

THE ASSESSMENT OF SOCIO-ECONOMIC POTENTIAL DENSITY OF ARCTIC TERRITORIES IN RUSSIA

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Abstract

The socio-economic potential is an important indicator that systematically characterizes a specific territory with its economic specifics, as well as the opportunities for its future development. The article presents a methodology for assessing the density of social and economic potential. The integral index of the socio-economic potential density of the territory takes into account the basic spatial characteristics (indicators): The density of the population concentrated on a given territory, the volume of fixed assets, as well as the level of economic development, defined as the accumulated volume of gross production per area of the economically developed space. On the basis of this method the estimation of the density of social and economic potential of Russian Arctic territories was carried out, a rating was obtained and a classification was made. Allocated 5 density types of socio-economic potential: metropolitan and industrial; urban and industrial; mixed, mainly West-Central; mixed, mainly Western; peripheral.

Keywords: socio-economic potential, arctic territories, index, classification

JEL classification:

1. Introduction

Up to the beginning of the present century, the economic potential of territories was put into the center of research on the regional economy. It was believed that the positive correlation between the population welfare and macroeconomic indexes was close to the one (Borodkin & Ajvazyan, 2006). It was enough to use the quantitative macroeconomic indexes of the system of national bills in its absolute expression or per capita to characterize the life quality. With the conversion to the new theories of the society development, the necessity of people's satisfaction assessment (both with the material and non-material conditions of their lives, such as environment condition, safety, political freedom) appeared. When saying 'the economic potential of territories' scientist started to mean the ability to accomplish not only economic but also social tasks.

The concept of socio-economic potential appeared, somehow or other, in all economic theories, including the classical and neoclassical directions, and modern schools. Herewith, during a long time, the main attention was paid to the resource potential (finance, mineral, land resources, etc.), and only recently – to the non-material types of potential (institutional, innovational potential, etc.). The concept of socio-economic potential is quite broad and generalizing, so it can include plenty of particular potentials of the territorial natural-

economic systems. They can involve natural, human, technical, industrial, financial, infrastructural, innovational, scientific, recreational, ecological, institutional, and other types of potential. Anyhow, presently there is no unified approach to its determination and formalization of components. In this work, we will determine the socio-economic potential as an ability of the territorial nature and economic system to realize its activity and to support the long-term balanced development with the use of all resources diversity, which is concentrated in it.

The socio-economic potential is not an economic category only. Its territorial belonging, its connection with the certain unique space, which forms it and transforms it subsequently, also has special importance. In Russia plenty of scientists, geographers and economists are engaged in the assessment of socio-economic potential and its various aspects. This concept became widespread in the 50s of 20 century in USSR (in 1954 the scientist S. G. Strumilin determined the socio-economic potential as a “synthetic index”, which shows “the level of people’s welfare” (Shulayeva, 2015)).

Now, development and application of socio-economic potential assessment techniques are made in leading research and analytical organizations. The technique of determination of investment attractiveness of regions, which was made by the rating agency "Expert RA" (considering two parameters – the level of potential and risk), can be regarded as an example. The essence is that the investment potential (in the proportion of the potential of the whole country) and the investment risk (the average level of risk among country is taken per unit) are calculated in each region of Russia. When saying “investment potential”, the authors mean a quantitative characteristic, which considers the saturation of the countryside territory (nature resources, manpower, main funds, infrastructure, etc.), consumer demand and other indexes that impact on potential volumes of regional investment. The potential shows what part of the All-Russian market the region takes, and risk (what can be the problems like for investors in regions). The total potential consists of nine parts: labor, financial, industrial, consumer, institutional, infrastructural, nature and resource, touristic, innovational. The integral risk consists of six particular risks: financial, social, managerial, economic, ecological and criminal. The contribution of the each particular risk or potential to the final indicator is estimated basing on the quiz of the representatives of the expert, investment and bank communities (“Rating...”, 2012).

