Assessment of town-forming enterprises' economic sustainability for Karelia's monoteoms

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Abstract. Due to the possible inclusion of Kalevalsky National Municipal District, Segezhsky Municipal District and Kostomukshsky Urban Okrug of Republic of Karelia into the Arctic Zone of Russian Federation (AZRF), three monoteoms may be added into AZRF: Segezha, Nadvoitsy and Kostomuksha. Obviously, these monoteoms are entitled to receive additional benefits, preferences from the state. But what about the basic elements of a single-industry town, i.e. its town-forming enterprises? In order to answer this question, the authors investigate a population dynamics in monoteoms of Republic of Karelia and analyze the economic stability of urban enterprises and their share in formation of population incomes. The research has been done towards the monoteoms of the categories I and II, as there are no monoteoms of category III in Republic of Karelia. The article draws conclusions about the economic sustainability of Karelia's urban enterprises for the period 2012-2018.

1. Introduction
There are three categories of monoteoms in Russian Government's Resolution of July 29, 2014 #709 "On the criteria for categorizing the municipalities of Russian Federation as mono-profile (monotowns) and categories of mono-profile municipalities of Russian Federation (monotowns) depending on risks of deterioration of their socio-economic situation": I is the monoteoms with the most difficult socio-economic situation (including in relation to the problems of the town-forming organizations functioning); II is the monoteoms with the risks of deterioration of the socio-economic situation; III is the monoteoms with a stable socio-economic situation. At the same time, a city or a town of the urban type may be considered as a monotown.

Based on the foregoing, we designate the definition of economic sustainability of the town-forming enterprises (according to the single-industry towns of categories I, and II) as the goal of the research. To achieve the designated goal, we define the following tasks: 1) to analyze the dynamics of the population in single-industry towns of Karelia; 2) to analyze the economic condition of the town-forming enterprises of categories I, and II in Republic of Karelia; 3) to evaluate the economic sustainability of the town-forming enterprises of the single-industry towns of Karelia in categories I, and II.

The relevance of the research topic is growing in connection to the proposal of the Ministry of Russian Federation for the development of the Far East and the Arctic to include several Polar Regions of Karelia into AZRF, since the climate and the specifics of the economy of the territories meet the criteria of Russian Arctic.

2. Risks of deterioration for socio-economic situation by categories of the single-industry towns
Table 1 lists the risk criteria for each category of the single industry towns.

**Table 1.** Categories of single-industry towns of Russian Federation depending on the risks of deterioration of their socio-economic situation [1]

| Risks \ Categories of single-industry towns | I | II | III |
|---------------------------------------------|---|----|-----|
| 1 Production activities of the town-forming organization | Terminated or under bankruptcy proceedings | Is conducted | Is conducted |
| 2 The release of employees of the town-forming organization (from the average number of employees) | More than 10% | More than 3% expected | No excess of 3% |
| 3 Market / industry conditions | Unfavorable | Risks are present | Stable |
| 4 Unemployment rate | Two or more times the average in the Russian Federation | Above the average in the Russian Federation | Below the average in the Russian Federation |
| 5 Socio-economic situation | The most difficult | Is deteriorated | Stable |

Based on the analysis of the economic condition of the town-forming enterprises, which will be carried out according to a group of indicators: revenue from sales, net profit, net assets and aggregate indicators of risk (AIR) (values: low, medium, high), we shall evaluate the economic stability of the enterprises.

AIR is a cumulative assessment of analytical indicators: due diligence index (DDI), financial risk index (FRI), payment discipline index (PDI), and company status, which depends on three risk factors: 1) presence of information about beginning of the liquidation procedure of the company; 2) applying bankruptcy proceedings to the company; 3) company lacks of equity.

An DDI can have a value from 1 to 99, the higher value reflects the greater likelihood that the company was created not for statutory purposes and does not have significant own assets and operations.

An FRI can have a value from 1 to 99, the higher value indicates the presence of signs of unsatisfactory financial condition of the company, which may lead to loss of solvency.

PDI can range from 0 to 100, the lower value indicates the high risk of late payments.

Analysis of the economic condition of town-forming enterprises will be carried out according to the SPARK information system (http://www.spark-interfax.ru).

