (for example, Trident Juncture, Arctic Challenge, Cold Response Exercises, Arctic Edge, Bold Quest)<sup>20</sup>. At the same time, in the US Arctic strategy, much attention is paid to issues of “soft” security, for example, the participation of non-Arctic states in Arctic cooperation [8].

The United States, like other Arctic countries, is working to determine the outer limits of its continental shelf in the Arctic Ocean beyond the 200-mile exclusive economic zone. In particular, ideas are being put forward to expand the boundaries of the shelf to 600 nautical miles from the coast of Alaska (obviously, for the purpose of exploration and production of hydrocarbons, which is currently technologically unrealizable), as well as the construction of pipelines from Alaskan (North Slope of Alaska) fields across the Canadian territory [8]. Konyshov V.N. and Sergunin A.A., considering the evolution of US national interests in the Arctic, their economic and military interests, note: “... the Trump administration lifted Obama's ban on the development of oil and gas

<sup>15</sup> US Navy Arctic Roadmap. 2014–2030. URL: <https://www.uaf.edu/caps/resources/policy-documents/us-navy-arctic-roadmap-2014-2030.pdf> (accessed 31 July 2021).

<sup>16</sup> The US Coast Guard's new Arctic strategy highlights geopolitics and security. URL: <https://www.arctictoday.com/the-us-coast-guards-new-arctic-strategy-highlights-geopolitics-and-security/> (accessed 12 April 2021).

<sup>17</sup> US Air Force, Space Force: Here Is Your New Arctic Strategy America's most active services in the region have a four-part plan to support the National Defense Strategy. URL: <https://www.defenseone.com/ideas/2020/07/us-air-force-space-force-introduce-new-arctic-strategy/167088/> (accessed 25 April 2021).

<sup>18</sup> New US Arctic Strategy. URL: <https://topwar.ru/181150-novaja-arkticheskaja-strategija-ssha.html> (accessed 13 April 2021).

<sup>19</sup> US Army's first Arctic strategy looks to “regain dominance” in extreme cold conditions. URL: <https://www.arctictoday.com/us-armys-first-arctic-strategy-looks-to-regain-dominance-in-extreme-cold-conditions/> (accessed 25 April 2021).

<sup>20</sup> US Arctic Strategy. URL: [https://russiancouncil.ru/analytics-and-comments/analytics/arkticheskaya-strategiya-ssha/?sphrase\\_id=57176163](https://russiancouncil.ru/analytics-and-comments/analytics/arkticheskaya-strategiya-ssha/?sphrase_id=57176163) (accessed 10 February 2018).



fields in the Alaska National Petroleum Reserve and the Arctic National Wildlife Refuge, as well as offshore fields in the Chukchi and Beaufort Seas. President D. Trump also decided to withdraw from the 2015 Paris Agreement on climate change, which undermined one of the most important pillars of Obama's Arctic strategy..." [9]. At the beginning of 2021, one of the first decrees by President J. Biden returned the United States to the Paris climate agreement<sup>21</sup>. In the same year, the Office of the Special Envoy for Climate Change was established, and a person responsible for cooperation in this area was appointed. President Biden ordered to prepare a report on the impact of climate change on US security. J. Biden signed decrees prohibiting issuing new licenses for oil and gas drilling on federal land, and doubling the amount of electricity produced from offshore wind turbines by 2030<sup>22</sup>.

The United States supports freedom of navigation in the Arctic Ocean, including the Northern Sea Route (NSR). It considers the Northwest Passage (NWP) to be an international strait, since it connects two parts of the high seas (the Arctic and Atlantic oceans). From this point of view, the waterway is considered Canadian territory, but foreign ships have the right of peaceful transit through it. According to Canada, the NWP is an inland waterway (this statement causes disagreement among experts in different countries), and all foreign vessels are therefore required to request permission to pass through it. Canada also takes into account Article 234 of Section 8 "Ice-covered areas" of the UN Convention on the Law of the Sea in determining the status of the NWP. Non-participation in the procedures of this Convention damages the image of the USA, does not meet the interests of Russia (in the context of the NSR) and Canada, creates inconsistency in the position of the USA and its partners in the Arctic Council, increases the risks of unpredictable state behavior in any issue on the Arctic topic [8].

The "weak link" of the US Arctic policy, in addition to lack of awareness about the processes taking place in the Arctic, is the scarcity of icebreakers capable of operating year-round with scientific expeditionary (and military) purposes in the Arctic Ocean. It reduces the ability of the US to respond quickly to arising emergencies in the Arctic, especially anthropogenic accidents and disasters, search and rescue people and ships in distress [8].

In 2015–2017, the United States chaired the Arctic Council. Since 2014, all countries of the Arctic region have established sanctions against Russia, which, in turn, responded to them with counter-sanctions [10]. As a result, cooperation in the Arctic between states has been curtailed in many areas, especially in the development of minerals and fuels, and the development of transport infrastructure. Against the backdrop of continuing sanctions, the US government remains interested in supplying liquefied natural gas from the Russian Arctic, especially during the winter. Russia and the US promote cooperation between the Coast Guard to prevent poaching and

---

<sup>21</sup> SShA vozvrashchayutsya k obyazatel'stvam Parizhskogo soglasheniya po klimatu [The United States is returning to the obligations of the Paris climate agreement]. URL: <https://tass.ru/mezhdunarodnaya-panorama/10510151> (accessed 13 June 2021).

<sup>22</sup> Klimaticheskiy den' v Belom dome [Climate Day at the White House]. URL: <https://www.bbc.com/russian/news-55836074> (accessed 13 June 2021).

improve navigational safety in the Bering Sea and the Bering Strait. In 2015, a Joint Agreement of Intention was signed to develop multilateral cooperation in a standard Arctic forum on protection, which assumes an important role in resolving important issues and national security. The United States and Russia maintain mutual interest in joint research and development of education in the Arctic, including in indigenous communities, in climate research, and in predicting dangerous weather events, such as flooding of northern rivers. A telecommunication infrastructure assessment of the Arctic has been carried out for the first time at the initiative of the USA. The Agreement to prevent Unregulated High Seas Fisheries in the central Arctic Ocean extends to the high seas, i.e. beyond the exclusive economic zones of the circumpolar states [10, 11].

