Singularity Point of the Russian Arctic

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Abstract. In the area of Yamal and Taimyr in the 20th century, a large industrial center developed. At the same time, the Eastern regions of the Arctic and Siberia remained outside the country's integrated economic system. Only gold and diamond mines work here. In the 90s, the organizational structure of economic relations disintegrates, and the region finally turns into a raw material appendage of the country — and this is a large part of its territory. Currently, falling interest of Western countries to Russian energy; the tangle of problems, the indicator of which was the Arctic, has generated the second crisis (a sharp in-depth “breakdown” of internal and external communications for pandemic COVID-19), impending disaster, as the natural ending of the impasse singularities, completes the life cycle of any system [1]. The article collects and analyzes information on the current situation in the production of energy resources, the state of transport, the demography of the region, and assesses prospects for its further development and restoration of the integrated mechanisms of the economy.

1. Introduction

One of the regularities in the evolution of any system is the staged development of the latter with a conditional emphasis on birth, maturity and extinction, fixing the sequence of realization of the characteristics inherent in the system as a kind of organized integrity.

Pursuing the problems of developing the Far North, we bring our judgments about the past, present and future of this extreme territory as an economic entity to a new level of understanding of the dynamics of events that have led the Arctic to a very unfavorable state.

Numerous publications of the last decade testify to this, characterizing the region as a territory excluded from the life of the country, the settlements of which, founded by Russian explorers, are dying out and losing their population; emphasizes the lack of roads due to the complexity of the tasks of reliable laying of routes on permafrost, the complexity of exploration and mining of minerals, their transportation only by sea and only in the summer, because the main contact artery of the North is the Northern Sea Route. And to all this - giant distances in the vastness of Siberia.

On a large-scale map of Siberia, the Far North encircles the territory of the Arctic Circle, comprising 80% of the area of the Russian Federation; 20% is European Russia to the Urals.

By natural features, Siberia can be divided in the latitudinal direction into three large fragments: Western Siberia in the Ob area, the Central Siberian plateau from the Yenisei to the Lena and the final, almost undeveloped tip of the Arctic to Chukotka, which is entirely located beyond the Arctic Circle and represents the planet’s cold pole.
The development of Siberia was carried out by waves in the mentioned sequence of the eastern vector.

The farsightedness of creating a strategic center of heavy industry in the Urals was justified during the years of World War II. Subsequently, the tone of the economic development of Siberia and the Far East (except for the necklace of cities on the route of the Great Siberian Railway) significantly decreased. After the crisis of the 90s, hydrocarbon production, first in the Khanty-Mansi Autonomous Okrug, and then with a reduction in reserves here, shifting the production center to explored reserves, became a salvation for the economy, which kept afloat thanks to the established raw oil and gas supplies to Western Europe and, more recently, to China. on the Yamal Peninsula. In this part of the Arctic there was a large industrial base with a metallurgical plant in Norilsk, which, together with oil and gas production, became a full-fledged user of the Northern Sea Route cargo fleet, for which several powerful icebreakers were built.

Currently, in the international market of oil and gas products due to the partial reorientation of Western countries to other energy sources, in particular, renewable energy sources - renewable energy sources: water, solar, wind - which make up almost 50% of energy needs [2], a decline in demand for Russian products has formed. The decrease in the intensity of the Northern Sea Route, the decommissioning of the icebreakers that accompanied the caravans of ships, the exclusion of ports on the NSR from the activity put them on the brink of survival with the loss of most of the infrastructure elements of the settlements, where only the services of weather stations and border towns are preserved.

Climate warming negatively affects the state of permafrost, the loss of the ecological balance of the tundra landscape, which in summer turns into swamps with small lakes, the water of which does not penetrate the underlying layers of permafrost, which nevertheless no longer holds the buildings built on it; they are destroyed, and the inhabitants leave them.

The inability of the state and private companies to assume the functions of active actors in reviving the socio-economic and cultural life of the east of Siberia and the Arctic does not escape the attention of Western countries, which have repeatedly stated their readiness to offer their services in the development of mineral resources and introduce a civilized form of organizing the environment. Through the translucent southeastern border, Chinese immigrants penetrate Siberian territory, successfully activating Siberian natural potentials.

At the same time, the Far North is becoming an indicator that reveals the problematic nature of Russian statehood in its legal territories. That is, the very impasse of a complex failure of the regional economic zone, which is doomed to the lack of real action to multifaceted involvement of the Far North in the country's economy, has formed.