3. **Analysis of population dynamics in the single-industry towns of Republic of Karelia**

In Republic of Karelia, 11 settlements are assigned to the single-industry towns. Moreover, 6 single-industry towns are included in the category I (Table 2), and 5 single-industry towns are included in the category II (Table 3).

**Table 2.** Population in the single-industry towns of the category I of Republic of Karelia, people (according to Kareliastat)

| Name of settlement | Status | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 |
|--------------------|--------|------|------|------|------|------|------|------|------|
| Kondopoga          | Town   | 32415| 31962| 31646| 31501| 31203| 30802| 30299| 29735|
| Pitkyaranta        | Town   | 11245| 11089| 10945| 10751| 10705| 10589| 10479| 10307|
| Pudozh             | Town   | 9536 | 9408 | 9269 | 9183 | 9153 | 9044 | 8897 | 8718 |
Table 2 shows that in the first category of the single-industry towns the population in 2019 compared to 2012 decreased monotonously in each of them. The largest decrease in 2019 was recorded in the urban villages of Muyezersky (87.6% compared to 2012) and Nadvoitsy (89.0%). The smallest decrease over the reporting period was noted in the town of Suoyarvi (92.1%).

**Table 3.** Population in the single-industry towns of the category II of Republic of Karelia, people (according to Kareliastat)

| Name of settlement | Status    | 2012  | 2013  | 2014  | 2015  | 2016  | 2017  | 2018  | 2019  |
|--------------------|-----------|-------|-------|-------|-------|-------|-------|-------|-------|
| Suoyarvi           | Town      | 9531  | 9383  | 9270  | 9126  | 9076  | 9053  | 8920  | 8781  |
| Nadvoitsy          | Urban village | 8288  | 8166  | 8025  | 7964  | 7825  | 7690  | 7564  | 7380  |
| Muyezersky         | Urban village | 3216  | 3157  | 3034  | 2966  | 2926  | 2862  | 2816  | 2816  |

Table 3 shows that of all the single-industry towns of category II only in Kostomuksha in 2019 there was an increase in the population to the level of 2012 (103.1%), but the population also began to decline from 2018 to 2019: the population in 2017 was 103.6% of the level of 2012. In all other monotowns of category II the population decreased in 2019 compared to 2012. The greatest decline occurred in Segezha (90.3%).

“Modern urbanistics is based on advantages of cities, it is the major part of population who provide surroundings diversity as a symbol of innovative creative work”, as stated by Zamjat in N.Ju. and Piljasov A.N. [2]. Among examined Karelia’s towns (tables 2 and 3), according to current Russian urban settlements classification, were met only small (population below 20000) and middle (population up 20000 to 100000) towns. There are only 3 towns, Kondopoga, Kostomuksha Segezha, which are middle in size.

Some Karelia’s monotowns (Pudozh, Suoyarvi, Lahdenpohja, urban villages Muyezersky, Vyartsilya) are unsuited to no urban allotment criteria: “population in a town should be not less then 12000, while population in an urban village should be more 3000” [3]. Negative changes in the population dynamics of the single-industry towns indicate the existence of unresolved socio-economic problems, which may be connected to “remoteness from the main economic centers and underdeveloped transport infrastructure, with the strong dependence of municipal budgets on tax payments of town-forming enterprises, with an increase in wage arrears board, with a reduction in housing, ... using outdated technologies and in general fixed assets of the enterprises” [4].

As follows from the calculations, the results of which are presented in table 4, the total population of monotowns of Karelia is declining faster than the population of Karelia as a whole.

**Table 4.** Population in the Republic of Karelia and its single-industry towns

| Indicator \ Year | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 |
|------------------|------|------|------|------|------|------|------|------|
| Kostomuksha      | 28496| 28716| 29036| 29356| 29511| 29526| 29381| 29367|
| Segezha          | 29066| 28555| 28117| 27813| 27494| 27108| 26666| 26241|
| Lahdenpohja      | 7716 | 7667 | 7539 | 7512 | 7493 | 7449 | 7294 | 7158 |
| Pindushi         | 4524 | 4437 | 4536 | 4476 | 4473 | 4347 | 4331 | 4303 |
| Vyartsilya       | 3077 | 3035 | 3013 | 2964 | 2982 | 2970 | 2941 | 2974 |
| Indicator \ Year | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 |
|-----------------|------|------|------|------|------|------|------|------|
| The population of Republic of Karelia, people | 63968 | 63693 | 63440 | 63253 | 62987 | 62708 | 62248 | 61805 |
| including in single-industry towns | 14711 | 14557 | 14443 | 14361 | 14284 | 14144 | 13962 | 13778 |
| The share of the single-industry towns in the total population of Republic of Karelia, % | 23,0 | 22,9 | 22,8 | 22,7 | 22,7 | 22,6 | 22,4 | 22,3 |

