

## NORTHERN AND ARCTIC SOCIETIES

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### The Arctic society under the environmental and climate change (based on survey results) \*

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**Abstract.** Changes of the environment and climate have different local consequences in the Arctic. The article presents the research results of these impacts on traditional nature management in the perception of residents of the Nenets Autonomous District. The materials of nine focus groups and expert interviews were conducted in 2014, 2015, 2017 in the town of Naryan-Mar and two rural settlements on the island of Kolguev and Kanin Peninsula. The author reveals some reasons for the negative impact on reindeer herding: changes in the vegetation cover of tundra and populations of animals and the birds there; changes in the diet of deer; deterioration of accessibility of snow-covered forages; irrational use of deer pastures; pollution of tundra by industrial debris and waste. Hunters noted a reduction in the period of the spring hunting, deterioration in the availability of hunting resources, a decrease in the number of geese and a shift in their migration routes due to changes in the ice regime. A reduction in the number of valuable fish species is typical for fisheries. It is associated with contamination and shallowing of water bodies, an increase in water temperature and excessive fish production. Climate change positively influences the diversity and productivity of wild resources, but intensive harvesting worsens the condition of the berry. A decrease in the quality of the natural resources traditionally used by the population was observed. It increases the degree of discomfort in the remote territories of the Arctic.

**Keywords:** *the Arctic zone of the Russian Federation, public opinion, traditional nature management, the state of the natural environment, climate change, natural resources.*

#### Introduction

The transformation of nature in the northern areas is of particular relevance due to the growing influence of climate change. It creates new conditions and threats for the life and nature management of the population. Against the background of the competition between the development of hydrocarbons and traditional management, the increasing influence of climatic factors undermines the survival and adaptation of the indigenous people in the Arctic.

In the scientific literature, the influence of environmental changes on reindeer husbandry and its development is noted. Abnormally hot summer weather, the absence of stable snow cover in winter and melting of perennial frozen soils has led to a reduction in reindeer pasture areas and the availability of deer food sources, caused a sharp decrease in the physiological activity of animals and predetermined the risks of their death [1, Klokov K. B., Mikhailov V.V.; 2, Kryazhensky F.V., Maklakov K.V. et al.]. Mass death of reindeer occurs in the Yamalo-Nenets Autonomous District. The “overpopulation” of the Yamal tundra, zoo-anthropogenic depletion of pasture lands and succession of natural disasters led the reduction by 43 thousand reindeer in 2013 - 2014 i.e.: from

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278 thousand to 235 thousand reindeer [3, Perevalova E.V.]. A similar situation is on the island of Kolguyev in the Nenets Autonomous District. The number of reindeer decreased from 12 thousand in 2012 to 200 reindeer (female mostly) by the end of 2014. A ten-year moratorium was introduced for the slaughter of reindeer on the island [4, Mikhailova G.V.].

Indigenous peoples depend on local natural resources mainly. Rapid climate change has exposed great risks of economic losses and health problems for indigenous population [5, Smith K.R., Chafe Z.]. Melting of permafrost increases the risk of returning pathogens such as anthrax. In 2016, this disease was found among reindeer on Yamal<sup>1</sup>. Changes in habitats, population density and the number of foxes and Arctic foxes due to the increase in average annual temperatures create prerequisites for the spread of rabies that is observed in the Nenets Autonomous district, where in recent years the epizootic situation on rabies is complicated [6, Romanenko T. M., Anufriev V. V., et al.].

Climate changes in the marine environment can have a decisive influence on the migration of commercial fish and, as a result, on the geography of fisheries in the Arctic and Subarctic seas. According to the experts, the positive effects will be combined with the negative effects at the same area or in other areas. The total effect for fishing industry will be negative even if we consider the expected trend of improving the fish resources in the Arctic waters [7, Kovalevsky D.V., Alekseev G.V. et al.; 8, Selin V.S., Vasiliev V.V.].

