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Perception of Environmental Problems by Residents of the Krasnoyarsk Krai Arctic Territories (Findings of Surveys in Norilsk and Dudinka)

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Abstract. The study was designed to identify the specific features in the perception of environmental problems and threats by people living in Arctic areas of the Krasnoyarsk Krai. The focus is on industrially and infrastructurally well-developed cities of Norilsk and Dudinka. The main method is a mass-scope questionnaire survey among the general public (n=713; 2022). The analysis was done using SPSS tools and the Python environment. We found that, as perceived by the citizens, the critical environmental threats common for the territories under study were illegal industrial waste dumps (indicated by 53.4 % of respondents) and unsanctioned household waste dumps and littering (52.7 %). Lower concerns were expressed regarding threats from mining and metal processing industries (43.4 %), illegal logging by individuals (43.9 %), oil and gas industries (harmful atmospheric emissions, oil spills) (44.7 %). Differences between the territories mostly appear in how the severity of the threat is perceived (“heavily threaten” vs “threaten”). The current environmental situation is evaluated more positively by residents of Dudinka. People of Norilsk, on the other hand, feel more positive about the environmental trends. People are least satisfied with air quality and tidiness of the environs, and more satisfied with the level of noise. The most pronounced differences between the cities were found in the perceptions of air quality, state of forests and parks, level of noise.

The findings of the study can be applied when preparing policy and standard-setting documents for the development of the Krasnoyarsk Krai Arctic areas and in the scientific monitoring of the implementation of the national project “Ecology”.

Keywords: Russian Arctic, Norilsk, Dudinka, environmental problems, environmental threats, public perception, industrial waste dumps, environmental pollution, littering.

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Research area: social structure, social institutions and processes (sociological sciences); regional and sectoral economy.

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Особенности восприятия экологических проблем населением арктических территорий Красноярского края (результаты исследования в городах Норильске и Дудинке)

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Аннотация. Работа посвящена выявлению особенностей восприятия экологических проблем и угроз населением арктических территорий Красноярского края. В фокусе внимания – индустриально и инфраструктурно развитые города Норильск и Дудинка. Основным методом исследования является массовый анкетный опрос населения, проведенный в период с конца июля по сентябрь 2022 года. Выборка исследования составила 713 человек. Анализ осуществлялся с использованием средств программного комплекса SPSS и среды Python. Установлено, что общими для изучаемых территорий критическими экологическими угрозами в восприятии населения являются незаконные свалки предприятий (отметили 53,4 % опрошенных), несанкционированные (стихийные) свалки, бытовой мусор (52,7 %). Чуть менее выражены, но все же значимы угрозы от деятельности горнодобывающих и металлургических предприятий (43,4 %), незаконных рубок леса гражданами (43,9 %), деятельности нефтегазовых предприятий (вредные выбросы в атмосферу, разливы нефти) (44,7 %). Межтерриториальные различия заключаются в первую очередь не в идентифицируемых угрозах, а в их воспринимаемой выраженности (распределение ответов между вариантами «сильно угрожает» и «угрожает»). Жители г. Дудинки гораздо более положительно оценивают текущее состояние среды по сравнению с жителями г. Норильска. Оценка динамики состояния природной среды за последние 10 лет характеризуется обратной картиной – население Норильска отмечает в большинстве своем положительные сдвиги либо сохранение ситуации, в то время как население Дудинки характеризует динамику состояния среды в месте непосредственного проживания скорее как отрицательную. В наименьшей степени оно удовлетворено качеством воздуха и чистотой среды,

в наибольшей степени – уровнем шума. Наиболее выражена разница между населенными пунктами в оценках состояния воздуха, состояния лесов и парков, уровня шума.

Результаты исследования могут найти применение в разработке программных и нормативных документов развития арктических территорий Красноярского края, в научном мониторинге реализации национального проекта «Экология».

Ключевые слова: Российская Арктика, Норильск, Дудинка, экологические проблемы, экологические угрозы, восприятие населения, свалки предприятий, загрязнение среды, бытовой мусор.

Научная специальность: 5.4.4. Социальная структура, социальные институты и процессы (социологические науки); 5.4.2 Экономическая социология (социологические науки).