The Norilsk Combine, which pollutes the environment with industrial emissions, turned out to be a cancerous tumor in the Taimyr Dolgan-Nenets National District. The plant annually releases into the atmosphere 22.4 million m 3 of toxic gases. Industrial waste around the entire city of Norilsk covers an area of almost 5,000 hectares.

2. Literature review
Reliance on the mono-economy of Siberia as a raw material base of the country turned out to be, of course, ineffective, since any economy requires competent integrated involvement in the circulation of all vital industries, both regional and the country as a whole.

V.M. Melnichenko in his article “On Ecology and Land Use in Taimyr” writes: “Zonal biocenoses here are on the verge of survival, or are completely degraded, since the level of concentration of toxic substances in the soil exceeds the natural background by 50-100 times, including MPCs of such heavy metals like copper, nickel, cadmium, cobalt, lead, zinc. This is also characteristic of Taimyr”[3]. Note that in terms of area (almost 900 thousand km2.), The Taimyr Dolgan-Nenets National District is equal to France and Germany combined.

On the peninsula, the traditional deer habitat, pastures are being destroyed and the number of herds is being reduced, although reindeer husbandry products are still of economic and cultural interest, so
far shown by tourists. Agriculture, fishing, hunting also fell into decay. The population is fighting for life or migrating to the seductive "benefits" of civilization in the city.

The depopulation of the North and the damping of economic activity here, indicating the unnecessary edge, causes unhealthy interest abroad and, of course, the alarm of the military.

Attempts to locally replace oil and gas resources with the power of hydropower plants provoke resistance from indigenous people [4].

The designed dam of the Evenki hydroelectric power station with a height of 140 - 200 m will cause flooding of about 1 million hectares along the Lower Tunguska channel. Under water there will be forests, pastures, settlements. It is planned to create four dams on the rivers of the Krasnodar Territory - with the same perspective. To save the shallowing Caspian, the idea of turning the Pechora and Vychegda rivers to the south was recently considered. Environmental disasters in Russia have never been planned with such a degree of irresponsibility. And the Caspian itself began to be filled with water.

E. Korshunov in the article “Attractive Arctic” of the collection “North of Russia in Naval and Economic Relations” rightly emphasizes the fact of the inhibition of the implementation of decisions and instructions on the sustainable development of the Arctic due to the imbalance “between the state’s resources to solve them and the goals set, between the interests of the state and potential private investors”[5]. Assessing the shortage of problematic press appearances in the Arctic, the author writes that the publications “only serve as a reminder of how long the problems of the Russian North have accumulated and list the lost opportunities.”

In the article of V.B. Arganov of the same collection formulates the principles of preserving the raw materials and energy security of Russia, emphasizing the priority of Russian programs, technologies and investments. Attention is drawn to the inadmissibility of a decrease in the activity of naval activity of Russia in the region (article by V.M. Apanasenko). These reminders are timely, because they express a reaction to the interests of foreign countries in the work of the Northern Sea Route and in the resources of the shelf of the Arctic Ocean.

3. Materials and methods

The unspoken concept of holding the Far North as a raw material reserve, the depletion of which forces us to find and exploit all new deposits “for sale” is frankly predatory, and this must be understood by state planning bodies, weighing the prospects for relations with private companies, as if taking on a useful mission maintaining the activity of crafts based on a compromise of interests of owners, the state and workers.

Moreover, the human factor requires special attention to the creation of favorable living conditions and the cultivation of corporate debt, which are not neglected in establishing an owner-employee relationship. This psychological subtlety of social conventionalism is known to the Japanese.

The principle of labor enthusiasm and collectivism, which was implanted in the USSR, and devotion to the temptations of a brighter future, found its inefficiency as a labor stimulus; but with a vengeance revealed social injustice in the distribution of public goods, the shameless deception of the workers, who were given the opportunity themselves to get out of the uncertainty of life.

Social ailments quickly affect the breakdown of the economic system, materialized in enterprises, industrial infrastructure networks, and, of course, in specific habitats: settlements, residential buildings, social services — and in this region, organic nature hardly survives without external influence. person. We have already raised the issue of complexity, but the need to create a duplicate latitudinal land highway along the ocean coast [6].

Concrete developments of the central organizations of Russia on the connection of separate industrial and economic centers of the North already exist [7,8], however, this task, apparently, is more rational to solve by a direct route adjacent to existing ports with the connection of meridional connections with intracontinental points.