Surveys of experts and people involved in traditional economic activities and environmental management are conducted to obtain data on local climate changes and their consequences for the population. In 2006–2007 in the Chukotka Autonomous District, indigenous people were interviewed and traditional environmental knowledge about ice and weather conditions, sea hunting in the Arctic was written down within a special project of the International Polar Year [9, Bogoslovskaya L.S., Vdovin B.I. et al.]. Surveys of rural residents of Yakutia took place in 2009–2010. This data on climatic and environmental changes and their impact on the traditional occupations of the rural population was a subject for scientific analysis [10, Vinokurova L.I.]. In 2010, the Barents Sea Branch of the World Wildlife Fund organized an expedition to the Vaigach Island for biological research. At the same time, an attempt was made to study climate change and living conditions from indigenous perspective [11, Davydov A., Mikhailova G.]. In 2010–2012, in Yakutia, Kamchatka and Chukotka, monitoring of current climate changes was organized for the Center for the Promotion of the Indigenous Minorities of the North (CP IMN). The project was supported by the Development Marketplace program of the World Bank. That time, local residents observed and recorded weather phenomena and climate changes that had not been noted or measured by specialists<sup>2</sup>. Sim-

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<sup>1</sup> Sibirskaya yazva obnaruzhena u oleney na Yamale v pervyye za 75 let [Anthrax was found in deer on Yamal for the first time in 75 years]. *Interfaks v Rossii*. 25.07.2016. URL: <http://www.interfax.ru/russia/520347> (Accessed: 17 July 2018). [In Russian]

<sup>2</sup> Korennyye malochislennyye narody Severa i izmeneniya klimata: ot sbora dannykh k real'nym planam adaptatsii [Indigenous Minorities of the North and Climate Change: From Data Collection to Real Adaptation Plans]. URL: [http://www.csipn.ru/component/blog\\_calendar/13?start=500](http://www.csipn.ru/component/blog_calendar/13?start=500) (Accessed: 17 July 2018). [In Russian]

ilar objectives had the project in 2012 in Alaska. Its residents acted as local environmental observers for the early detection of significant environmental changes [12, Berner J., Brubaker M.]. Interviews with reindeer herders were used in the analysis of the causes of reindeer death on the Yamal Peninsula in 2013–2014 [3, Perevalova E.V.].

Involvement of the population in the assessment, monitoring of the consequences of the environmental and climate change allows to obtain a large complex of various characteristics in their connection with the urgent needs of nature management and life. Thus, awareness of the changes in specific areas of permanent residence in the Arctic is growing.

### ***Materials and methods of research***

The secondary analysis of the field materials, ethnic and sociological surveys of the island and mainland residents of the Nenets Autonomous District was applied to study the consequences of the environmental transformation and climate change for the indigenous use of natural resources and life of the population in the Arctic. The data collection was made in the town of Naryan-Mar, the village of Nes' (the Kanin Peninsula) and the village of Bugrino (the Kolguev Island) in the Nenets Autonomous District. The collection of field ethnic and sociological material was carried out with the help of focus groups (or group interviews), as it is one of the qualitative methods of sociological research. An improbable target sample was used to form focus groups.

In 2014, three focus groups were organized on the Kolguev Island, in the village of Bugrino of the Kolguev village Council of the Nenets Autonomous district (NAO): a focus group of representatives of the education, a focus group of pensioners and a focus group of reindeer husbandry employees. In 2015, three focus groups were also held in the village of Nes' of the Kanin village Council of NAO: a focus group of pensioners, a focus group of representatives of education and medicine, and a focus group of representatives of agriculture. In the town of Naryan-Mar in 2017 focus groups of pensioners, representatives of industry and indigenous people of the North were held.

In general, the ethnic and sociological material of nine focus groups was analyzed. In addition, the materials of interviews with representatives of local authorities, heads of enterprises, organizations, medical workers, and stakeholders in environmental management in these settlements were used.

### ***Results and their discussion***

The transformation of the environment and climate change in the public opinion of the population of the Arctic are constructed around traditional types of economic activity and nature management: reindeer herding, hunting, fishing, and gathering plants.

*Reindeer husbandry.* Northern reindeer husbandry is the main form of traditional way of life and management of the indigenous population of the Arctic. In the Nenets Autonomous district, this type of environmental management is also a leading industry in the agricultural sector. The district has the third largest reindeer herd in Russia — about 180 thousand reindeer. At the

end of 2016, the NAO had 114 reindeer herding brigades belonging to agricultural organizations of different ownership forms: 13 agricultural production cooperatives, 9 family-tribal communities, one state unitary enterprise and one peasant farm<sup>3</sup>.