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Introduction and theoretical framework

Human impact on ecosystems has been growing in all sectors of the Global Arctic (Bergmann et al., 2022; Sedova, Kochemasova, 2018; Vasil'tsov, Iashalova, Novilov, 2021). The most heavily affected by pollution are northern industrial hubs, military facilities, and transport corridors (Iurkevich et al., 2021). Substantial impact on Arctic ecosystems is produced also by pollutant transport by air and stream flow (Brekhuntsov et al., 2020; Makosko, Matesheva, 2022). Data are available that in addition to biological effects (Lamoureux-Tremblay, 2020; Saltykova et al., 2020) contamination of the natural environment in the North and the Arctic produces a multifaceted socio-psychological impact on the population (Saraeva, 2019). At the same time, as pointed out by Saraeva and Sukhanov (Saraeva, Sukhanov, 2020), “the social environment of ecologically “contaminated” territories – especially in critical and extreme environmental ill-being situations – is not always able to make up for the detrimental mental effect of a distorted natural

environment” (Saraeva, Sukhanov, 2020: 18). These issues are particularly topical in Arctic areas, where the living conditions for people are described as those of extreme climatic discomfort and which also suffer a number of chronic socio-economic problems (Skuf'ina et al., 2021: 23–28). Meanwhile, the economic space of the Arctic macroregion remains substantially differentiated, comprising both relatively new economic development spots (e.g., Kostomuksha municipality) and areas with a long industrial history, which usually have high levels of cumulative environmental damage.

The best developed Arctic territories of the Krasnoyarsk Krai in terms of economy and infrastructure are the Norilsk industrial district (NID) and its associated City of Dudinka. Thus, the NID harbors the largest metal industry facility in the world's Arctic, which has long acted as the base for reclaiming its spaces (Iurkevich et al., 2021). Current strategic development priorities for the Russian Arctic are such that the role of these territories in the emerging spatial organization of the macroregion's economy will be growing

further (Tsykalov et al., 2020). In view of this as well as the long history of NID industrial development, which has caused heavy environmental contamination (Pyzhev et al., 2021), and the recent accidents involving major diesel fuel spills (Troshko et al., 2020), studies of the environmental perspective of the socio-economic development of the territories are becoming even more topical. In particular, the perception of environmental problems by local people has so far remained virtually unstudied. This perspective is central to this article.

The literature related to the subject field of our study definitely deserves attention, one reason being the distinctive features of the study objects. To wit, Klyukina (Kliukina, 2018) used sociological surveys to map the perceptions of current environmental threats to human health by residents of industrial cities of the Murmansk Region. Potravnaya studied the ethnicity- and gender-specific perceptions of environmental problems by indigenous (Evenks, Yukaghir, Dolgans, Sakha) citizens of some Arctic regions. The weightiest problems revealed in that study proved to be pollution of the environment in traditional livelihood areas, reindeer population decline, degradation of traditional hunting and fishing targets, absent or poor system for household waste removal and processing, overall climate change (Potravnaia, 2020). In a series of papers based on data from some regions of Northern Russia and its Arctic Zone (namely, Yamalo-Nenets Autonomous Okrug), Romashkina (Romashkina, Vylegzhanina, 2015; Romashkina, Vylegzhanina, 2016; Davydenko, Romashkina, 2017) compared the statistics on the human impact on the environment, environmental illnesses, and citizens' subjective perceptions of environmental threats. The latter aspect was investigated relying on sociological surveys.

The actual level of accumulated or ongoing anthropogenic impact on natural ecosystems is not the only factor to alter the perception of environmental threats over time. Other momentous factors are the information environment and communication pathways, as well as how much the respondents trust the sources of the information. In his studies of the

social interpretations of environmental risks by citizens of Cherepovets, Platonov (Platonov, 2015; Platonov, 2016) remarks that "the society is growing more sensitive to environmental threats, and where it used to take a grave environmental disaster to spark a public outcry, the public now reacts to reports of much less hazardous phenomena appearing in mass media or spreading as rumors" (Platonov, 2016: 103–104). In their study of differences in the perception of environmental threats and risks by representatives of different cultural types of individuals in the Kaliningrad Region, Krishtal and Shchekoturov noted that all groups of respondents tended to have greater trust in the information coming from their close social network, public activists, and environmentalists (Krishtal, Shchekoturov, 2020).

Furthermore, some researchers have found that apart from social attributes such as age and income, the perception of environmental threats and risks is influenced by the respondents' general environmental awareness and involvement in pro-environmental practices (Bolaños-Valencia et al., 2020). Generally speaking, however, studies of the public perception of environmental problems in the Arctic macroregion are so far rather limited, especially in spatial coverage, and are mostly concerned with certain ethnic groups or regions, with no attempts at comprehensiveness.

Statement of the problem

The team of authors undertook to bridge the above-mentioned research gap by means of a large-scope environmental-economic study of Arctic territories, encompassing the Murmansk Region, Nenets Autonomous Okrug, Arctic territories of Karelia, Komi Republic, Arkhangelsk Region, and Krasnoyarsk Krai. Scientific findings for some of these regions have been published elsewhere (e.g., for Arctic territories of the Republic of Karelia (Volkov et al., 2021)), serving as a background for a cross-regional comparative analysis of the situation. This paper provides an analysis of the perception of environmental problems and threats by residents of highly industrialized areas in the Krasnoyarsk Krai included in the Russian Arctic Zone according to the Presidential Decree



Fig. 1. Survey areas

“On the land territories of the Arctic Zone of the Russian Federation”¹. (Fig. 1).

