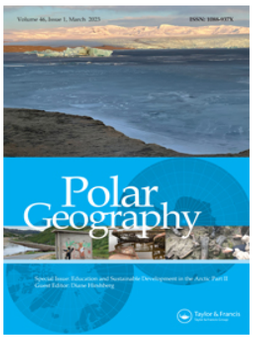

Polar Geography

ISSN: (Print) (Online) Journal homepage: https://www.tandfonline.com/loi/tpog20

Teaching the Arctic's sustainable development at Russian universities

Alexander Sergunin & Maxim Gutenev

To cite this article: Alexander Sergunin & Maxim Gutenev (2023) Teaching the Arctic's sustainable development at Russian universities, Polar Geography, 46:1, 18-40, DOI: 10.1080/1088937X.2023.2210177

To link to this article: https://doi.org/10.1080/1088937X.2023.2210177

POLAR GEOGRAPHY
2023, VOL. 46, NO. 1, 18–40
https://doi.org/10.1080/1088937X.2023.2210177

Taylor & Francis
Taylor & Francis Group

RESEARCH ARTICLE

OPEN ACCESS Check for updates

Teaching the Arctic's sustainable development at Russian universities

Alexander Sergunin[a] and Maxim Gutenev[b]

[a]Department of International Relations Theory & History, St. Petersburg State University, St. Petersburg, Russia; [b]Department of International Relations, Political Science and Regional Studies, South Ural State University, Chelyabinsk, Russia

ABSTRACT

This study examines how teaching sustainable development (SD) is organized in the Russian universities responsible for training specialists for the Arctic. The empirical data for the study are drawn from Russian universities' curricula and course syllabi. The paper discusses both achievements and problems related to the integration of SD courses into university programs. On the one hand, SD-related disciplines became an integral part of many natural and social sciences training programs. On the other hand, some problems can be identified: First, very few courses and programs are based on the so-called integrated approach to the SD concept which includes all components of sustainability. Second, not all UN Sustainable Development Goals are properly covered by university curricula. Third, some university teachers prefer the concept of resilience rather than sustainability, considering it more realistic. Fourth, many SD courses and programs tend to ignore indigenous knowledge about SD strategies. Fifth, not all Arctic SD-related university programs and courses are properly equipped with teaching materials. Finally, many SD courses are of a purely theoretical character and, for this reason, not very helpful for practical application of knowledge and skills acquired by students.

ARTICLE HISTORY
Received 6 February 2023
Accepted 1 May 2023

KEYWORDS
Arctic; Russia; sustainable development; university curricula; teaching

Introduction

UNESCO's Education for Sustainable Development (ESD) program has played a crucial role in the worldwide launch of university courses and programs on sustainable development (SD) in general and particularly in the Arctic. It is a UN program that views education as an instrument that encourages changes in knowledge, skills, values, and attitudes to enable a more sustainable and just society for all (UNESCO, 2013). ESD, the term most used internationally and by the UN, aims to empower and equip current and future generations to meet their needs using a balanced and integrated approach to the SD economic, social and environmental dimensions. Agenda 21, 'a comprehensive plan of action to be taken globally, nationally and locally by organizations of the United Nations System, Governments, and Major Groups in every area in which human impacts on the environment' (UN, 1992) was the first international document that identified education as an essential

CONTACT Alexander Sergunin a.sergunin@spbu.ru Department of International Relations Theory & History, St. Petersburg State University, 1-3 Smolny St., St. Petersburg 191060, Russia

tool for achieving sustainable development and highlighted areas of action for education (Leicht et al., 2018).

The adoption of the 2030 Agenda for Sustainable Development (2015) has provided fresh impetus for ESD and a very favorable environment in which to scale up the implementation of this program. The Agenda sets an ambitious universal education program with the adoption of Sustainable Development Goal (SDG) 4. Under this goal, one of the most ambitious, interesting, and challenging targets is Target 4.7, which is defined as follows:

> By 2030, ensure that all learners acquire the knowledge and skills needed to promote sustainable development, including, among others, through Education for Sustainable Development and sustainable lifestyles, human rights, gender equality, promotion of a culture of peace and nonviolence, global citizenship and appreciation of cultural diversity and of culture's contribution to sustainable development. (United Nations, 2015)

One definition of ESD is an 'interdisciplinary learning methodology covering the integrated social, economic, and environmental aspects of formal and informal curriculum' (Advance HE, 2019). For UNESCO, ESD involves:

> … integrating key sustainable development issues into teaching and learning. This may include, for example, instruction about climate change, disaster risk reduction, biodiversity, and poverty reduction and sustainable consumption. It also requires participatory teaching and learning methods that motivate and empower learners to change their behaviors and take action for sustainable development. ESD consequently promotes competencies like critical thinking, imagining future scenarios and making decisions in a collaborative way. (UNESCO, 2020)

Since Moscow was one of the key initiators of both documents the Russian higher education system was among the leaders of introducing SD-related training programs (at the bachelor, master and Ph.D. levels) and integrating SD courses into the university curricula. However, the Arctic-oriented programs and courses were launched later and in a limited number of Russian universities because Moscow didn't turn its attention to the Arctic Zone of the Russian Federation (AZRF) until the late 2000s. In the 1990s and early 2000s, there was a lack of interest in the AZRF which was to a larger extent forgotten and abandoned. Russia's 'return' to the Far North took place in 2007–2008 when the Kremlin adopted the first Russian Arctic strategy (Medvedev, 2009), tried to restore the region's industrial and transport infrastructure, and started military modernization programs (Konyshev & Sergunin, 2014; Konyshev et al., 2017; Sergunin & Konyshev, 2016). In this context, Moscow became interested again in training specialists for exploring and developing the AZRF. The Arctic studies programs were established in certain Russian universities, including programs and courses on SD.

This paper tries to examine how teaching SD is organized in Russian universities responsible for training specialists for the AZRF. It starts with a description of data and the method of analysis. The second section explains why ESD is important for the development of Arctic studies programs in Russia. The next section focuses on the content of Russia's Arctic SD-related programs and courses. Particularly, different interpretations of the SD concept by the Russian scholarship are examined. The interface between the academic discourse on Arctic sustainability and the Russian government's AZRF strategies is discussed. The fourth – and most important – chapter presents the results of the study and discussion. It especially explores the geographic distribution of Russian universities running Arctic SD programs, structural organization of these programs, as well as the themes and issues that

are covered by the university curricula and course syllabi. In conclusion, both Russian universities' achievements and problems related to teaching Arctic sustainability are identified.

Data and method

The empirical data for the study are drawn from curricula and course syllabi of 14 universities located both in the AZRF and other Russian regions, including Moscow and St. Petersburg. These universities were identified by two criteria – geographical (universities located in the AZRF and sub-Arctic areas) and the presence of Arctic SD-related courses in the university curricula.

According to the first criterion, four universities were identified: Murmansk Arctic State University (MASU), Murmansk State Technical University (MSTU), Arkhangelsk-based Northern (Arctic) Federal University (NArFU), and Yakutsk-based North-Eastern Federal University (NEFU). All of them have training programs specially designed for training a skilled labor force for the AZRF.

As far as the second group of universities is concerned, they were selected on the basis of an Internet search and the authors' personal experience of teaching at and cooperating with a number of St. Petersburg- and Moscow-based universities. A keyword search was carried out among the Russian university curricula with the aim to identify Russian universities located in the non-Arctic or sub-Arctic regions but, nevertheless, involved in the Arctic SD-related training programs. The following keywords were used for the Internet search: 'Arctic', 'Arctic Zone of the Russian Federation', 'North', 'Arctic or Northern studies', 'sustainable development', 'resilience', 'rational use of natural resources', 'environmental management', 'nature management', 'natural resources management', 'ecology', and 'geoecology'. During the Internet search, these keywords were used both individually and in combination with each other. The search was carried out across educational programs at all three levels – the bachelor, master's, and Ph.D. levels.[1]

On the basis of both the Internet search and the authors' professional experiences and contacts, 10 universities were selected: St. Petersburg State University (SPSU), St. Petersburg State Technical University (SPSTU), Russian State Hydrometeorological University (RSHMU), State Polar Academy (SPA) (merged with the RSHMU in 2015), Baltic State Technical University (BSTU) ('Voenmekh'), St. Petersburg Mining University (SPMU), Moscow State Institute of International Relations (MGIMO), Russian Academy of National Economy and Public Administration (RANEPA), Tomsk State University (TSU) and Tyumen' Industrial University (TIU). Some Russian universities that are involved in the training of specialists for the Russian Arctic (for example, the St. Petersburg-based Russian State Pedagogical University with its Northern Peoples Institute) do not have programs or courses on Arctic sustainability in their curricula and therefore were not included in this study.

For further (and more detailed) study of the educational programs of both groups of Russian universities, a content analysis of the course syllabi was conducted. Access to the course syllabi was obtained either via university websites or personal contacts. In some cases, the full texts of these syllabi are available on the Internet, but most universities publish only syllabus abstracts on their websites. But even abstracts can be used with a sufficient degree of certainty to judge the content and nature of these courses. Some universities have published textbooks for these courses, which serve as an additional source of information about the content of these disciplines.