Concern of the focus groups is caused by the number of reindeers in the Nenets Autonomous District and reindeer death, associated not only with the worsening of their habitat conditions due to anthropogenic influence and industrial activity. The locals noted that the observed natural and climatic changes could have a direct or indirect impact on the reduction in the number of reindeers.

Residents of the Kolguev island paid attention to changes in *tundra vegetation* and substitution of reindeer moss vegetation: where moss was, “is now high grass growing’ and a lot of bushes. In the summer, the moss became dry: “if earlier you could walk on the carpet: the moss was soft, now it crunches under your feet like chips, and most of the tundra is dry”. The locals also noted a change in the taste of the reindeer meat: it had “become bitter”. People explained this with the bush bark: “you know that reindeer meat tastes bitter in the woods usually”, where the reindeers were “bark eating”. According to the indigenous people, the abundance of mushrooms, not typical for the island, significantly affected the change in the reindeer diet in 2012, when they began to die: “reindeer did not eat anything, they were walking on these mushrooms, because there were a lot ... Then they got swelled bellies”.

According to the observations of the focus groups participants, in winter the availability of snow-covered reindeer feed depends on the weather. After a series of thaws and frosts, a dense snow and ice cover is usually formed: “the earth is covered with several layers of ice, [ ... ] snow falls, melts, ice is formed, and then snow and ice again. It is like a cake — three layers of ice. Reindeer may not be able to get [food] for themselves”.

In the public consciousness, degradation of the moss tundra is associated with the irrational use of reindeer pastures, reflected in the media<sup>4</sup>. In particular, the participants of the focus group from the representatives of education appealed to the results of scientific research known to them: “studies were made, [...] everything was trampled down, and deer have nothing to eat there”. However, it was noted that environmental conditions had been forcing nomadic economy to adjust the timing and path routes of reindeer herding. Thus, shifts in temperature and ice cover are the reason for *the urgent return of reindeer herds from winter nomads*: “... [river] Mezen does not freeze, so this year reindeer herders have returned early from the Mezen forests”.

The representatives of agriculture mainly associated the worsening of pastures with the *mechanical destruction of the tundra soil cover*: “I'm more worried about the tundra. It was all

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<sup>3</sup> V NAO prinyat novyy zakon ob olenevodstve. [A new law on reindeer breeding has been approved in the NAO]. URL: <http://adm-nao.ru/press/government/12955/> (Accessed: 17 July 2018). [In Russian]

<sup>4</sup> Prichinami massovogo padezha oleney na o. Kolguyev stali izbytok pogolov'ya i nedostatok pastbishch. [The reasons for the mass deer case on about. Kolguev steel livestock abundance and lack of pasture]. URL: <http://nvinder.ru/news/2997-prichinami-massovogo-padezha-oleney-na-okolguyev-stali-izbytok-pogolovya-i-nedostaok> (Accessed: 17 July 2018). [In Russian]

traveled, walked, [ ... ] and the soil will be restored after a very long time”, “[ ... ] tundra suffers because of technology”. On the disturbed tundra areas, lichen is restored slowly: “after the transport, only grass grows”. Opinions are expressed about the anthropogenic pollution of the moss of the Kanin Peninsula caused by the impact of the military range: “degradation of reindeer pastures — it is ecology, [rocket] range. Reindeers should eat healthy food, and here everything is poisoned”. *Pollution of tundra with industrial waste and garbage* due to the extraction of hydrocarbons and after the deployment of military units was observed.

The ongoing and planned projects of *industrial development of the Arctic* were considered by representatives of the indigenous peoples of the North in the context of their possible impact on the traditional economy and environmental management. Thus, the construction of roads, the railway to the port of Indiga, according to focus groups, affects the interests of reindeer herders: “the worst thing is that there will be railway there. And the port is built on the calve places, calve pastures. It [the railway] will cross all [pastures]”. The development of fields in the center of the Kolguev Island raises concerns, as the road and the pipe from the field will cross the island and the routes of reindeer herding brigades: “If there will be new drillings, then the land will be reduced. And those [drillings] that stand on the edge, do not disturb us that much”.