The main tasks for the study are to:

1) identify the respondents’ main attitudes regarding their living environment and its changes, perceived threats to the environment, level of satisfaction with its key components. This task is addressed through a specialized sociological survey among residents

of highly industrialized areas in Krasnoyarsk Krai included in the Russian Arctic Zone – cities of Norilsk and Dudinka;

2) draw conclusions regarding the trends in environmental-economic processes and topical environmental problems in the development of the Krasnoyarsk Krai Arctic territories relying on the results of an integrated sociological survey and comparison against data on actual environmental pollution levels.

¹ Executive Order of the President of the Russian Federation #296 of May 5, 2014 “On the land territories of the Arctic Zone of the Russian Federation” [digital resource] / Documents section of Russian President’s official website // Accessible at: <http://www.kremlin.ru/acts/bank/38377> (in Russian)

Methodology and Methods

The main method is a mass-scope questionnaire survey among residents of the Kras-

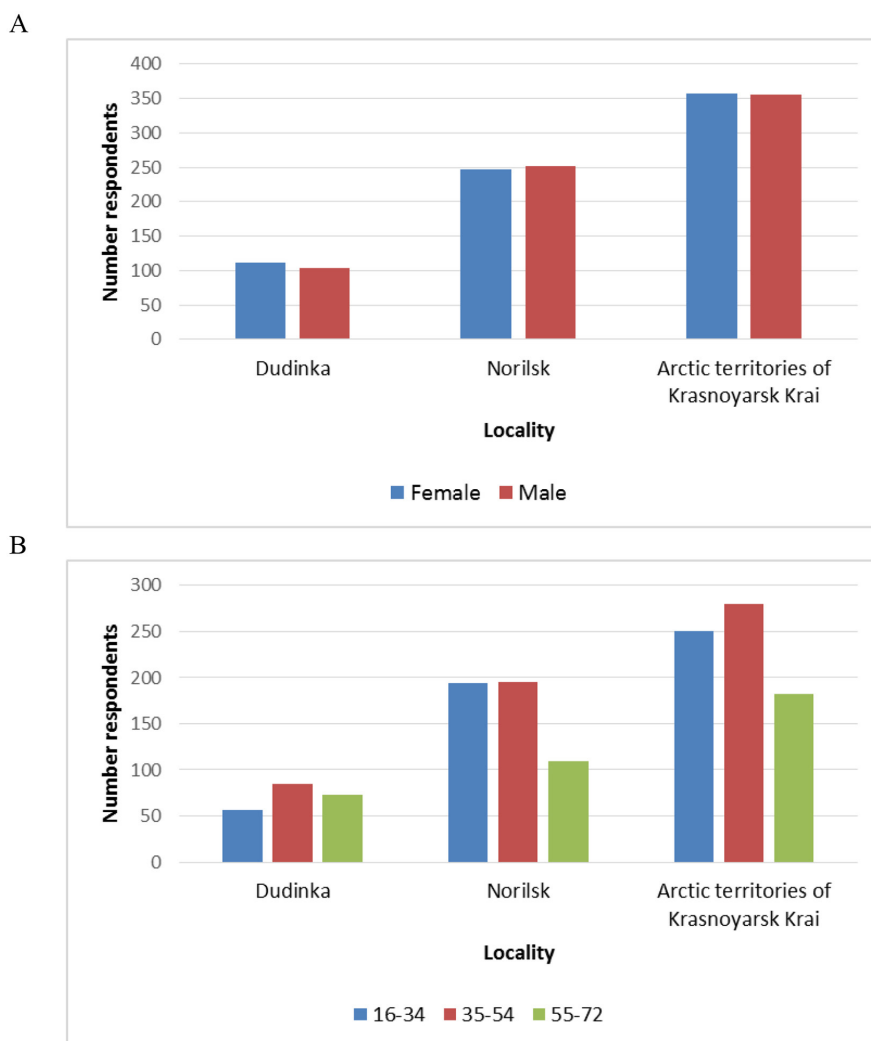


Fig. 2. Characteristics of the sample for the sociological survey (questionnaire among citizens) of Arctic areas of the Krasnoyarsk Krai (A – by gender, B – by age)

noyarsk Krai's highly industrialized areas belonging to the Russian Arctic Zone – cities of Norilsk and Dudinka, carried out in the period from late July through September 2022. The sample size was 713 persons. The age and gender parameters of the sample are given in Fig. 2.

All respondents were informed of the aims of the survey and expressed willingness (consent) to cooperate.

Methodologically, the survey was structured into blocks of questions about the current state of the environment and its trends, perceived threats to the environment, the re-

spondent's capability to influence these threats, level of satisfaction with key environmental components, relative significance of environmental problems in the overall socio-economic and ecological context, fitting in Schwartz's theoretical "norm activation" model (Schwartz, 1977) and Stern's "value-belief-norm" theory (Stern, 2000).