The US Arctic Strategy defines scientific research as the basis for solving the strategic problems of the Arctic development. During the US chairmanship of the Arctic Council, an Agreement on the development of international Arctic scientific cooperation was developed. This refers to the facilitation of international scientific research, which will contribute to the dissemination of research among scientists, the free exchange of scientific results, the facilitation of border crossing and the unification of statistics. The document identifies geographic areas where the parties to the agreement, in accordance with international law, will provide assistance in obtaining permits to conduct research, access to areas for research, etc. [10].

The Arctic Research and Policy Act (1984), the Arctic Policy Directive (2009), and the Arctic Research Plan for 2017–2021 may be considered the main documents that guide US research policy in the Arctic. According to the general documents, the research priorities are to “improve understanding” of the health of Arctic residents, opportunities to improve their well-being, climatic and atmospheric changes in the Arctic and their consequences, predicting changes in sea ice cover, cryosphere, ice caps, including the Greenland Ice Shelf, and their impact on climate, infrastructure, marine and freshwater ecosystems in the Arctic and their role in the climate system <sup>23</sup>.

A distinctive feature of the US polar research structure is the multilevel integration of personnel, equipment and systems from federal services, agencies and councils (National Geological Survey, National Aerospace Agency, National Oceanographic and Geophysical Data Centers), the National Academy of Sciences and numerous universities which form research consortia with foreign partners [12]. Transnational corporations, the National Council for Science and Technology, the Department of State, the Ministry of Agriculture, the Ministry of National Security (Coast Guard), the Ministry of Transport, the Ministry of the Environment take part in the development of research topics. There are advisory councils under the President and the US Congress. US Department of Defense’s Arctic-focused research programs include Marine Biology Research Program, Naval Research Office program that combines civilian and military initiatives in the Arctic. The goal of the programs of the Department of Oceanography and Cartography of the Navy is the

---

<sup>23</sup> Co-operation in the Arctic Science – Challenges and Joint Actions / Report of the 2nd Arctic Science Ministerial, 25-26 October 2018, Berlin, Germany, p. 84.

development of innovative tools, devices that provide the possibility of performing applied research in Arctic conditions<sup>24</sup>.

The Science Initiative of the National Science Foundation “Navigating the New Arctic” contributes to the understanding of the nature of changes in biological, physical, chemical and human systems by creating a network of observations from mobile and stationary platforms using mathematical tools<sup>25</sup>. The Department of Energy is implementing the Next-Generation Ecosystem Experiments (NGEE-A) project<sup>26</sup>, which aims to improve the prediction of climate change and understanding of related processes in Arctic ecosystems. The Regional Science Initiative of the Office of Naval Research Stratified Ocean Dynamics of the Arctic<sup>27</sup> (SODA) aims to study temperature fluctuations and water circulation in the Beaufort Sea Basin to better understand their role in sea ice behavior and radio wave propagation. The US Department of the Interior, within the framework of public-private US-Canadian programs, is conducting expeditionary studies of the Beaufort Sea and the Chukchi Sea<sup>28</sup>.

The National Aeronautics and Space Administration (NASA) runs a program in the field of geosciences. It includes global research and modelling of the Arctic Ocean, polar atmosphere, ice, permafrost, carbon and ecosystems, which helps to understand trends in changes of the Arctic systems and the role of the Arctic in the global system. The NASA ICESat-2 mission aims to measure ice height, land topography, and vegetation characteristics to quantify changes in ice sheet mass balance, sea ice thickness, and large-scale changes in biomass<sup>29</sup>.

Arctic research is managed and coordinated by the US Arctic Research Commission (USARC), which was created by the Arctic Research and Policy Act of 1984<sup>30</sup> [12]. It participates in the development of a research strategy, organizes interaction on the implementation of the strategy with federal and municipal authorities, as well as with foreign partners, contributes to updating Arctic research programs, as well as to the exchange of information between participants. The Commission determines the goals and objectives of research in the Arctic, including the development of knowledge about natural resources, observation and forecasting of environmental changes, improving human health, developing infrastructure, including renewable energy sources, studying the sustainability of local communities, their language and culture<sup>31</sup>. The Commission supports fundamental research that “contributes to understanding” of engineering, physical, biologi-

---

<sup>24</sup> Co-operation in the Arctic Science – Challenges and Joint Actions / Report of the 2nd Arctic Science Ministerial, 25-26 October 2018, Berlin, Germany, p. 84.

<sup>25</sup> National Science Foundation. URL: [https://www.nsf.gov/news/special\\_reports/big\\_ideas/arctic.jsp](https://www.nsf.gov/news/special_reports/big_ideas/arctic.jsp) (accessed 10 April 2021).

<sup>26</sup> NGEE-A project. URL: <https://ngee-arctic.ornl.gov/> (accessed 10 April 2021).

<sup>27</sup> SODA Science Initiative. URL: <http://www.apl.washington.edu/project/> (accessed 10 April 2021).

<sup>28</sup> Bureau of Ocean Energy management. URL: <https://www.boem.gov/> (accessed 10 April 2021).

<sup>29</sup> Co-operation in the Arctic Science – Challenges and Joint Actions / Report of the 2nd Arctic Science Ministerial, 25-26 October 2018, Berlin, Germany, p. 84.

<sup>30</sup> United States Arctic Research Commission. Report on the Goals and Objectives for Arctic Research 2015-2016, May 2015, p. 3.