*Changes in the populations of animals and birds* in the Arctic are estimated the same way. According to the focus groups participants, the increase in the number of barnacle goose and the expansion of its nesting grounds reduce the area suitable for reindeer herding on the island of Kolguev: “Goose from the shore went to the tundra. Where the goose is, the deer gets no place — it smells much there, especially in the lakes”. The increase in the number of foxes and Arctic foxes is of concern to the population due to the spread of rabies, the risk of attack of rabies-infected Arctic foxes on reindeers and herders. On the mainland, the population noted an increase in the number of polar bears, recorded cases of bears attacks on home deer.

The reindeer herding problems are related not only to Nenets people, but also to the district residents who use the products of reindeer herding. In 2017, concern of the mainland population of the district was caused by a ban on the sale of certain reindeer products (liver, kidneys) due to the increased content of harmful substances in them. Reducing the number of reindeers in remote and isolated areas, like the Kolguev Island, creates a deficit of reindeer meat and stimulates its replacement with other available one, e.g., poultry. Thus, traditional food culture or “aibordanie” — eating raw reindeer meat is threatened. The resident of the island noted that she felt a headache when she did not eat raw meat, and she would be forced to go to the mainland to do “aibordanie”.

*Hunting.* Hunting is a traditional way of using the wildlife in the Nenets Autonomous District. Now, amateur and sports hunting is developing. Commercial hunting is not carried out. Most district hunters hunt for home consumption. Mainly geese, ducks, and willow ptarmigans are harvested. Fur animals — foxes and Arctic foxes — are harvested individually. An important role is

played by the hunt for waterfowl in spring and autumn, when the people run out of stocks of frozen reindeer meat and the autumn slaughter of deer is not started<sup>5</sup>.

According to the interviewees, almost all the adult male population of the village hunts. Traditionally, they hunt migratory bird (geese) and partridge. According to the villagers, they make up more than half of their meat diet.

Arrival of geese, ways of their flight depend on climate. So, in 2015, in Nes', Chyzha, and Shoina settlements geese were not found. The geese "all went to the Islands" (incl. the Kolguev Island). Hunters said it was caused by the climate change: an early snowmelt, on the Barents Sea the snow melted and geese past the village of Nes'. A different situation was observed in 2014: the Kanin Peninsula was in the snow for a long time, so the geese returned back to the Nes' village and even nested here. *A reduction in the period of hunting was observed in spring as well as the worsening of the hunting resource availability*: if in the 1980s "flights were long, the geese flew for a long time", now "2-3 days". Previously, the geese were gathering around the village, and the hunt was near the village. Now people have to drive to hunt. A possible reason for this is the lack of snow at the end of April, "soil opens early" and the geese immediately "go" North.

According to the survey, *the number of geese is reducing, and they are the main objects of hunting, especially bean goose and white-fronted goose*. According to hunters, the so-called white-throated (white-throated goose) is reducing in the number, it has "left". The goose bean is almost absent in the spring hunting period, but not in the autumn. The decrease in the number of hunting resources is associated with *the displacement of the flying paths*: in recent years the goose is flying a side, bean goose and white-fronted goose are flying via swamps — to the East / South of the village Nes'. However, the majority of hunters believed that the population of the bean goose had declined, "the bean goose is a rare bird"; some hunters tried not to shoot the bean, "especially if the birds had a few". Respondents recorded cases of "black goose" and "gray goose" appearance. The latter one was described by the participants of the focus group: "it was gray, closer to white and smaller in size". According to respondents, there were many swans, compare to 4-5 years ago when no swans had been observed. In 2015, at the time of the survey in the village of Nes', about 300 swans were grazed near the sea. As the population of swans increased, some hunters believed hunting them was allowed.