Technical treatment of the data was done in SPSS system. Analysis of the data was performed using methods of spatial economics, ecological economics, statistical analysis, sociological analysis, and the dialectic approach.

Results and Discussion

Current state and dynamics

of the environmental situation in Arctic territories of the Krasnoyarsk Krai as perceived by their residents.

The perceived environmental wellbeing

The levels of satisfaction with the current state of the environment and its dynamics among citizens were studied both for the sub-region in general and for specific places of residence. The situation was evaluated at different spatial scopes (from strictly local to global). The responses to the question “How satisfied are you with the state of the environment?” are shown in Fig. 3.

As opposed to the previously surveyed areas of the Karelian Arctic, Murmansk Region, Nenets AO, as well as Arctic territories of the Arkhangelsk Region and Komi Republic, here we see more significant differences in opinions between respondents from differ-

ent settlements and in the ranking of objects of different spatial scopes by residents of the same city. Thus, citizens of Norilsk showed lower satisfaction with the state of the city environment than respondents from municipalities surveyed in other regions (e.g., Volkov et al., 2021). The reason must be the obvious extractive-industry profile of the local economy and operation of large industrial installations that have been contaminating the environment over the long industrial development history. At the same time, Norilsk residents showed a somewhat more positive opinion of the state of the environment on the scopes of the region, Russia, the Arctic, and the planet. A different image is generated by answers of respondents from Dudinka: the state of the environment in their place of residence is evaluated the highest among all spatial scopes and differences between the latter are not so pronounced as in the answers given by respondents from Norilsk.

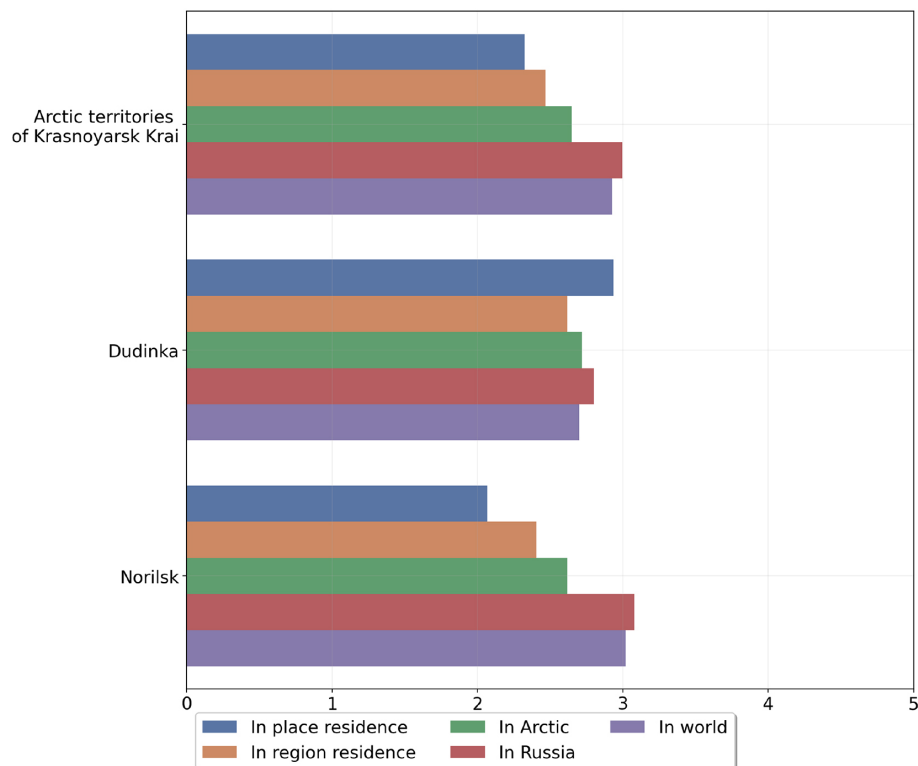


Fig. 3. Level of satisfaction with the state of the environment among residents of Arctic territories of the Krasnoyarsk Krai

The assessment of trends in the state of the environment by respondents from the two settlements was, however, the reverse (Fig. 4). Almost 50 % of Dudinka residents noted its deterioration in their actual place of residence, while the dominant answers from citizens of Norilsk were “not changed” or “improved”. This must be due to the renovations implemented at industrial installations in the city and its surroundings.

As to the level of satisfaction with different components of the environment, residents of the Krasnoyarsk Krai Arctic territories were least satisfied with air quality and tidiness of the environs and best satisfied with the level of noise (Fig. 5). The opinions on the state of forests and parks and on water quality were also rather critical.

There were significant differences in the levels of satisfaction with different components of the environment between residents of Norilsk and Dudinka. They differed the most in their evaluation of air quality, state of forests

and parks, and the level of noise (Table 1). The industrialism of Norilsk is the reason its residents felt more critical about these factors.