<sup>31</sup> United States Arctic Research Commission. URL: [https://www.arctic.gov/reports\\_goals.html](https://www.arctic.gov/reports_goals.html) (accessed 10 April 2021).

cal, geological, chemical, educational, social and cultural processes in the Arctic, as well as interactions and linkages among ocean, terrestrial, atmospheric, biological and human systems between Arctic and global systems. The USARC is made up of president-appointed representatives of the academic scientific community (4 members), corporations (2 members), and one representative of the Alaska Native people [13].

The National Oceanic and Atmospheric Administration (NOAA) supports research in weather forecasting and warning, sea ice extent and thickness, basic science to improve understanding and early detection of climate and ecosystem change, recommendations to improve marine and coastal resource management, and strengthening national and international cooperation<sup>32</sup>.

Several universities are located in Alaska. The University of Alaska was founded in 1917 (more than 31.000 students, 7.000 employees, over 400 training programs from undergraduate to doctoral studies), it has campuses thousands of miles away from each other — the University of Anchorage (UAA), University of Fairbanks (UAF) and the University of Alaska Southeast (UAS) in Juneau. Each university includes colleges<sup>33</sup>. Their courses of study include engineering, the humanities and pedagogy, business, journalism, mass communication, aviation, philology, television and film, medicine, agriculture, climatology, biology, oceanography, geophysics and energy. The university receives federal subsidies, which are spent on research and academic projects, including the “UA Scholars scholarship program”. The Alaska Sea Grant program is operated in conjunction with NOAA. It promotes development of coastal communities and provides research and educational services through the Marine Advisory Program. Together with NASA, the Space Research Support Program in the field of aerospace sciences and geosciences is being implemented.

The University of Alaska Anchorage, founded in 1954, has over 18.000 students in the humanities, aviation technology, civil engineering, health sciences, social work, seismic engineering, ocean exploration technology, and graduate programs in biology and clinical psychology. The university has institutes and research centers that carry out studies on the northern (Arctic) topics: the Center for Educational Policy and Research of Alaska, the Institute for Social and Economic Research, the Center for the Study and Response to Health Problems, the Institute of Natural Resources and the Environment, the Law Center<sup>34</sup>.

The University of Alaska Fairbanks (UAF) was founded in 1917 and has about 9.000 students and 2.500 employees<sup>35</sup>. The university consists of the Schools of Engineering and Mining, Fisheries and Ocean Sciences, Liberal Arts, Science and Mathematics, Rural and Local Development, Management, Natural Resources, and the College of Engineering. This is the main university in Alaska, which provides training for doctoral programs under the guidance of world-famous sci-

<sup>32</sup> National Oceanic and Atmospheric Administration. URL: <https://www.noaa.gov/> (accessed 10 April 2021).

<sup>33</sup> University of Alaska. URL: <https://www.alaska.edu/shapingalaskasfuture/about/> (accessed 10 April 2021).

<sup>34</sup> Research centers and institutes of the University of Anchorage. URL: <https://www.uaa.alaska.edu/academics/departments/justice-center/> (accessed 10 April 2021).

<sup>35</sup> University of Alaska Fairbanks. URL: <https://uaf.edu/facts/index.php> (accessed 10 April 2021).

entists. Arctic research is conducted in the fields of climate, geography, geophysics, seismology and volcanology, supercomputing, marine research, biology, northern engineering, energy, transportation, Alaska Native languages and health, Arctic politics, security, emergency response, planning and forecasting of regional development. Outside of Fairbanks, the university's research infrastructure includes the Poker Flat test site, Toolik Lake station, the Juneau Fisheries Center, the Center for the Study of Marine Products and Oceanology on Kodiak Island.

The University of Alaska Southeast (UAS) was established in 1987 and has over 5.000 students. This division of the University consists of the School of Arts and Sciences, the College of Education, the School of Professional Training, the Alaska Maritime Training Center<sup>36</sup>. UAS conducts research activities with the Alaska Coastal Forest Center, the Alaska Pilot Program to Incentivize Competitive Research, the Pacific Northwest Division of Ecosystem Research, and the University of Fairbanks School of Fisheries and Ocean Sciences.

Alaska Pacific University was founded in 1957 in Anchorage and is a member of the Eco League, which brings together liberal arts colleges that implement programs in the field of humanities, human sciences, environmental protection and sustainable development<sup>37</sup>.

The Alaska Vocational Technical Center — Institute of Technology (about 1.600 students) offers professional education programs in health care, business, accounting, information and communication technology, construction, energy and transportation<sup>38</sup>.

The uniqueness of Ilisarvik College (founded in 1996, 1.700 students, 110 employees) is in the preservation of the cultural heritage of the Iñupiat<sup>39</sup>. The college implements educational programs in business, medicine, information and communication technology, emergency services, plumbing and construction, teacher education in the Arctic, and the film industry.

Prince William College Valdez<sup>40</sup> offers pre-university training and vocational programs in art, industrial technology, oil spill response and safety management, education and social services for the disabled, tourism management, information and communication technologies.

As other Arctic states, the United States focuses on supporting research infrastructure for expeditionary and field research. Biological and physical studies of the ecosystem of the Beaufort Sea lagoon and the North Gulf of Alaska are carried out at Toolik Station. The Utqiavik station measures atmospheric radiation, conducts research in astrophysics and atmospheric air monitoring. Similar tasks are solved by the Summit station in Greenland, managed jointly with the government of the island.

---

<sup>36</sup> University of Alaska Southeast. URL: <http://uas.alaska.edu/about/index.html> (accessed 10 April 2021).

<sup>37</sup> Alaska Pacific University. URL: <http://www.thebestcolleges.org/schools/alaska/alaska-pacific-university/> (accessed 10 April 2021).

<sup>38</sup> Alaska Vocational Technical Center — Institute of Technology URL: <https://avtec.edu/avtec-information/about-us> (accessed 10 April 2021).

<sup>39</sup> Ilisarvik College. URL: <http://www.ilisagvik.edu/recognition-for-growing-enrollment/> (accessed 10 April 2021).

<sup>40</sup> Prince William College Valdez. URL: <https://pwsc.alaska.edu/about/index.cshtml> (accessed 10 April 2021).