In sum, 14 bachelor, 35 master's, 2 specialist, and 8 Ph.D. programs were selected (see Table 1).

Before presenting the results of this study and discussion, it is necessary to explain why ESD is important for the development of Arctic studies in Russia and – more generally – for the country's higher education system and what discussions are taking place in the Russian academic community on the SD concept.

Why ESD is important for the promotion of Arctic studies at Russian universities?

One of the main ESD priorities is to make education an effective tool for changing individual behavior in the sphere of SD. More specifically, according to the ESD goals, educators should develop strategies to help people choose more sustainable options, which is applicable to the AZRF as well. For example, in accordance with the ESD requirements, most of the Russian Arctic studies programs aim to provide students with basic knowledge from the natural sciences, social sciences, and humanities to understand:

- the principles of sustainable development;
- how they can be implemented;
- the values involved, and
- the ramifications of their implementation (UNESCO, 2012).

As for the practical skills that students should obtain upon the completion of training programs these skills are supposed to enable them to:

- continue learning after they leave university;
- find a sustainable livelihood, and
- live sustainable lives (UNESCO, 2017).

More specific practical skills include the abilities to:

- communicate effectively both orally and in writing;
- think about systems (both natural and social sciences);
- think in terms of time – to forecast, to think ahead, and to plan;
- think critically;
- use multiple perspectives to understand another person's viewpoint;
- analyze values underlying differing positions;
- move from awareness to knowledge to action;
- work cooperatively with other people;
- develop an aesthetic response to the environment and the arts (UNESCO, 2017, 2020).

More recently, Russian and international educators started to pay attention to a different ESD dimension. This school argues that the purpose of education is not to contribute to solving specific sustainability problems here and now by promoting particular behavioral outcomes but that it should aim at the 'empowerment' of active, critical, and independent citizens that are able to decide for themselves and to participate in democratic decision-making (Skopitskaya, 2012; Van Poeck & Vandenabeele, 2012).

Table 1. SD-related programs in the Russian universities responsible for training specialists on the Arctic.

No.	Name of university	Tier/level and names of training programs			
		Bachelor	Master	Specialist	Ph.D.
Arctic Zone of the Russian Federation					
1.	Murmansk Arctic State University	• Environmental management in the Arctic • Nature management and environment protection in the Arctic	• Ecology (replaced by the program on Bioecology. Biology of the Arctic territories)		
2.	Murmansk State Technical University	• Operation and maintenance of oil and gas facilities on the Arctic shelf	• Ecological safety of water facilities in the Arctic • Water drainage and wastewater treatment in the Arctic Zone of the Russian Federation		
3.	Northern Arctic Federal University	• Living systems of the Arctic and sub-Arctic	• Arctic biodiversity • Arctic territories' development management • European studies: the Arctic vector • Management of environmental risks in the Arctic		• Geoecology • Ecology
4.	North-Eastern Federal University		• Arctic area studies • Arctic law. Environmental law • Arctic sustainable development • Rational land-use in the Northern and Arctic territories		
Non-Arctic regions					
5.	St. Petersburg State University	• Ecology and nature management • Geography • Geography of Polar countries	• Baltic and Nordic studies • Cold region environmental landscapes integrated sciences (CORELIS) • Environmental management • Geoecological monitoring and rational use of natural resources • International Cooperation in Environmental Policy and Sustainable Development • Polar and marine sciences (POMOR) • Social geography		• Geography

(*Continued*)

Table 1. Continued.

No.	Name of university	Tier/level and names of training programs			
		Bachelor	Master	Specialist	Ph.D.
6.	St. Petersburg State Technical University		• Environmental engineering in urban construction • Environmental security in industry	• Geoecology	
7.	Russian State Hydrometeorological University	• Environmental problems of large cities, industrial zones and polar regions • Public administration	• Environmental management and security of the northern regions • Environmental security of the polar regions • Geoinformation support of hydrometeorological and hydrographic activities in the Arctic • Oceanographic and hydrographic support for marine activities in the Arctic • Oceanology		• Geoecology • Information-measuring and control systems in hydrometeorology and ecology. • Oceanology Geography • Atmosphere and climate sciences • Economics and public economy management
8.	State Polar Academy (merged with the RSHMU in 2015)	• Ecology and nature management • Water bio-resources and aquaculture	• Public administration		
9.	Baltic State Technical University ('Voenmekh')	• Economics	• General and strategic management • Master of business administration and engineering		
10.	St. Petersburg Mining University	• Ecology and nature management	• Ecology and nature management	• Mining. Engineering ecology	
11.	Moscow State Institute of International Relations (MGIMO)		• International oil and gas business and development of Arctic resource • Legal support of energy cooperation and development of oil and gas resources in the Arctic		
12.	Russian Academy of National Economy and Public Administration		• The Russian North's development management		
13.	Tomsk State University	• Ecology and nature management	• Ecology and nature management • Siberian and Arctic studies		
14.	Tyumen' Industrial University		• Arctic and sub-Arctic natural resources		

Source: Constructed on the basis of university curricula and course syllabi.

In other words, SD-related educational programs should become an instrument for the democratization of Russian society and the decision-making system on Arctic policies. In practical terms, it means that not only Russia's federal government but also sub-state units (members of the Russian Federation and municipalities) and non-state actors (local communities, indigenous peoples, environmental and human rights NGOs, universities, mass media, etc.) should partake in building SD strategies (SDSs) in the AZRF. This is very important for changing current Russian SDS planning practices in the AZRF which are now very centralized and obviously lack active participation of civil society institutions (Bobylev et al., 2021, pp. 880–881; Sergunin, 2020, p. 245; Tianming et al., 2021).

Given this new role of education, Russian universities dealing with Arctic studies should become not only producers of knowledge and experts/specialists on the Arctic but also effective instruments of society's democratic transformation.

Thinking about the course content: what is sustainable development?

According to the Russian strategic documents on the Arctic (Putin, 2013, 2020a, 2020b), political leadership and expert community, SDS should become a key element of Russia's national policy in the region. However, it remains unclear what specifically the Russian decision-makers and academics mean under the SDS concept. How is this concept reflected in Russia's current national strategies for the AZRF? Has the SDS already been operationalized in Russia's concrete programs, projects, and implementation mechanisms in the region or it is still – more or less – just on paper?

In the Russian scholarship, sustainable development is an eclectic concept, as a wide array of views fall under its umbrella. Its definition dates back to the 1987 UN Brundtland report, which defines sustainable development as 'development which meets the needs of the present without compromising the ability of future generations to meet their own needs' (United Nations 1987).

The Russian experts differ in their interpretation of the SDS concept. One school, the 'economists', following the Brundtland report's approach believes that sustainable development is a pattern of resource use that aims to meet human needs while preserving the environment so that these needs can be met not only in the present but also for future generations. For this school, sustainable development is an economy in equilibrium with basic ecological support systems. As for the AZRF the 'economists' insist on the need to preserve its fragile ecological balance while exploring and developing the region's natural resources. They oppose unlimited economic growth and call for mandatory ecological expertise in all developmental projects (Danilov et al., 2005; Dobretsov & Pokhilenko, 2010; Kontorovich et al. 2010).

The Russian 'green' environmentalist school, which dates back to Vladimir Vernadsky's teaching on biosphere and noosphere (Vernadsky, 1998), emphasizes the ecological aspects of the SDS. The 'greens' believe that the Arctic ecosystem is unique and – at the same time – fragile. For this reason, it cannot be sacrificed to the AZRF's successful economic development based on the exploitation of natural resources (Dushkova & Evseev, 2011; Sokolov, 2013). The environmentalists criticize Russia's official Arctic strategy that aims at making the AZRF a 'strategic resource base'. They underline that the AZRF should avoid the 'resource curse' and keep its ecosystems intact. They warn that if the economic activities in the Arctic are not reduced to a reasonable minimum the ecological implications will be catastrophic not only for the region but also for the entire world. They note, for example, that the Arctic shapes not only the regional but also the world's weather.

The third, 'anthropological'/human-centric, approach focuses on the social aspects of the SDS underlining the necessity to subordinate its economic and ecological components to the needs of human development. For this reason, the main attention is paid to the 'human dimension' of Russia's Arctic strategy – indigenous peoples, urban population, labor migrants, etc. (Fomina, 2013; Savel'eva & Savel'ev, 2010).

However, over the last two decades, the so-called integrated approach to the SDS that has been proposed by both the UN and Arctic Council (AC) gained momentum in the Russian academic community (Danilov-Danilyan & Piskulova, 2015; Dodin, 2005; Heininen, Sergunin & Yarovoy, 2014; Tatarkin, 2014). According to such an integrated approach, the SDS is conceptually broken into three constituent parts: environmental, economic, and social (see Figure 1).

The *economic dimension* of the Russian SDS has the following priorities for the AZRF: sustainable economic activity and increasing prosperity of Arctic communities; sustainable use of natural, including living, resources; development of transport infrastructure (including aviation, marine and surface transport); and information technologies and modern telecommunications (Danilov et al., 2005; Dodin, 2005; Tatarkin, 2014).