The group of scientists from Independent Institute for Social Policy (IISP) developed typologies of regions for some goals of social politics. The level of economic development in region, the economic state of households (statistical indicators – GRP, ratio of income to living wage and level of poverty) and development of the territory (statistical indicators – population density, which represents the degree of auspiciousness of climate, the type of economic use, infrastructure, etc.) were taken as basic differentiating features. In accordance with the given results, all the Russian regions were divided into the four types:

- "rich" and developed;
- "rich" and low-developed;
- "poor" and developed;
- "poor" and low-developed.

In the typology of regions, made by Gaidar Institute for Economic Policy (Boots et al., 2002; Barinova, 2015), authors distinguished three characteristics of the economic situation for Russian regions. It is necessary to consider the interregional differences when studying the question of economic development: population welfare, investment activity, economic potential. One of the key indicators to classify the regions by economic potential, was the ratio of GRP and GDP's temps of development, which characterize current economic state in the region in comparison with the state of Russian economic in general.

Russian Ministry of Economic Development made an order to the Council of a study of the Productive Forces, that invented a methodical approach, which allows making a classification of Russian regions by the degree of auspiciousness of their socio-economic state, (Grishkina, 2012). The authors put 16 facts in the base of calculation of the integral index of the socio-economic state of the region, that can be divided into four blocks:

- Reproductive process in a region;
- Innovational and infrastructural potential in a region;
- Investment and financial potential in a region;

State of social sphere in a region.

At the same time, authors suggest using the indicator of GRP's volume for one employee as the most representative assessment indicator of the general efficiency.

In the most cases the socio-economic potential, which is determined on the base of both particular and integral indexes, is calculated per capita. However, there is the range of society development and nature management problems that require some density characteristics, because its objective feature is unevenness of space spread.

The integral index of socio-economic potential density considers basic space characteristics (indicators): the density of concentrated population on the given territory, the volume of the main funds, and also the level of economic development, determined as accumulated volume of gross production per one of a figure of the economically developed area. The quantitative expression of "economically mastered space" is possible using the indicator of the area of built-up lands of the municipal formation. Thus, it is possible to obtain a real concentration of economic potential without considering weakly developed zones, which is especially important for the Arctic. In the work (Baburin et al., 2015) authors gave the unordinary technique of calculation of the density of socio-economic potential so that to realize the assessment of potential risks and natural disasters in the socio-economic area. This index allows estimating quantitatively the territory potential on the system mesolevel (if the region is regarded as a macro-system, then on a level of municipality). As a result of mathematical processing of chosen indicators, the ranking of municipalities was made according to the level of density of socio-economic potential of their territories, and the typology was made. If absolute values of index components allow estimating the economic scope in general, specific values demonstrate the features of their spread and degree of concentration, and also the interregional municipalities differentiation according to this characteristic.

2. Materials and methods.

As an information data source for the calculation of socio-economic potential's density index of the territory were used: databases of Russian Federal State Statistic Service (Rosstat) municipalities, databases of territorial organizations of federal statistic, multifunctional statistic portal "Multistat", annual reports about socio-economic development (from the websites of municipalities) and other resources. In Russian Federation municipal statistics is imperfect. That expressed by an absence of many important indicators, which are widely used on a regional level, by data incompleteness and by a low degree of objectivity for particular areas. All this limits the opportunities of municipal statistics application in researches and creates the necessity to introduce more assumptions. These circumstances were considered while developing the socio-economic potential density index of the territory. The population, value of main funds and gross product were chosen as main parameters.

Population involves consumers and workforce. Without any doubt, the population is inhomogeneous and the same population could possess different potential. It depends on many factors. Pitirim Sorokin had been writing about the importance of population quality. Assessing the population losses during the First World War in the article "Contemporary State of Russia", he noticed: "The system of any society, the perfection of its social life, the spiritual and material prosperity and, finally, its historical destinies, first of all, depend on the nature, features, and behavior of those who are the part of this society; careful research on the phenomena of rising and fall of entire nations shows that one of their causes was a sudden quality change of population contents in that or another direction" (Sorokin, 1992, p.188). Perhaps it would be more right to use the human capital instead of population, but today the calculation technique of this indicator is not perfect and could not give objective results. That is why the indicator of total population number on the 1st January of this year was chosen.