The analysis of the level of satisfaction with individual components of the environment is finalized into a holistic factual representation when combined with perceived environmental threats (Table 2). At this stage of the analysis, the answers of respondents to the question “How do you evaluate the threat the stated installations pose to the environment in your neighborhood?”² were grouped as follows: “a minor threat” and “a threat” were treated together as “a threat”, while “a heavy threat” and “a very heavy threat” were grouped into “a heavy threat” category. Taking the Krasnoyarsk Krai Arctic territories in general, there were the following perceived environmental threats – illegal industrial waste dumps (the “heavy threat” option was selected

² Answers given on the 5-point scale “not a threat – minor threat – ... – very heavy threat”.

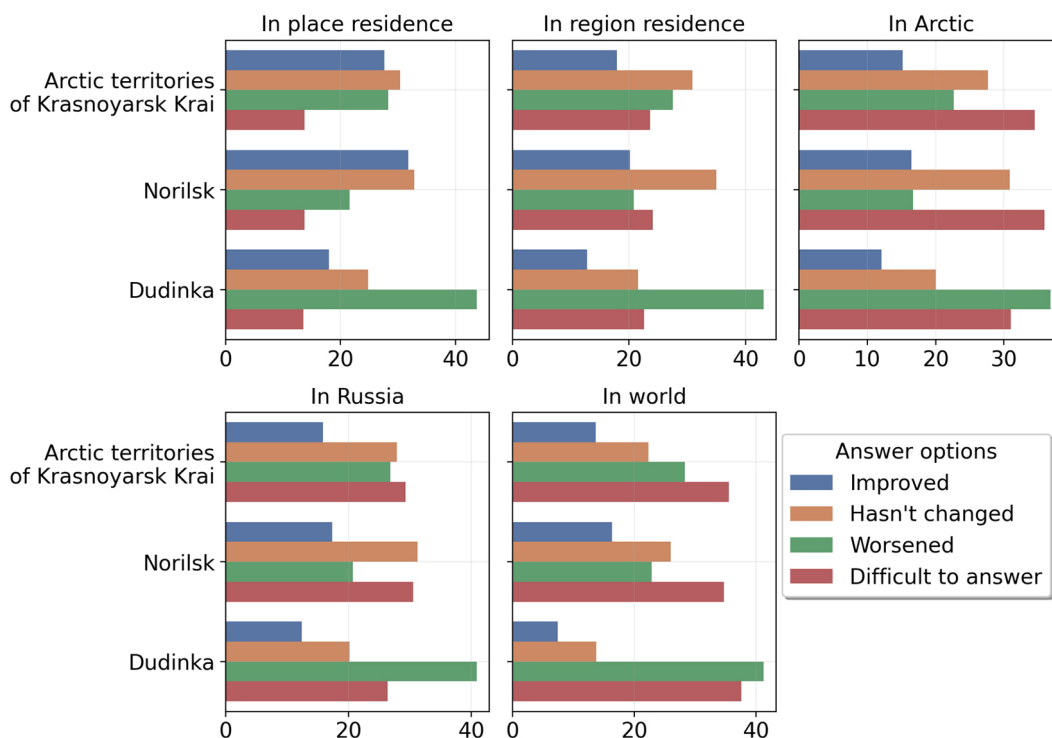


Fig. 4. Evaluation of environmental trends by residents of the Krasnoyarsk Krai Arctic territories across spatial scopes