The *environmental dimension* of Russia's AZRF SDS includes monitoring and assessment of the state of the environment in the Arctic; prevention and elimination of environmental pollution in the Arctic; Arctic marine environment protection; biodiversity conservation in the Arctic; climate change impact assessment in the Arctic; and prevention and elimination of ecological emergencies in the Arctic, including those relating to climate change (Danilov et al., 2005; Dodin, 2005; Tatarkin, 2014).

Finally, the *social dimension* of the strategy focuses on the health of the people living and working in the Arctic; education and cultural heritage; prosperity and capacity building for children and the youth; gender equality; and enhancing well being, including eradication of

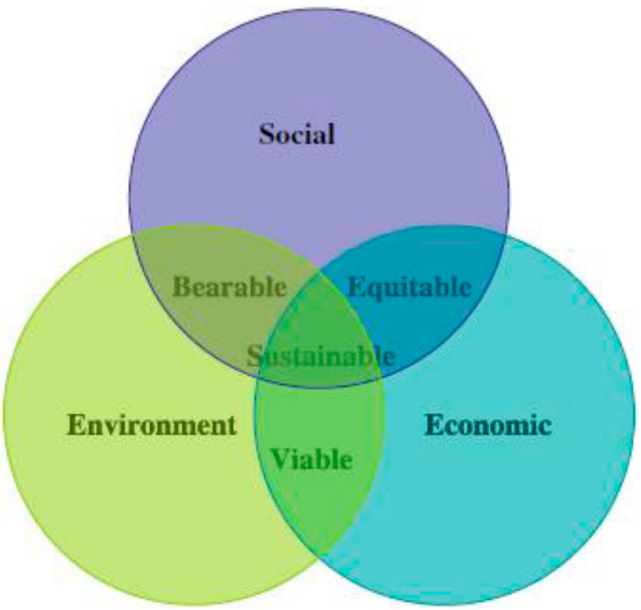

Figure 1. Sustainable development: three dimensions.

poverty among Arctic people (Konyshev et al., 2017; Sergunin and Konyshev, 2016, pp. 50–52; Tatarkin, 2014).

As the evolution of the Russian Arctic doctrines demonstrates, Moscow's thinking on the regional strategy is changing fundamentally. While in the 2008 doctrinal document on the Arctic the AZRF was seen as Russia's 'strategic natural resources base' (Medvedev, 2009), the later strategies put the main focus on the region's SD (Putin, 2013, 2020a, 2020b). It should be noted that the most recent Russian strategic documents on the Arctic not only integrated the SD concept but also made its human/social dimension a main priority for Moscow's SDS in this region (Putin, 2020a, 2020b). There is, however, some criticism of the Kremlin's policies in the AZRF. Some scholars believe that the economic/resource-oriented aspects of Russia's regional strategies are still dominant ones while ecological and human/social dimensions of Moscow's SDS to a larger extent remain on paper (Konyshev et al., 2017; Sboichakova, 2018; Sergunin, 2018; Voronchikhina, 2021).

It should be noted that the SD theory was recently challenged by a resilience concept which became rather popular among Russian scholars (especially among natural scientists). The followers of the new theory contrapose the SD and resilience concepts. They believe that, compared with the essentially utopian SD concept, the principle of resilience is more realistic in terms of solving the socio-economic and environmental problems facing the AZRF (Bogopol'sky, 1998; Ponkin, 2015). According to this school, resilience is the capacity of a system to survive, adapt, and grow in the face of unforeseen changes, even catastrophic incidents, while SD is hardly achievable because it is impossible to foresee and prevent all potential threats and challenges.

A less radical version of the resilience theory does not set these concepts against each other. This group of researchers believes that resilience is one of the qualities of sustainability or a stage in the implementation of a SDS (Lukin, 2015; Pavlenko & Glukhareva, 2010; Protopopova, 2019; Selin & Vasiliev, 2009; Stolbov, 2009).

The resilience concept becomes increasingly popular among Russian experts on the AZRF economic and environmental development who believe that it is more important to make Arctic economic and ecological systems resilient to various endogenous and exogenous stressors than ensure their (highly improbable) SD.

Results and discussion

Two dimensions of university programs were studied – structural and problematic.

The structural analysis of university curricula aims to examine how the Arctic SD-related programs are organized in terms of geography and internal structure, including their levels/tiers and components.

In terms of geography, only four universities are from three AZRF regions – Arkhangelsk, Murmansk, and Republic of Sakha-Yakutia (see Table 1). The St. Petersburg-based university community is the biggest one among Russia's non-Arctic academic centers: seven (half of the institutions under consideration) universities are located in this city. It is an old Russian tradition (dated back to the tsarist and Soviet times) to train specialists for the Russian High North and the Far East in St. Petersburg/Leningrad where the most of Russian higher education institutions have been located since the nineteenth century.

The AZRF universities are relatively new: all of them were established in the Soviet era. With exception of programs in engineering, fishery, and marine sciences, until the late 1990s–early 2000s these universities mostly specialized in pedagogical studies, social

sciences, and humanities without a specific focus on Arctic sustainability. In the 2000s, most of the AZRF classical universities and specialized institutions (technical, medical, pedagogical ones) were merged to form large and multidisciplinary university complexes, such as, for example, the NArFU (Arkhangelsk), NEFU (Yakutsk, Republic of Sakha-Yakutia) and MASU (Murmansk).

Only after this reorganization did the AZRF universities launched a number of Arctic sustainability-related programs. Despite rather massive funding programs from the federal government, the AZRF universities are still less developed than other Russian (centrally located) institutions and to a larger extent dependent on their 'elder brothers' from St. Petersburg and Moscow. This is especially true for the AZRF social sciences and humanities programs because very few northern universities have their own dissertation committees to grant Ph.D. and Doctor of Sciences (Habilitation) degrees. To obtain these degrees teachers and scholars from the AZRF universities still have to go to St. Petersburg, Moscow, Tomsk, Novosibirsk, and other Russian well-established university centers.

Moscow-, Tomsk-, and Tyumen-based universities take part in training specialists for the AZRF because they traditionally have strong schools in areas, such as natural resource extraction and processing (especially hydrocarbons) and environmental law (Moscow State Institute of International Relations, 2018; North-Eastern Federal University, 2023b; Tomsk State University, 2022a, 2022b, 2022c; Tyumen' Industrial University, 2022).

As for the internal organization of the Arctic sustainability training programs, it should be noted that 12 of 14 Russian universities have special Arctic/polar programs (see Table 2). Two St. Petersburg-based institutions – the BSTU and SPMU – formally have no Arctic-related programs but in fact they have a 'polar component' in their programs such as economics, business administration, strategic management and mineral resource processing. Noteworthy, the BSTU implements its bachelor program on economics and master program on business administration and engineering together with the Nord University (Norway) (Baltic State Technical University, 2022, 2023a).

As mentioned above, the master tier/level is the main producer of Arctic specialists. There are 35 master programs on various aspects of Arctic sustainability while there are only 14 bachelor, 2 specialist and 8 Ph.D. programs in this field. Only three universities (NArFU, SPSU, and RSHMU) have a full cycle of professional training, i.e. all three levels of higher education, including bachelor, master, and Ph.D. ones. Other universities have only two initial levels.

The fact that Arctic training is mainly focused on the master tier can be explained by specifics of both the Russian higher education system and Arctic studies. Since the moment when Russia accepted a three-tier (bachelor-master-Ph.D.) Bologna system instead of the Soviet-like two-level (specialist-Ph.D.) structure, the first (bachelor) phase is perceived both by the educators and practitioners as a rather preliminary/introductory kind of higher education. University graduates with the bachelor's degree are not considered real experts/specialists because their curricula include mainly basic disciplines and almost lack a proper specialization in particular areas. Only four out of nine universities with bachelor programs related to Arctic sustainability run programs with elements of specialization on Arctic studies: programs on environmental management and nature management and environmental protection in the Arctic (MASU), operation and maintenance of oil and gas facilities on the Arctic shelf (MSTU), living systems of the Arctic and sub-Arctic (NArFU) and geography of polar countries (SPSU). However, even this training is viewed as insufficient to obtain proper competencies and skills to work in the AZRF. It

Table 2. The nature of the SD-related programs and courses in the Russian universities responsible for training specialists on the Arctic.