The cost of main funds can be considered as the indicator of the industrial potential as a material base for successful development of the regional economy. First of all, the main funds are a resource. I. M. Mayergoiz noticed that they are the measure of the economic strength and the base of current recreation process of the economic activity on the territory at the same time (Mayergoiz & Zhukov, 1973). The main funds are the productive assets, which are aimed to use them more than once or all the time during the long period (no less than one

year) for goods production, providing market and non-market services, for administrative needs or for transferring to other organizations for temporary possession and use or for temporary use for payment. For their assessment on the municipal level, it is reasonable to use the indicator of a cost of the municipal main funds (according to full reports value; millions of rubles).

As far as the indicator of gross product for the municipalities is not calculated by Rosstat, and, at the same time, there is no unified way to determine it, it is necessary to find other indicators that would demonstrate results of economic activity of territorial formation on the given territorial level. To these ends, it is suggested to use the indicator of municipalities gross production by the types of economic activity, provided with the statistic information and considered by Rosstat in sectoral structure of gross value added (GVA), and occupying the great part of it.

The gross production of municipalities is calculated as the sum of the next indicators:

1. Industrial production (the sum of three types of economic activity: electric energy, gas and water production and distribution; manufacturing activities and extraction of mineral resources);
2. Agricultural production;
3. The volume of paid services to the population;
4. Retail turnover (in actual prices).

To reduce the degree of the influence of municipalities main funds in a real socio-economic process, which make the part of 3-30 % of the total sum, it is necessary to introduce weight coefficients. Main funds can reach the higher-than-usual value in the most depressive subsidized areas and disfigure the final rating. In this regard, next weight coefficients were chosen: multiplying the 0,4 – for population and gross output and decreasing coefficient 0,2 – for main funds (according to experts' opinion).

Areas of economic activity, especially in Russian Arctic zone, have pronounced localization in space, that's why it is necessary to analyze the chosen economic indexes from the point of their connection with the land use of the particular territory. In this connection, while transferring parameters of the socio-economic potential index from the absolute to relative values, it is more reasonable to compare not per capita, but per area of municipalities. The statistical data about all the municipalities, made by Rosstat, allow to emphasize two categories of municipalities land: the land of agricultural appropriation (index "Area of farmland") and the land of residence (index "Total area of built-up land"), where the main socio-economic potential of these territories is concentrated. The indicators of the population and main funds should be referred to "Total area of built-up land", and the gross output – to the sum of indicators "Area of farmland" and "Total space of built-up land", if the part of agro-section in the economic structure of the region is high enough.

The next step is the conversion of index component specific value into dimensionless numbers. For this, we used the algorithm, suggested in the work (Tikunov, 1985). It involves the normalization of base values (1):

$$\hat{x}_{ij} = \frac{|x_{ij} - x_j^0|}{|\max/\min x - x_j^0|} \quad i=1, 2, 3, \dots, N; j=1, 2, 3, \dots, M \quad (1)$$

where \bar{x} - base values; x_j^0 - index values, fluctuations from which have the conceptual meaning of some optimum, this can be the worst or the best meanings or the best values of j index from the point of their influence (positive or negative) on the resulting integral estimation; $|\max/\min x|$ - are the values of base values, which differs most from x_j^0 ; n - the amount of evaluating territorial units, m - amount of used for the calculation indexes.

This normalization is given for the conversion of non-comparable indexes into the fluctuation from the best or the worst base value. Received meanings, as a result of normalization, are limited by the interval (0;1).