4. Analysis of the economic sustainability of town-forming enterprises of the single-industry towns of Karelia

Single-industry towns of Karelia account for 63.9% of the republican output of industrial products [5].

The main factor in the stability of a single-industry town is its town-forming enterprise. This fact is confirmed by the work of foreign authors, such as Ehsani K., Tony K., Carlson L., Magill D., Green H., Brit D. [6].

The town-forming enterprise carries out production activities within the framework of which a substantial part of the population living in the territory of the single-industry town is provided with a job. In assessing the impact of existing town-forming enterprises on the socio-ecological and economic situation in single-industry towns, it is necessary to take into account that these enterprises bear social, environmental and economic responsibility to their residents. Therefore, town-forming enterprises are obliged to solve the problems of environmental degradation, public health and employment, etc.

Thus, in town-forming enterprises, three main functions can be identified:

- **economic** function involves ensuring the receipt of a significant amount of money into the town budget, including by paying taxes, since the volume of production can be half the volume of production of the single-industry town.

- **social** one involves providing residents of the single-industry town with a job, providing life (heat and light), providing cultural events (sports, libraries, cinemas).

- **ecological** one involves ensuring the health of the population through the use of advanced technologies for air and water purification in production (high-quality treatment facilities), reducing the environmental impact on the environment (planting a single-industry town) etc. [7].

Let us consider the dependence of the monotyp of Karelia on town-forming enterprises, which can be expressed as the share of town-forming enterprises in the formation of population incomes (Table 5).

**Table 5. The share of the town-forming enterprise in the formation of the population incomes of the single-industry towns of Karelia, %** [8]

| Name of settlement | 2012 | 2013 | 2014 | 2015 | 2016 |
|--------------------|------|------|------|------|------|
|                   | 2012 | 2013 | 2014 | 2015 | 2016 |
| Kondopoga         | 50,9 | 41,9 | 35,7 | 36,5 | 36,7 |
| Pitkyaranta       | 10,4 | 13,1 | 17,6 | 38,6 | 29,6 |
| Pudozh            | 4,7  | 4,2  | 2,6  | 4,3  | 4,0  |
| Suoyarvi          | 12,9 | 13,3 | 6,4  | 3,1  | 16,4 |
| Nadvoitsy         | 41,1 | 34,0 | 28,8 | 33,8 | 28,1 |
| Muyezersky        | 4,6  | 10,8 | 8,9  | 5,0  | 6,6  |

4
The calculations of N. Kolesnikova and other authors show that for the period 2012–2016 the role of the single-industry towns of category I in the formation of population incomes decreased as a whole. In the single-industry towns of category I it is necessary to consider two settlements: Suoyarvi and Kondopoga, as their town-forming enterprises have all three risk factors (see table 6). Table 5 shows that in 2012 the share of the town-forming enterprise “Kondopoga” OJSC amounted to more than half of the population incomes, but there was a drop to 35.7% by 2014. At present, “Kondopoga” OJSC has all three risk factors, which characterizes the company as economically unsustainable. The same can be applied to “Cardboard Factory Suoyarvi” CJSC. And the production activity of the town-forming enterprise was terminated in such companies as “Nadvoitsky Aluminum Plant” OJSC, “Pitkyaranta Pulp Mill” OJSC, “Pitkyaranta Pulp” LLC, “Pudozhsky LesPromHoz” LLC.