The US has vessels capable of performing a wide range of research in the Arctic: the Sikuliq, a survey ship that facilitates ice research, is owned by the National Science Foundation. The US Coast Guard operates the icebreakers Healy and Polar Star<sup>41</sup>.

Thus, the strategic goal of the US research policy in the Arctic region derives from its Arctic strategy and is to ensure comprehensive national security and sustainable economic and social development in Alaska and throughout the Arctic. For this, long-term interdepartmental and interdisciplinary research projects have been developed, which are implemented in synergy between the state, private corporations, universities, civil and military scientists, international scientific groups and associations of countries. Priority research in the Arctic in the United States covers a wide range of areas of fundamental and applied science: from the study of processes of climatology, ecology, geoecology, glaciology, biology, medicine, inclusive education, history and rights of indigenous peoples to issues of ensuring national and global military and economic security [12, 14].

### ***Canada's Arctic strategy and approaches to implementing it in research and development***

In Canada, the concept of “North” is broader than the concept of “Arctic”. The concept of “Northerness” is relatively deeply grounded and researched in Canadian geography. The main criterion for the southern border of the North in Canada is the isotherm of the warmest month — 10°, and the average annual temperature — not higher than 0°. The Canadian geographer R. Gaida divides the country into zones with varying degrees of development and determines the boundaries of the North on this basis. According to G. A. Agranat, the undeveloped areas in Canada extend into mid-latitude forest, steppe and mountainous regions in the South, and that is why their boundaries cannot be used as boundaries of the North [15, p. 27].

In 1967, R. Philips, recognizing that “it is difficult to define the North”, proposed to return to the administrative-political criterion and to accept only the Yukon and the Northwest Territories as the North. In 1970, C.J. Rea's monograph “The Political Economy of the North” was published, where the author analyzes the development of the North as an economy of undeveloped areas. Rea proposes a zoning of the North of Canada based on the administrative-territorial division, as a result of which the northern regions of the provinces and territories located above 60° N were assigned to the North — Yukon and northwest territories [15, p. 28].

In 1948, Canadian geographer L.E. Hamelin made an attempt to zone the North using a scoring system. He identified several physical-geographical and economic-geographical features of peripheral territories: geographical latitude, summer and winter temperatures, the duration of seasonal soil freezing, precipitation, forest cover, transport accessibility (by land and air), population density, economic development. Basic calculations were made in 1965, and in 1968, he refined his work by dividing Canada into the Middle, Great and Far North according to the degree of “northerness”. An attempt to solve the problem of zoning the North on the basis of combining

---

<sup>41</sup> Co-operation in the Arctic Science – Challenges and Joint Actions / Report of the 2nd Arctic Science Ministerial, 25-26 October 2018, Berlin, Germany, p. 85.



qualitative and quantitative indicators was made, but it was not widely implemented and was not used in national legislation. One of the reasons is the use of signs that characterize not only the zone of the North, but also other areas that are not very favorable for the permanent life of the population. The methods used indicate the arbitrariness and insufficient justification of the calculation of points. As a result, the St. Lawrence River region, and the mountainous regions of Asia can also be assigned to the zone of the North, despite the lack of a specific “northern” score. Hamelin considers the North to be more of a historical-geographical concept than a physical or economic-geographical one, he believes that the higher the degree of development of the territory, the less “northern” it is. As a result, Hamelin concludes that some areas may lose their “northernness” as they are developed, which threatens all the northern regions of the Earth and is difficult to agree with [15, pp. 39–41].

The polar sector of Canada is formed by the federal territories of Yukon, Nunavut, the Northwest Territories, Newfoundland and Labrador, and partially by the provinces of British Columbia, Alberta, Saskatchewan, Manitoba, Quebec and Ontario, all lands north of 60° N and the coastal area of Hudson Bay and James Bay, the northeast cape on Ellesmere Island, and the Beaufort landfall of the Canada-US border. The area of the northern territories is 4.3 million km<sup>2</sup> (21% of the Arctic), which is the second largest area in the world after Russia [8, p. 87]. The Canadian North has been developed to a much lesser extent than the Arctic zone of the Russian Federation, both in socio-economic and military terms. About 110 thousand people live in the territories of the Canadian North<sup>42</sup> (against 2.5 million people in the subjects of the Russian Arctic).

In 2004, the “Fundamentals of the Northern Strategy” were developed, in 2009 it was updated under the new name “Canada's Northern Strategy: Our North, Our Heritage, Our Future”, which determined the long-term goals for the development of the country's Far North and, according to some researchers, had more of an “inward” than an “outward” (as an example — the United States) focus on the Arctic region<sup>43</sup>. Canadian policy in the North has been implemented for a long time under the slogan “Develop or lose”, which implies the need for comprehensive development of the peripheral territories with regular and mixed, public-private funding [8, p. 88]. In 2013, Canada's northern policy was determined by the following goals: protecting the country's sovereignty in its polar sector; ensuring the socio-economic development of the North; taking measures to protect the environment and to adapt to climate change; development of self-government, economic and political activity of the northern territories.

When developing a new Arctic strategy, in September 2019, the Canadian government published a framework document defining the state's policy in the Arctic and the northern regions of the country up to 2030<sup>44</sup>. It emphasizes international cooperation, although at present it “has

---

<sup>42</sup> Statistics about the Canadian North. URL: <https://arcticstat.org/research> (accessed 10 May 2020).

<sup>43</sup> Canada's Northern Strategy. Our North, Our Heritage, Our Future / Government of Canada, Ottawa, 2009. 48 p.