Most of the route crossing the territory of the Gulf of Ob during flooding by ocean waters will inevitably be laid as a bridge or along a protective dam.
Finally, it is time to develop eastern continental routes that are stably functioning both in winter and in the summer period of permafrost melting. Radically updated technologies for protecting dirt roads, effective road surfaces, inventory bridges, sites, as well as replenishing the fleet of modern vehicles with high cross-country ability and carrying capacity [9] are needed.

Thus, a whole package of problems has developed that determines the severity of the singular crisis in the Arctic, which threatens a social and economic catastrophe, when considerations of saving resources to prevent it or neutralize the results will no longer be a criterion of expediency. The pandemic as a factor in the separation of society, forcing personal self-isolation, dealt a blow to the most vulnerable historically established tradition of mankind to a collective dwelling; broke ties in the city, in production and management, in the sphere of everyday life.

It turned out that the form of organization of the living environment, materialized in architecture, gives an unexpected effect of the effects of isolation, an insurmountable shock that immediately destroys the civilization system, the logic of which is “the connection of everything with everything”. Even before the consequences of the pandemic were realized, a number of publications disputed the appropriateness of the existing system of spatial differentiation of the living environment due to the radical transformations of labor relations in the post-industrial city, which stimulate the distant "breeding" of individual functions [10].

But, on the other hand, options for settling extreme zones with intentionally archaic techniques that support the humanitarian nature of living conditions in any climatic circumstances are considered [11].

Types of human activity are distributed among related areas of space, logically differentiated by the degree of necessary accessibility. The compactness of the housing solution, including the kitchen, living room, bedrooms, sanitary unit (we will limit ourselves to a minimum), is complemented by the natural remote location of the store, school, stadium, savings bank ... In total, all functions that determine the integrity of the life support system make up a block of patterns with different distances of their mutual contact.

We are accustomed to the traditional spatial structure of the city, fairly uniform for cities large and small. True, recently there have been structural changes that are out of sight, characterizing the urban environment as post-industrial: enterprises that produce material products are moved outside the city, and you can earn income “from the air” sitting at a computer at home.

The computerization process smoothly and inevitably entered the life of the urban population, freeing it from direct contacts with colleagues and relatives. But freedom by ordering one's distance from business and recreational communication turned out to be - thanks to the pandemic - a fierce illusion, with no choice. The need for mutual isolation was only a starting blow to small and medium businesses, trade, employment in state institutions and enterprises, transport, energy consumption, catering, forms of collective leisure (theaters, libraries, gyms, clubs ...), and the education system.

The process of transition to remote forms of social contacts in all spheres of life has been gradually begun long ago, with the creation, for example, back in 1974 in Moscow of the Lebed residential complex - a cluster of four multi-story buildings, united by the podium of social services [12], of the residential quarter “Ostozhenka” with controlled access, foreign skyscrapers forming functionally unified groups in which you can live and work without leaving your apartment.

As if a prudent experiment was being conducted to test the capabilities of a civilized habitat in cases of urban re-densification, virus outbreaks, computer zombies, and terrorism. Such complexes successfully protect their residents from the expansion of not only viruses. Perhaps this is a paradox, but the self-segregation of the unification of individual, often elite or ethnic castes leads to the destruction of urban society itself on a large scale and even the strengthening of the spirit of mutual hostility and hostility.

In this case, those public buildings in which the atmosphere of democracy is nevertheless maintained and which represent social nodes of city-wide significance also fall out of the system of contacts and lose the status of necessity.
Not without reason, as a spontaneous act of counteracting the collapse of the city, various societies begin to emerge: “coworking”, “coliving”, all kinds of street flashmobs, enthusiasts nostalgic for communal apartments ... However, the future is still in isolation.

How will this affect the architecture of the city and what lessons from living in extreme regions of the Arctic can be learned from these forms of distancing life?

4. Results
With social fluctuations, urban studies become the object of the least successful development forecasts. You can only build patterns of interaction of functional nodes within a particular habitable space and its immediate surroundings, including for extreme zones. The whole package of life support forms can be divided according to functional features - patterns [13]. As a rule, there is a set of patterns that has been established for a particular civilizational level and ethnic characteristics, the use of which involves options for near and long mutual distance.

So, for a full-fledged functional dwelling, a package of patterns in the form of the mentioned division of an apartment into rooms that satisfy standard needs for comfort is normal. Patterns of additional social functions like leisure in recreational facilities, social infrastructure services are located at a distance from home; some of them can be as close as possible to the living space; for most, their remote location — a stadium, a market, a theater — is appreciated.