		Universities with special Arctic training programs						Universities without special Arctic training programs					
		Integrated SD courses			One-dimensional courses			Integrated SD courses			One-dimensional courses		
No.	Name of university	Bachelor	Master	Ph.D.	bachelor	master	Ph.D.	bachelor	master	Ph.D.	bachelor	master	Ph.D.
Arctic Zone of the Russian Federation													
1.	Murmansk Arctic State University	+	–	–	+	+	+	n/a	n/a	n/a	n/a	n/a	n/a
2.	Murmansk State Technical University	–	–	–	+	+	+	n/a	n/a	n/a	n/a	n/a	n/a
3.	Northern Arctic Federal University	–	–	–	+	+	+	n/a	n/a	n/a	n/a	n/a	n/a
4.	North-Eastern Federal University	–	+	–	+	+	+	n/a	n/a	n/a	n/a	n/a	n/a
Non-Arctic regions													
5.	St. Petersburg State University	+	+	–	+	+	+	n/a	n/a	n/a	n/a	n/a	n/a
6.	St. Petersburg State Technical University		–	–	+	+	–	n/a	n/a	n/a	n/a	n/a	n/a
7.	Russian State Hydrometeorological University	–	–	+	+	+	+	n/a	n/a	n/a	n/a	n/a	n/a
8.	State Polar Academy (merged with the RSHMU in 2015)	–	–	–	+	+	–	n/a	n/a	n/a	n/a	n/a	n/a
9.	Baltic State Technical University ('Voenmekh')	n/a	n/a	n/a	n/a	n/a	n/a	+	–	–	+	+	+
10.	St. Petersburg Mining University	n/a	n/a	n/a	n/a	n/a	n/a	–	–	–	+	+	–
11.	Moscow State Institute of International Relations (MGIMO)	–		–	–	+	–	n/a	n/a	n/a	n/a	n/a	n/a
12.	Russian Academy of National Economy and Public Administration	–	–	–	–	+	–	n/a	n/a	n/a	n/a	n/a	n/a
13.	Tomsk State University	–	–	–	–	+	–	n/a	n/a	n/a	n/a	n/a	n/a
14.	Tyumen' Industrial University	–	–	–	–	+	–	n/a	n/a	n/a	n/a	n/a	n/a

Source: Constructed on the basis of university curricula and course syllabi.

is believed that only the master level, which is seen as an equivalent of the Soviet-type specialist program (or the recently reborn specialist program), can provide students with the necessary qualifications for a successful professional career in the Arctic.

Ph.D. programs related to Arctic sustainability are run by those universities (NArFU, SPSU, and RSHMU) which have dissertation committees empowered to grant Ph.D. degrees. Almost all these programs belong to natural sciences – ecology, geoecology, geography, oceanology, and hydrometeorology. The only exception is the RSHMU Ph.D. program on economics and public economy management (2021a). This, however, does not prevent some Ph.D. students from other programs to defend theses on the Arctic SD-related problematique. For example, in December 2018, a Ph.D. dissertation titled 'The role of the Arctic Council in making of ecological security policy in the Arctic' (specialization in global politics) was defended in the SPSU (Sboichakova, 2018). Another example is the Ph.D. thesis 'Political and legal aspects of ensuring environmental safety in the Arctic Zone of the Russian Federation' which was defended in the same university in March 2021 (Voronchikhina, 2021). Interestingly, the texts of these dissertations are available both in Russian and English. According to the SPSU requirements, its dissertation committees should include not less than one foreign professor and public defenses can be held both in Russian and English.

On the whole, the current structure of the Russian training system on Arctic sustainability is to a larger extent adequate to the existing needs of the AZRF in terms of providing it with specialists of different levels of qualifications. However, as the analysis below demonstrates there are problems with the content of programs and courses taught in the universities responsible for training specialists for the AZRF.

In contrast with the structural analysis, *the problem-oriented analysis* aims to examine themes and issues that are covered by the university curricula and course syllabi.

As mentioned above, almost all universities in this study (except two of them) run Arctic-related training programs (see Table 1). However, it should be noted that only one master program which is implemented jointly by the NEFU and the University of Hokkaido (Sapporo, Japan) is totally devoted to Arctic sustainability (North-Eastern Federal University, 2023c). Other programs are of specialized nature: they focus on specific aspects of sustainability.

Most of them are related to the environmental aspects of industrial and agricultural activities. For example, NEFU has a master's program in rational land use in the Northern and Arctic territories (North-Eastern Federal University, 2023d). The MSTU runs a bachelor program on the operation and maintenance of oil and gas facilities on the Arctic shelf and master programs on the ecological safety of water facilities in the Arctic and water drainage and wastewater treatment in the AZRF (Murmansk State Technical University, 2018a, 2018b, 2019). The SPSU has a master's program in geoecological monitoring and rational use of natural resources (St. Petersburg State University, 2018b). The SPSTU has master's programs on environmental engineering in urban construction and environmental security in industry (St. Petersburg State Technical University, 2023a, 2023b). The SPA, which merged with the RSHMU in 2015, had bachelor programs on ecology and nature management and water bio-resources and aquaculture (State Polar Academy, 2013). The BSTU has a master's program in business administration and engineering (Baltic State Technical University, 2022). The SPMU has bachelor, master's, and specialist programs in nature management and engineering ecology (St. Petersburg Mining University, 2022a, 2022b, 2022c). The TIU runs master's program on Arctic and sub-Arctic natural resources (Tyumen Industrial University, 2022).

Another popular category of the SD-related programs is environmental management and ecology in the High North. For instance, the MASU has bachelor programs on environmental management and nature management and environmental protection in the Arctic and a master program on ecology which was replaced by the program on bioecology (Murmansk Arctic State University, 2019a, 2019b, 2021, 2022). The NArFU runs master's programs in Arctic territories' development management and management of environmental risks in the Arctic as well as Ph.D. programs on ecology and geoecology (Northern Arctic Federal University, 2017a, 2017b, 2021b, 2021e). The RSHMU has a bachelor program on environmental problems of large cities, industrial zones and polar regions (Russian State Hydrometeorological University, 2022b), master's programs in environmental management and security of the northern regions (Russian State Hydrometeorological University, 2020a, 2021b), and Ph.D. programs in ecology and geoecology (Russian State Hydrometeorological University, 2020b, 2022a, 2022c). The SPSU has master programs on cold region environmental landscapes integrated sciences (CORELIS), geoecology (including monitoring, environmental management, and environmental safety), and international cooperation in environmental policy and sustainable development (St. Petersburg State University, 2018a, 2020, 2022a, 2023b). The SPSTU runs a specialist program on geoecology where the environmental problems of northern regions are addressed (St. Petersburg State Technical University, 2023c). The TSU has bachelor and master programs on ecology and nature management and on Siberian and Arctic studies (Tomsk State University, 2022a, 2022b, 2022c).

The third category of programs is devoted to sustainable socioeconomic development of the Arctic territories. Several universities implement such programs at all three levels of higher education: NArFU (Northern Arctic Federal University, 2021b), RSHMU (Russian State Hydrometeorological University, 2021a, 2021e), SPA (State Polar Academy, 2013), SPSU (St. Petersburg State University, 2018d, 2023a, 2023b), TSU BSTU (Baltic State Technical University, 2023a, 2023b), and RANEPA (Russian Academy of National Economy and Public Administration, 2021).

Some programs aim to train specialists in biodiversity and living resources of the Far North (NArFU, NEFU, SPSU, SPA), oceanology, hydrometeorology and marine science (SPSU, RSHMU, SPA), polar geography (SPSU), polar law (NEFU, SPSU, MGIMO) and area studies (NArFU, NEFU, SPSU, SPSTU, TSU).

Taken together the above programs address the most important Arctic sustainability problems. However, in reality, most of Russian universities still prefer a compartmentalized rather than multidisciplinary approach to training specialists on the Arctic SDS. Along with the above mentioned NEFU-University of Hokkaido joint master program, the elements of multidisciplinarity are demonstrated by the SPSU's bachelor program in polar geography and master's programs on CORELIS and international cooperation in environmental policy and sustainable development, SPSTU's master's program in Nordic countries, RANEPA's master program on the Russian North's development management and TSU's master's program in Siberian and Arctic studies. Other university programs are of narrow-focused or highly specialized nature which prevents the Russian higher education system from training specialists with a complex and integrated vision of Arctic sustainability.

According to the UN ESD program, the quality of university programs is evaluated by the extent to which they reflect the UN 17 SDGs in their curricula. The ESD supporters believe that educators can contribute to achieving the SDGs by, first, developing cross-cutting sustainability competencies that are needed to deal with many different

sustainability challenges and to relate the different SDGs to each other. Second, according to this school, the ESD can equip learners with specific cognitive, socio-emotional, and behavioral learning outcomes that enable them to deal with the particular challenges of each SDG. (UNESCO, 2017, p. 58). To what extent do the Russian universities dealing with Arctic studies correspond to the ESD requirements?

As Table 3 demonstrates, three SDGs are totally missing from the university curricula: 'No poverty', 'Quality education' and 'Gender equality'. While the first SDG might be not a very high priority for the AZRF (this SDG is mostly designed for the less developed countries), the quality education and gender-related issues are quite important for the Russian Arctic regions – both for indigenous peoples and non-indigenous populations.

As far as the 'Quality education' SDG is concerned relevant programs and courses are missing in the Russian university curricula but, according to the Russian higher education system's standards, the university administration and faculty members should take care of the quality of training programs (including the Arctic SD-related ones) in their universities. In principle, both university administrators and teachers understand the important role of education and lifelong learning opportunities for all (formal, non-formal, and informal learning) as main drivers of SD, for improving people's lives and in achieving the SDGs in the AZRF. All Russian universities have quality assurance systems and some of them established special units to control the quality of education. For example, the NArFU developed its quality control system on the basis of the European Standards and Guidelines which have been adopted by the European Network for Quality Assurance (an integral part of the Bologna process) (Northern Arctic Federal University, 2020). The RSHMU uses St. Petersburg-based certificate centers of the International Organization for Standardization to assess quality of its training programs (Russian State Hydrometeorological University, 2023).