<sup>44</sup> Canada's Arctic and Northern Policy Framework. URL: <https://www.rcaanc-cirnac.gc.ca/eng/1560523306861/1560523330587> (accessed 10 May 2020).

an impulsive character, and the authorities do not have clear development plans for the region”<sup>45</sup>. Canada's Arctic and Northern Policy 2019 contains statements about the need to address the strategic challenges facing the northern regions of the country. At the same time, the document does not outline a specific plan with a list of measures and their funding to resolve these challenges. The Strategy identifies eight priorities for federal government policy up to 2030: health and social well-being of northern and indigenous people; development of energy, transport and communication infrastructure; a strong, sustainable, diversified and inclusive northern economy; knowledge-oriented approach in decision making; sustainability and health of the Arctic environment; harmonization of relations between indigenous and non-indigenous peoples; a law-based international order in the region that effectively responds to new challenges and opportunities; ensuring the safety and security of the Canadian Arctic and its inhabitants.

Priority areas for Canada in the Arctic at the global level include strengthening sovereignty over the Canadian Arctic Archipelago and adjacent water areas; determination and consolidation of the outer boundaries of the country's continental shelf in the Arctic Ocean and the search for legal opportunities to solve the remaining border problems; development of cooperation with the Arctic and non-Arctic states in accordance with the 2030 Agenda for Sustainable Development<sup>46</sup>.

Since the beginning of the 21st century, Canada's foreign policy in the North and the Arctic relied on its neighbor and historical ally — the United States. There is a desire to finally overcome differences over the use of the NWP and the drawing of a demarcation line in the southern Beaufort Sea, as well as disputes with Denmark over the uninhabited island of Hans in the Kennedy Channel in northern Greenland (“the intelligent war of whiskey and schnapps” almost “ended” in 2012, when Denmark adjusted its baseline defining approach). In May 2019, Canada (and previously Denmark, Russia) filed a 2100-page application (“submission”) to the UN Commission on the expansion of the continental shelf in the Arctic Ocean around the Lomonosov and Mendeleev ridges over an area of more than 1.2 million km<sup>2</sup><sup>47</sup>.

During its chairmanship of the Arctic Council (2013–2015), Canada supported its work, and at the ministerial session in Kiruna in 2013, it was decided to expand the observer countries of the Arctic Council<sup>48</sup>. With the participation of Canadian experts in Kiruna, an Agreement on cooperation in the field of preparedness and response to marine oil pollution in the Arctic was signed, an agreement on the creation of the Arctic Economic Council and a collective fund for financing environmental projects was reached. The second Arctic Human Dimension Report was prepared, which is of interest for Arctic socio-economic policymaking and promoting the interests of indigenous peoples in environmental management in the northern and arctic regions [16].

<sup>45</sup> Igra na vtorykh rolyakh: kuda vedet arkticheskaya politika Kanady [Playing a sideline: where Canada's Arctic policy leads]. URL: <https://goarctic.ru/abroad/igra-na-vtorykh-rolyakh-kuda-vedyet-arkticheskaya-politika-kanady/> (accessed 15 May 2021).

<sup>46</sup> Arctic and Northern Policy Framework International chapter. URL: <https://www.rcaanc-cirnac.gc.ca/eng/1562867415721/1562867459588> (accessed 10 May 2021).

<sup>47</sup> Ibid.

<sup>48</sup> Arctic Council (observer countries). URL: <https://arctic-council.org/ru/about/observers/> (accessed 10 May 2021).

Scientific research in Canada is considered as one of the tools for the implementation of the northern (Arctic) policy. In this sense, there are similarities with the organization of US research activities in the Arctic. The Canadian Arctic Research Program 2030 includes significantly more social science research for the development of indigenous peoples than ever before. Traditional knowledge of local communities and modern scientific knowledge will be equally taken into account when making government and corporate decisions. International cooperation plays a major role in closing gaps in knowledge about a changing environment and how to adapt to it, especially given the complexities associated with Arctic and northern science. At the international level, Canada will “intensify its efforts to protect indigenous knowledge” and “promote stronger international research collaboration” by 2030 <sup>49</sup>.

In 2014, the Science, Technology and Innovation Strategy was adopted in Canada, which focuses research on priorities of health and life sciences, natural resources and clean energy, information and communication technologies, research and environmental protection [10]. In the same year, the Canadian Research Council developed the Arctic Research Program. The document formulates priority research areas: the use of natural resources, the development of transport and social infrastructure, the sustainable development of the northern region, the adaptation to climate change, the creation of highly qualified jobs, and the improvement of the population’s well-being. In 2009, a Science Development Strategy was adopted in the Northwest Territories, with priorities including sustainable development, management of natural resources, cultural diversity, and public health and welfare <sup>50</sup>.

Established in 1991, the Canadian Polar Commission (CPC) is mandated to monitor research activities, provide interface between national research centres and universities and foreign scientific organizations, including for mutual access to research infrastructure. The Commission ensures the interaction of research and educational organizations with the Sustaining Arctic Observing Network (SAON), established at the initiative of the Arctic Council in 2007 as part of the International Polar Year 2007–2008, by the Association of Canadian Universities for Northern Studies (42 educational institutions) and the Network of Canadian Competence Centers (Arctic-Net), which unites about 150 scientists from universities, experts from federal and regional departments [12]. The prerequisite for the creation of SAON was the need to combine the resources of different countries to perform long-term observations in the Arctic and obtain open, free and timely access to data to ensure the solution of pan-Arctic and global problems <sup>51</sup>.

In 2015, the Canadian Polar Research Agency (POLAR) <sup>52</sup> was established on the basis of the CPC. It is a member of the International Arctic Science Committee and the Scientific Committee of

---

<sup>49</sup> Canada’s Arctic and Northern Policy Framework. URL: <https://www.rcaanc-cirnac.gc.ca/eng/1560523306861/1560523330587> (accessed 10 May 2021).

<sup>50</sup> Canada’s Northwest Territories Science Development Strategy (2009). URL: [http://nwtresearch.com/sites/default/files/nwt\\_science\\_agenda.pdf](http://nwtresearch.com/sites/default/files/nwt_science_agenda.pdf) (accessed 01 November 2019).