By means of comparison of all the territorial units with the condition of "the best" or "the worst" territorial unit, which have the meaning \bar{x}^c for all indexes, the ranking is made. It is made with the use of Euclidian distance \bar{d}^0 - as a remoteness degree of all territorial units

from the conditional unit. The application of this measure requires additional treatment of the data array according to the method of main components for index system orthogonalization.

Received values of evaluating column-vector characteristics \hat{d}^0 are additionally normalized according to the formula (2) for the convenience of next use and analysis:

$$\hat{d}_i^o = \frac{d_i^o - \min d^o}{\max d^o - \min d^o}, \quad i = 1, 2, 3, \dots, n. \tag{2}$$

After the normalization, the final values \hat{d}^0 vary in the limits from 0 (corresponds to the worst complex valuation) to 1 (corresponds to the best complex valuation).

Apart from the opportunity to rank the received index values, the used algorithm allows to emphasize the unified territory groups and to make their classification. It can be reached by dividing the Euclidian distances corresponding indexes into the one-type steps. Such procedure can have many variants, what allows to receive the whole range of territory grouping. The quality of dividing territories into groups should be estimated with the help of the coefficients of canonical correlation and also heterogeneity coefficients (Tikunov, 1997). This allows choosing one variant, final and the best from the statistical point of view.

3. Research results and discussion.

As a result of calculating procedures, the rating of the socio-economic potential density of Arctic territories was received. After that, the classification, consisting of 5 socio-economic potential types, was developed and mapped (Figure 1, Table 1).

Figure 1. Map of the types of economic exploration on the Arctic territories

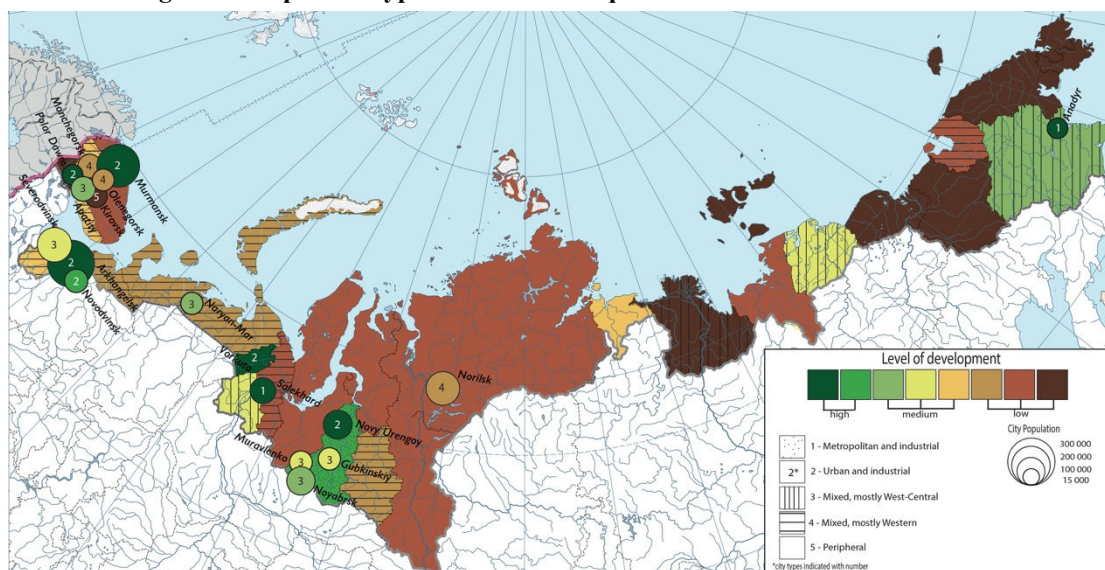


Table 1. The types of economic exploration on the Arctic territories.