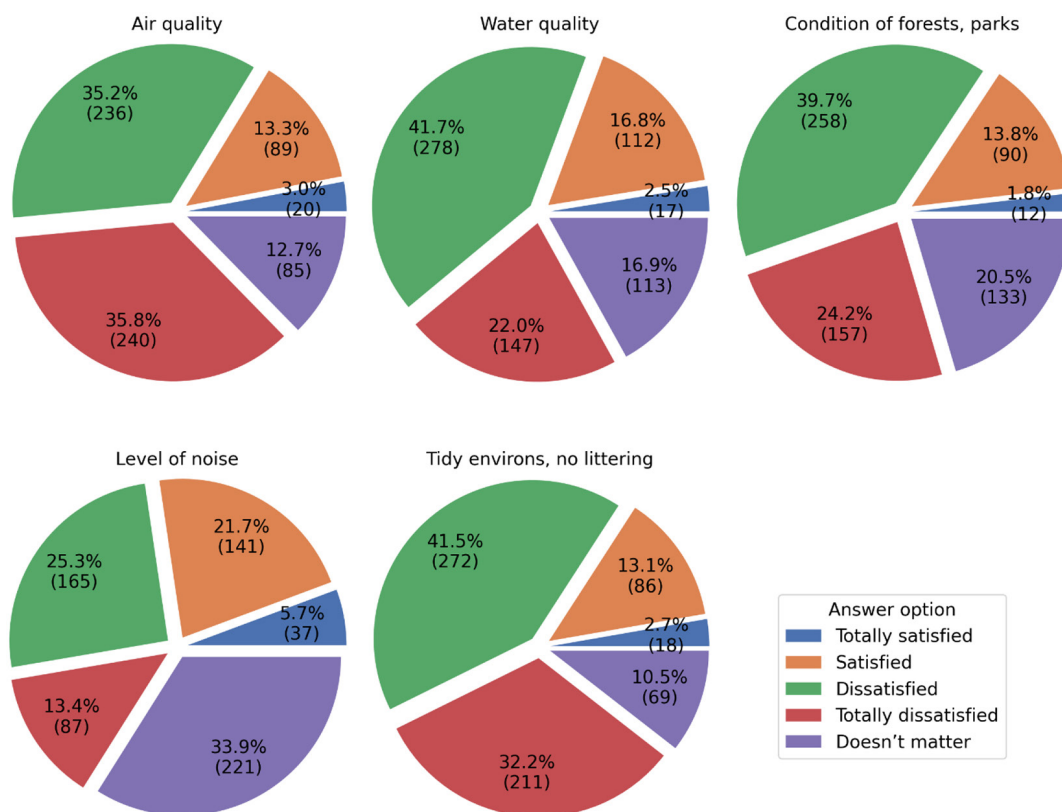


Fig. 5. Level of satisfaction with components of the natural environment among residents of the Krasnoyarsk Krai Arctic territories

Table 1. Level of satisfaction with components of the environment among residents of different settlements in Arctic territories of the Krasnoyarsk Krai

Answer options	Settlement	Water quality	Air quality	State of forests and parks	Level of noise	Tidy environs, no littering
Totally dissatisfied	Dudinka	19.0 %	7.4 %	15.2 %	6.5 %	31.5 %
	Norilsk	23.4 %	48.2 %	28.1 %	16.4 %	32.5 %
Dissatisfied	Dudinka	48.3 %	26.1 %	36.9 %	23.4 %	42.9 %
	Norilsk	38.7 %	39.2 %	40.9 %	26.2 %	40.8 %
Satisfied	Dudinka	19.0 %	37.4 %	22.7 %	27.9 %	13.3 %
	Norilsk	15.8 %	2.8 %	10.0 %	18.9 %	13.0 %
Totally satisfied	Dudinka	2.9 %	9.4 %	2.5 %	9.0 %	3.9 %
	Norilsk	2.4 %	0.2 %	1.5 %	4.2 %	2.2 %
Doesn't matter	Dudinka	10.7 %	19.7 %	22.7 %	33.3 %	8.4 %
	Norilsk	19.7 %	9.6 %	19.5 %	34.2 %	11.5 %

by 53.4 % of respondents), unsanctioned household waste dumps, littering (“heavy threat” option selected by 52.7 % of respondents), and the somewhat less pronounced activities of oil and gas companies (hazardous atmospheric emissions, oil spills) (“heavy threat” option selected by 44.7 % of respondents), illegal logging by individuals (“heavy threat” option selected by 43.9 % of respondents), and activities of mining and metal processing companies (landscape alteration, hazardous discharges) (“heavy threat” option selected by 43.4 % of respondents).

The threats evaluated as the least significant were aquaculture and trout farming, as well as nuclear, cogeneration, and hydroelec-

tric power plants. Perceived by local people as significant but relatively less critical threats (the option “a threat” grossly prevailed) were the transport and the related issues (air pollution, engine oil leaks, etc.) (67.6 %), military activities (products of incomplete combustion, radioactive contamination) (62.4 %), unsanctioned fisheries, logging by businesses (52.1 %) (Table 2). A thing to observe when comparing these findings with data from other Arctic regions (e.g., Volkov et al., 2021) is that perhaps the only threats perceived by people in every area as heavy or very heavy are unsanctioned household waste dumps, littering, and illegal industrial waste dumps. The perceived sever-

Table 2. Perceived threats to the immediate environment of residents of the Krasnoyarsk Krai Arctic territories¹

Answer options	Dudinka	Norilsk	Krasnoyarsk Krai
Activities of mining and metal processing companies (landscape alteration, hazardous discharges)			
Not a threat	5.9 %	5.0 %	5.3 %
Heavy threat	45.0 %	42.6 %	43.4 %
A threat	49.0 %	52.4 %	51.4 %
Unsanctioned fisheries, logging by businesses			
Not a threat	10.9 %	10.7 %	10.8 %
Heavy threat	33.3 %	38.8 %	37.1 %
A threat	55.7 %	50.5 %	52.1 %
Unsanctioned household waste dumps, littering			
Not a threat	3.4 %	6.3 %	5.4 %
Heavy threat	55.2 %	51.6 %	52.7 %
A threat	41.4 %	42.2 %	41.9 %
Illegal logging by individuals			
Not a threat	10.3 %	13.3 %	12.4 %
Heavy threat	43.1 %	44.2 %	43.9 %
A threat	46.7 %	42.4 %	43.7 %
Activities of oil and gas companies (hazardous atmospheric emissions, oil spills)			
Not a threat	4.4 %	6.2 %	5.6 %
Heavy threat	51.2 %	41.7 %	44.7 %
A threat	44.3 %	52.1 %	49.7 %
Aquaculture, trout farming			
Not a threat	36.7 %	32.7 %	34.0 %
Heavy threat	16.1 %	12.2 %	13.4 %
A threat	47.2 %	55.1 %	52.6 %

¹ Answers to the question “How do you evaluate the threat the stated installations pose to the environment in your neighborhood?”