<sup>51</sup> Sustaining Arctic Observing Network (SAON). URL: <http://www.arcticobserving.org/> (accessed 11 November 2019).

<sup>52</sup> Canadian Polar Research Agency (POLAR). URL: <http://www.canada.ca/en/polar-knowledgel> (accessed 01 November 2019).

Antarctic Research. The focus of the Agency's scientific research is formed by tasks, including the accumulation and dissemination of new knowledge about the Arctic, the development of the Canadian Arctic Research Station (CHARS). POLAR activities include environmental monitoring, modeling and forecasting of environmental changes, educational activities.

With the CPC support, the Canadian Northern Studies Trust (CNST) annually provides targeted funding for training in the natural sciences, social sciences, humanities and engineering disciplines for about 300 students from 35 universities [10].

The backbone of Canada's Arctic scientific infrastructure is the Canadian Network of Northern Research Operators (CNNRO), which includes a research station in Cambridge Bay, stations of McGill University, the University of Calgary, the universities of La Val, Alberta, British Columbia, technical resources of federal services and national space agency. The main goal of CNNRO is contribution to the sustainable development of northern territories and local communities by supporting research and creating a knowledge agency in the North of Canada<sup>53</sup> [12].

Laval, Quebec, hosts the headquarters of the Network of Centres of Excellence of Canada (ArcticNet)<sup>54</sup>. It is an international association for Arctic scientists and managers working together with partners, especially from indigenous communities, on research, health, social sciences and humanities. The task of the network is to accumulate knowledge in the field of climate change, adaptation to it and the industrialization of the coastal regions of the Canadian North. The research program includes projects on key topics: northern policy, maritime systems, Inuit health, education, adaptation and economic development, knowledge transfer in Inuit territories.

The Social Economy Research Network of Northern Canada, consisting of Aurora College, Nunavut Arctic College and Yukon College (University), unites scientists working in the North in the fields of social economics, resource management, public policy, socio-economic development of the region, indigenous peoples<sup>55</sup>.

The Department of Natural Resources of Canada operates the Geo-mapping for Energy and Minerals Program, which aims to increase the degree of geological exploration of the Canadian North, enabling the involvement of northern communities in the use of mineral and land resources to preserve the environment and create new economic development opportunities. The Department of Indian Affairs and Northern Canada initiated the Northern Contaminants Program. It includes measures to conduct environmental, social, medical monitoring of indigenous communities, which contributes to the prevention of their health, disturbed as a result of the entry of pollutants into their traditional habitat<sup>56</sup>.

<sup>53</sup> Canadian Network of Northern Research Operators (CNNRO). URL: <http://cnnro.ca> (accessed 10 April 2021).

<sup>54</sup> Network of Centres of Excellence of Canada (ArcticNet). URL: <http://www.arcticnet.ulaval.ca/> (accessed 10 April 2021).

<sup>55</sup> Social Economy Research Network of Northern Canada. URL: <http://yukonresearch.yukoncollege.yk.ca/sern/aboutsernnoca/> (accessed 10 April 2021).

<sup>56</sup> Co-operation in the Arctic Science – Challenges and Joint Actions / Report of the 2nd Arctic Science Ministerial, 25-26 October 2018, Berlin, Germany, p. 35.

The Association of Canadian Universities for Northern Studies, established in 1978, brings together more than 40 Canadian universities that provide training and research for the development of the North and the Arctic. Its mission is to organize discussions on northern research and education, and to promote northern research and education through international cooperation, including a grant system (using the Canadian Research Support Fund)<sup>57</sup>.

As in other northern states, there is a strong emphasis at the national level to support both expeditionary and field research infrastructure. The Canadian High Arctic Research Station (CHARS) has been operating since 2007 in Cambridge Bay, Nunavut, as a world-class, year-round multidisciplinary science and technology hub. CHARS promotes international partnerships between scientists, indigenous peoples, the public and private sectors. The research program is focused on the priorities identified by Canada's northern strategy and is in line with responsible social, economic and environmental policies in the Arctic<sup>58</sup>. Canada uses a constellation of satellites operated by the national government to carry out research activities: RADARSAT-2 (a polar orbiting satellite that collects images in various weather conditions), RADARSAT Constellation Mission (an orbital system of several satellites in geostationary orbit, providing observation of the Arctic region), SCISAT (collects data that provides a view of the stratosphere and the Earth's ozone layer)<sup>59</sup>.

Canada uses a fleet of icebreaking vessels for research on natural resources in the North and Arctic zones. The Coast Guard's icebreaker fleet is used for both applied and fundamental tasks in the Arctic, with seven vessels (only two are operational). The 13600 hp diesel-powered icebreaker Amundsen (13600 hp) is owned by the Government of Canada and operated by the Coast Guard, equipped with laboratory and field equipment to support research in the natural, medical and social sciences. During summer operations, scientific activities in the Arctic are supported by the icebreakers Louis S St-Laurent and Sir Wilfrid Laurier Amundsen. Martin Bergmann is a research vessel operated by the Arctic Research Foundation. Nuliajuk is a multi-purpose research vessel of the Government of Nunavut dedicated to study and sustainable development of fisheries in Northern Canada<sup>60</sup>. It should be noted that Canada, like the United States, does not have its own nuclear-powered icebreakers, which underlines the relevance of maintaining and developing relations with the Russian Federation. In 2008, Canada announced plans to build the heavy icebreaker John Diefenbaker, but as of 2020, work has not started yet<sup>61</sup>.

The only educational institution in the Northwest Territories of Canada is Aurora College (founded in 1968, 600 students, 400 employees) with campuses in Tebach (in Fort Smith), Yellowknife and Aurora (in Inuvik) and a network of dozens of educational centers throughout the region.

<sup>57</sup> Association of Canadian Universities for Northern Studies. URL: <http://acuns.ca/en/> (accessed 10 April 2021).

<sup>58</sup> Canadian High Arctic Research Station. URL: <https://www.canada.ca/en/polar-knowledge/constructingstation.html> (accessed 10 April 2021).