**Table 6. Economic sustainability of the town-forming enterprises in single-industry towns of category I, Republic of Karelia, by main type of production activity, level and risk factors for the period 2012–2018**

| Monotown  | Town-forming enterprises | Production activities / aggregate level of risk / risk factors | The main activity of the enterprise | Economic sustainability of the enterprise |
|-----------|--------------------------|-------------------------------------------------------------|-----------------------------------|------------------------------------------|
| Suoyarvi  | “Cardboard Factory Suoyarvi” CJSC | Conducted / AIR = high/ DDI = medium, FRI = high, PDI – not defined/ 1, 2, 3 – present | Paper and paperboard manufacturing | Unsustainable |
|           | “Zapkarelles” JSC | Conducted / AIR = medium / DDI = low, FRI = high, PDI – not defined 1, 2- NA, 3-present | Logging | Unsustainable |
| Kondopoga | “Kondopoga” OJSC | Conducted / AIR = high/ DDI = low, FRI = high, PDI – not defined/ 1, 2, 3 – present | Paper and paperboard manufacturing | Unsustainable |
| Muyezersky | “Muyezersky LesPromHoz” JSC | Conducted / AIR = medium / DDI = low, FRI = high, PDI – not defined 1,2, 3- NA, 3-present | Logging | Unsustainable |
| Nadvoitsy | “Nadvoitsky Aluminum Plant” OJSC | The company ceased operations upon merger in 2003 | | |
Let us analyze the economic sustainability of the town-forming enterprises of the single-industry towns of Suoyarvi and Kondopoga according to three indicators: sales revenue, net profit, net assets that determine the risk factors of the enterprise. The single-industry town of Suoyarvi has two town-forming enterprises: “Cardboard Factory Suoyarvi” CJSC and "Zapkarelles" JSC. Dynamics of indicators of economic activity of “Cardboard Factory Suoyarvi” CJSC for the period 2012–2018 presented in Figure 1. In addition to the sales revenue, two other indicators have negative values in 2012. Sales figures are positive, but negligible, and net income is negative in the period 2013–2018. Values of net assets have negative values for the period 2016–2018 (data for 2013–2015 not found). Thus, “Cardboard Factory Suoyarvi” CJSC has lost its economic function in relation to the single-industry town and is unsustainable.

**Figure 1.** Dynamics of indicators of economic activity of “Cardboard Factory Suoyarvi” CJSC, million rubles

Figure 2 shows dynamics of indicators of economic activity of “Zapkarelles” JSC for the period 2012–2018. The sales revenue is growing for the period 2012–2018, but the net income and net assets are negative for the period 2013–2017. “Zapkarelles” JSC is characterized as a more sustainable company compared to “Cardboard Factory Suoyarvi” CJSC, but taking into account the third risk factor, it is also an economically unsustainable.
Figure 2. Dynamics of indicators of economic activity of “Zapkarelles” JSC, million rubles

Figure 3 shows dynamics of indicators of economic activity of “Kondopoga” OJSC for the period 2012–2018. The sales revenue fluctuations are observed for the period 2012–2018, the value of the revenue fell almost two times in 2013, there was a noticeable increase by 2016, but the value of revenue fell to about the level of 2013 by 2018. The values of net profit and net assets are negative since 2016. The dynamics of the considered indicators illustrate the unsustainable activity of “Kondopoga” OJSC, which characterizes the company as economically unsustainable. Nevertheless, being in the bankruptcy stage, “Kondopoga Pulp and Paper Mill” (“Kondopoga” OJSC) currently produces almost 2 tons of newsprint per day [9].

Figure 3. The dynamics of the production activities’ results of “Kondopoga” OJSC, million rubles

The territory of Kondopoga was included in the list of territories of advanced social and economic development (TOSED) in 2017. Two residents (woodworking company “KLEZ-Astar” LLC and travel company “Karelia-Tour” LLC) entered the territory in 2018. There are wider opportunities for diversifying the economy of the single-industry town.

The town-forming enterprise “Muyezersky LesPromHoz” JSC has the positive values of sales, and negative net profit and net assets for the period 2012–2018, which together with the third risk factor defines the company as unsustainable.

“Nadvoitsky Aluminum Plant” OJSC, which was previously the town-forming enterprise of the single-industry town of Nadvoitsy, began to belong to “RUSAL” company in 2003, which announced its closure at the end of 2018. The territory of Nadvoitsy was included in the TOSED list in 2016. The only one resident (“Russian Radiator” LLC) came to the territory in 2017, which began to produce radiators by using capacity of the former town-forming enterprise.