Teaching of the 'Gender equality' SDGis in the embryonic stage in the Russian higher education system (Il'chenko, 2018; Martynova, 2005). Very few Russian universities have gender-related programs and courses and none of those institutions, which deal with training specialists on Arctic sustainability, pay attention to gender issues in the AZRF.

Two other SDGs – 'No hunger, food security, sustainable agriculture' and 'Reduced inequalities' are given peripheral attention. Only the SPSU has several courses on agriculture and agro-industrial complexes in the frame of a bachelor program in geography (St. Petersburg State University, 2022c). The 'Reduced inequalities' SDG is addressed by some social science courses at the NEFU, SPSU and RANEPA but it is not identified as a special (and important) priority for the Arctic SDS.

As compared to the Western higher education institutions (especially the Nordic, Canadian, and US ones), Russian universities pay relatively little attention to the 'Climate Action' SDG. Only five (NEFU, SPSU, RSHMU, BSTU and TSU) of 14 universities responsible for training specialists for the AZRF have special courses on climate change – global and regional – in their curricula. The rest of these universities address this issue in some general courses in environment, ecological security, hydrometeorology, and so on but do not emphasize its importance for the Arctic region by suggesting special courses in this field. Partially, it can be explained by a rather skeptical attitude of the Russian climatologist mainstream thinking to the global climate change phenomenon (especially to the most radical version of climatology – the global warming theory). Many Russian experts believe that climate change is of cyclic nature: cold periods alternate with warm ones at regular intervals. Moreover, according to this school, the current global warming trend is

Table 3. SDG-related themes and issues in the programs and courses in the Russian universities responsible for training specialists on the Arctic.

No.	Name of university	No poverty	No hunger, food security, sustainable agriculture	Good health & well-being	Quality education	Gender equality	Clean water & sanitation	Affordable & clean energy	Decent work & economic growth	Industry, innovation and infrastructure	Reduced inequalities	Sustainable cities and communities	Responsible consumption and production	Climate action	Life below water	Life on land	Peace, justice, strong institutions	Partnerships for the goals
Arctic Zone of the Russian Federation																		
1.	Murmansk Arctic State University						+			+		+				+	+	+
2.	Murmansk State Technical University						+		+	+			+			+		
3.	Northern Arctic Federal University							+		+		+	+			+	+	+
4.	North-Eastern Federal University			+			+		+	+	+	+	+	+	+	+	+	+
Non-Arctic regions																		
5.	St. Petersburg State University		+	+			+	+	+	+	+	+	+	+	+	+	+	+
6.	St. Petersburg State Technical University			+				+					+			+		
7.	Russian State Hydrometeorological University			+			+					+	+	+	+	+	+	
8.	State Polar Academy (merged with the RSHMU in 2015)						+								+	+		
9.	Baltic State Technical University ('Voenmekh')								+	+			+	+		+		
10.	St. Petersburg Mining University						+		+	+			+			+		
11.	Moscow State Institute of International Relations (MGIMO)							+										
12.	Russian Academy of National Economy and Public Administration								+	+	+	+	+			+	+	+
13.	Tomsk State University									+		+	+	+	+	+	+	
14.	Tyumen' Industrial University							+		+			+			+		

Source: Constructed on the basis of university curricula and course syllabi.

generated by natural rather than anthropogenic factors and, for this reason, there are no grounds for alarmism and radical measures to stop further economic growth (Alekseev et al., 2018; Danilov et al., 2005).

Three SDGs – 'Industry, innovation and infrastructure', 'Responsible consumption and production' and 'Life on land' – are absolute leaders among the 'peers'. 10, 11 and 13 universities, respectively, teach courses on these SDGs. This is not surprising because most university programs on Arctic studies are devoted to the sustainable development of industries, transport infrastructure, flora and fauna in the AZRF. As mentioned above, the integrated approach to SDS is still not embedded in Russia's university curricula and courses.

It should be also mentioned that one more important issue is not covered by the Russian university programs and courses – the role of traditional knowledge in promoting the Arctic SD. Several universities (NArFU, NEFU, SPSU, SPSTU, RANEPA and TSU) teach courses on the indigenous peoples-related problematique. However, they basically focus on ethnographic/cultural aspects and the need for preservation of the indigenous peoples' traditional way of life rather than on their SD experiences.

As course syllabi analysis shows, most courses on environmental and economic management, ecological security, geoecology, industrial development, rational use of natural resources, oceanology are based more on the resilience rather than on the SD concept (Baltic State Technical University, 2023a, 2023b, 2022; Moscow State Institute of International Relations, 2018, 2021; Murmansk Arctic State University, 2019a, 2019b; Murmansk State Technical University, 2018a, 2018b, 2019; Northern Arctic Federal University, 2017a, 2017b, 2021a, 2021d, 2021e; North-Eastern Federal University, 2023d; Russian State Hydrometeorological University, 2020a, 2020b, 2020c, 2021b, 2021c, 2021d, 2022a, 2022b, 2022c, 2022d; St. Petersburg Mining University, 2022a, 2022b, 2022c; St. Petersburg State Technical University, 2023a, 2023b, 2023c; St. Petersburg State University, 2018a, 2018b, 2018c, 2020, 2021a, 2021b, 2022a, 2022b, 2022c; Tomsk State University, 2022a, 2022b; Tyumen' Industrial University, 2022). The SD concept is more popular among university teachers representing social sciences (Northern Arctic Federal University, 2021b, 2021c; North-Eastern Federal University, 2023a, 2023c; Russian Academy of National Economy and Public Administration, 2021; St. Petersburg State University, 2023a, 2023b; Tomsk State University, 2022c). This can be explained by the natural sciences' proclivity for tackling more concrete problems, while social sciences favor a more complex/comprehensive approach aiming to harmonization of the economic, environmental, and social/humanitarian aspects of sustainability.

As far as textbooks and teaching materials are concerned formally, there are no special textbooks on Arctic sustainability published in Russia. To fill the existing vacuum in this sphere Russian university teachers and students use some research monographs and edited volumes as a replacement for textbooks. For example, books by David Dodin (2005), Yuri Lukin (2013), and Alexander Tatarkin (2014) are often used as textbooks in the frame of various Arctic SD-related courses. However, these publications are criticized either for the 'geological bias' (Dodin, 2005) or being too general and paying little attention to Arctic sustainability issues (Lukin, 2013; Tatarkin, 2014). Moreover, they were published before the adoption of the 2015 UN SDGs and do not cover them.

To introduce students to the SD theory and problematique university teachers use some standard Russian textbooks on SD (Danilov-Danilyan & Piskulova, 2015; Vashalova, 2017) although they lack a specific focus on the Arctic. There is also a teaching literature on specific disciplines and aspects of sustainability such as, for example, environmental management (Danilov et al., 2005), rational use of natural resources (Bobylev & Perelet, 2013;

Konstantinov & Chelidze, 2014), geoecology (Dodin & Surkov, 2002; Smirnov, 2006), climate change (Kislov, 2011; Morina et al., 2013), socioeconomic development (Bobylev & Perelet, 2013; Kuznetsov & Selimenkov, 2015), regional planning (Bobylev & Perelet, 2013; Kuznetsov & Selimenkov, 2015), indigenous peoples (Shtyrov, 2012; Tishkov, 2016), and so on.

However, special textbooks on Arctic SD are still in high demand in the Russian university community.

Conclusions

Several conclusions emerge from the above analysis:

On the one hand, the Russian higher education system made great strides in developing Arctic SD studies over the last two decades. The Arctic SD-related programs and courses became an integral part of the curricula of Russian universities responsible for training specialists for the AZRF. All three levels of the higher education system (bachelor, master's, and Ph.D.) are involved in teaching Arctic sustainability courses although master's degree programs serve as the main producer of Arctic specialists. It should be noted, however, that only three universities (NArFU, RSHMU and SPSU) have the full cycle of professional training in the field of Arctic sustainability. Some Russian universities established joint programs on Arctic studies with foreign universities, including SD- and indigenous peoples-related training programs. It should be noted, however, that some of them were cancelled or suspended with start of the Ukrainian war in February 2022. In accordance with the ESD requirements, the Russian SD-related university programs and courses address most of the UN SDGs.

On the other hand, some problems can be identified: First, depending on the nature of the university or training program the very interpretation of the SD concept can be different. In some courses and programs, emphasis is given to only one or two aspects of sustainability. Very few courses and programs are based on the integrated approach to the SD concept which aims at harmonizing all three components of sustainability (environmental, economic, and social). Second, not all the important UN SDGs (e.g. 'Quality education', 'Gender equality', 'Climate action') are reflected in or properly covered by university curricula. Third, some university teachers believe that the SD concept is rather utopian/unrealistic and prefer to speak about resilience rather than on sustainability. Fourth, many SD courses and programs tend to ignore indigenous knowledge about SD strategies. Fifth, not all Arctic SD-related university programs and courses are properly equipped with textbooks and other teaching materials. Finally, many SD programs and courses are of purely theoretical character and do not aim at a practical application of knowledge and skills acquired by graduates in academia.