Table 1 Continued

Answer options	Dudinka	Norilsk	Krasnoyarsk Krai
Transport and the related issues (air pollution, engine oil leaks, etc.)			
Not a threat	5.4 %	7.1 %	6.6 %
Heavy threat	27.1 %	25.3 %	25.8 %
A threat	67.5 %	67.6 %	67.6 %
Military activities (products of incomplete combustion, radioactive contamination)			
Not a threat	11.3 %	14.9 %	13.8 %
Heavy threat	29.4 %	35.7 %	33.8 %
A threat	59.3 %	49.3 %	52.4 %
Nuclear power plants (NPP)			
Not a threat	21.6 %	24.7 %	23.8 %
Heavy threat	29.5 %	23.4 %	25.2 %
A threat	48.9 %	51.9 %	51.0 %
Hydroelectric power plants (HPP)			
Not a threat	24.9 %	27.1 %	26.4 %
Heavy threat	20.1 %	16.4 %	17.6 %
A threat	55.0 %	56.5 %	56.0 %
Cogeneration power plants (CPP)			
Not a threat	22.1 %	18.8 %	19.8 %
Heavy threat	24.2 %	19.7 %	21.1 %
A threat	53.7 %	61.5 %	59.1 %
Illegal industrial waste dumps			
Not a threat	4.6 %	7.2 %	6.4 %
Heavy threat	55.7 %	52.5 %	53.4 %
A threat	39.7 %	40.4 %	40.2 %

ity of other threats was spatially differentiated, depending primarily on the local patterns of economic activity.

Another essential aspect of social sentiments is the citizens' perceived capability to influence the environmental wellbeing of their neighborhood through existing institutional arrangements. The responses to the question "Does the current legislation help citizens care for the nature, for the natural and the living environment?" are shown in Fig. 6. According to the results, people are generally rather doubtful regarding the efficacy of the legislation – 43.8 % of respondents in the Krasnoyarsk Krai said it "neither helped nor hindered" in caring for the environment. It is noteworthy that the share of citizens utterly dissatisfied with how current leg-

islation performs in caring for the nature and the environment is several times higher in Dudinka versus Norilsk. This can probably be explained both by the more vigorous environmental activity in Norilsk and by the specific features of environmental law enforcement in Dudinka, which needs to be additionally studied.

Overall, environmental problems appear to have much greater weight in the context of the citizens' socio-economic and natural environments in Norilsk, which shows when analyzing the answers to the question "Which of these problems you think apply the most to your city?" (Fig. 7). In Norilsk, environmental problems currently dominate in citizens' perceptions, overweighing price growth and influx of migrants.

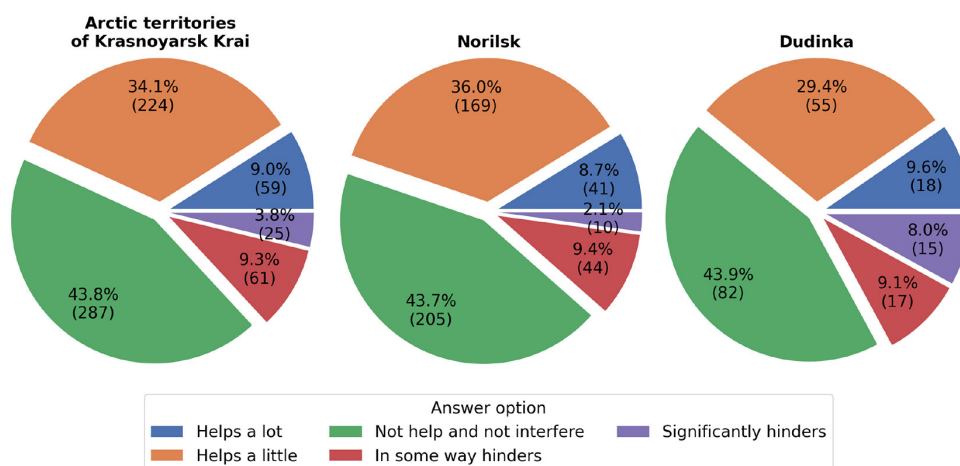


Fig. 6. Distribution of answers to the question "Does the current legislation help citizens care for the nature, for the natural and the living environment?"