The type and characteristics	Municipalities as parts of the type
Type 1: Metropolitan and industrial 1 subtype: metropolitan; 2 subtype: industrial	1 subtype: Salekhard city; Anadyr' city 2 subtype: Purovsky municipal area;
Type 2: Urban and industrial	Murmansk city; Polyarniye Zory city; Arkhangelsk city; Novodvinsk city; Vorkuta city; Novy Urengoy city
Type 3: Mixed, mostly West-Central 1 subtype: west-central, urban; 2 subtype: central-eastern	1 subtype: Apatity city; Severodvinsk city; Naryan-Mar city; Shuryshkarsky municipal area; Gubkinsky city; Labytanagy city; Muravlenko city; Noyabrsk city; 2 subtype: Shuryshkarsky municipal area; Allaihovskiy area; Anabarsky national area; Anadyrsky municipal area; Chaunsky municipal area
Type 4: Mixed, mostly Western	Kolsky municipal area; Tersky municipal area; Kovdorsky municipal area; Monchegorsk city; Olenegorsk city; Mezensky municipal area; Onezhsky municipal area; Novaya Zemlya; Zapolyarny municipal area; Krasnoselkupsky municipal area; Priuralsky municipal area;
Type 5: peripheral 1 subtype: peripheral with low level of economic potential; 2 subtype: peripheral with high level of economic potential	1 subtype: Nizhnekolymsky municipal area; Ust-Yansky municipal area; Providensky municipal area; Khandalakhsky municipal area; Lovozersky municipal area; Pechengsky municipal area; Kirovsk city; Primorsky municipal area; Turukhansky municipal area; Taimyrsky Dolgano-Nenetsky municipal area; Bulunsky municipal area; Bilibinsky municipal area; Iultinsky municipal area; Chukotsky municipal area 2 subtype: Nadymsky municipal area; Tazovsky municipal area; Yamalsky municipal area;

Type 1: metropolitan and industrial (1 subtype: metropolitan; 2 subtype: industrial). Municipalities that are included in this type, head the rating of the socio-economic potential density of the territory. On the one hand, this type includes two regional capitals of the Asian part of Russian Arctic – Salekhard and Anadyr, due to two factors: high absolute potential value and a small area of economically developed territory, which determines the high degree of the space concentration. On the other hand, this type includes Purovsky municipal area, which is the largest oil-and-gas-producing center of Yamalo-Nenetsky autonomous area (the part of gas-producing in the area makes 40 %, oil – about 90 %, gas-condensate – 66 %, from the total production in the area in 2015). It is important to notice that in industrial production volume Purovsky area almost doubles Norilsk, which follows it in the rating in this index.

Type 2: urban and industrial. This type is represented only by the cities, mostly of the European part of Russian Arctic zone. It includes regional capitals and largest (from the point of population and scale of the economy) cities: Murmansk, Arkhangelsk, Vorkuta, and also less crowded cities: Novodvinsk, Polyarniye Zory. Each of the three specific indicators in this taxon is higher than average; the population density per a unit of economically developed area reaches its maximum. It seems, for Norilsk it would be normal to belong to this category, however, it turned to be of another type (with lower density characteristics, type 4), because it has the spacious area of developed territory, namely – large industrial districts. The reason of Anadyr's non-inclusion is directly opposite: it turned to be in the category with maximal density characteristics because of low space).

Type 3: mixed, mostly West-Central (1 subtype: west-central, urban; 2 subtype: central-eastern). The most common for Russian Arctic zone municipalities are concentrated in this type because all aggregated indicators they have are close to average. In this type there are two sub-types, which are emphasized on the assumption of the features that cause each municipality inclusion in this type.

Concerning the first sub-type, the large and economically developed cities can be related to this group. They are Apatity, Severodvinsk, Naryan-Mar, Gubkinsky, Labytnangi, Muravlenko, Noyabrsk (“the second in importance” in its regions), that has quite high socio-economic potential.