If Russia wants to provide the AZRF with qualified specialists, ensure its sustainable development, and achieve rather ambitious goals in its Arctic region, the above problems should be adequately addressed and solved.

Note

1. In some Russian universities with training programs on engineering and natural sciences, specialist-level programs were reestablished several years ago. With the further decoupling between the Russian higher education system and the Bologna process, the number of specialist programs at various Russian universities is constantly increasing.

Disclosure statement

No potential conflict of interest was reported by the author(s).

Funding

This research was supported financially by the grant from the Russian Science Foundation No. 22-28-20276 and the grant from the St. Petersburg Science Foundation under agreement No. 38/2022 from 14.04.2022 on 'The role of St. Petersburg in the development of Arctic science diplomacy of the Russian Federation'.

References

Advance HE. (2019). *Education for sustainable development*. https://www.advance-he.ac.uk/knowledge-hub/education-sustainable-development-0.

Alekseev, G. V., Radionov, V. F., Smolyanitsky, V. M., & Filchuk, K. V. (2018). Results and prospects of the climate studies and climate service in the Arctic. *Arctic and Antarctic Research*, *64*(3), 262–269 (in Russian). https://doi.org/10.30758/0555-2648-2018-64-3-262-269

Baltic State Technical University. (2022). *Master of business administration and engineering*. Joint Norwegian-Russian Program Curriculum. https://www.voenmeh.ru/education/international/mbae (in Russian).

Baltic State Technical University. (2023a). *Economics*. Joint Norwegian-Russian Bachelor Program Curriculum. http://sib-bstu.ru/bakalavriat/kursy/pervyy-god/ekonomika.html (in Russian).

Baltic State Technical University. (2023b). *General and strategic management*. Joint Norwegian-Russian Master Program Curriculum. http://sib-bstu.ru/magistratura/uchebnyj-plan.html (in Russian).

Bobylev, N., Gadal, S., Konyshev, V., Lagutina, M., & Sergunin, A. (2021). Building urban climate change adaptation strategies: The case of Russian Arctic cities. *Weather, Climate, and Society*, *13*(4), 875–884. DOI: 10.1175/WCAS-D-21-0004.1

Bobylev, S., & Perelet, R. (Eds.). (2013). *Sustainable development in Russia*. German-Russian Bureau of Environmental Information. (in Russian).

Bogopol'sky, Y. A. (1998). Management system's adaptability as a factor of ensuring of an enterprise' resilience. *Murmansk State Technical University Bulletin*, *1*(1), 137–144 (in Russian).

Danilov, A. I., Dmitriev, V. G., Kochemasov, Y. V., Morgunov, B. A., & Frolov, I. E. (2005). *Strategic environmental-economic assessment and action plan on the Arctic sustainable development*. The Arctic and Antarctic Research Institute (in Russian).

Danilov-Danilyan, V. I., & Piskulova, N. A. (Eds.). (2015). *Sustainable development: New challenges*. Aspect Press (in Russian).

Dobretsov, N. L., & Pokhilenko, N. P. (2010). Mineral resources and development in the Russian Arctic. *Russian Geology and Geophysics*, *51*(1), 98–111. https://doi.org/10.1016/j.rgg.2009.12.009

Dodin, D. A. (2005). Arctic sustainable development. *Nauka* (in Russian).

Dodin, D. A., & Surkov, V. S. (2002). *The Russian Arctic. Geological History, Mineragenia, Geoecology*. Russian Research Institute of Oceanic Geology (in Russian).

Dushkova, D., & Evseev, A. (2011). Analysis of technogenic impact on geosystems of the European Russian north. *The Arctic and the North*, *4*, 1–34. http://narfu.ru/upload/iblock/673/16.pdf (in Russian).

Fomina, O. (2013). Big problems of small nations are being discussed on Yamal, March 29. http://www.vesti.ru/doc.html?id=1067747 (in Russian).

Heininen, L., Sergunin, A., & Yarovoy, G. (2014). *Russian strategies in the Arctic: Avoiding a New cold War*. International Discussion Club "Valdai".

Il'chenko, P. A. (2018). Problems of gender education in Russia and Sweden. *Bulletin of Science and Education*, *11*, 88–90. https://cyberleninka.ru/article/n/problemy-gendernogo-obrazovaniya-v-rossii-i-shvetsii/viewer (in Russian).

Kislov, A. V. (2011). *Climate studies*. Academia Publishing Center (in Russian).

Konstantinov, V. M., & Chelidze, Y. B. (2014). *Ecological fundamentals of nature management*. Academia Publishing Center (in Russian).

Kontorovich, A. E., Epov, M. I., Burshtein, L. M., Kaminskii, V. D., Kurchikov, A. R., Malyshev, N. A., Prischepa, O. M., Safronov, A. F., Stupakova, A. V., & Suprunenko, O. I. (2010). Geology and hydrocarbon resources of the continental shelf in Russian Arctic seas and the prospects of their development. *Russian Geology and Geophysics*, *51*(1), 3–11. https://doi.org/10.1016/j.rgg.2009.12.003

Konyshev, V., & Sergunin, A. (2014). Russia in search of its Arctic strategy: Between hard and soft power? *The Polar Journal*, *4*(1), 2–19. https://doi.org/10.1080/2154896X.2014.913930

Konyshev, V., Sergunin, A., & Subbotin, S. (2017). Russia's Arctic strategies in the context of the Ukrainian crisis. *The Polar Journal*, *7*(1), 104–124. https://doi.org/10.1080/2154896X.2017.1335107

Kuznetsov, A. P., & Selimenkov, R. Y. (2015). *Regional economic development: Environmental and economic aspects*. Institute of Socioeconomic Development of Territories, Russian Academy of Sciences (in Russian).

Leicht, A., Combes, B., Byun, W. J., & Agbedahin, A. V. (2018). From agenda 21 to target 4.7: The development of education for sustainable development. In A. Leicht, J. Heiss, & W. J. Byun (Eds.), *Issues and trends in education for sustainable development* (pp. 25–38). UNESCO Publishing.

Lukin, Y. F. (2013). *The Russian Arctic in a changing world*. The Northern Arctic Federal University Press (in Russian).

Lukin, Y. F. (2015). Ensuring security and sustainable development of the Arctic region. *The Arctic and the North*, (21), 190–197 (in Russian). https://doi.org/10.17238/issn2221-2698.2015.21.190

Martynova, T. N. (2005). Gender problems of higher education. *Basic Research*, (1), 27–30. http://fundamental-research.ru/ru/article/view?id=5609 (in Russian).

Medvedev, D. (2009). *Foundations of the state policy of the Russian federation in the Arctic up to and beyond 2020*. Rossiyskaya Gazeta, March 30. http://www.rg.ru/2009/03/30/arktika-osnovy-dok.html (in Russian).

Morina, O. M., Derbentseva, A. M., & Morin, V. A. (2013). *Meteorology and climate studies*. Pacific State University Press (in Russian).

Moscow State Institute of International Relations. (2018). *Legal support of energy cooperation and development of oil and gas resources in the Arctic*. Master Program Curriculum. https://mgimo.ru/sveden/education/m_400401_18-bup-poes-i-onr-arktiki.pdf (in Russian).

Moscow State Institute of International Relations. (2021). *International oil and gas business and development of Arctic resources*. Master Program Curriculum. https://mgimo.ru/sveden/education/m_380402_18-bup-mnb-i-or-arktiki.pdf (in Russian).

Murmansk Arctic State University. (2019a). *Ecology*. Master Program Curriculum. http://www.masu.edu.ru/upload/iblock/4fa/06.04.01-15-12-3125_2019_ЭКО.pdf (in Russian).

Murmansk Arctic State University. (2019b). *Environmental management in the Arctic*. Bachelor Program Curriculum. https://www.masu.edu.ru/upload/iblock/42e/Характеристика%20ОП%2005.03.06%20БЭКО%202019.pdf (in Russian).

Murmansk Arctic State University. (2021). *Nature management and environmental protection in the Arctic territories*. Bachelor Program Curriculum. https://www.masu.edu.ru/upload/iblock/855/qzpz60bgwmhbnsu4ek7kynbsfijqwgtu/Характеристика%20ОП%2005.03.06%20БЭКО%202022.pdf (in Russian).

Murmansk Arctic State University. (2022). *Bioecology. Biology of the Arctic territories*. Master Program Curriculum. https://www.masu.edu.ru/upload/iblock/62e/5a2h5jghxom72jvr1npxww1v1w6exlte/06.04.01-20-12-3125_2022_БАТ.pdf (in Russian).

Murmansk State Technical University. (2018a). *Ecological safety of water facilities in the Arctic*. Master Program Curriculum. http://www.mstu.edu.ru/education/programs/up/files/УП_20.04.01_Тб(м)_ОФО_2018.plx.pdf?1593104761 (in Russian).