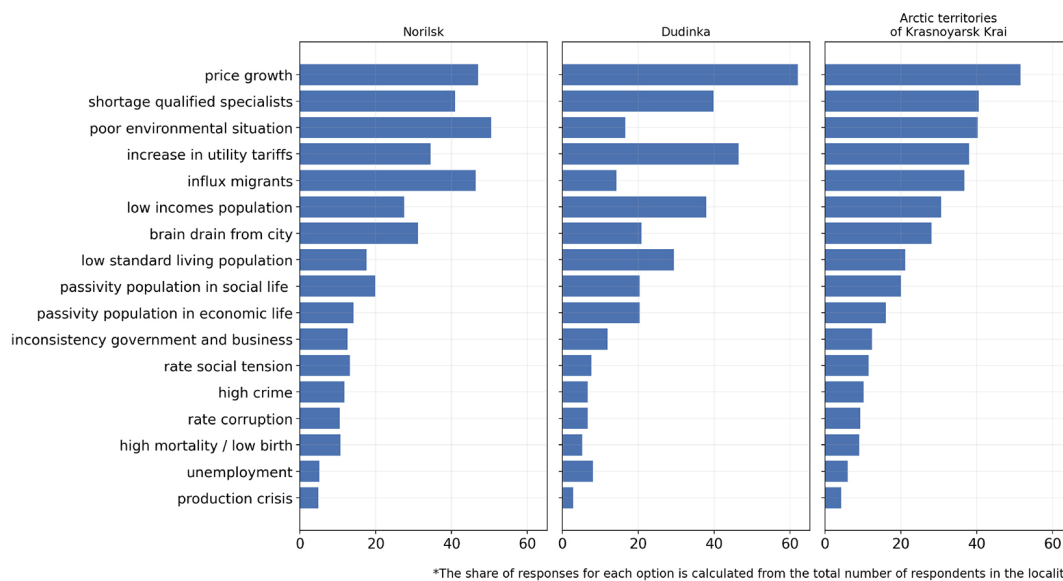


Fig. 7. Significance of problems in the respondents' actual places of residence, Krasnoyarsk Krai Arctic territories

Conclusions

Having integrated the available statistics, data from official sources, and the results of a sociological survey among citizens of Arctic territories of the Krasnoyarsk Krai, we can conclude the environmental wellbeing of the areas depends on a combination of both common and area-specific anthropogenic impacts.

The critical environmental threats common for the surveyed areas are:

- illegal industrial waste dumps;
- unsanctioned household waste dumps, littering;

Somewhat less pronounced yet significant threats are:

- activities of oil and gas companies (hazardous atmospheric emissions, oil spills);

- illegal logging by individuals;
- activities of mining and metal processing companies.

Moderate environmental threats in the citizens' perception are:

- transport and the related issues (air pollution, engine oil leaks, etc.);
- military activities (products of incomplete combustion, radioactive contamination);
- unsanctioned fisheries, logging by businesses.

A comparison between the cities shows that the relatively more significant for Dudinka are threats posed by activities of oil and gas companies (hazardous atmospheric emissions, oil spills), but the differences between the territories were not so much about the threats identified as about their perceived severity (distribution of answers between the “heavy threat” and “threat” options).

Another conclusion is that the current state of the environment is evaluated far more positively by people of Dudinka versus Norilsk citizens. The perception of environmental dynamics over the past 10 years, however, exhibits the reverse trend – people of Norilsk mostly noted either improvements or status quo, whereas respondents from Dudinka described changes in the state of the environment in their neighborhood rather as a deterioration. They were least satisfied with air quality and tidiness of the environs and the most content with the level of noise. Norilsk being a highly industrialized city, its residents were more critical about some components of the environment. The two cit-

ies diverged the most in the perceptions of air quality, state of forests and parks, level of noise. A noteworthy fact is the more critical attitude of Dudinka citizens towards the current legislation regarding how it performs in advocating care for and conservation of the environment.

Among the measures for optimizing the environmental component of social wellbeing one can prioritize the development of economic incentives for sorting and deeper processing of municipal and industrial wastes. The ways to overcome the relatively negative perception of the efficacy of legislation in environmental conservation in Dudinka include additional scientific analysis of local law-enforcement and judicial practices as well as intensified administrative control of law enforcement by government agencies. The tools that may arguably prove effective are wider publicity for environmental problems and making hotline phone numbers for issues of environmental monitoring and violations better known to the general public.

Potential direct application areas for the findings of this study are the preparation of policy and norm-setting documents for the development of the Krasnoyarsk Krai Arctic territories, improvement of the performance indicators and targets of the National Project Ecology, and scientific monitoring of its implementation.

Further research could go into the details of how the social wellbeing of people in Arctic communities is related to the perceived environmental threats and the institutional mechanisms in the environmental-economic sphere.

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