When developing a program to eliminate the demographic vacuum of the Far North - strengthening previously established settlements, organizing new residential / industrial formations on communication routes with distant points, reference settlements of weather services and survey camps, road services - it is advisable to focus on standard complexes of standard volumetric containers of container type. The logic of living in an extreme environment rigidly disavows the prestige of life contrary to the climate in cottages with gardens and flower gardens. Containers are transported in place and combined in compact or dispersed groups.

Depending on the expected period of habitation in such groups of container “development”, they are provided with an optimal regular set of patterns.

For example, for the service base on the highway, a full set of personnel life support patterns and patterns of the service itself are provided: repair pavilion, power plant, materials warehouse, gas station. The remaining forms of service are presented either in mini form, or are located in the remote center of the region.

It is enough to have three functional types of habitable complexes: a) hotel type, provided with a maximum minimum of patterns; b) an object that is average in terms of social and economic functions with additional additional patterns; c) a complete set of patterns of primary and secondary use. (Fig. 1).

![Figure 1](image)

**Figure 1.** Variants of localization of life support patterns in the environment a habitat: big circle - the main pattern, small black circle - optional pattern.

Production and equipping of multi-functional blocks should be based on the principles of mobile architecture, high-quality technological solutions, have the necessary level of design of the architectural space and its filling, focusing on the concept of a clean architectural form.

In the location of such objects on the territory, it is necessary to adhere to civilized principles of a harmonious landscape solution.
5. Conclusions
The Russian Arctic, as part of Siberia and together with it a territory four times larger than European Russia, was on the brink of disaster in the socio-economic, cultural and defense aspects. A parade of planets has formed, summarizing all the omissions, mistakes, difficulties in developing the territory, remoteness from the center, substituting the Russian Federation under the pressure of the inconsistency of managing such a large country.

The unexpected global blow of the pandemic to the established economic and political regimes of almost all states showed how destructive such a “smallness” could have shaken civilization. The exposure of the economic imbalance, the economic and transport vacuum of the region, the outflow of the population give a direct signal to mobilize all the forces of the state to restore the integral ties of Siberia with European Russia, and strengthen the country's defense capabilities on the northern and southeastern borders.

Huge expenditures of finance and business efforts will be required, and even if it is beyond our competence, we are not alone in decisive demands to overcome the skills of disposing of unrequited charity to the Russian “friends” to the Russian Federation, tightening control over financial transactions, and punishing embezzlers. Russia should remain worthy of Mikhail Lomonosov’s predictions that its strength will grow in Siberia. The Far North is a part of Russia that calls for careful and economic relations.

6. References
[1] Nazaretyan A P 2017 Nonlinear future (Moscow: Argamak-Media Press) p 508
[2] Shnajder A 2015 Northern Sea Route is a strategic project of the Russian Federation
[3] Melnichenko V M 2012 On the Ecology of Land Use in Taimyr Energiya: ekonomika, tekhnika, ekologiya vol 11 pp 63-67
[4] Tarasov A 2019 Extremists will be heated NG vol 73
[5] Korshunov E 2013 Attractive Arctic North of Russia in Naval and Economic Relations (SPb Politekhnika-servis) vol 2 chapter 2 p 520
[6] Tkachev V N and Sarvut T O 2016 Development of the Russian Arctic Vol 17 (Moscow: Science Review) pp 74-80
[7] Kobylkin D N, Levin B A, SHepit'ko T V 2014 Creating an Efficient Transport System in Russia’s Arctic Zone: Challenges and Prospects Mekhanizaciya stroitelstva vol 4 pp 4-7
[8] Kurilo O 2015 North is degraded without roads (Moscow: RBK Press) vol 214 pp 9
[9] Revzin G 2020 What will be more important - uniqueness or liquidity? (Moscow: Kommersant-Weekend Press) pp 20-21
[10] Ogorodnikov I A 2015 Housing and environmental issues Energiya: ekonomika, tekhnika, ekologiya vol 12 pp 61-65
[11] Milashechkina O N, Ezhova I K Energy saving buildings (Saratov: SGTU Press) p 76
[12] Etenko V P 2017 The evolution of architecture quality in Russia Yesterday Today Tomorrow (Moscow: Editus Press) p 432
[13] Tkachev V N, Sarvut T O 2019 Experience of translation of the mechanism of the theory of fractals to the principles of the development of the environment of the habitation of Siberia and Polarians Architecture and Construction of Russia vol 2 (230) pp 48-57