Special attention was paid to *the increase in the population of barnacle goose* on the island of Kolguyev: "real geese has decreased in population, but barnacle goose has increased", "goose does not nest in the North nests, it was kicked out, there are few geese". A similar phenomenon is observed on the mainland. Hunters from the Nes' village remember that back in 1990-1994 they rare could see or shoot barracks, they were "surprised by such a bird". In their opinion, because of

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<sup>5</sup> Materialy, obosnovyayushchiye limit dobychi okhotnich'ikh resursov na territorii Nenetskogo avtonomnogo okru-ga v 2015–2016 g., Nar'yan-Mar 2015 g. [Materials justifying the limit of hunting resources in the Nenets Autonomous District in 2015–2016, Naryan-Mar 2015]. Department of Natural Resources of the Nenets Autonomous District. URL: [http://dprea.adm-nao.ru/media/uploads/.../04/.../Материалы\\_обоснования\\_2015-2016.rtf](http://dprea.adm-nao.ru/media/uploads/.../04/.../Материалы_обоснования_2015-2016.rtf) (Accessed: 17 July 2018). [In Russian]

the climate warming, the island bird goose (barnacle goose) filled all the local hunting grounds and “kicked out the goose”. Currently, the population of barnacle geese has already moved to the village of Chyzha — 150 km, and about 15–18 years ago these birds nested only on the Islands.

Environmental changes are not considered in the regulation of hunting and in establishing of its time limits. The timing of the spring hunt may not coincide with the time of geese flight. So, the hunters from the Nes’ village noted that in 2015 hunting began on May 16, and the goose had flown earlier on May 6–8. *Non-coincidence of the flying geese with the timing of spring hunting* makes it uneven or causes the violation of the hunting regulations. In order to solve this problem, in 2018, the NAO Department of Natural Resources, Ecology and Agro-Industrial Complex conducted an Internet survey on the optimal timing for the spring hunting.<sup>6</sup>

*Fishing.* The list of fishing areas of the Nenets Autonomous District currently includes 93 sites: 81 sites for commercial fishing, 7 — for indigenous people, 4 — for coastal fishing and 1 — for sports and amateur<sup>7</sup>.

Fish resources are in the focus for the local population. The NAO residents – respondent of the survey — were engaged in amateur and sport fishing for their own consumption. In their opinion, the number of valuable species of fish, previously consumed by the locals, is decreasing: “we now have few salmon”, “there is less grayling”. Char was not rare seven years ago: “we put twelve nets ... [ ... ] even caught [char] with hands... now one is caught for a half of summer and that’s all”. A decline in production of saffron cod, flatfish and polar cod is visible as well: “earlier we had tons of the caught cod. A huge amount of saffron cod was there and flatfish. There was polar cod — all polar cod is gone”.

The participants of focus groups spoke about the spread of pink salmon. They called it “weed”: “there is more pink salmon. It was not found in the Pechora. Now it is”, “pink salmon — it has littered our river”. It is widely believed that the increase in the number of pink salmon negatively affects salmon: “pink salmon increased in number a lot, they say, it can replace salmon”.

According to the survey, *water pollution and shallowing of water bodies* have a negative impact on the main populations of industrial fish. *The increase in water temperature* leads to a reduction in the number of fish and causes a decrease in the fish migration area up the rivers during spawning: “the water is warmer, the usual fish leaves”, “because when the water is warmer, it [remains] in the sea”. Another negative factor is *excessive illegal fishing*. It has an impact not only on population size, production volumes, but also contributes to reducing the size: “the number of fish decreases. The fish is getting smaller”. According to the focus group of indigenous peoples of the North, the construction of a port in the village of Indiga and dredging will lead to *lower quality of water* and have negative consequences for fish and marine animal populations.

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<sup>6</sup> Golosovaniye po srokam vesenney okhoty zavershitsya v nachale aprelya. [Voting on the timing of spring hunting will end in early April] Government of the Nenets Autonomous District. 12.03.2018. URL: <http://adm-nao.ru/press/government/17873/> (Accessed: 19 July 2018). [In Russian]

<sup>7</sup> Rybakam NAO dobavili uchastkov. [They added areas to the fishermen in NAO]. URL: <http://fishnews.ru/news/32264> (Accessed: 17 July 2018). [In Russian]

Abnormal weather conditions harm traditional fishing. Residents of the Nes' village noted that approximately in 2012 a solid ice cover was absent on the water surface — “the river had no ice in the time of traditional winter fishing”. Periods of fishing decreased: earlier, in the Nes' village “herring was caught by everyone and it was enough. Now it is necessary to catch a particular period”.

Unusual for the modern time is the case of catching of an almost three-meter polar shark with fishing nets near the village of Bugrino. It was in the media where it was also noted that in the 20<sup>th</sup> century Russian, Norwegian and Icelandic fishermen had been actively fishing for sharks.<sup>8</sup> Locals had not seen sharks for many years and connected this case with the environmental and climate change.