<sup>59</sup> Co-operation in the Arctic Science – Challenges and Joint Actions / Report of the 2nd Arctic Science Ministerial, 25-26 October 2018, Berlin, Germany, p. 36.

<sup>60</sup> Co-operation in the Arctic Science – Challenges and Joint Actions / Report of the 2nd Arctic Science Ministerial, 25-26 October 2018, Berlin, Germany, p. 37.

<sup>61</sup> *Ibid.*

The college implements specialist training programs and university-level applied bachelor's programs for business administration, education, healthcare, and social work. The college conducts research and development in the fields of water resources, air quality, permafrost, the use of alternative energy sources, northern building technologies, agriculture, food technology development in order to ensure food security and protect the health of the local population <sup>62</sup>. The college has a research institute responsible for licensing and coordinating research, communication with the scientific community, government and the public. The main areas of research are ecology, geology, biology and atmospheric research <sup>63</sup>.

Higher education programs in Nunavut are provided by the College of the Arctic (founded in 1995, over 1500 students and 250 employees), which has campuses in Iqaluit, Cambridge Bay and Rankin Inlet. The college consists of educational centers, a research institute and a specialist training center <sup>64</sup>. The college specializes in the training of personnel for indigenous peoples in undergraduate programs in ecology, biology, management, medicine, pedagogy and social work. These programs are carried out in collaboration with the universities of Canada: the University of Regina (teacher training program) and Dalhousie University (nursing) <sup>65</sup>. The Research Institute is an advisory body under the government of Nunavut, it acts as an information center, provides guidance to scientists working in the area (including supporting expeditionary research) <sup>66</sup>.

Yukon offers higher education programs at Yukon College (established in 1963, over 7000 students and 700 employees) <sup>67</sup>. The college promotes education, acts in the interests of indigenous peoples and supports their culture. Educational programs are integrative, with a focus on the study of the North: management of renewable resources, training of teachers and social workers, implemented jointly with the University of Regina, jurisprudence, protection and conservation of the environment, implemented jointly with the University of Alberta, master of business administration, in conjunction with the University of Alaska Southeast. Research at the college is conducted in the following areas: climate change and adaptation, biochar research, water purification, alternative energy sources, cold climate mining technologies, permafrost, food security, information and communication technologies, health and well-being of the population. The structure of the college includes the Yukon Research Center, which deals with issues of climate change, glaciology, hydrology, geology, cryosphere, terrestrial biology and ecology, law, and indigenous traditional knowledge. The college's research infrastructure includes a metal analysis laboratory, water treatment bioreactors, a permafrost assessment laboratory, and a social sciences laboratory <sup>68</sup>.

---

<sup>62</sup> Aurora College. URL: [http://www.auroracollege.nt.ca/\\_live/documents/content/Annual\\_Report.pdf](http://www.auroracollege.nt.ca/_live/documents/content/Annual_Report.pdf) (accessed 10 April 2021).

<sup>63</sup> Canadian Network of Northern Research Operators (CNNRO). URL: <http://cnnro.ca> (accessed 10 April 2021).

<sup>64</sup> College of the Arctic. URL: <https://www.arcticcollege.ca/about> (accessed 10 April 2021).

<sup>65</sup> UArctic University. URL: <https://www.uarctic.org/member-profiles/canada/8665/nunavut-arctic-college> (accessed 10 April 2021).

<sup>66</sup> Research Institute. URL: <https://www.nri.nu.ca/> (accessed 10 April 2021).

<sup>67</sup> Ucon University. URL: <https://education.uarctic.org/universities/canada/8940/yukon-university> (accessed 10 April 2021).

<sup>68</sup> Yukon College. URL: <https://www.yukoncollege.yk.ca/research> (accessed 10 May 2020).



Thus, for the scientific and educational space of the provinces and territories of northern Canada, a high degree of integration of science and education in the region, their interconnection and orientation towards international cooperation should be noted. University colleges train specialists in a wide range of disciplines, revealing current areas of Arctic research. They conduct research expertise and organize theoretical and applied research in accordance with the socio-economic needs of the region and the national strategy for the development of the High North.

### ***Conclusion***

The relevance of the Arctic issues over the past decades is due to objective factors, primarily the fact that irreversible transformations are currently taking place there. They are determined by two main and interrelated factors — climate change and globalization, followed by geopolitical, technological, organizational and institutional transformations. Rapid changes in the natural environment of the Arctic are reflected at all levels of education and research topics. There is a lack of knowledge of current processes and their consequences for more than 4 million inhabitants near and beyond the Arctic Circle. Therefore, much attention abroad (as well as in Russia) is paid to the organization of applied and fundamental research in the field of studying the impact of climate change (considered in the context of air temperature increase in the Arctic region exceeding the world average by 2–4 times) on the state of ice, ecosystems of the Arctic Ocean and its coasts, environmental pollution, the vital activity of indigenous peoples. The countries of North America are no exception here.

Having considered the features of the research policy of the USA and Canada in the Far North and in the Arctic region, we can conclude that the foundations of such a policy are formulated in the national strategies of both countries. The interest in the Arctic from the US and Canada is due to economic benefits, the strategic geographical position of the Arctic, the passage of transport communications in the Arctic Ocean, the use of natural resources by indigenous peoples, who are the first to feel changes in the climate system of the Arctic and the consequences of these processes. In recent years, the increased activity of Russia and China in the Arctic can be added to this list of reasons. In the 21st century, the United States and Canada have defined a very broad range of research areas and actors in the Arctic. The governments of both countries are inclined to expand international cooperation and involve business and the scientific community in science-based decision-making on the Arctic agenda in order to implement research policies. Cooperation tools include multilateral projects, circumpolar mobility through the Arctic Council, the University of the Arctic and cooperation programs at the national level.