According to Dmitriy Yu. Faykov, “if, for objective reasons, the town-forming enterprise is forced to significantly reduce the volume of activity, diversification is the best development path for the city.
As the current practice shows, TOSED are called upon and help to carry out not a “shock”, but a gradual diversification of the economy of the single-industry towns” [10].

We can conclude from an analysis of the sustainability of town-forming enterprises of the category I in the single-industry towns of Karelia that none of 8 town-forming enterprises are economically sustainable. In addition, 4 enterprises ceased their production activities as a town-forming element of the single-industry town (see Table 6).

Large town-forming enterprises of “Segezhsky Pulp and Paper Mill” OJSC, “Karelia Chipboard” JSC, “Karelsky Okatysh” OJSC in the single-industry towns of the category II have good results for a group of indicators: revenue from sales, net profit, net assets and aggregate indicators of risk (see. Table 7). The share of these enterprises in the formation of the population incomes has good indicators, which is growing steadily for Segezha, and they have insignificant fluctuations for Kostomuksha and Pindushi (see Table 5).

Town-forming enterprise “Vyartsilsky Hardware Plant” CJSC did not have any of the three risk categories for the period 2014–2016, but this company has a risk category III for the period 2016–2018, which, combined with the negative values of net profit and net assets for the same period, characterizes the company as economically unsustainable.

Thus, out of the 5 town-forming enterprises of category II under consideration, 3 are economically sustainable, 1 is economically unsustainable, and “Bumeks-Les” LLC enterprise was liquidated due to bankruptcy in 2018 (Table 7).

**Table 7.** Economic sustainability of town-forming enterprises in the single-industry towns of the category II for Republic of Karelia by main type of production activity, level and risk factors for the period 2012-2018

| Monotown      | Town-forming enterprise               | Production activities / aggregate level of risk / risk factors | Main type of production activity | Economic sustainability of the enterprise |
|---------------|--------------------------------------|---------------------------------------------------------------|----------------------------------|------------------------------------------|
| Segezha       | “Segezhsky Pulp and Paper Mill” OJSC | Conducted / AIR = low/ DDI = low, FRI = low, PDI – not defined 1,2,3 - NA | Pulp Production                  | Sustainable                              |
| Pindushi      | “Karelia Chipboard” JSC              | Conducted / AIR = low/ DDI = low, FRI = medium, PDI – not defined 1,2,3 - NA | Manufacture of plywood, wood veneered panels and wood-based panels | Sustainable                              |
| Kostomuksha   | “Karelsky Okatysh” OJSC              | Conducted / AIR = low/ DDI = low, FRI = medium, PDI – not defined 1,2,3 - NA | Opencast mining                  | Sustainable                              |
| Lahdenpohja   | “Bumeks-Les” LLC (microenterprise)   | The company was liquidated due to the bankruptcy of 2018        |                                  |                                          |
| Monotown | Town-forming enterprise | Production activities / aggregate level of risk / risk factors | Main type of production activity | Economic sustainability of the enterprise |
|----------|------------------------|---------------------------------------------------------------|---------------------------------|----------------------------------------|
| Vyartsilya | “Vyartsilsky Hardware Plant” CJSC (big enterprise) | Conducted / AIR = medium / DDI = low, FRI = high PDI – not defined 1,2, – NA 3 - present | Cold drawing wire production | Unsustainable |

5. Conclusion
Summing up the overall result of the research, we conclude that according to official “SPARK” information system data, out of 13 studied town-forming enterprises in the 11 single-industry towns of Karelia, only 3 enterprises belonging to the category II turned out to be economically sustainable. In total, there are 5 unsustainable town-forming enterprises, with 4 enterprises in the category I and 1 enterprise in the category II. There were 5 town-forming enterprises that terminated their activity, moreover, 4 enterprises in the category I and 1 enterprise in the category II.

In connection with the possible inclusion of Segezhsky municipal district and Kostomukshsky Urban Okrug of Republic of Karelia into the Arctic territory of Russia, three more single-industry towns can be added to it: Segezha, Nadvoitsy and Kostomuksha. It is natural that these single-industry towns may receive additional preferences from the state.

For additional references on the international Arctic Region single-industry town’s research see, for example, in [11].

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