According to the local population, *the appearance and taste of fish have changed*: “tasteless, I think, it has become”, “it has lost its taste due to oil spills”; the fish is “ugly”, “bald”, “and salmon can be bald too”. On the island of Kolguev, barrels of fuel pollute the water and have an anthropogenic impact on fish. A population of the village of Bugrino recorded the following facts: “the fish is not like it has been”, flatfish “gets sick”, “smells kerosene [diesel] a little”.

*Wild plants gathering*. The population of the district considers the gathering berries and mushrooms an additional income. It ensures their food security. The NAO authorities support several business projects for the processing of mushrooms and various berries: cloudberry, cranberry, blueberry, blueberry and red currants<sup>9</sup>.

Changes in the temperature regime and the increase of the vegetation period have a positive impact on the *diversity and productivity of wild plants*. The island of Kolguev is rich with mushrooms, and the local population is actively collecting them. The productivity of cloudberry on the island has become quite high: “earlier, cloudberry were not there every year”, and it was collected ones in two years.

However, the opinion of the urban population of the district is not so simple; they believe that the change in the amount of berry (cloudberry) depends on the places of gathering: somewhere more, somewhere less. An increase in the number of berry pickers, intensive *gathering of berries for sale* also contribute to the reduction of berries. The participants in the focus groups noted the reduction of berries as well because “all berries were exchanged for money”.

Reindeer breeding has a negative impact on the ability to collect wild plants. It happens due to the change in the length of the hauls and stays of reindeer herds on the Kanin peninsula. The available wild growing resources are not suitable for gathering: “everything is trampled by reindeer, [...] the reindeer breeders began to drive the herds to the villages for a long time”, “mushrooms,

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<sup>8</sup> Vblizi ostrova Kolguyev v Nenetskom okruge pojavilis' akuly (Arkhangel'skaya oblast') [Sharks appeared near the island Kolguev in the Nenets district (the Arkhangelsk Oblast)]. Novosti 29, 2012. URL: [http://www.news29.ru/novosti/proishestviya/Vblizi\\_ostrova\\_Kolguyev\\_v\\_Nenetskom\\_okruge\\_pojavilis\\_akuly\\_Arkhangelskaya\\_oblast\\_/20588/print](http://www.news29.ru/novosti/proishestviya/Vblizi_ostrova_Kolguyev_v_Nenetskom_okruge_pojavilis_akuly_Arkhangelskaya_oblast_/20588/print) (Accessed: 17 July 2018). [In Russian]

<sup>9</sup> Pri okruzhnoy podderzhke v NAO realizuyutsya dva novykh biznes-proyektov po pererabotke dikorosov. [In the NAO the district supported two new business projects for processing wild plants] URL: <http://adm-nao.ru/press/government/16383/> (Accessed: 17 July 2018). [In Russian]



cranberries, cloudberries feed us. And if they are all trampled, then the pensioners have no place to pick up mushrooms and berries. There is no place to go, there are no clean places”.

An anthropogenic impact on the local berries was also noted: “now the cranberries are turning black”, “two year ago rain fell down and all the [cranberries] turned black”. According to the residents of the village of Nes’, atypically large cloudberries are growing in the areas contaminated by radiation. Locals do not collect these berries.

### **Conclusion**

According to the inhabitants of the Arctic territories, all types of traditional economic activities and environmental management (reindeer herding, hunting, fishing, and gathering wild plants) are affected by both climate change and anthropogenic impact. Concerns among the population are caused by the lower availability and quality of traditionally used natural resources, as well as related events. The problems of reindeer herding are the most widely represented. The perception of the death rates of home reindeer reflects changes in temperature and ice cover, vegetation of tundra and populations of animals, birds, as well as deficiencies in the organization of deer grazing, negative impacts of economic and other activities. The positive effects of climate change are noted for the gathering of wild plants. It is manifested in an increase in the diversity and productivity of wild-growing resources. In general, weather anomalies, climate changes make significant adjustments in the timing and duration of traditional economic activities and environmental management; threaten the food security of people and increase the degree of discomfort and extremity of their life in the remote Arctic areas.

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