Despite its relevance, the topic remains insufficiently studied. The significance of the article lies in attracting the attention of Russian scientific and educational, research organizations, and the business community to cooperation with partners from the Arctic countries in the field of improving scientific and educational technologies in the interests of sustainable socio-economic development and environmental management in the Arctic territories.

## References

1. Kondratov N.A. Strategii zarubezhnykh gosudarstv po osvoeniyu Kraynego Severa i Arktiki: geograficheskiy analiz [Strategies of Foreign Countries for the Development of the Far North and the Arctic: Comparative Analysis]. *Geograficheskiy vestnik* [Geographical Bulletin], 2020, no. 4, pp. 96–109.
2. Robards M.D., Huntigton H.P., Druckenmiller M., Lefevre J., Moses S.K., Stevenzon Z., Watson A., Williams M. Understanding and adapting to observed changes in the Alaskan Arctic: Actionable knowledge co-production with Alaska native communities. *Deep-Sea Research Part II-Topical Studies in Oceanography*, 2018, vol. 152, pp. 203–213. DOI: 10.1016/j.dsr2.2018.02.008
3. Butler L., Bullin C., Bally J., Tomtene M., Neuls E. Learn Where You Live, Teach From a Distance: Choosing the Best Technology for Distributed Nursing Education. *Northern Review*, 2016, no. 43, pp. 39–49.
4. Petrov A.N. Inuvialuit Social Indicators: Applying Arctic Social Indicators Framework to Study Well-Being in the Inuvialuit Communities. *Northern Review*, 2018, no. 47, pp. 167–185. DOI: 10.22584/nr47.2018.008
5. Zashihina I., Postnikova M. Social Implications of Media Education in the Curriculum of a Future Teacher. *Media Education (Mediaobrazovanie)*, 2019, vol. 4, pp. 608–618.
6. Anderson K.L., Kaden U., Druckenmiller P.S., Fowell S., Spangler M.A., Huettmann F., Ickert-Bond S.M. Arctic Science Education Using Public Museum Collections from the University of Alaska Museum: an Evolving and Expanding Landscape. *Arctic Science*, 2017, vol. 3, no. 3, pp. 635–653. DOI: 10.1139/as-2017-0010
7. Lipatov V.A. Provision of Educational Service with the Use of Distance Technologies for Disabled Persons (Case study: The State of Alaska and Northern Regions of the Russia Federation). *Otkrytoe obrazovanie* [Open Education], 2016, vol. 20, no. 4, pp. 23–28. DOI: 10.21686/1818-4243-2016-4-23-28
8. Chistobaev A.I., Kondratov N.A. Arktika: geopoliticheskie i geoeconomicheskie interesy zarubezhnykh stran [Arctic: The Geopolitical and Geo-Economic Interests of Foreign Countries]. *Geopolitika i bezopasnost'* [Geopolitics and Security], 2014, no. 1 (25), pp. 84–91.
9. Konyshev V.N., Sergunin A.A. U.S. — Russia Relations in the Arctic: Cooperation or Competition? *World Economy and International Relations*, 2018, vol. 62, no. 9, pp. 103–111. DOI: 10.20542/0131-2227-2018-62-9-103-111
10. Zhuravel V.P. Arkticheskiy sovet: perekhod predsedatel'stva ot SShA k Finlyandii, dal'neyshee ukreplenie rossiysko-finlyandskogo sotrudnichestva [The Arctic Council: Transition of Chairmanship from the US to Finland, Further Strengthening of Russian-Finnish Cooperation]. *Arktika i Sever* [Arctic and North], 2017, no. 28, pp. 24–35.
11. Zagorskiy A.V. *Rossiya i SShA v Arktike* [Russia and the USA in the Arctic] / Rossiyskiy Sovet po mezhdunarodnym delam [Russian International Affairs Council]. Moscow, NP RSMD Publ., 2016, 24 p. (In Russ.)
12. Zaykov K.S., Kalinina M.R., Kondratov N.A., Tamitskiy A.M. Strategicheskie priority nauchnykh issledovaniy Rossii i zarubezhnykh gosudarstv v arkticheskom regione [Strategic Research Priorities of Russia and Foreign Countries in the Arctic Region]. *Arktika: ekologiya i ekonomika* [Arctic: Ecology and Economy], 2016, no. 3, pp. 29–37.
13. Pavlenko V.I., Podoplekin A.O., Kutsenko S.Yu. Sistema fundamental'nykh nauchnykh issledovaniy v Arktike i realizatsiya geopoliticheskikh interesov tsirkumpolyarnykh stran [The System of Basic Research in the Arctic and the Geopolitical Interests of Circumpolar Countries]. *Arktika: ekologiya i ekonomika* [Arctic: Ecology and Economy], 2014, no. 4 (16), pp. 86–92.
14. Zaikov K.S., Kalinina M.R., Kondratov N.A., Tamitskii A.M. Innovation Course of Economic Development in the Northern and Arctic Territories in Russia and in the Nordic Countries. *Economic and Social Changes: Facts, Trends, Forecast*, 2017, vol. 10, no. 3, pp. 59–77. DOI: 10.15838/esc/2017.3.51.3
15. Agranat G.A. *Ispol'zovanie resursov i osvoenie territorii Zarubezhnogo Severa* [Use of Resources and Development of the Territory of the Foreign North]. Moscow, Nauka Publ., 1984, 263 p. (In Russ.)
16. Zhuravel V.P. Itogi predsedatel'stva v Arkticheskom sovete Kanady, SShA i Finlyandii (2013–2019 gg.) [The Results of the Chairmanship in the Arctic Council of Canada, the USA and Finland (2013–2019)].

*Bol'shaya Evraziya: razvitie, bezopasnost', sotrudnichestvo* [Greater Eurasia: Development, Security, Cooperation], 2019, pp. 309–312.

*The article was submitted 02.06.2021; approved after reviewing 29.07.2021;  
accepted for publication 01.08.2021*

*Contribution of the authors: the authors contributed equally to this article.*

*The authors declare no conflicts of interests.*