Murmansk State Technical University. (2018b). *Water drainage and wastewater treatment in the Arctic zone of the Russian federation*. Master Program Curriculum. http://www.mstu.edu.ru/education/programs/up/files/УП_080401v_ВиОСВ(м)_ОФО_2018.pdf?1593104761 (in Russian).

Murmansk State Technical University. (2019). *Operation and maintenance of oil and gas facilities on the Arctic shelf*. Bachelor Program Curriculum. http://www.mstu.edu.ru/education/programs/up/files/УП%20НГД_ОФО_210301pp_2019.pdf?1593104761 (in Russian).

North-Eastern Federal University. (2023a). *Arctic area studies*. Master Program Curriculum. https://monitorfiles.svfu.ru/fgos3plus/izfir/41.04.01/AR/ofo/1/41.04.01%20%D0%9E%D0%BF%D0%B8%D1%81%D0%B0%D0%BD%D0%B8%D0%B5%20%D0%9E%D0%9F%D0%9E%D0%9F.pdf (in Russian).
North-Eastern Federal University. (2023b). *Arctic law. Environmental law*. Master Program Curriculum. https://monitorfiles.svfu.ru/fgos3plus/yf/40.04.01/APPOOSPPDDUVSKAIF/ofo/1/Общая%20характеристика%20ОП%202021.pdf (in Russian).
North-Eastern Federal University. (2023c). *Arctic sustainable development*. Master Program Curriculum. https://monitorfiles.svfu.ru/fgos3plus/ien/05.04.06/URASPUKhYa/ofo/2/ОПОП%20УРА.pdf (in Russian).
North-Eastern Federal University. (2023d). *Rational land-use in the Northern and Arctic territories*. Master Program Curriculum. https://yagu.s-vfu.ru/course/index.php?categoryid=667 (in Russian).
Northern Arctic Federal University. (2017a). *Ecology*. Ph.D. Program Curriculum. https://narfu.ru/upload/iblock/84d/06.06.01-Ekologiya_–17.pdf (in Russian).
Northern Arctic Federal University. (2017b). *Geoecology*. Ph.D. program curriculum. https://narfu.ru/upload/iblock/aaf/05.06.0-Geoekologiya_–17.pdf (in Russian).
Northern Arctic Federal University. (2020). *Quality assurance monitoring*. https://narfu.ru/studies/monitoring/ (in Russian).
Northern Arctic Federal University. (2021a). *Arctic biodiversity*. Master Program Curriculum. https://narfu.ru/entrant/proforientacia/choice/detail.php?ID=314912 (in Russian).
Northern Arctic Federal University. (2021b). *Arctic territories' development management*. Master Program Curriculum. https://narfu.ru/entrant/proforientacia/choice/detail.php?ID=280873 (in Russian).
Northern Arctic Federal University. (2021c). *European studies: The Arctic vector*. Master Program Curriculum. https://narfu.ru/entrant/proforientacia/choice/detail.php?ID=342300 (in Russian).
Northern Arctic Federal University. (2021d). *Living systems of the Arctic and subarctic*. Bachelor Program Curriculum. https://narfu.ru/entrant/proforientacia/choice/detail.php?ID=282724 (in Russian).
Northern Arctic Federal University. (2021e). *Management of environmental risks in the Arctic*. Master Program Curriculum. https://narfu.ru/upload/iblock/86c/Buklet-magisterskoy-programmy-Upravlenie-ekologicheskim-riskami-v-Arktike-2020_rus.pdf (in Russian).
Pavlenko, V. I., & Glukhareva, E. K. (2010). Environmental change's impact on the economic development of the Russian Arctic regions. *Forecast Issues*, (2), 68–77 (in Russian).
Ponkin, I. (2015). The concept of the resiliency of the system towards the negative factors. *Public Service*, (5), 15–17 (in Russian).
Protopopova, E. V. (2019). Ecosystem approach to the preservation of the Russian Arctic's ecosystem. *Science at the Turn of Millenniums*, (12), 310–314 (in Russian).
Putin, V. (2013). The strategy for the development of the Arctic zone of the Russian federation and ensuring national security for the period up to 2020. February 20. http://правительство.рф/docs/22846/ (in Russian).
Putin, V. (2020a). Fundamentals of the Russian federation's policy in the Arctic up to 2035. March 5. http://static.kremlin.ru/media/events/files/ru/f8ZpjhpAaQ0WB1zjywN04OgKiI1mAvaM.pdf (in Russian).
Putin, V. (2020b). The Russian Federation President's Decree No. 645, October 26, 2020 'On the Strategy for the Development of the Arctic Zone of the Russian Federation and Ensuring National Security up to 2035'. http://static.kremlin.ru/media/events/files/ru/J8FhckYOPAQQfxN6Xlt6ti6XzpTVAvQy.pdf (in Russian).
Russian Academy of National Economy and Public Administration. (2021). *The Russian North's development management*. Master Program Curriculum. https://www.ranepa.ru/images/docs/svedeniya_ooo/obrazovanie-2019/Ucheb_plan_38.04.04_29_2019_z.pdf (in Russian).
Russian State Hydrometeorological University. (2020a). *Environmental management and security of the northern regions*. Master Program Curriculum. https://www.rshu.ru/sveden/education/program/download/12774/05.04.06%20УПиЭБСР%20ОФО%202020.pdf (in Russian).
Russian State Hydrometeorological University. (2020b). *Information-measuring and control systems in hydrometeorology and ecology*. Ph.D. Program Curriculum. https://www.rshu.ru/sveden/education/program/download/11949/27.06.01%20ИИиУСГМиЭОС%20ОФО%202020.pdf (in Russian).

Russian State Hydrometeorological University. (2020c). *Oceanographic and hydrographic support for marine activities in the Arctic*. Master Program Curriculum. http://dovus.rshu.ru/file2546.pptxhttps://www.rshu.ru/sveden/education/program/download/12768/05.04.05%20ОГОМДА%20ОФО%202020.pdf (in Russian).

Russian State Hydrometeorological University. (2021a). *Economics and public economy management*. Ph.D. Program Curriculum. https://www.rshu.ru/sveden/education/program/download/13395/Экономика%20ОФО%202021.pdf (in Russian).

Russian State Hydrometeorological University. (2021b). *Environmental security of the polar regions*. Master Program Curriculum. https://www.rshu.ru/sveden/education/program/download/12781/05.04.06%20ЭБПО%202021%20ОЗФО.pdf (in Russian).

Russian State Hydrometeorological University. (2021c). *Geoinformation support of hydrometeorological and hydrographic activities in the Arctic*. Master Program Curriculum. https://www.rshu.ru/sveden/education/program/download/12755/05.04.05%20ГИО%20ОФО%202021.pdf (in Russian).

Russian State Hydrometeorological University. (2021d). *Oceanology*. Master Program Curriculum. http://dovus.rshu.ru/content/magistratura/annotation_oceanhttps://www.rshu.ru/sveden/education/program/download/12767/05.04.05%20О%20ОФО%202021.pdf (in Russian).

Russian State Hydrometeorological University. (2021e). *Public administration*. Bachelor Program Curriculum. http://www.rshu.ru/university/stud/docs_new/2019/599.pdfhttps://www.rshu.ru/sveden/education/program/download/13407/38.03.04%20ГиМУ%20ОФО%202021.pdf (in Russian).

Russian State Hydrometeorological University. (2022a). *Atmosphere and climate sciences*. Ph.D. program curriculum. https://www.rshu.ru/sveden/education/program/download/14038/Науки%20об%20атмосфере%20и%20климате%202022.pdf (in Russian).

Russian State Hydrometeorological University. (2022b). *Ecology and nature management. Environmental problems of large cities, industrial zones and polar regions*. Bachelor Program Curriculum. https://www.rshu.ru/sveden/education/program/download/13997/05.03.06%20ЭПБГПЗиПО%20ОФО%202022.pdf (in Russian).

Russian State Hydrometeorological University. (2022c). *Geoecology*. Ph.D. Program Curriculum. https://www.rshu.ru/sveden/education/program/download/14046/Геоэкология_2022.pdf (in Russian).

Russian State Hydrometeorological University. (2022d). *Oceanology*. Ph.D. Program curriculum.https://www.rshu.ru/sveden/education/program/download/14039/Океанология%202022.pdf (in Russian).

Russian State Hydrometeorological University. (2023). *Quality assurance system*. https://quality.rshu.ru/content/smk (in Russian).

Savel'eva, S., & Savel'ev, A. (2010). Spatial reorientation of Russia's national interests. *Murmansk State Technical University Bulletin*, *13*(1), 73–76 (in Russian).

Sboichakova, A. (2018). *The role of the Arctic Council in making of ecological security policy in the Arctic* [Unpublished doctoral dissertation]. St. Petersburg State University.

Selin, V. S., & Vasiliev, V. V. (2009). Potential climate warming's impact on economic activities in the Arctic. *The North and the Market*, (1), 27–30 (in Russian).