On the contrary, the second sub-type is represented by less developed and most depressive rural areas. Their inclusion in this type of quite high-density values of socio-economic potential density can be explained mostly by the high values of main funds density. For instance, Shuryshansky area of Yamalo-Nenetsky autonomous area is one of the less urbanized and less economically developed in its region. The part of region's own income is the least among the area, what causes its dependence on subsidies. That's why the importance of municipal property funds is very high. The base values (population, gross production and main funds) in the Allaikhovsky area of Yakutiya have the lowest values among all the Arctic areas. Nevertheless, the degree of their concentration in space is quite high because of the absolute minimum of the built-up land space value. While calculating the specific indexes, this cause quite high (more than average) values. In Anabarsky area, where the main economic sphere is diamonds production, and in Anadyrsky municipal area, which specializes in the extraction of minerals and deer farming, the economic indicators are a bit higher, and low values of developed territory space make them closer to the average values.

Type 4: mixed, mostly Western. This type is represented mostly by the municipalities of the European part of Russian Arctic zone. In the most cases, typical density characteristics of the index components are lower than in average for the total number but higher than for type 5. On the one hand, this type includes the areas that possess quite high absolute values because of large industrial zones (Kovdorsky district of Murmanskaya area, Norilsk city, Zapolyarny district of Nenetsky autonomous area, etc.). On the other hand, there are less economically developed areas, where the minimal space of developed land provided high specific values of index components (Tersky district of Murmansk area, Arkhangelsky area's Novaya Zemlya, etc.).

Type 5: provincial (1 subtype: peripheral with low level of economic potential; 2 subtype: peripheral with high level of economic potential). The lowest density characteristics are common for this type (several times lower than in total number). Also, on the assumption of the main principle, which is based on the density method, we can emphasize 2 sub-types.

In the first sub-type there are the least developed peripheral municipal areas: Nizhnekolymsky, Ust-Yansky, Turuhansky, Chukotsky, Lovozersky, Iultinsky (make part of the last ten positions in the absolute value rating in the gross output value).

In the second sub-type, on the contrary, the most economically developed oil-and-gas-productive areas of Yamalo-Nenetsky autonomous area are concentrated. They are included in the first five municipalities in the absolute gross production: Nadymy, Tazovsky, Yamalsky areas. Their inclusion in the group determined by the calculation specificity: zones of agricultural appropriation, whose space reaches 90 % in this areas, are included in the space of developed land; also the space of built-up land is high, so the specific values are low. The reason of inclusion of Kandalashsky area and the city of Kirovsk of Murmansk area is also determined by the high space of built-up land (because of the large industrial zones), and by the homogeneous potential spreading among the territory.

4. Conclusion

The socio-economic potential is an important indicator, which characterizes the certain territory with its economic specificity, and also the opportunities for its development. Besides, on the grounds of socio-economic potential data, it is possible to make the comparison of different territory systems, both according to particular parameters and integral indexes, depending on the aims of the certain research.

The micro-geographical analysis of socio-economic potential density characteristics among the territory, which was made in this research, has shown that the more severe nature conditions are and territory development level is lower, the higher the level of heterogeneity is. This means that opportunities of using statistic models based on the ATD net get worse for its assessment. In accordance with that, the special technique, allowing to rationalize the

density method of socio-economic potential assessment, was made, at the expense of its comparison with the certain areas of nature-management types.

The approbation of the given technique on the level of Russian Arctic zone municipalities, made as a pilot step, has shown, that the high density of socio-economic potential, could characterize two different variants at the same time:

- high absolute potential, equally spread on the large agricultural zone;
- low potential, concentrated on the little space.

This important conclusion demonstrates the specificity of arctic territories development, which supposes in all the cases, except the cases of mineral extraction with the space character, the realization of productive force concentration on the limited spaces. One of the aspects of this conclusion is the variant of nature risks assessment, where, in the case of theoretical disaster, the most attackable territory is the territory where the socio-economic potential reaches the highest point of concentration (with the condition that its absolute values are low).

This is the platform for making strategic decisions in the conditions of global changes in nature and society.

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