Sergunin, A. (2018). The interplay of the human security and sustainable development concepts: The case of Russia's Arctic industrial centers. In K. Hossain, J. M. R. Martín, & A. Petrétei (Eds.), *Human and societal security in the circumpolar Arctic. Local and indigenous communities* (pp. 50–75). Brill.

Sergunin, A. (2020). Planning for sustainability: The Russian case. In R. W. Orttung (Ed.), *Urban sustainability in the Arctic. Measuring progress in circumpolar cities* (pp. 228–252). Berghahn Books.

Sergunin, A., & Konyshev, V. (2016). *Russia in the Arctic. Hard or soft power?* Ibidem-Verlag.

Shtyrov, V. A. (2012). *The present-day status and ways of development of indigenous peoples of the North, Siberia and Far East of the Russian Federation*. The Council of the Federation, the Russian Federation. http://council.gov.ru/media/files/41d44f244940b60fdf20.pdf (in Russian).

Skopitskaya, T. A. (2012). The teacher in education for sustainable development. *Education for the Whole Life: Life-Long Learning for Sustainable Development*, *10*(1), 232–233.

Smirnov, N. P. (2006). *Geoecology*. St. Russian State Hydrometeorological University Press (in Russian).

Sokolov, Y. I. (2013). The Arctic: on the problem of the accumulated environmental damage. *The Arctic: Ecology and Economy*, (2), 18–27 (in Russian).

St. Petersburg Mining University. (2022a). *Ecology and nature management*. Bachelor Program Curriculum. https://spmi.ru/sites/default/files/imci_images/univer/svedenia_jb_organizacii/ucheb_plan/2022/izb-22-2.pdf (in Russian).

St. Petersburg Mining University. (2022b). *Ecology and nature management*. Environment Management and Protection. Master Program Curriculum. https://spmi.ru/sites/default/files/imci_images/univer/svedenia_jb_organizacii/ucheb_plan/2022/emm-05.04.06-22-2.pdf (in Russian).
St. Petersburg Mining University. (2022c). *Mining*. Engineering Ecology. Specialist Program Curriculum. https://spmi.ru/sites/default/files/imci_images/univer/svedenia_jb_organizacii/ucheb_plan/up_21.05.04_izs-22.pdf (in Russian).
St. Petersburg State Technical University. (2023a). *Environmental engineering in urban construction*. Master Program Curriculum. https://ice.spbstu.ru/edu/08.04.01/08.04.01_23/ (in Russian).
St. Petersburg State Technical University. (2023b). *Environmental security in industry*. Master Program Curriculum. https://ice.spbstu.ru/edu/20.04.01/20.04.01_11/ (in Russian).
St. Petersburg State Technical University. (2023c). *Geoecology*. Specialist Program Curriculum. https://ice.spbstu.ru/edu/05.06.01/05.06.01_01/ (in Russian).
St. Petersburg State University. (2018a). *Environmental management*. Master Program Curriculum. earth.spbu.ru/netcat_files/userfiles/education/master/2018/18_5531_1.pdf (in Russian).
St. Petersburg State University. (2018b). *Geoecological monitoring and rational use of natural resources*. Master Program Curriculum. http://earth.spbu.ru/netcat_files/userfiles/education/master/2018/18_5529_1.pdf (in Russian).
St. Petersburg State University. (2018c). *Geography of polar countries*. Bachelor Program Curriculum. http://earth.spbu.ru/netcat_files/userfiles/education/bachelor/2015/15_5019_1.pdf (in Russian).
St. Petersburg State University. (2018d). *Social geography*. Master Program Curriculum. http://earth.spbu.ru/netcat_files/userfiles/education/master/2018/18_5516_1.pdf (in Russian).
St. Petersburg State University. (2020). *Geoecology: Monitoring, environmental management and environmental safety*. Master Program Curriculum. http://earth.spbu.ru/netcat_files/userfiles/education/master/2020/5797.pdf (in Russian).
St. Petersburg State University. (2021a). *Geography*. Ph.D. Program Curriculum. earth.spbu.ru/netcat_files/userfiles/prikazy/20210415_3360_1.pdf (in Russian).
St. Petersburg State University. (2021b). *Polar and marine sciences (POMOR)*. Master Program Curriculum. earth.spbu.ru/netcat_files/userfiles/prikazy/20220715_8013_1.pdf (in Russian).
St. Petersburg State University. (2022a). *Cold region environmental landscapes integrated sciences (CORELIS)*. Master Program Curriculum. earth.spbu.ru/netcat_files/userfiles/prikazy/20220718_8099_1.pdf (in Russian).
St. Petersburg State University. (2022b). *Ecology and nature management*. Bachelor Program Curriculum. earth.spbu.ru/netcat_files/userfiles/Uchebn_Plan_2022/UP_SV.5024.2022.pdf (in Russian).
St. Petersburg State University. (2022c). *Geography*. Bachelor Program Curriculum. earth.spbu.ru/netcat_files/userfiles/prikazy/20220718_8091_1.pdf (in Russian).
St. Petersburg State University. (2023a). *Baltic and Nordic studies*. Master Program Curriculum. https://spbu.ru/postupayushchim/programms/magistratura/issledovaniya-baltiyskih-i-severnyh-stran (in Russian).
St. Petersburg State University. (2023b). *International cooperation in environmental policy and sustainable development*. Master Program Curriculum. sir.spbu.ru/obrazovanie/master/eco/ (in Russian).
State Polar Academy. (2013). *Training programs*. http://www.gpa-spb.ru/abiturientu/napravleniya-podgotovki (in Russian).
Stolbov, A. (2009). Optimization of marine strategy in the Arctic. *Marine Record*, *1943*(1), 56–63. (in Russian).
Tatarkin, A. I. (Ed.). (2014). *The Russian Arctic: The modern paradigm of development*. Nestor-Istoriya (in Russian).
Tianming, G., Bobylev, N., Gadal, S., Lagutina, M., Sergunin, A., & Erokhin, V. (2021). Planning for sustainability: An emerging blue economy in Russia's coastal Arctic? *Sustainability*, *13*(9), 4957. https://doi.org/10.3390/su13094957
Tishkov, V. A. (Ed.). (2016). *The Russian Arctic: Indigenous peoples and industrial development*. Nestor-Istoriya (in Russian).
Tomsk State University. (2022a). *Ecology and nature management*. Bachelor Program Curriculum. https://www.tsu.ru/upload/iblock/05b/9vqfuan6kiq5bfuevub6e28rgdkw2g2i/05.03.06_Prirodopolzovanie_2022.pdf (in Russian).

Tomsk State University. (2022b). *Ecology and nature management*. Master Program Curriculum. https://www.tsu.ru/upload/iblock/a97/0o34c6dy9uagu2fz88csdyt5vpx877k3/UP_05.04.06_Ekologiya_i_upravlenie_2022.pdf (in Russian).

Tomsk State University. (2022c). *Siberian and Arctic studies*. Master Program Curriculum. https://www.tsu.ru/upload/iblock/441/wtfkqq5e1xp7o5ifa14m26c18lzkqfc5/UP_05.04.06_Ekologiya_i_prirodpolzovanie_Izuchenie_Sibiri_i_Arktiki_2022.pdf (in Russian).

Tyumen' Industrial University. (2022). *Arctic and sub-Arctic natural resources*. Master Program Curriculum. https://www.tyuiu.ru/wp-content/uploads/data2/sveden/education_programs/eduplan/2022/08/15/05.04.01%20ГЛм%20(РАСм)%20ОФО%20набор%202022_9770.pdf (in Russian).

UNESCO. (2012). *Education for sustainable development sourcebook*. https://sustainabledevelopment.un.org/content/documents/926unesco9.pdf.

UNESCO. (2013). *Education for sustainable development*. May 10. https://en.unesco.org/themes/educationsustainable-development.

UNESCO. (2017). *Education for sustainable development goals: Learning objectives*. https://www.unesco.de/sites/default/files/2018-08/unesco_education_for_sustainable_development_goals.pdf.

UNESCO. (2020). *Education for sustainable development*. https://en.unesco.org/themes/education-sustainable-development.

United Nations. (1987). Chapter 2: Towards sustainable development. A/42/427. Our Common Future: Report of the World Commission on Environment and Development. United Nations. http://www.un-documents.net/ocf-02.htm.

United Nations. (2015). *2030 Agenda for sustainable development and its 17 sustainable development goals*. www.un.org/sustainabledevelopment.

United Nations (UN). (1992). *Earth summit agenda 21*. United Nations. https://sustainabledevelopment.un.org/outcomedocuments/agenda21.

Van Poeck, K., & Vandenabeele, J. (2012). Learning from sustainable development: Education in the light of public issues. *Environmental Education Research*, *18*(4), 541–552. https://doi.org/10.1080/13504622.2011.633162

Vashalova, T. V. (2017). *Sustainable development*. YouWrite (in Russian).

Vernadsky, V. I. (1998). *The biosphere*. Peter A. Nevraumont Book.

Voronchikhina, D. (2021). *Political and legal aspects of ensuring environmental safety in the Arctic Zone of the Russian Federation* [Unpublished doctoral dissertation]. St. Petersburg State University.